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Review of the Literature Evaluating the Effect of Countermeasures to Reduce Alcohol Impaired Driving (1980–1989)

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Volume II—Individual Analyses and Assessments

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16. Abstract

This two-volume report documents the results of an extensive review and analysis of impact evaluations of alcohol-traffic crash countermeasures. Evaluations published since 1980 are covered by the review. Volume I presents a synthesis of the findings on the impact of three major classes of countermeasures: (1) restricting alcohol availability, (2) deterring and incapacitating drunk drivers, and (3) treating and rehabilitating drunk drivers. Volume II contains summaries of the assessments of individual evaluations.

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- Herbert M. Simpson, Traffic Injury Research Foundation of Canada;
- Evelyn R. Vingilis, Addiction Research Foundation;
- Robert B. Voas, National Public Service Research Institute, Inc.; and
- Allan F. Williams, Insurance Institute for Highway Safety.

This project required an-depth review of the evaluation studies that were identified during the course of the project. Drs. Perrine, Vingilis, Voas, and Williams assisted us in this review process, as did Donald W. Reinfurt and J. Richard Stewart of The University of North Carolina Highway Safety Research Center, and Hans C. Joksch of Mid-America. We appreciate all the work our reviewers put into this effort.

When we began this project, we contacted a number of researchers and practitioners in the alcohol safety field and in related fields and asked them to help us identify pertinent literature. So many responded that we do not have room to list them all here, but we are grateful for their help.

Other Mid-America staff who helped were Connie Wiliszowski, who was associated with the project as a research assistant, and Georgine Russell and Marie Ulwick, who helped in the report production.

We thank all who assisted.

Ralph K. Jones

John H. Lacey

CONTENTS

ACKNOWLEDGEMENT i

CONTENTS iii

AUTHOR INDEX v

INTRODUCTION 1

INDIVIDUAL ASSESSMENTS 3

AUTHOR INDEX

Adlaf, EM 95
Agent, KR 72
Albrecht, L 65
Argeriou, M 14
Arizona Department of Public Safety 3, 4
Ben-Arie, O 6
Beshai, N 7
Blefgen, H 52, 107
Bloch, SA 8
Blomberg, RD 9, 75, 76
Blose, JO 10
Blount, WR 11
Borok, LS 104
Brackett, RQ 12
Brown, DB 13
Brown, ME 14
Calderwood, R 15
California State Department of Motor Vehicles 15, 30, 31, 61, 71, 84, 103
Cameron, MH 16
Carnahan, T 12
Carraro, BA 35
Cave, TC 21
Chadwick, JR 44
Chung, L 108
Cochran, D 14
Colon, I 17-19
Cottrell, BH 21
Cutter, HS 19
Dowling, AM 40, 63
Drummond, AE 21
Eavy, PW 22
Edwards, M 22
Ellingstad, VS 69, 102
Epperlein, T 80
Epstein, L 98
Falkowski, CL 23
Felici, L 49
Fields, M 120
Florida Bureau of Public Safety Management 25
Frank, L 26

Geller, ES 82
George, GC 6
Grossman, M 86, 87
Gruenewald, P 98, 99
Hagen, RE 117
Hagge, RA 27
Haque, O 28
Harris, SS 117
Hause, JM 109
Healy, DJ 21
Heeren, T 96
Helander, CJ 30, 31
Hilton, ME 31
Holden, RT 33
Holder, HD 10
Hoskin, AF 35
Hoxie, P 35, 94
Hyle, P 65
Institute for Traffic Safety Management and Research 37, 39, 40, 63
Joksch, HC 41, 43
Jones, B 41, 42
Jones, RK 43, 45
Kadell, DJ 44
Karpf, RL 117
Klingberg, CL 44, 91
Klotzbier, E 49
Lacey, JH 43, 45, 47, 74, 75
Landrum, JW 68
Laurence, S 98
LeClair, DP 49
Lee-Gosselin, ME 22
Lei, H 107
Leland, LS 82
Levy, D 50, 51
Li, LK 74
Liban, CB 52
Lucke, RE 45
Lund, AK 120
Lynn, C 59, 60, 110
Maghsoodloo, S. 13
Maguin, E 92
Mangione, T 32, 96
Marchetti, LM 45, 47
Marsh, WC 27, 61
Marshall, PB 3
McCartt, AT 63

McCarty, D 14
McCleary, R 80
McConnell, EJ 27, 117
McKinnon, DP 63
McKnight, AJ 65
McLean, AJ 66
Meyers, A 32
Miles, SM 68
Minnesota House of Representatives Research Department 66, 67
Morelock, S 96
Mucatel, M 96
Murphy, PV 45, 47
Neff, RL 68
Nichols, JL 69, 102
O'Connell, JP 44
O'Day, J 118
Ogborne, AC 70
Paulsrude, SP 44, 89
Peck, RC 44, 71, 103, 104
Perrine, MW 85, 104
Pigman, JG 72
Popkin, CL 45, 47, 74, 75
Preusser, DF 9, 75, 76
Reis, RE 77
Rhodenizer, E 110
Robinson, CD 78
Ross, HL 78-81
Roth, T 98, 99
Ruschmann, PA 45
Russ, NW 82
Ryan, BE 83
Sadler, DD 84, 85
Saffer, H 86, 87
Salzberg, PM 44, 89, 91
Schmidt, HJ 43
Scotch, N 32, 96
Shea, D 51
Shore, ER 92
Skinner, D 35, 94
Smart, RG 70, 95
Smith, RA 96
Stewart, JR 45, 47, 74, 75, 97
Stewart, K 98, 99
Strang, PM 16
Struckman-Johnson, DL 69, 102
Swartz, L 6

Sykora, K 107
Tashima, HN 103
Temer, RG 104
U.S. Department of Transportation, NHTSA 105
Ulmer, RG 9, 75
Utah Highway Safety Division 106
Vasquez, JE 83
Vingilis, ER 52, 107, 108
Voas, RB 81, 109, 110
Votey, HL 111
Vulcan, AP 16
Wagenaar, AC 113, 114
Waller, PF 74
Walsh, BM 115
Weinberg, K 120
Weinstein, EB 69
Williams, AF 76, 116, 117
Williams, RL 27, 117
Windham, GO 68
Wolfe, AC 118
Womack, K 12
Womble, K 119
Woods, B 15
Woodward, JA 63
Yalung-Mathews, D 35
Zador, PL 76, 117, 120

INTRODUCTION

This report presents results of a research project performed by Mid-America Research Institute for the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-88-C-05126, entitled "Historical Documentation and Assessment of Existing Literature in the Field of Alcohol Traffic Safety Evaluation (1980-Present)." Mid-America was joined in this effort by the University of North Carolina Highway Safety Research Center (HSRC).

The objective of the project was to perform a comprehensive assessment of the traffic safety *impact* of drunk driving countermeasures in the United States. In addition, some related countermeasures implemented in other countries (particularly Canada and Australia) were examined to provide perspective or to fill gaps in U.S. evaluations. The assessment dealt with documents published during the period 1980-1989.

This volume contains a compendium of Mid-America's assessments of each individual countermeasure program. It is organized by author. Each assessment contains a complete bibliographic cite and each assessment is presented in a common format. The individual assessments are summarized and synthesized in Volume I of this report.

INDIVIDUAL ASSESSMENTS

Amick, DR; and Marshall, PB. (1984). An evaluation of the Bonneville County DUI accident prevention program (project safety). *Traffic Safety Evaluation Research Review* 3(3):7-21. (May 1984).

Description of the Countermeasure Program and its Operational Environment. Evaluates the effect of "an integrated systems approach" to DWI in Bonneville County, Idaho. The program, called Project Safety, began on October 1, 1979, and was evaluated over a 15-month period starting on that date. The program included a DWI STEP component, a probation and parole component, and a PI&E component. The enforcement component used two-man teams stressing nighttime / early morning enforcement at "high-DWI involvement." Also, more patrol vehicles, a "direct" breath testing instrument, and videotape equipment were purchased. Pre-sentence and probation staff were increased from two to five, and feedback was received on the status of offenders assigned to treatment. Inpatient and intermediate care services were provided "at the beginning of the project," and outpatient and educational services were also provided. The nature of these services was not described. The PI&E campaign included radio interviews of DWIs, TV interviews on DWI, news releases, booths at community events, and presentations at local high schools. Media coverage decreased substantially after the first six months of the project.

Definition of the Target Population. All potential DWIs in the county.

Research Design. Used a time series model with two control counties in Idaho. The impact measure was number of fatal and injury accidents occurring between 8:00 p.m. and 5:00 a.m. The time period examined was January 1975 through January 1981. Also used daytime fatal and injury accidents in the study counties and statewide as comparison series.

Statistical Methods. Used the Box-Jenkins method for analyzing the time series data. Use of this method appears to be appropriate.

Interpretation and Objectivity. Found that there was a significant reduction in nighttime injury accidents in Bonneville County ($p=.05$). The reduction started to occur one month after project inception, and amounted to 4.6 accidents per month compared to the pre-project level. Accidents in the one comparison county remained unchanged, and accidents in the other comparison county increased. Statewide accidents remained stable during the project period.

Arizona Department of Public Safety (1981). *An impact assessment of Arizona's lowered legal drinking age and a review of the previous research.* Phoenix, AZ: Arizona Department of Public Safety.

This paper consists of two definite parts: a review of the literature on drunk driving and the effect of lowering the drinking age; and an evaluation of the effect of the lowered drinking age in Arizona. This review deals only with the second part.

Description of the Countermeasure Program and its Operational Environment. This study does not deal with a countermeasure, but with the opposite of a countermeasure, that is the lowering of the legal drinking age. However, the findings should shed light on the potential effect of the corresponding countermeasure.

Definition of the Target Population. The measure studied is the lowering of the legal drinking age in Arizona from 21 to 19 on August 13, 1972. Thus, the most affectable group is drivers 19 and 20.

Research Design and Statistical Methods. The research design is interrupted time series analysis. Monthly data for Arizona, mostly from January 1960 through December 1980 was used. The following time series were studied: total traffic accidents, total injury producing accidents, total traffic injuries, total fatal accidents, total traffic fatalities, hard liquor sales, wine sales, and beer sales, and, for a limited time period, gasoline sales.

The statistical technique used is a Box-Jenkins autoregression time series analysis, studying each time series separately and including as an external factor only the intervention effect. The authors recognize another external disruption between late 1973 and early 1977, resulting from the 1973 oil embargo, and the imposition of the 55 mph speed limit in April 1974. They claim, "Our analysis again incorporated procedures to control for these events." Since they present the detailed models, one can see that the only control they perform is to run additional analysis for some time series covering only the period 1960 through October 1973.

Note that although the population affected are only drivers 19 and 20 years old due to limited availability of data, only data for all accidents involving all drivers could be studied. This is a very serious weakness of the study. It can easily invalidate the findings.

Interpretation and Objectivity. The authors found significant (at the 95% level) increases in total fatal accidents, total traffic fatalities, and beverage sales. For fatal accidents, they found an increase of 26.123%, for total fatalities 36.48%. These figures are suspiciously large.

The effects which the authors found do not seem to occur at the time of the intervention, but to be the result of changes in the trend, beginning a few years earlier. The only effect not readily explainable by this hypothesis is the rapid rise of fatal accidents and deaths late in 1973.

Asch, P; and Levy, DT. (1987). Does the minimum drinking age affect traffic fatalities? *Journal of Policy Analysis and Management* 6(2):180-192.

Description of the Countermeasure Program and its Operational Environment. The countermeasure examined is the raised legal minimum drinking age in states that have done so.

Definition of the Target Population. Drivers age 18 to 21 years.

Research Design. Asch and Levy performed a nationwide cross-sectional study for the year 1978, using logarithmic regression models. As dependent variables, they used fatality rates for 1) all fatal accidents, 2) single-vehicle fatal accidents, and 3) single-vehicle nighttime fatal accidents. The analyses of interest were restricted to drivers aged 18, 19, 20 and 21 years. The rates were the ratio of fatalities to the number of licensed drivers of the corresponding age, for each state.

Independent variables used were:

- Percentage of a state's highway mileage classified as "municipal";
- Average speed on rural interstate highways;
- Vehicle miles of travel divided by gasoline consumption (used as an indicator of vehicle size);
- Per capita personal income;
- Percentage of male licensed drivers;
- Percentage of licensed drivers aged 15 to 24 years;
- Absolute apparent alcohol consumption per person age 14 years and above;
- Minimum legal driving age with driver education;
- Minimum legal drinking age in 1978;
- The percentage of the state's driving population, aged 18 to 20 years, that legally could drink in 1978;

- A dummy variable indicating whether an age group was legally allowed to drink; and

- A dummy variable indicating whether an age group was in its first year of legal drinking.

Statistical Methods. See above.

Interpretation and Objectivity. To treat states as "observations", and to use certain total, average (per capita, for example), or percentage values for each state as dependent and independent variables, and perform regression analyses is a common econometric approach. The results, however, may be biased or even invalid, if not all factors having an effect are included.

The variables which Asch and Levy selected are known, or are likely to affect, traffic accidents and deaths. However, others which are known to have effects, or to be correlated with fatal accidents, were omitted.

The most obvious factor omitted by Asch and Levy is annual miles travelled per licensed driver. This figure ranges from 8,200 in New York to 15,000 in Wyoming. From this alone one should expect the fatal accident rate per driver to be higher in Wyoming than in New York.

Other researchers have used other independent variables that plausibly could have an influence on the traffic death rate (for example, an indicator of accessibility of medical care, or periodic motor vehicle inspection), or have strong empirical relations, e.g., the homicide rate and the non-traffic fatal accident rate.

Since the selection of variables by Asch and Levy is arbitrary, and since even for plausible factors inferior data were used, one cannot have complete confidence of the results of their regression analyses.

Ben-Arie, O; Swartz, L; and George, GC. (1986). The compulsory treatment of alcoholic drunken drivers referred by the courts: A 7 to 9 years outcome study. *International Journal of Law and Psychiatry* 8(2):229-235. (1986).

Description of the Countermeasure Program and its Operational Environment. This is a clinical study following 50 patients who were offered therapy as a condition for suspension of sentence for drunk driving. The basic question addressed is whether treatment under duress is effective in the long-term for recidivist alcoholic drunken drivers offered therapy as a condition of suspension of sentence.

Definition of the Target Population. Offending drivers in Cape Town, South Africa guilty of driving while under the influence of alcohol who were suspected of being alcoholics.

Research Design. This is not a statistical but a clinical study following the long-term drinking patterns of some 50 offenders convicted of DWI between January 28, 1974 and October 15, 1975. These offenders, who were diagnosed as alcoholic, were receiving treatment at an alcoholic unit with intensive follow-up as a part of a three-year suspended sentence. There is no non-treatment control group for comparison purposes. The goal is to look at the long-term (that is 7-9 years following conviction) effects of being referred to the treatment program given that the offender is judged to be an alcoholic. The success of the program is judged according to the before versus follow-up rating on a 4 point drinking pattern scale ranging from 1. continuously abstinent to 4. constant drinking.

Statistical Methods. No statistical analysis was applied in this study.

Interpretation and Objectivity. The authors conclude that the therapy for these alcoholics was effective in that 40 percent of the original 50 were generally sober. They conclude that the success of this coercive program stems from the threat of imprisonment; hospital staff showing special care to these patients; repeated court experiences having therapeutic effect; and there being regular outpatient treatments. Unfortunately, there is no non-treatment comparison group which would show how drinking patterns would have changed without intervention and so the conclusions reached by the authors are tentative at best.

Beshai, N. (1984). California DUI law: One year implementation. *Abstracts & Reviews in Alcohol and Driving* 5(3):11-19. (Jul 1984).

Description of the Countermeasure Program and its Operational Environment. An evaluation of California's 1982 drunk driving law (AB 541). The description of the law is cursory, and there is essentially no description of the operational environment.

Definition of the Target Population. Presumed to be all potential alcohol-impaired drivers. No breakdown is given of any driver populations targeted by the law or the evaluation.

Research Design. Used a before-and-after quasi-experimental design with no control group, a relatively weak design. Alcohol-involved accidents (not defined) per 100,000 population were the measure of effectiveness. These accident rates were computed for each of California's 58 counties, for one year before the passage of the law (1981), and one year after (1982).

Statistical Methods. Conducted paired t-tests for each of the 58 counties to determine whether the mean difference was significantly different from zero. Correlation coefficients were also calculated for some of the variables.

Interpretation and Objectivity. Found that the accident rate after the law was 282 compared to 315 before the law, which was significant at the .01 level. The decrease in number of accidents was correlated with the increase in number of DWI arrests. The author concluded from this that the study "supports the hypothesis that drinking driving behavior improved consequent to the implementation of the DUI law." The design of the study was too weak to support this conclusion.

Bloch, SA; Aizenberg, RA; and Davis, CC. (1985). *Drinking and driving treatment: A study of 15 first and multiple offender programs in Los Angeles County.* Automobile Club of Southern California.

Description of the Countermeasure Program and its Operational Environment. The primary objective of this study was to examine the major components of DUI treatment programs in Los Angeles County including screening and monitoring processes, referral capacities, alcohol education and counseling orientations and strategies, and client populations. Also of interest was to assess the degree to which these programs complied with government regulations.

Definition of the Target Population. The target population was residents of Los Angeles County involved in drunk driving rehabilitation programs, either as first offenders or as multiple offenders.

Research Design. This is *not* a research study but a descriptive study of 15 "typical" DUI rehabilitation programs in Los Angeles County. After selecting 15 DUI programs using a purposive sampling design to represent a wide range of program types, a number of areas were examined for each of the 15 programs. These areas included (1) client diagnostic screenings; (2) client monitoring and referral; (3) program strategies and (4) client composition.

Statistical Methods. As this is a descriptive statistical study, the methodology consists primarily of presenting a series of tables showing the breakdown of the 15 programs across a number of variables such as estimated percentage of clients screened by treatment programs or usage of formal diagnostic screening tests, etc. The only test statistics that were used are minimal, namely to show that the non-random sample is at least representative of the client population served in this area. Also, the proportion of females in the 15 programs was not statistically different from all programs in the county.

Interpretation and Objectivity. The conclusion basically summarized the results of a host of tables with respect to each of the four major study areas namely: diagnostic screenings; client monitoring and referral; program strategies; and

client composition. The bottom line conclusion is that, as of the time when the report was written, the data suggest a high degree of compliance of these 15 programs with respect to the existing standards.

Blomberg, RD; Preusser, DF; and Ulmer, RG. (1987). *Deterrent effects for mandatory license suspension for DWI conviction.* Washington, DC: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. Examined the specific and general deterrence effects of Wisconsin's 1982 law mandating three to six month license suspensions for first-time convicted drinking drivers. The law went into effect in May, 1982. Other provisions of the law included: a .10% illegal *per se* feature; possible vehicle impoundment for driving while under suspension; a $150 surcharge on the fine; and a provision discouraging plea bargaining. The effect of the law was studied both statewide and within Milwaukee County where a PI&E campaign supported by this project was conducted. Detailed descriptive data are provided for Milwaukee County and Brown County, which was used as a comparison jurisdiction.

Definition of the Target Population. All drunk drivers and potential drunk drivers. Characteristics are provided for the driving population in Milwaukee County and Brown County, which had no PI&E program.

Research Design. The analysis of accident data used time series of a surrogate of alcohol-related accidents: single-vehicle injury and fatal accidents involving male drivers which occurred between 10:00 p.m. and 4:59 a.m. on Thursday, Friday, or Saturday nights. A comparison series excluding single-vehicle injury and fatal accidents occurring between 10:00 p.m. and 4:59 a.m. from all Wisconsin accidents was used to control for reporting changes and trends. No comparisons were made with other states not having the intervention, but comparisons were made between Milwaukee County and Brown County to determine the effect of the PI&E campaign.

The analysis of the effect of the law on subsequent accidents and DWI convictions dealt with four groups of drivers. Group 1 had a DWI conviction during the period May 1, 1980 to April 30, 1980 (pre-law), but none during the previous one-year period. Group 2 had a DWI conviction during the period May 1, 1981 to April 30, 1982 (post-law), but none during the previous one-year period. Two comparison groups of drivers with moving violations in the pre-law and post-law periods, respectively, and no DWIs in the previous year and moving violations in their respective prior year were also studied. The analysis dealt with the number of accidents / convictions that had occurred one year after the index conviction.

Statistical Methods. Used Box-Jenkins techniques for analyzing the accident data. The recidivism analysis used an older SAS procedure (PHGLM) which

is quite adequate for the analysis. Data for the comparison groups of drivers described above were used to control for possible differences in enforcement / adjudication and crash likelihood in the pre-law and post-law periods.

Interpretation and Objectivity. Concluded that the change in the law was associated with a reduction in alcohol crashes (as defined in the study) of about 110 per month statewide, and about 10 per month in Milwaukee. These reductions suggested a drop in alcohol-related crashes of about 25%. The authors thought that the media campaign may have produced a reduction of another 15% in Milwaukee which occurred during the first four months of the campaign. The credibility of these findings is lessened by the absence of a comparison state or of any Wisconsin series directly reflecting economic conditions.

The study also found that the new law reduced DWI recidivism and subsequent accidents in Wisconsin. The weighted reduction in recidivism amounted to about 0.7% (6.1% to 5.4%), and the weighted reduction in injury and fatal crashes was about 0.6% (2.7% to 2.1%).

Blose, JO; and Holder, HD. (1987). Liquor-by-the-drink and alcohol-related traffic crashes: A natural experiment using time-series analysis. *Journal of Studies on Alcohol* 48(1):52-60. (1987).

Description of the Countermeasure Program and its Operational Environment. Before 1978, restaurants and clubs in North Carolina could sell only beer and wine for on-premise consumption; however, patrons could bring their own liquor and consume it. Since 1978, counties and cities could hold referendums to allow sale of liquor by the drink in licensed establishments. Several counties allowed this in 1978 and 1979. The authors studied the accident experience in these counties and in control counties to determine any effect of the opportunity to buy liquor by the drink.

Definition of the Target Population. All drivers 21 or older in the affected counties. Drivers under 21 are not affected because the minimum drinking age for liquor was 21 years (18 for beer and wine).

Research Design and Statistical Methods. A very elaborate research design was used. Two groups of counties were studied. One which issued permits in November, 1978 and another which began issuing permits beginning in January, 1979 until March, 1979. Other counties were not included because they issued permits at different times, or only a few permits. For each of the included counties, a matched control county which did not permit liquor by the drink was selected on the basis of population changes and per capita income changes.

Two dependent variables were used. Accidents where the police indicated that a driver had been drinking and single-vehicle nighttime accidents by males 21

or older, the latter as a proxy for accidents involving alcohol (restriction to fatal accidents was not possible because of low case numbers). As a control variable, the latter was used for drivers under 21 years who should not have been affected by the change in law.

Box-Jenkins ARIMA models were fitted to the logarithms of the data for the period 1973 through 1982. The models for the two groups of treatment counties show significant intervention effects for both dependent variables, and none for the control variable. As a second step, the times of assumed intervention effects were exchanged: January, 1979 for the first group of counties; and November, 1978 for the second group of counties. Then the coefficients of the intervention effects became either non-significant, or the fit of the models much worse. This supports the conclusion that the intervention effects appear at the expected times.

The control groups of accidents (drivers under 21 years) showed no intervention effect. The control counties for treatment group 2 did show a significant change in HBD accidents, but not in SVNMO accidents. None of the control counties showed a significant intervention effect for accidents of drivers under 21.

Though the methods are very sophisticated, one can have some doubts whether they are adequate. Six figures show monthly data, and moving averages which exhibit certain patterns. SVNMY accidents in both treatment counties showed a reversal of the time trend around the time of the intervention. HBD in treatment group 2 shows also a slight reversal, in addition to an intervention effect. A simple ARIMA model can not represent such reversals. The author should have shown how well the models represented the actual data, and not only discussed the correlation coefficients.

Interpretation and Objectivity. The two sets of treatment counties showed increases of HBD accidents by 17% and 24%, the comparison counties 9% and 15%. SVNMO accidents showed increases of 14% and 16% in the treatment counties, practically nothing in the comparison counties. The design of the study is as powerful as practically possible. There are some subjective elements in the omission of certain treatment counties and the selection of the control counties. However, it does not appear that this should bias the findings.

The authors present and discuss the findings in a realistic manner and with the necessary caveats.

Blount, WR. (1983). *The effect of drinking driver rehabilitation efforts on rearrests when drinker type is controlled. August 15-16, 1983. San Diego,* Falls Church, VA: AAA Foundation for Traffic Safety. 22-37.

Description of the Countermeasure Program and its Operational Environment. Evaluated several different rehabilitation programs conducted by an organization in Hillsborough County and Pinellas County, Florida. Attempted to identify problem drinkers and social drinkers prior to assignment to the various treatments. Also attempted random assignment to the programs through agreements with judges. Those found to be social drinkers were assigned to either a "read only control" group and given a series of materials to read at home, or to a DWI school and social-drinker class modeled after the "Phoenix Plan" of Stewart and Malfetti. The course consisted of four 2-1/2 hour sessions given at the rate of one session per week. About 20 students attended each class. The problem drinkers were assigned either to a read only control group; a DWI school (apparently similar to the DWI school for social drinkers with same number and length of sessions) and problem-drinker class (with factual material similar to that used in the social drinker class, but with emphasis on different topics); or a group which added group therapy (five months at one hour per week) to the DWI school / problem-drinker class.

Definition of the Target Population. The two groups (social and problem drinkers) were described in some detail with breakdowns by age, sex, and BAC at time of arrest. Comparisons were made between groups with respect to subject characteristics, treatment assignments, and course completion, with essentially no significant differences emerging. For example, program completers in the various groups had about the same characteristics as non-completers.

Research Design. See above. DWI arrest recidivism was tracked for up to 18 months from assignment and / or completion.

Statistical Methods. Used a survival analysis approach for analyzing recidivism. Method for determining the significance of differences in recidivism was not discussed.

Interpretation and Objectivity. Concluded that drinking driving behavior seems to have been changed for both the social drinker and the problem drinkers. For the social drinker group, the data suggest that the treatment reduced 18-month recidivism by 35%, from .121 to .079 ($p = .01$). For problem drinkers, the group completing DWI school + class + group therapy had an 18-month recidivism rate of .060 compared to .145 for the control group (no level of significance indicated). However, only 55% of the problem drinkers assigned to the two treatments completed their treatment.

Brackett, RQ; Carnahan, T; and Womack, K. (1983). *Evaluation of DWI enforcement activities in 1983.* College Station, TX: Texas Transportation Institute.

Description of the Countermeasure Program and its Operational Environment. This study is an evaluation of Selective Traffic Law Enforcement Programs (STEP) carried out in 18 rural counties of Texas in 1983. The evaluation

contains both an administrative component and an impact evaluation based on DWI accidents, single vehicle accidents, and all accident occurrences.

Definition of the Target Population. Drunk drivers in the 18 counties.

Research Design. A DWI accident overrepresentation index was developed and its value calculated from 1982 data. This index was used to select the 18 study counties. The exact selection process is not given. DWI, single vehicle, and total accidents occurring during June, July, and August 1983 were compared with those occurring in the same months in 1982, for the 18 STEP counties and statewide. The administrative evaluation involved comparing enforcement hours, citation rate, and conviction rates with the corresponding target values.

Statistical Methods. No statistical tests were presented.

Interpretation and Objectivity. Accidents generally increased in the STEP counties in 1983 relative to 1982. The increases, however, were much lower than statewide (e.g., 10 percent vs. 50 percent). This suggests positive benefits from the programs. In view of the county selection process, and the fact that historical data prior to 1982 was not presented, it is difficult to estimate what the expected accident experience in the 18 counties should have been. Thus, counties with high accident indices for a given year might be expected to have lower indices in another year. It is not clear how much of the estimated effect might be due to regression.

Brown, DB; and Maghsoodloo, S. (1981). A study of alcohol involvement in young driver accidents with the lowering of the legal age of drinking in Alabama. *Accident Analysis and Prevention* 13(4):319-322.

Description of the Countermeasure Program and its Operational Environment. Examined the highway safety effect of *reducing* the legal drinking age in Alabama from 21 to 19 years.

Definition of the Target Population. The evaluation dealt with the effects of the drinking age rollback on drivers in the 18 to 20 age group.

Research Design. The study involved a before-and-after analysis of single-vehicle accidents in Alabama. "Before" was defined as 1972-1974, and "after" was 1976-1979. The accidents were divided into two groups, an alcohol-related group and a non-alcohol related group. Single-vehicle accidents were classified as alcohol-related if so indicated in the police accident report, or if BAC was positive. The percentage of 18-20 drivers in the alcohol-related group was compared with the percentage in the non-alcohol-related group, before and after the reduction in drinking age.

Statistical Methods. Relied mainly on chi-square tests comparing various combinations of the categories described above, for example, alcohol-related compared to non-alcohol-related in the before period, alcohol-related compared to non-alcohol-related in the after period, and alcohol-related compared to non-alcohol-related in each of the study years. The statistical aspects of this paper were discussed by Koch as part of the paper "Commentary on statistical issues underlying the evaluation of a social policy change on motor vehicle accident involvement," *Accident Analysis and Prevention*, 13(4), pp 323-329. Concerning this study, Koch points out that the total number of single vehicle fatal accidents for the affected age group after 1975 did increase essentially the same as for other age groups (16-17, 21-25, 26-35, and over 60). The relative increase in the proportion of alcohol related accidents for the 18-20 group after 1975 could be due to either more drinking, without an increase in the risk of getting into a fatal single vehicle accident, or due to a change in alcohol reporting by investigating officers, an explanation which Brown and Maghsoodloo seem to dismiss.

Interpretation and Objectivity. On the basis of the statistical tests, the study concluded that a statistically significant increase in alcohol-related single-vehicle accidents occurred after the drinking age was lowered from 21 to 19 in Alabama. Other hypotheses for this increase were not explored in any depth. Koch's discussion of statistical aspects of the study should be a warning against taking the findings of the study as more than suggestive of an effect.

Brown, ME; Cochran, D; Argeriou, M; and McCarty, D. (1984). *An evaluation of drunk driving in Massachusetts under Chapter 373, Acts of 1982.* Boston, MA: Massachusetts Trial Court.

Description of the Countermeasure and its Operational Environment. This is a process evaluation of Chapter 373 which pertains to the court practices and penalties of Driving Under the Influence of Liquor (DUIL).

Target Population. Arrestees for DUIL.

Research Design. A sample of drunk driving case records were obtained in March and April of 1983. The disposition of these cases was compared with similar dispositions in 1973, 1976, and 1981. Guilty findings increased dramatically in 1983 and continued Without Finding cases decreased correspondingly. Profiles of drunk driving defendants with respect to age, sex, and prior DUIL arraignments were also developed.

Statistical Methods. No statistical analysis was applied to the process evaluation. chi-square tests were used to compare age, sex, and prior DUIL distributions in developing the drunk driving defendants profiles.

Conclusions and Interpretations. Changes in the DUIL dispositions were in the direction intended by Chapter 373, though few comments were made concerning the absolute magnitudes (e.g., in 1983 still 50 percent were Continued Without Finding).

Calderwood, R; and Woods, B. (1983). Impact evaluation of the breath alcohol testing mobile units (BAT mobiles) in Albuquerque, New Mexico. *Traffic Safety Evaluation Research Review* 2(4):21-35.

Description of the Countermeasure Program and its Operational Environment. Evaluates the impact of the Albuquerque Breath Alcohol Testing Mobile Units (BAT Mobiles) program on alcohol-related crashes. Two such units were operational in that city, the first beginning in April, 1979, and the second beginning in June, 1981. Provides an excellent, detailed description of the operation of the BAT mobile squad and its effects on drunk-driver total processing time and the time required for patrol officers to process an arrested drunk driver.

Definition of the Target Population. All drunk drivers and potential drunk drivers. No characteristics are provided.

Research Design. Used an interrupted multiple-time series design analyzing Wednesday-Saturday, nighttime fatal-plus-injury, accidents over a period of 10 years (1972-1981). This measure was transformed to a rate per gallon of gasoline sold to account for possible changes in VMT that could confound the analysis. Control series included those consisting of equivalent daytime rates in Albuquerque, and of rates in Santa Fe and Farmington, and the combined rates of other statewide urban areas of New Mexico. Gasoline sales were obtained from state tax records.

Statistical Methods. Used an ARIMA model. Usage appears appropriate, but more detail could have been provided.

Interpretation and Objectivity. Concludes that the program reduced alcohol-related accidents, but had insufficient data to estimate the amount of the reduction. Mentions other drunk-driving related activities in the test jurisdictions that could have contributed to the effect.

California State Department of Motor Vehicles (1986). *An evaluation of the impact of a warning letter for first time DUI offenders. Volume 6: An evaluation of the California drunk driving countermeasure system. (Final report).* Sacramento: California State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. The California DMV conducted this analysis to determine whether warning letters and informational materials could successfully augment other DUI

countermeasure efforts, resulting in reductions in subsequent accident and DUI recidivism rates. Two issues were addressed: frequency of mailing and type of warning letter. Exhibits of the warning letters were provided.

Definition of the Target Population. All drivers convicted of a first offense DWI (no priors for the past five years). The sample contained only drivers over the age of 21 with a valid California license.

Research Design. Treatment plus control groups with "quasi-random" assignment adjusted for covariates. The design was not completely random because of the necessity to select different treatment groups at different times. However, the time period over which all the groups were selected was only 4 1/2 months. There were three treatment groups: NOTS Group, which received the standard warning letter that had been used in the past; Experimental Group I, which received one mailing of the experimental warning letter; and Experimental Group II, which received two mailings (separated by seven to 12 weeks) of the experimental letter.

Statistical Methods. For the frequency-of-mailing analysis, used a 2x2 factorial analysis of covariance as implemented in the SPSS MANOVA procedure. The two factors were frequency of contact (1 or 2) and selection time period (2 or 3). For the type-of-letter analysis, used a 3x3 incomplete-design factorial analysis of covariance (SPSS MANOVA procedure). The factors were type of warning letter (NOTS, experimental, or control) and time period (1, 2, or 3).

Interpretation and Objectivity. Warning letters were found to provide no significant reduction in accidents or convictions for DUI offenders. Neither the frequency of mailing nor the type of warning letter appeared to make any difference. It was recommended that none of the letters studied be implemented.

Cameron, MH; Strang, PM; and Vulcan, AP. (1981). Evaluation of random breath testing in Victoria, Australia. In: *Alcohol, Drugs and Traffic. Volume III of the 8th international conference. Proceedings. June 15-19, 1980. Stockholm, Sweden.* Stockholm, Sweden: Almqvist & Wiksell International. 1364-1381.

Description of the Countermeasure Program and its Operational Environment. The countermeasure program whose effect on alcohol-related crashes was evaluated with the use of short-term (2 week) intensified "random" breath testing (RBT) in various "non-overlapping" sectors of Melbourne, Australia. Other possible factors that might have affected the dependent variables, Melbourne-wide publicity and a petrol drivers' strike that may have reduced driving due to fuel shortages, are briefly mentioned. No other countermeasures are mentioned.

Definition of the Target Population. The target population is not clearly identified, but appears to be anyone who drove in Melbourne, Australia, between the hours of 8 p.m. and 4 a.m. on Thursday, Friday and Saturday nights from late October through early December. Some analyses look at the entire Melbourne metropolitan area, others examine only the regions of the city specifically targeted by the increased RBT activities.

Research Design. Effectiveness of RBT was measured in several ways. *First*, the number of fatalities during the intensified RBT weeks (and 2 subsequent weeks) was compared with the number during the same period of the previous year. There was a substantial reduction, but this cannot be clearly attributed to the program, since historical differences between the years are not controlled by this design. This problem is ameliorated *somewhat* by the use of "control weeks" during which no RBT was conducted during either year, and during which there was no noteworthy difference in fatalities across time. *Second*, the number of serious casualty accidents (those that resulted in a fatality or a hospitalization) was compared between sectors of Melbourne exposed to intensified RBT and those not, or not yet, exposed. Some comparisons showed a reduction, while others did not (the authors do offer a reasonable, though largely hypothetical, explanation for these somewhat inconsistent findings). *Third*, hospital BAC records were matched with police accident reports to determine whether the proportion of driver casualties with BAC above .05% decreased. Again the results were somewhat inconsistent, but generally appeared to indicate that RBT did reduce the proportion of drivers killed who had a BAC greater than .05%. Extreme caution is necessary when considering this result, however, since *only 55% of drivers who were killed or taken to a hospital* could be matched with hospital BAC measurements. *Finally*, effects of RBT on perceived risk of detection were examined.

Statistical Methods. Statistical tests consisted almost exclusively of simple tests for difference of proportions.

Interpretation and Objectivity. As described in the section above, the analysis indicated that, in general, the implementation of RBT resulted in decreases in impaired driving behavior.

Colon, I. (1984). The alcohol beverage purchase age and single-vehicle highway fatalities. *Journal of Safety Research* 15(4):159-162.

Description of the Countermeasure Program and its Operational Environment. Countermeasures studied are: 1) state monopoly on alcohol distribution; and 2) the frequency of package stores of retail outlets per capita. Both are not primarily intended as countermeasures against DWI, but they may have effects on it.

Definition of the Target Population. Study population is the entire population of the U.S. in 1976.

Research Design. Research design is a cross-sectional study of the 50 states and DC. Dependent variable is the fatality rate in single motor vehicle accidents (from FARS) per licensed driver. Independent variables are: 1) the percentage of a state's population being in metropolitan areas; 2) the logarithms of the percentage of male drivers; 3) average annual miles driven per driver; 4) package stores or retail outlets per capita; and 5) state monopoly on alcohol distribution represented by a 0/1 variable. The author mentions an additional analysis where per capita consumption of distilled spirits was added to the independent variables, but turned out to be insignificant.

Statistical Methods. The author uses multiple regression analysis to estimate the effect of the independent variables. Regression analysis is a suitable technique for detecting the influence of factors only if all, or at least all factors with a noticeable influence, are included. If not included, factors are correlated with the included factors, their coefficients can be seriously, even catastrophically biased by the omission. In this case, the selection of independent variables appears arbitrary.

Interpretation and Objectivity. The author concludes that "restriction of curtailment of retail outlet frequency can not be carried out dogmatically or mechanically. A point of diminishing return is reached when outlet frequency goes just beyond one per 1,000 for the drinking age population. One explanation is that people tend to drive further to make their purchases when outlets are sparsely located." One cannot have complete confidence in the first conclusion because the analysis is not sufficiently sophisticated to support it and the second conclusion is more a speculative hypothesis than a conclusion.

Colon, I. (1983). County-level prohibition and alcohol-related fatal motor vehicle accidents. *Journal of Safety Research* 14(3):101-104.

Description of the Countermeasure and its Operational Environment. This is a study of the traffic safety effects of a legal environment in which it is illegal to sell beverage alcohol. In the United States, this appears on a county level and in this study fatal crash rates in states with dry counties are examined.

Definition of the Target Population. All drivers in jurisdictions where serving of beverage alcohol is prohibited.

Research Design and Statistical Methods. The author studies the effects of county-level prohibition of alcohol sales. He identifies 15 states which in 1976 contained "dry" counties. The percentages of the states' population recording in the dry counties ranged from 0.1% to 42.2%. The author uses FARS figures for total traffic fatalities, single vehicle fatalities, number of licensed drivers, and

total miles driven. He aggregates data for the 15 "dry" states (without regard to the fact that states where only 0.1%, 0.4%, or 1.4% of the population live in dry counties can hardly be considered "dry"), and for the other states.

Interpretation and Objectivity. The author compares the fatality rate per licensed driver for the dry and for the wet states, and finds a significantly higher rate for the "dry" states. Similarly, he compares the rates for single vehicle fatalities and finds again a significantly higher rate for "dry" states. He recognizes that dry states tend to be more rural than wet states, and that annual miles per driver are higher in them. To account for this, he also compares fatality rates per mile driven. In both cases, he finds again significantly higher rates for the dry states than for the wet states.

He found that "constant support was found for the hypothesis that dry areas have higher motor vehicle fatality rates than wet areas." If the total motor vehicle fatality rate for drivers in the wet states had been projected for drivers in the dry states, there would have been only 12,445 deaths instead of 15,540. However, the difference can not be attributed solely to county prohibition. A tentative hypothesis suggested by the data is that drinkers in dry counties drive to neighboring counties and states to purchase alcoholic beverages. They thereby increase their accident risk through added driving and through driving under the influence when purchases are made in taverns. This hypothesis is tentative.

A potential flaw in the analysis is to combine states with as few as 0.1%, 0.4%, 1.4% and other low percentages of the population living in dry counties with states where 26.9%, 28.6%, 31.2%, 42.2% of the population live in them, into one group and contrast them with "wet" states.

Colon, I; and Cutter, HS. (1983). The relationship of beer consumption and state alcohol and motor vehicle policies to fatal accidents. *Journal of Safety Research* 14(2):83-89.

Description of the Countermeasure Program and its Operational Environment. This study examines the effect of several alcohol availability variables and alcohol consumption on fatal motor vehicle accident rates among the 50 states and the District of Columbia.

Definition of the Target Population. Assumed to be all potential drinking drivers.

Research Design. The data base used by the authors, FARS, is definitely adequate. The analytic approach was regression analysis Their approach and analysis, though fairly common, is weak. First a regression-analysis can make realistic estimates of effects only if all, or at least the most important factors are included. Otherwise, the results can be seriously biased.

Though the authors select several plausible independent variables, the choice of measures for them may still affect the results. How well the percentage of metropolitan residents measures the relative incidence of urban/rural driving, is an open question. Whether the percentage of drivers under 21 measures the effect of young drivers adequately is also questionable, considering the still high accident involvement of drivers 21-25 years of age.

Statistical Methods. After preliminary analysis, the authors excluded several measures of alcohol consumption, mainly the alcohol equivalent of all beverages, distilled liquor and wine, because they failed to relate significantly to motor vehicle fatal accidents and fatalities. They did, however, retain beer consumption, though with $r = 0.171$, it did neither significantly correlate with fatal accidents, nor with fatalities ($r = 0.157$). In their final analysis, they obtain a significant regression coefficient for beer, but overlook that they might also have obtained a significant coefficient for other measures.

Interpretation and Objectivity. Considering the high correlation between beer consumption and the number of outlets, a thorough analysis of this correlation, and its effects on the results would have been appropriate; since the authors did not do it, their findings can not be considered as more than an interesting hypothesis.

Colorado Division of Highway Safety (1984). *A decade of progress.* Colorado Division of Highway Safety.

Description of the Countermeasure Program and its Operational Environment. Not an evaluation of any particular countermeasure. Presents statistics on the number of "alcohol-related" fatalities projected at the 1974 rate per 100 million VMT and compares this to the "actual" rate. Concludes that all of the DWI programs in effect from 1973-1984 saved 321 lives. Provides a list of legislation enacted over this period.

Definition of the Target Population. Presumed to be all drinking drivers in the state of Colorado.

Research Design. Examined "alcohol-related" fatal crashes retrospectively. Used no control group and did not consider other factors that may have contributed to the claimed number of lives saved.

Statistical Methods. Compared actual rates with 1974 projected rates. No statistical procedures used.

Interpretation and Objectivity. Conclusions not justified on the basis of the research design described.

Cottrell, BH. (1987). *Final report. Evaluation of wide edgelines on two-lane rural roads.* Virginia Transportation Research Council.

Description of the Countermeasure Program and its Operational Environment. Evaluated the effects of 8-inch edge lines placed on several rural roads in Virginia. Found no effects on run-off-the-road accidents or other "related" accidents, including run-off-the-road involving drugs or alcohol (presumably from police accident reports).

Definition of the Target Population. Presumed to be all drinking drivers in the state of Virginia.

Research Design. Used a before and after design with a comparison group. The treatment locations were three segments of rural roads totaling 55.2 miles in length. Five years of accident data were collected, three years before and two years after. Each segment had its own comparison group.

Statistical Methods. Used chi-square tests to evaluate the significance of differences in number of accidents among the various groups.

Interpretation and Objectivity. Concludes that wide edgelines had no significant effect on the incidence of the types of accidents studied and recommended that wide edgelines not be considered as a countermeasure in Virginia. The conclusion appears justified for the types of roads considered, provided there was no significant increase in travel from the before to the after period. The finding appears inconclusive for DWI accidents because of the apparent use of HBD as a criterion for DWI-related. The recommendation that wide edgelines "not be considered" is not warranted because of the limited extent of the study.

Drummond, AE; Cave, TC; and Healy, DJ. (1987). The risk of accident involvement by time of week - an assessment of the effect of zero BAC legislation and the potential of driving curfews. In: *Young drivers impaired by alcohol and drugs.* Royal Society of Medicine Services Ltd.

Description of the Countermeasure Program and its Operational Environment. This paper outlines a method for collecting exposure data and presents accident risk estimates by time of week for various driver experience groups. The method is illustrated by trying to detect changes and exposure following the implementation of zero BAC legislation. Given the overlap between alcohol-related and night-time accidents, the potential safety benefits of a driving curfew for novice drivers is purportedly examined.

Definition of the Target Population. All drivers in Melbourne, Australia.

Research Design. There is no clear research design described herein. First, the method for collecting the on-road exposure in Melbourne is described including

the oversampling of weekends and nighttimes to achieve reliable estimates of exposure for these periods having a high incidence of drunk driving. Accident risks by length of driving experience (ranging from less than one year to three or more years) is examined by using crash data for each group divided by the exposure determined from the on-road survey. Overall comparisons by driving experience are made as well as crash risks by day versus night and by weekday versus weekend, and for driver only, driver and one passenger or driver and two or more passengers.

The countermeasure addressed is the effect of zero BAC legislation on novice driver exposure. Again, denominator data is obtained from the on-road survey and divided by weekday/weekend day versus night groupings. The potential for nighttime curfews for novice drivers is examined using a modeling process which involved licensing age, licensing rate, curfew severity, etc. to obtain estimates of curfew effectiveness and zero BAC effectiveness.

Statistical Methodology. Most of the study is a descriptive study with no statistical comparisons made. Generally, variance estimates were not available and hence comparisons were not possible. Rates compared are involvements per million vehicle kilometers. There is an indication of some type of modeling using variables such as licensing age and licensing rate, etc. However, no details are indicated to suggest that this is multiple regression or logistic regression or categorical data modelling.

Interpretation and Objectivity. The authors conclude that there were considerable reductions in exposure of first-year drivers, particularly at night on weekends following implementation of zero BAC legislation. They indicate that the potential safety benefits of various novice driver licensing options including curfews were estimated through a modelling process. However, neither in the summary or the conclusion are the results of these modelling efforts presented.

Eavy, PW; Edwards, M; and Lee-Gosselin, ME. (1987). *Group interviews for probationary drivers with low violation levels: An evaluation of the traffic safety impact.*

Description of the Countermeasure Program and its Operational Environment. This is an evaluation of an experimental program which required beginning probationary drivers who had accumulated two or more traffic convictions to appear before state authorities for a group re-examination.

Definition of the Target Population. Beginning drivers during the probationary period who show signs of poor driving behavior, namely when they accumulate two or more traffic convictions.

Research Design. This was truly an experimental design with eligible subjects randomly assigned to either the experimental group or to an untreated control

group. Driving records were compared between the two groups at 6 months and 12 months following the treatment.

Statistical Methods. Comparisons are made using t-tests of six-month and twelve-month accident and conviction rates, and twelve-month mandatory suspension rates.

Interpretation and Objectivity. Both six-month and twelve-month conviction rates were significantly lower for the experimental group, as were twelve-month mandatory suspension rates. The experimental group also had lower six-month accident rates, but at twelve months there was no significant difference. The experimental program seems to clearly have some positive effects, at least in the short-term.

Falkowski, CL. (1984). *The impact of 2-day jail sentences for drunk drivers in Hennepin County, Minnesota.* Washington, DC: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. The purpose of the study was to evaluate the impact of the two-day jail sentence by assessing the policy in practice, the impact of the policy on the workhouse, on convicted drunk drivers, on traffic accidents and DWI arrest data and public perceptions of the two-day jail policy.

Definition of the Target Population. This is a multifaceted study and consequently has a number of target populations, namely convicted drinking drivers and the general population of Hennepin County. Both specific and general deterrence were assessed.

Research Design. Different approaches were used in assessing the different impacts. In assessing various aspects of the policy in practice, a sample of 1,400 DWI cases (15% of total number of first time DWI cases heard from July 1982-Jan. 1984) was drawn from the court calendars. Under the impact of policy on the workhouse, it is not clear how or what data were gathered. One assumes that the total number of commitments by type of offense were gathered for both the men and women's workhouses. Impact of the policy on convicted drunk drivers was evaluated using information obtained from a group of 300 convicted drunk drivers who filled out questionnaires (not related to the study) as part of DWI educational programs. The author states that the sample is not necessarily representative but provides no information on sampling bias. Impact on traffic safety was evaluated by subjecting monthly night-time (10:00 p.m. - 4:00 a.m.) injury accidents and DWI arrest data for Hennepin and Ramsey to time-series analyses. Traffic fatalities were assessed by a before-after, experimental-comparison design. Public perceptions were evaluated by using the Hennepin County data from a larger state-wide telephone survey of Minnesota

drivers conducted during October - December 1982. A number of the questions presented seemed of questionable validity.

Statistical Methods. The statistical methods varied. Various methods of strength of association were used, such as Cramer's V and chi-square for the sample of 1,400 DWI cases and the survey data. The workhouse and DWI survey data were not subjected to analyses but rather were described in terms of percentages. The traffic data were analyzed using Box-Jenkins time series with 49 pre-policy and 17 post-policy data points. Both a bivariate model between DWI arrests and nighttime accidents and a final model which incorporated arrests, policy and nighttime accidents were used. Because the number of fatalities per month were too small to accommodate time series analyses, a chi-square statistic was used to assess pre-post, experimental-comparison traffic fatalities.

Interpretation and Objectivity. The author's conclusions are:

1. In spite of the fact that two-day jail sentences are voluntarily imposed by the municipal judges (vs. statutorily required), there is a high degree of judicial compliance. Even after two years and a large turnover of judges, roughly 82 percent of the DWI offenders are sent to jail for two days.

2. There has not been an increase in the number of DWI trials held, nor has there been an increase in the length of time from arrest to sentencing in DWI cases.

3. The Hennepin County Adult Corrections Facility, for the most part, has been able to effectively accommodate the DWI offenders serving two-day sentences. There is no chronic overcrowding.

4. Drunk drivers who served their two days in jail are more likely than those who did not, to believe that the policy is fair and that it should be continued.

5. There has been a statistically significant average monthly reduction of 35 night-time injury accidents coincident with the adoption of the policy and after a two-month lag time in Hennepin County. This is a 20 percent reduction when compared to the pre-policy monthly average. There has also been a marked increased in the number of DWI arrests.

6. The number of traffic fatalities in Hennepin County has declined but not significantly more than in neighboring Ramsey County which did not have a DWI jail policy during the time periods considered.

7. Frequency of alcohol consumption and a perceived increase in the likelihood of punishment are the strongest determinants of self-reported changes in drinking and driving behavior for Hennepin County drinkers.

8. In regard to self-reported changes in drinking and driving behavior, daily drinkers are the exception to most patterns found. Although their number is quite small (N=5), this suggests that a different approach is necessary for the chronic, daily drinker (pg. iii).

The conclusions provide a very positive reflection of the policy, more than is warranted by the data. In the body of the paper, the author notes that there is great variability in sentencing practices among the judges. Also that the convicted DWIs were in favor of the policy. However, the survey of convicted DWIs is hardly a random sample. In fact, the survey is so potentially biased (how biased we are not told), that we cannot objectively say anything about the convicted DWIs' perceptions. The significant drop in nighttime injury accidents is strongly related to increases in arrests and it is impossible to know whether the reductions are due to certainty, severity or both, of punishment. The fact that both the comparison county and the state had similar trends would suggest that perhaps certainty of punishment was a greater deterrent force. The finding of a two-month lag in significant downward trend in relation to the policy change is also hard to explain. Some of the questions of the state-wide survey (e.g. "Starting last January, the Hennepin County Courts began sentencing drunk drivers to two days in jail. Were you aware of this before I called?") seemed very "loaded" and one should question the validity of data derived therefrom.

Florida Bureau of Public Safety Management (1986). *Impact of DUI legislation in the state of Florida. Draft final report.* Department of Community Affairs, Bureau of Public Safety Management.

Description of the Countermeasure Program and its Operational Environment. The study examined fatal accident death rates in Florida to evaluate the impact of the state's 1982 DWI law. Concluded that the new law was a major factor in reducing traffic fatalities by 15.8% during the period 6/82-6/83. Gives a good synopsis of the new law which increased the *per se* law sanctions to those of the presumptive limit sanctions which required (under the new law), for first offense: 50 hours of public service, an increased maximum fine (from $25 to $250), increased license suspension (90 days to six months); for second offense, $500 minimum fine, license suspension of five years; third offense, $1,000 minimum fine, 10 year license suspension; fourth offense, permanent license suspension. Other features include restricted license for first offenders only after attending a substance abuse course.

Definition of the Target Population. Presumably, all impaired drinking drivers.

Research Design. Not a formal evaluation. Approach involved looking at fatal accident data. No control group, no consideration of other factors, except to note that number of teen age drivers decreased in 1982 and that vehicle miles travelled did change.

Statistical Methods. Examination of raw accident data only.

Interpretation and Objectivity. Found that fatality rates peaked in January 1982, and decreased until June 1983. Fatality rates peaked at the end of 1983 and remained stable in 1984 and 1985 at a level lower than the pre-law level. Found that number of arrests and sanction severity increased after new law. Avoided any direct conclusion about the causal relationship between the new law and reduced fatality rate.

Frank, L. (1986). *The effect of the 1983 RBT "blitz" on the frequency of casualty accidents in Melbourne residential streets.* Hawthorn, Victoria, Australia: Road Traffic Authority.

Description of the Countermeasure Program and its Operational Environment. An intensified Random Breath Testing (RBT) program was implemented on arterial roads in Melbourne and its effect on crashes there as well as on residential streets was assessed. The RBT program was described only in the most general terms, not giving any significant information for identifying any confounding effects. Such effects might well be suspected because of the nature of the research design (see below).

Definition of the Target Population. Not explicitly defined. Was apparently all drivers using the roads during the evaluation period.

Research Design. Used a treatment period of October 24 - December 31, 1983, and a control period of the same months and days in 1981 and 1982. Both the treatment and the control periods had RBT, but the treatment period had "much more intensive" RBT instead of "routine" RBT. The dependent variable was number of accidents occurring on residential streets. Such a design would be appropriate if other, possibly confounding, variables were taken into account. There is no indication that they were, and this weakens the findings of the study.

Statistical Methods. The analysis used chi-square tests to explore relationships among various categorical variables, including number of various types of accidents on residential streets and on arterial roads during the treatment and control periods. The methods were appropriate for the data collected, and the Ns were generally large enough to detect reasonably small changes.

Interpretation and Objectivity. The author concluded that the study results "support the suggestion that alcohol-affected drivers use residential streets to

avoid RBT stations." The study found that while RBT is effective in reducing accidents on arterial roads, some of these accidents were shifted to residential streets. This shift was quite large, resulting in a 20% increase for residential streets. The shift was statistically significant only for single-vehicle, weekend accidents. Nevertheless, there was a net decrease in accidents overall, and this was attributed to RBT. The author states that, while her results were not conclusive, they were sufficiently strong to warrant countermeasures against the use of residential streets to avoid RBT stations. This is a reasonable conclusion, even though other confounding effects were not ruled out in the study.

Hagen. R.E.; McConnell, EJ; and Williams, RL. (1980). *Suspension and revocation effects on the DUI offender.* Sacramento, California: State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. A study of the effects of driver license suspension on DWI offenders. California law required license suspension for multiple offenders, but not for first offenders.

Definition of the Target Population. Implicitly, all multiple offenders.

Research Design. The research design was described in detail as having involved driver-record searches (accidents and DWI convictions) of 1st offenders, 2nd offenders, and 3rd offenders (N=4488); and questionnaire surveys of 2,500 drivers who were having their license reinstated after having their license suspended or revoked for multiple DWIs.

Statistical Methods. Unspecified survival analysis techniques were used for the recidivism study and categorical data analysis techniques (also unspecified) were used for analysing the questionnaire surveys.

Interpretation and Objectivity. Concluded that license suspensions are effective in reducing recidivism (both accident and DWI), and that suspended drivers drive less than if they had not been suspended. Speculates that there may be a high-risk group of first offenders that could be identified through pre-sentence investigation for license action.

Hagge, RA; and Marsh, WC. (1988). *The traffic safety impact of provisional licensing.* Sacramento, CA: California Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. This study evaluated California's provisional licensing program for drivers 16-17 years old. The program went into effect on October 1, 1983, and required such drivers to complete additional parent-supervised driving practice; to wait longer after failing a written or driving test before retesting; and to be subject

to postlicensing controls at lower negligent operator points. The details of the program were described, but the operational environment was not.

Definition of the Target Population. Young drivers aged 16 to 17.

Research Design. General deterrence and specific deterrence studies were conducted. Several types of accidents in the general deterrence component were studied, including surrogate alcohol-related accidents. Older drivers in California were used as a control, and the same series was also used in four other states as controls.

The specific deterrence component examined driver records data from the California DMV. The report indicates that great care was used in setting up the data file for this analysis. Basically, the design compared the subsequent accident and major traffic violation convictions of the pre-PDL group with that of the post-PDL group. The target group was compared to a control group of older drivers. Limitations of the design and data were discussed at length.

Statistical Methods. The time series analysis used Box-Jenkins methods. Survival analysis methods were used in the specific deterrence analysis.

Interpretation and Objectivity. The time series analysis indicated a positive effect on all accidents among 15-17 year olds in California, but no significant effect on surrogates of alcohol-related accidents. The specific deterrence analysis found no significant effects on subsequent convictions or accidents.

Haque, O; and Cameron, M. (1987). *Evaluation of the effect of the Victorian zero BAC legislation: July 1984 - December 1985.* Hawthorn, Victoria, Australia: Road Traffic Authority.

Description of the Countermeasure Program and its Operational Environment. An initial evaluation zero BAC legislation in Victoria, Australia, which prohibits any learner (L), first-year probationary (P), unlicensed or disqualified driver or motorcycle rider from driving or riding with any alcohol in his or her blood. The introduction of the new law was accompanied by PI&E campaign to promote awareness of the law and its penalties. The campaign included paid advertising as well as PSAs. The description of the law appears quite complete, but there is no accompanying description of the operational environment.

Definition of the Target Population. The evaluation is concerned with the target group indicated above, minus motorcyclists. A separate evaluation of novice drivers who were not disqualified and unlicensed was also performed. There were no data on the characteristics of the target groups.

Research Design. A time series design was used in the evaluation. It compared the number of "serious casualty accidents" (SCA) of the experimental groups

with the SCAs of two different control groups. A SCA is an accident in which at least one person is killed, injured, or hospitalized. Control group 1 was "standard license holders" (presumed to be drivers in general), and control group 2 was probationary drivers who had held their license more than a year. The authors considered both control groups not to be totally satisfactory, the first group because it included older, more experienced drivers, and the second group because it had a relatively small number of accidents and may also have been influenced by the legislation because of peer influence and because they had previously been first-year probationary drivers. The main study studied four different time series of SCAs, target drivers at "alcohol times of the week" and "non-alcohol times of the week," and standard license holders at these two times of the week.

Statistical Methods. ARIMA techniques were used. Models were developed for the pre-legislation period extending from January 1977 to May 1984. Intervention models were then developed and any effects of the intervention were determined by subtracting the coefficient of the control series intervention from that of the SCA target drivers at alcohol times of the week. The methods seem to have been properly applied.

Interpretation and Objectivity. The study concluded that there was a reduction of about 4% in the number of learner, first-year probationary, unlicensed and disqualified drivers involved in alcohol-related SCAs after the introduction of the zero-BAC legislation in Victoria. However, the power of the tests conducted were enough to detect a change of 10%. This was because of insufficient post-intervention data. Forty months of post-intervention were needed to detect such a small effect instead of the 18 months of data that were available.

Harrison, WA. (1988). *Evaluation of a drink-drive publicity and enforcement campaign.* Victoria, Australia: Road Traffic Authority.

Description of the Countermeasure Program and its Operational Environment. An enforcement and advertising campaign was conducted by the Victoria Police and the Road Traffic Authority, linking drink-drive enforcement with general traffic enforcement. The enforcement component implemented a new law permitting a PBT of a driver stopped for any offense. The PI&E component primarily involved two TV spots, the first stressing the use of regular enforcement units and the patrolling of residential streets, and the second concentrating on the police checking all drivers for alcohol. Provides a short background discussion of pre-law police procedures.

Definition of the Target Population. Target group was apparently young drinking males who lived in the Melbourne area and drove motor vehicles.

Research Design. Used a before-and-after telephone survey, one in November, 1987, and the other at the end of January, 1988. There were 400 respondents to each survey which targeted male drinkers age 18 to 30 who drove a motor vehicle. The questions were designed to measure the penetration of the advertisements into the target group and to determine the effect of the advertisements on driver perception of police procedures and behavior.

Statistical Methods. Used a chi-square analysis. Found that the before and after groups differed significantly on two important variables, age and occupation. The analysis controlled for age but not occupation, performing separate analyses for each age group for each question.

Interpretation and Objectivity. Pre-and post-surveys indicated that the advertising campaign reached a group of 18-30 year old males, and that the campaign resulted in an increased perception of the chance of apprehension. There was some evidence of a reduction in drink-drive behavior among drivers in the 21-24 age group. The results were reported objectively.

Helander, CJ. (1986a). *Evaluation of the California Drunk Driving Countermeasure System. Volume 5. The California DUI (driving under the influence) Countermeasure System: An evaluation of system processing and deficiencies.* Sacramento, CA: California State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. Evaluates DWI offender processing (adjudication and sanctioning) in California. No specific countermeasure was evaluated in this study. Gives an excellent description of California's DWI control system.

Definition of the Target Population. NA.

Research Design. Involved offender tracing in jurisdictions supporting 44 police agencies in seven counties. Cohort analyzed is 3959 drivers arrested for DWI during one week in November, 1981, and the same week in 1982. Procedures were very thorough.

Statistical Methods. Presentation was raw data with no computation of sampling errors, etc. This is appropriate to the objectives of the study.

Interpretation and Objectivity. Produced some fascinating statistics. Conviction rates varied from 38% to 84% with an overall average of about 55%. 13% of arrested drivers were unlicensed, and 9% arrested for DWI were under suspension or revocation. 30% of convicted DWIs were repeat offenders. 20% of those convicted for DWI received a license suspension or revocation. The average time between DWI arrest and DMV action was over six months, most of this being due to court processing time. Improvements were noted in some indexes during 1982 when the *per se* law and other reforms (including recording

pleading down to reckless driving). Concludes that, because of the extremely low probability of a conviction given a violation (about .003), the new law's increased sanction severity have probably been ineffective. Interpretations are reasonable.

Helander, CJ. (1986b). *An evaluation of the California habitual traffic offender law. Final report.* Sacramento: California State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. Analyzed the outcomes of arrests of a sample of 1849 drivers meeting the criteria for being an habitual traffic offender (HTO). Good description of the countermeasure itself. Does not discuss the operational environment.

Definition of the Target Population. Excellent.

Research Design. Adequate for its purpose. Examined court records of a sample of drivers qualifying as HTOs.

Statistical Methods. Straight presentation of data. Adequate for the purpose, given the overwhelming finding of no effect of the law.

Interpretation and Objectivity. Found that less than 4% were prosecuted as a HTO and only 1% were convicted, even though the fatal/injury accident mean of the HBO was 10 times that of drivers in general. Concluded that the new law was ineffective due to lack of prosecutor cooperation, primarily because of double jeopardy considerations.

Hilton, ME. (1983). *The effectiveness of recent changes in California law as drinking-driving countermeasures: An interrupted time series analysis.* Berkeley, CA: Alcohol Research Group.

Description of the Countermeasure Program and its Operational Environment. An evaluation of California's new DWI law.

Definition of the Target Population. All DWI offenders.

Research Design. Analyzed time series of various types of fatal accidents, including all fatals, daytime fatal accidents, weekend fatal accidents, and weekday fatal accidents.

Statistical Methods. Used the ARIMA model.

Interpretation and Objectivity. Appropriately concluded that the new law was not responsible for the 12.9% statistically significant reduction in fatal crashes computed by the model. This conclusion was based on the finding that similar

reductions occurred in other measures that could not be related to alcohol and drunk driving.

Hingson, RW; Scotch, N; Mangione, T; and Meyers, A. (1983). Impact of legislation raising the legal drinking age in Massachusetts from 18 to 20. *American Journal of Public Health* 73(2):163-170.

Description of the Countermeasure and its Operational Environment. This paper examines the impact of raising the drinking age in Massachusetts during the initial two years after enactment.

Definition of the Target Population. Study population was persons 16-19 years of age in Massachusetts. Control population was the corresponding persons in New York, with the exception of New York City and Nassau County.

Research Design and Statistical Methods. One part of the study dealt with findings of a survey, the other analyzed accident data.
One thousand teenagers were interviewed by random telephone dialing in Massachusetts and New York, just before the law went into effect in Massachusetts, and again at one and then two years later. The second analysis used data from FARS, 1976 through 81. Single vehicle nighttime fatal accidents were used, and all fatal accidents. Accidents were classified according to the age of the youngest driver; 16-19 year old drivers, and drivers 20 and older were distinguished.

Three Statistical Methods were used:

1) dependent variable was the accident counts for each age group and year, and a log-linear model fitted to the New York and Massachusetts data.

2) the logarithm of the number of accidents was used as dependant variable, and age group, year, and state were used as factors.

3) an analysis of covariance model (regression?) used the logarithm of the accident number as dependent variable, and the logarithm of the New York accident numbers as independent variables.

No intervention terms were mentioned. This means that the authors should have tested the pre-change year effects against the post-change year effects, but they do not describe the tests they performed. They report only the results, "The teenage single vehicle nighttime fatal accident changes in Massachusetts relative to New York did not achieve statistical significance when tested using log linear analysis ($p>.1$) but were significant when tested by analysis of variance and covariance ($p<.05$)."

Interpretation and Objectivity. The survey showed that the percentage of respondents who bought alcohol most often at bars/clubs/restaurants declined by more than half; those that bought in liquor stores and grocery stores declined by about 30%, and those that drank at home, and had others buy nearly doubled. In all cases, the differences against New York were significant. Driving after any drinking declined significantly by a quarter, but not drinking in cars.

The authors present and discuss more details about self-reported drinking, and enforcement of the new laws. The percentage of self-reported accidents, and of self-reported serious injury accidents declined in Massachusetts and New York, with no significant difference.

Separate crash analyses for 18-19 year olds, and 16-17 year olds, showed a significant drop in Massachusetts relative to New York, for the first, and increases for both states for the second group.

For all fatal accidents, no significant differences were found. The authors mention that there is only a 13% chance to miss a 15% reduction with a test using the 0.05 significance level.

The authors present their findings with great caution.

This telephone survey seems to be adequately designed, though one might question using upstate New York as a control jurisdiction. Connecticut or Rhode Island may be more similar to Massachusetts in many respects. Though a telephone survey does not give an unbiased sample of this population (the authors do not mention whether any techniques were used to improve representativeness) using the same technique before and after should allow for unbiased, though not necessarily representative, estimates of changes.

For the analysis of fatal accident data, again the sole reliance on upstate New York as a control is questionable. However, the before time patterns in New York and Massachusetts are similar, for nighttime single vehicle accidents as well as for all accidents.

Using raw accident counts rather than rate per licensed driver or per population is objectionable. There is no way to estimate how much this might have affected the results.

Overall, the survey part of the study appears valid, and the results as credible as self-reported information can be. The analysis of the fatal accident data has weaknesses and is not adequately described.

Holden, RT (1983). Rehabilitation sanctions for drunk driving: An experimental evaluation. *Journal of Research in Crime and Delinquency* 20(1):55-72.

Description of the Countermeasure Program and its Operational Environment. Evaluates the Tennessee DWI Probation Follow-Up Demonstration Project in which 4,126 Memphis first-offense DWIs categorized as problem drinkers or social drinkers were randomly assigned to one of several treatments, *viz.*: probation supervision, education/therapy, or supervision plus education / therapy. A control group consisting of convicted DWIs with no conditions of probation was also used. Found that none of the programs were effective for DWI or other misdemeanors or felonies. The description of the project was adequate, including how persons were assigned to the project (as a condition of probation, either after conviction or on a judgement-withheld basis). The description of the various "treatments" was better than average. Social drinkers attended only the education program (basically, a DWI school) of the education / therapy treatment; problem drinkers attended both the DWI school plus an assertiveness training program consisting of eight 1.5 hour group therapy sessions. Subjects assigned to supervision had to report to their probation officer once a month for a .5 hour meeting for a period of one year.

Definition of the Target Population. Consisted of first offender DWIs classified as either social or problem drinkers using Mortimer-Filkins plus BAC at the time of arrest.

Research Design. Used a 2X2 factorial randomized experimental design. Each subject was followed for a minimum of two years, one year in the program and one year after the program. Rearrest rates for DWI and for other misdemeanors and felonies were the measures of effectiveness.

Statistical Methods. Used failure analysis techniques with a so-called proportional hazard rate model, i.e.:

$\lambda = \lambda_0 \exp(\beta X)$, where:

λ = instantaneous recidivism rate

λ_0 = recidivism rate without covar

X = covariates.

Calculates significance using a BMD procedure (BMDP2L). Method is appropriate for the data and design. Could also have used the SAS LIFREG procedure which is more direct.

Interpretation and Objectivity. Concludes that none of the treatments had any significant effect on DWI recidivism, either for social drinkers or problem drinkers. However, one treatment, supervision, had a significant effect on non-DWI recidivism for problem drinkers. Provides data that indicate that nearly all of the subjects completed their treatment. Observes that the classroom

settings were probably inappropriate for the subjects: 41% had less than a high school education, and 71% reported family incomes of less than $12,000. Also, many clients had prior criminal records and were not likely to be affected by such treatments. Further, the treatments themselves were relatively weak. Finally, the author concludes that the "sanction" of being arrested and made subject to traffic law system procedures may have been a stronger sanction than the treatments and could very likely have swamped any treatment effects. All of these conclusions and observations were appropriate and insightful.

Hoskin, AF; Yalung-Mathews, D; and Carraro, BA. (1986). The effect of raising the legal minimum drinking age on fatal crashes in 10 states. *Journal of Safety Research* 17(3):117-121. (Fall).

Description of the Countermeasure Program and its Operational Environment. Countermeasure is the raising of the minimum legal drinking age in 10 states, in some from 18 to 19, in others 18 to 20, 18 to 21 or 19 to 21.

Definition of the Target Population. Study populations are the affected age groups. In addition, drivers 25-29 years old were used as control groups. Time frames were the years 1975 through 1982.

Research Design and Statistical Methods. The study design was to compare single vehicle nighttime fatalities (the paper is not clear whether all fatalities are used or only driver fatalities) per licensed driver before the change, and after the change. Comparisons were made for the treatment groups or for the control groups, and for the ratios of treatment to control groups.

Interpretation and Objectivity. Looking only at the treatment groups, nine out of ten show a decrease, only one an increase, and a statistical test shows a significant reduction. On the other hand, only three out of the ten control groups show a reduction, seven an increase; there is no significant difference. The ratios for treatment to control groups also show a significant decline. The statistical techniques seem to be appropriate. The design, however, has a flaw. The author did not consider the possibility that the younger drivers might have had a declining trend fatality rate everywhere, not only in the treatment states, even if the considerably older control group did not show such a trend.

Hoxie, P; and Skinner, D. (1987). *A statistical analysis of the effects of a uniform minimum drinking age.* Washington, DC.: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. The countermeasure program is the uniform minimum drinking age of 21. The operational environment is the 50 states and the District of Columbia during the years 1975-1984. Actually studied was not a uniform minimum drinking age of 21, but drinking ages of 18, 19, 20, and 21.

Definition of the Target Population. The target population of the study was the group of drivers 18-20 years old; for some analysis, also drivers 14-17, and 21-23 were considered.

Research Design. The fatality event used to define the dependent variable was an accident involving a driver 18-20 years old. Dependent variable was the number of all persons killed in such accidents, divided by the number of persons 18-20 years old (the number of persons rather than the number of licensed drivers was used because the latter is not completely available). For the analysis, the logarithm of this rate was used, which allows simpler interpretation of the results. Different independent variables were used in several models. All models used one variable which described which proportion of the 18-20 year olds were allowed to drink, considering the legal age limit, the time of change of the limit, and the effects of a "grandfather clause", if any. Data from 50 states and the District of Columbia over 10 years gave 510 data points for the analysis. A pooled, cross-section time series model was used. Four alternative models were studied.

Model I explored 13 potential independent variables (ranging from VMT over stolen cars to average annual temperature) and found the following significant:

- the intervention variable
- age
- unemployment rate
- per capita beer consumption
- percent of VMT that is rural

Model II used the intervention variable, 50 dummy variables describing differences among the states, and 9 dummy variables describing common differences between years, to account for a time trend and fluctuations over time. The intervention variable was again significant. Model III used the same variables as Model II, and in addition, a fatality rate for all drivers over 20 years old. This variable was significant, as was the intervention variable. Model IV used the variable of Model I, and of Model II combined. Here, the unemployment rate, and the percentage of rural VMT became insignificant. All models were estimated with constant weights, and with variable weights. Differences in the results were usually small. Models III and IV gave the best (essentially equal) fit of the data, Model II was somewhat worse, and Model I was the worst.

Two potential "spillover" effects were also studied, by using their fatality involvement as dependent variable. For the 14-17 year old group, no apparent effect was found. For the 21-23 year old group, a more subtle effect has been hypothesized: that after raising the drinking age to 21, they would be "inexperienced" in drinking and have a higher accident involvement than they would have, had they had "experience" in drinking. To study this effect, the

intervention variable was lagged by the number of years the drinking age was raised, and used to replace it in Model II. Its coefficient turned out to be not significant, and to have the wrong sign.

Finally, the author applied these findings to estimate how the number of traffic deaths had changed, if all states had a minimum drinking age of 21 in 1984.

The design has a slight weakness by using rates per population rather than drivers (it would have been worthwhile to perform the analysis with the latter rate, even if the number of data points had been smaller). The use of fatalities rather than fatal accidents might also have an undesirable impact, because of the effects of multivehicle accidents and vehicle occupancy.

The design is strong, because two basically different models were used. One using specific factors which might effect accidents, another which is more flexible in accounting for unexplained trends. Also, the 21-23 year old group was used to test whether the intervention variable was likely to measure the effect of the intervention on the target group, and not a broader effect.

Overall, the strengths overcompensate the weakness. The study of the potential spillover effect on the 21-23 year old group is weaker, because the variable used to indicate such an effect was simply the lagged intervention variable. This ignores that immediately after the change, some of the higher age groups contain both inexperienced drivers and experienced drivers, sometimes following complex patterns. The model treated them all as experienced. This would reduce the apparent effect of experience.

Statistical Methods. The statistical methods are appropriate and competently applied. A common weakness is that the correlations among the coefficients of Model I are not shown, and that no residuals are presented.

Interpretation and Objectivity. The study's conclusion that 18-20 year old drivers are involved in 11% fewer fatalities if they are not allowed to drink, than if they are allowed to drink, is well supported by the results of the analysis. The estimates of how many lives would have been saved in 1984 if all states would have had a drinking age of 21, and of how many were actually saved because some had higher drinking ages than 18 are also plausible.

Institute for Traffic Safety Management and Research (1985). *An evaluation of the county stop-DWI programs in the metropolitan region: Nassau, New York City, Suffolk.* Albany, NY: New York State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. There are a series of five (I-V) reports all dealing with the evaluation of New York's STOP-DWI Program. These evaluations were done by the Institute for Traffic Safety Management and Research in 1985 and 1988. [A synthesis

evaluation is reported by two of the investigators, McCartt and Dowling (1985), and is reviewed elsewhere in this document.] They constitute generally an evaluation of this program for the first 30 months of implementation (December 1981 - May 1984). The STOP-DWI Program (i.e., "Special Traffic Options Program for Driving While Intoxicated") had four basic provisions: (1) significant mandatory minimum penalties consisting of fine and/or jail for DWI and also driving while ability is impaired (DWAI); (2) county programs developed and implemented by the counties, funded through the return of fines for alcohol-related offenses; (3) oversight of the local programs by the New York State Commissioner of Motor Vehicles; and (4) submission of an evaluation of the program. It is unique in its extensiveness and also in the return of fines to the county.

The first four studies provide county-by-county evaluations of the programs with each county being introduced demographically followed by administrative and impact evaluations. The components of the administrative evaluation consist of enforcement, prosecution, adjudication, probation, rehabilitation, public information, education, evaluation, and administration. The components of the impact evaluation involve before and after analysis of accident experience. The final report (V) is a follow-up report (September 1986) consisting of an evaluation of the first four years of the program and is presented at a statewide level.

More specifically, the elements of the program and subsequent evaluation include the following: (1) documentation of the various program activities including incoming revenues as well as expenditures and time charts of the various county activities; (2) establishment of various immediate intervention programs and enforcement and adjudication efforts; (3) linking the results of the program to changes in public perception, knowledge, attitudes and behaviors with regard to drinking and driving as was done through mail and telephone surveys of New York State licensed drivers carried out in the spring of 1983 and the spring of 1984; (4) examination of the impact of the programs through before and after analysis of accident experience; a variety of surrogate measures were used such as fatal nighttime crashes, fatal single vehicle nighttime crashes, fatal single vehicle nighttime crashes involving male drivers, etc.; and (5) examination of alternative explanations to changes seen such as looking at factors like weather, "safety" factors, drinking age changes, economy, vehicle miles of travel, efforts of citizens' groups, national and regional crash trends, etc.

Definition of the Target Population. The general driving population of New York State with particular emphasis on drivers who drink and drive.

Research Design. This is not applicable to the administrative evaluation. For the impact evaluation, the design was basically a before versus after study with some minimal attention paid to appropriate control groups.

Statistical Methods. In making the before versus after comparisons, generally the baseline period of five years prior to December 1981 was compared with the subsequent period, namely the first two years of the program and then also the six months in latter 1983 and early 1984. The six-month periods were compared with the corresponding six-month periods in the baseline. T-tests were used to determine differences between the before and after percentages. Log-odds ratios were used to try to incorporate control groups. Thus, log-odds ratios were used to compare nighttime fatal crashes to daytime fatal crashes in the before versus after period. In study V, which was the statewide study, a multivariate time series analysis was used to examine shifts in nighttime fatal crash experience.

Interpretation and Objectivity. At this point, each of the studies will be addressed with respect to various findings.

I. Institute for Traffic Safety Management and Research. (1985). *An evaluation of the county STOP-DWI programs in the metropolitan region: Nassau, New York City, Suffolk.* Albany, NY: New York State Department of Motor Vehicles.

This study (as well as the others) provides table after table documenting the administrative evaluation of the program in each of the respective counties. With respect to impact of the various programs:

Nassau: Alcohol-related crashes as measured by injury crashes showed a significant drop following the STOP-DWI Program. In addition, the survey of attitudes showed an increase in knowledge and perceptions about drinking and driving.

New York City: Nighttime fatal crashes were down but there was no significant change in injury crashes.

Suffolk County: Injury accidents showed a significant downward shift with implementation of the program.

II. Institute for Traffic Safety Management and Research. (1985). *An evaluation of the county STOP-DWI programs in the north county region.* Albany, NY: New York State Department of Motor Vehicles.

As in the previous report, there are voluminous tables dealing with the administrative evaluation. With respect to the impact evaluation, the individual programs deemed successful in reducing alcohol-related crashes in the following counties: Clinton, Essex, Franklin, Lewis, St. Lawrence, Warren, and Washington. The program had ambiguous results in Jefferson and Oneida counties and showed no positive effect in Hamilton, Herkimer and Oswego counties.

III. Institute for Traffic Safety Management and Research. (1985). *An evaluation of the county STOP-DWI programs in the Hudson-Mohawk region.* Albany, NY: New York State Department of Motor Vehicles.

Again, following introduction to each of the counties, there are voluminous tables representing the administrative evaluation of efforts carried out in conjunction with the local programs. With respect to the impact of the programs on DWI-related crashes, there were positive results in Albany, Delaware, Greene, Montgomery, Rensselaer, Schenectady, and Schoharie counties and ambiguous results in Saratoga county and non-significant results for Fulton county.

IV. Institute for Traffic Safety Management and Research. (1985). *An evaluation of the county STOP-DWI programs in the mid-Hudson region.* Albany, NY: New York State Department of Motor Vehicles.

Again, following the detailed demographic introduction to each of the counties as well as a host of tables describing the administrative evaluation of the various aspects of the programs, the results of the impact on crashes is presented. There were indications of significant decreases in DWI-related crashes in Columbia, Orange, Sullivan, Ulster, and Westchester counties with ambiguous results presented for Putnam and Rockland counties. (Copies of pages for Dutchess county were missing from the packet.)

V. Dowling, AM (1986). *STOP-DWI: The first four years. An evaluation update.* Albany, NY: Institute for Traffic Safety Management and Research.

This final report represents an update on the others and covers the first four years of New York State's STOP-DWI county programs. The program period covered includes December 1981 through November 1985. Descriptive and statistical data relating to three of the components previously studied are provided including data on program activities, program expenditures and revenues, arrests and convictions, and fatal accident experience. Also provided are some data on changes in the caseloads of the probation and rehabilitation communities.

A variety of tables summarizing the administrative evaluation are provided. The areas covered include enforcement and process adjudication, probation, and rehabilitation/treatment.

The impact analysis covered fatal accident experience again using various surrogates for alcohol and non-alcohol related crashes. Analyses are presented for total fatal crashes, fatal nighttime crashes, single vehicle nighttime fatal crashes, single vehicle male driver nighttime fatal crashes, and weekend nighttime fatal crashes. Fatal crashes are also examined with respect to pedestrian crashes, fatal crashes per vehicle mile traveled and rural versus urban

versus New York City area. The general conclusion is that, while daytime crashes dropped by seven percent during this four-year period, nighttime crashes fell by 27 percent. They conclude that "of the analyses on the fatal crash experience, STOP-DWI continues to show success in reducing alcohol-related accidents and injuries in New York State."

Joksch, HC. (1988). *The impact of severe penalties on drinking and driving.* Washington, DC: AAA Foundation for Traffic Safety.

Description of the Countermeasure Program and its Operational Environment. Examined the highway safety impact of three "severe" sanctions for drunk driving: mandatory jail, mandatory community service, and a hard driver license suspension / revocation. The states studied were Colorado, Nevada, New Jersey, New Mexico, Oregon, Tennessee, Utah, and Washington. The pertinent laws in each of these states were summarized.

Definition of the Target Population. The target population was tacitly all potential first-offense drunk drivers. No characteristics of these drivers were presented.

Research Design. The period studied was 1980-1985. Involved a time-series analysis of the percentage of fatally injured drivers at various BACs in the study states which included the eight states with severe sanctions (see above) and six states without severe sanctions. These 14 states were selected on the basis that more than 60% of killed drivers were tested for BAC during 1980-1985, and that at least 100 such drivers were so tested in 1982.

Statistical Methods. A time trend model was fitted to the percentage of killed drivers at or above various BACs, and the quotient of the actual to the predicted percentage was analyzed as a function of time.

Interpretation and Objectivity. The study found that drunk driving declined in all of the 14 states studied over the 1980-1985 time period, and that the effect was greater at the higher BAC levels. The study found no indication that the decline was greater in states that had severe sanctions than in states without severe sanctions. The study was considered exploratory by the author, and no attempt was made to explore quantitatively hypotheses for the lack of any apparent effect.

Jones, B. (1986). *The effectiveness of habitual traffic offender license revocation in Oregon.* Salem, Oregon: Oregon Motor Vehicles Division.

Description of the Countermeasure Program and its Operational Environment. This is an evaluation of the effectiveness of license revocation with respect to habitual offenders - drivers who have accumulated three or more major traffic offenses within a five year period. Reckless driving, DUIL, hit-and-run, driving

while suspended or revoked, eluding, and violations such as assault and manslaughter or murder with a motor vehicle constitute major offenses.

Definition of the Target Population. Habitual offenders.

Research Design. After a person accumulates two major traffic offenses within a five year period, a warning letter is sent stating that another major offense will result in license revocation. The study compares the subsequent driving records of 594 revoked drivers with the records of 522 drivers who were sent a second warning letter rather than a notice of revocation. This latter group can be considered as a non-equivalent control group.

Statistical Methods. Pre-test and post-test comparisons between the revoked and control groups were made using t-tests. Pre-tests compared the groups with respect to age and sex composition, major prior convictions, non-major convictions, accidents, and all driving involvements. The revoked group had a significantly higher rate of major convictions per driver. The post-test compared driving records of the two groups with respect to driving while suspended/revoked, other major violations, high risk non-major violations, driving uninsured, other non-major violations, and accidents.

Interpretation and Objectivity. The revoked group had significantly lower rates of both high risk and other non-major violations and of driving uninsured. This was not a designed study but made use of a comparison group which was available due to administrative problems. The conclusions seem to be justified.

Jones, B. (1985). *Senate bill 710 and traffic safety: a preliminary report on the effectiveness of Oregon's new drinking driver law. (Full report).* Oregon: Oregon Motor Vehicles Division.

Description of the Countermeasure Program and its Operational Environment. An extensive evaluation of Oregon's new Drinking Driver Law, Senate Bill 710. The law went into effect on July 1, 1984. The new law contained provisions for failure or refusal of a breath-alcohol test, a waiting period for issuing a provisional license during administrative suspensions, and an administrative *per se* law which allowed the arresting officer to confiscate the license of a driver who had failed or refused a breath test. The bill also established a 48-day mandatory jail / community service sentence for a first-offense DWI, a mandatory alcohol evaluation, and mandatory treatment program for an alcohol / drug dependent person. The impact evaluation examines the effect of the law on motor vehicle deaths and serious injuries. The description is adequate for the purpose of the impact evaluation, especially in conjunction with data presented elsewhere in the report (e.g., data on alcohol consumption).

Definition of the Target Population. All drunk drivers and potential drunk drivers in the state of Oregon. Characteristics of various samples of this population are provided.

Research Design. Used an interrupted time series quasi-experimental design, employing Box-Jenkins ARIMA methods. Several measures were used, including all fatalities, alcohol-involved fatalities, nighttime fatalities, and various ratios. The time series studied covered the 1977-1984 time period. Fatality data were from FARS. No control states were included.

Statistical Methods. Used Box-Jenkins ARIMA models. The discussion indicates an excellent understanding of these techniques.

Interpretation and Objectivity. Concluded tentatively that the law probably reduced alcohol-related deaths and injuries. Noted that the effect was "certainly not overwhelming," a caveat with which we would agree, especially given the level of statistical significance selected for the analyses, 0.20.

Jones, RK; Joksch, HC; Lacey, JH; and Schmidt, HJ. (1988). *Field evaluation of jail sanctions for DWI.* Washington, DC: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. Evaluated the effect of Tennessee's two-day mandatory jail sanction on general deterrence, special deterrence, and the operation of the drinking-driver control system. Provides a detailed description of the law and its effects on the Traffic Law System in two case-study jurisdictions.

Definition of the Target Population. The general deterrence component addressed all potential drunk drivers. Descriptions of the characteristics of DWI populations are provided.

Research Design. The general deterrence study used a variety of fatal accident data from FARS for Tennessee and two comparison states, Alabama and Kentucky. A time series design was used over a 10-year period that surrounded the date the new law went into effect - July, 1982. Control series accounting for economic factors and alcohol consumption were included in the analysis.

The special deterrence analysis examined the recidivism rates of several cohorts convicted of DWI, each cohort consisting of all drivers convicted in a given year. The cohorts represented the years 1977 - 1985. Possible confounding factors (for example, differential changes in the number of multiple offenders over time) were considered.

Statistical Methods. Used a variety of methods, including simple regression analyses with intervention variables, and ARIMA methods. Nonlinear regression analyses and Markov models were used in the study of recidivism rates.

Interpretation and Objectivity. The study found that jail had an initial effect on DWI recidivism, but no measurable effect on alcohol-related crashes. Driver surveys suggested that a possible reason for the apparent lack of an effect on drunk driving was a lack of public awareness of the sanction and its imposition. The conclusions accurately reflected the study results.

Kadell, DJ; and Peck, RC. (1982). *An evaluation of the alcohol reexamination program for drivers with two major traffic convictions.* Sacramento, California: State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. Evaluation of a DMV program implemented in 1978 to deal with drivers with 2 or more "major" traffic violations within a 3-year period. The program allowed the DMV to re-examine such drivers and to impose appropriate administrative driver-license sanctions.

Definition of the Target Population. Aimed at drivers with 2 or more serious traffic violations within a 3-year period. Serious violations were defined as hit-and-run, reckless driving, driving under the influence, and vehicular manslaughter.

Research Design. A true experimental design was used with random assignment to treatment and control groups. Measured the subsequent 8-month rate of various types of accidents for the treatment group and the control group. Also analyzed other measures, including conviction rates for various violations, including DWI.

Statistical Methods. Used appropriate tests to determine both the significance of and any differences in outcomes between the two groups, and the power of the tests to detect effects.

Interpretation and Objectivity. The authors concluded that "a substantial and statistically significant reduction in traffic reconvictions was attributed to the re-examination," and that "there was no evidence that the effect of treatment was greater on alcohol-related accidents than on those not obviously alcohol-related." The study concluded that the re-examination was "more likely cost-beneficial than not." The study also suggested to the authors that license suspension would be more effective than probation. License suspension was recommended in place of the re-examination, regardless of alcohol involvement.

Klingberg, CL; O'Connell, JP; Salzberg, PM; Chadwick, JR; and Paulsrude, SP. (1984). *Evaluation of Washington state's 1979 driving while intoxicated (DWI) laws.* Olympia, Washington: State Traffic Commission.

Description of the Countermeasure Program and its Operational Environment. This is the full report of the study by Salzberg and Paulsrude (1984) which is reviewed elsewhere in this report.

Lacey, JH; Marchetti, LM; Stewart, JR; Popkin, CL; Murphy, PV; Lucke, RE; Jones, RK; and Ruschmann, PA. (1988). *Enforcement and public information strategies for DWI general deterrence: the Indianapolis, Indiana experience.* Washington, D.C.: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. The countermeasure program used combined enforcement / PI&E strategies in which the PI&E component promoted the specific strategies used (for example, enforcing DWI at high-DWI locations). The descriptions of the strategies are quite detailed.

Definition of the Target Population. Used a general deterrence approach aimed at drunk drivers in general.

Research Design. Used an experimental jurisdiction (Indianapolis) and a comparison jurisdiction (Cincinnati) and studied various alcohol-crash surrogates in the two cities using time-series methods.

Statistical Methods. Used the SAS ARIMA procedure, but no details are given.

Interpretation and Objectivity. Data are presented in various graphs. Two show the percent of crashes judged to be alcohol related in Cincinnati and Indianapolis. Since the cities show different "before" trends, Indianapolis essentially level, Cincinnati with a clearly declining trend, no conclusions can be drawn from comparing these series of data.

In the conclusions it is recognized that Cincinnati may have been a poor choice for a control city. Because of that, and the lack of description of the analyses, this study allows no conclusions, positive or negative, on the effects of the project on DWI.

Lacey, JH; Stewart, JR; Marchetti, LM; and Jones, RK. (May 1989). *An assessment of the effects of the implementation and publicizing of administrative license revocation for DWI in Nevada.*

Description of the Countermeasure Program and its Operation Environment. This study describes two countermeasure programs. The first is the implementation of an administrative *per se* law which came into effect in the state of Nevada in

July of 1983 together with other important legislation including a .10 illegal *per se* law and a preliminary breath test law, which provided for a 90-day license revocation for drivers refusing the preliminary test. Finally, the legislative package also provided for a prohibition of plea bargaining and mandatory minimum penalties including two days in jail upon conviction for a first DWI offense. The second countermeasure program evaluated is a public information program designed to inform drivers of the nature and penalties provided by the administrative *per se* law. This public information program was undertaken in the fall of 1986. Both countermeasure programs are well described and data on the application of the programs are provided. For example, the number of suspensions under both the pre-existing implied consent law and the new administrative *per se* law are provided throughout the period of the application of the law and the application of the second countermeasure, public information.

The only limitation in the description of the program is the indication that the application of the law in 1983 had no effect (p. 3, item Spring and Summer, 1985) which is later contradicted by the data presented in the article. It might be more appropriate to say that the early analyses conducted in 1985 did not detect a change, but analyses conducted following further data maturation demonstrated a change.

Definition of the Target Population. The target countermeasure populations are generally well described and the demographic variables available to the investigators (sex and age) are separately analyzed and, where found to be significant, are controlled through covariance analysis.

Research Design. The research design made use of analysis of variance comparisons for before and after questionnaire data and time series for accident data. In general, the research design appeared adequate with two potential exceptions. First, there was no apparent effort to collect data on the other elements of the drunk driving law package which was passed in 1983. For example, data might have been available on the extent to which the Nevada police were equipped with prearrest testers and perhaps on the number of charges filed on refusal to take a prearrest test. This type of data might have given some indication of the use (or lack of use) of the prearrest test law. The fact that arrests did not increase significantly suggest that the prearrest portion of the package was not utilized. Because the other laws passed at the same time as the administrative *per se* law in 1983 present a threat to the validity of the study, it appeared that it might have been useful to have attempted to determine the extent to which these other laws were actually applied. Another type of data that might have been available for analysis is the number of two-day jail sentences actually imposed on convicted drinking drivers.

The second limitation in the research design came in respect to the study of recidivism. The study ultimately demonstrates quite clearly that recidivism rates

were lower for the first two and a half years of the post versus the pre-recidivism periods. It is not clear whether the driver record system for the state of Nevada would have permitted a separate analysis of recidivism in relationship to whether the repeat offense occurred during a period of actual driving suspension or whether it occurred in a period following the restoration of the license. It is, therefore, not clear whether the effect which is shown occurred because more of the apprehended drinking drivers were under suspension and, therefore, driving less (or perhaps more carefully or both), or whether it occurred because there was a deterrence effect produced by knowledge from the experience of having lost the license on the spot to the police officer which deterred drinking and driving even after the individual's license was restored. In the absence of the ability to do this analysis, it would have been desirable for the authors to at least indicate that there were two possible effects of the administrative *per se* law.

Statistical Methods. Statistical procedures used appeared to be adequate and to have adequate statistical power. In general, the procedure appears to have been adequate to the data available.

Interpretation and Objectivity. It appears to this reviewer that the authors are quite objective in presenting their data.

This is a strong study in demonstrating that a change occurred in drinking and driving in 1983 and 1986. The principal threats to the validity of the study relate to the issue of what caused the change. Change in 1983 was potentially a product of a number of different factors. The data presented relate almost entirely to the administrative *per se* law, and while the authors acknowledge that other factors could have had an effect, there is no attempt to determine whether the other components of the law did in fact impact the driving public.

Lacey, JH; Stewart, JR; Marchetti, LM; Popkin, CL; and Murphy, PV. (1986). *Enforcement and public information strategies for DWI (driving-while-intoxicated) general deterrence: Arrest drunk driving - The Clearwater and Largo, Florida experience.* Chapel Hill, NC: University of North Carolina Highway Safety Research Center.

Description of the Countermeasure Program and its Operational Environment. This report is on a combination of certain DWI enforcement strategies, and a PI&E campaign about the increased enforcement. The enforcement strategies and material used in the PI&E campaign are described in detail. Timetables of events for the PI&E campaign, and some quantitative information on the intensity of the PI&E campaign are given. No quantitative information on the actual extent of increased enforcement is given.

Definition of the Target Population. Implicitly all drinking-drivers.

Research Design. The effects of the campaign are evaluated by comparing the study jurisdictions, Clearwater and Largo, with comparison jurisdictions, Sarasota and Bradenton. To evaluate the impact of the PI&E campaigns, telephone surveys were conducted in September 1983, immediately before the start of the campaign, in March 1984, and in October 1984. As indication of alcohol related crashes, two measures were used:

- crashes which were alcohol-related in the opinion of the investigating officer.
- nighttime crashes.

Statistical Methods. For the telephone survey, data were arrayed and discussed, but with no statistical analysis. For the analysis of crashes, alcohol-related crashes in the study areas as percentage of alcohol related crashes in study and comparison areas were used. The data points were shown, and two types of statistical analysis performed. In the first analysis, a linear time trend, and an intervention effect were used. They appear to fit the data very well. The second analysis uses a model in the first differences (this allows an implicit time trend), with an intervention effect, an error term, and error terms of the two proceeding months.

Interpretation and Objectivity. With respect to the telephone survey, there were slight differences in the composition of the respondents over time: in the study areas, the percentage of respondents which were male, increased; in the comparison area, it decreased. Though the relative change was not significant, it could possibly have affected the responses to the question.

Changes of the responses (in percentages) over time were presented and compared with those in the comparison group. No statistical analysis was performed to determine which of these changes are due to random variations. Overall, there is an impression of a change in the expected direction.

The evaluation of the effect of the program on crashes was also limited. The difficulty of separating an effect of the program from that of a change in the accident reporting requirement which occurred at the same time, is correctly described. The analyses found that the intervention effect was significant, 12.5 and 20.3 percentage point drop, respectively, from a before-intervention level of 65%-70%.

The change of the number of alcohol related crashes was so abrupt that it raises the suspicion of a change in reporting practices. However, because there was very heavy publicity at the beginning of the project, a strong initial effect is plausible.

It was also reported that the data on nighttime crashes gave similar results as those for alcohol related crashes.

LeClair, DP; Felici, L; and Klotzbier, E. (1987). *The use of prison confinement for the treatment of multiple drunken driver offenders: an evaluation of the Longwood treatment center.* Massachusetts Department of Correction.

Description of the Countermeasure Program and its Operational Environment. A minimum security prison designed exclusively to detain and provide alcoholism education and treatment to multiple drunken driving offenders.

Definition of the Target Population. Multiple DWI offenders.

Research Design and Statistical Methods. This study involved a comparison of the reincarceration rate of DWI offenders treated at the special facility with that of offenders handled through the normal prison procedures.

Interpretation and Objectivity. This report presents a detailed description of the development and operation of the program, and a very limited evaluation of its effect. The critical findings are: "Our research demonstrated that 6% of the Longwood program completers were returned to prison within one year of release. This compares to a department wide recidivism rate of 25% and to a rate of 19% for other low security institutions similar to the Longwood program."

First, one must realize that offenders assigned to Longwood were highly selected. Of 562 OUI offenders committed to the house of corrections in Dedham and Billerica, 86 (15%) were transferred to Longwood. After screening according to various criteria, 117 (26%) were found eligible, but 31 were not interested in transferring. The remaining were transferred.

There are some differences between the Longwood population and the OUI population in county houses of correction: the percentage of females is much higher, the mean age is higher, the educational level is higher, and more are single.

To measure the outcome, 305 residents released from Longwood were examined. Forty-two were "program failures" (returned to county house of correction, or escaped); only the rest were included in the evaluation; 263 were followed for six months, 174 for nine months, and 99 for 12 months. During these periods, 4%, 13%, and 11% had at least one subsequent arrest for DUI, respectively. Of the last group, 6% were re-incarcerated during the 12 months of follow-up.

Since the population studied was highly selected, and finally volunteered, the results cannot be taken at face value. Also, the recidivism rates of 25% overall,

and 19% for other minimum security prisons with which the Longwood rate is compared are not characterized in detail, e.g. for which offense. Therefore, the comparison may not be valid.

Levy, D. (1988). Methodologies for the evaluation of local traffic safety programs - With an application to New Jersey DWI programs. *Evaluation and Program Planning* 11.

Description of the Countermeasure Program and its Operational Environment. This article principally focuses on methods, so the description of the programs evaluated is almost lacking. However, three programs were evaluated in New Jersey. The first was an information program entitled "SOBER" (Stay Off the Bottle, Enjoy the Road). The second program evaluated was a "DWI" (Driving While Intoxicated) Task Force which involved an attempt to improve highway safety by means of pamphlets, public service announcements, scenarios for students and other consciousness-raising efforts of the danger of drinking and driving. This task force also recruited community organizations into the program including police agencies, alcohol treatment facilities, and public schools. The final program evaluated was entitled the "Strike Force" which provided overtime funding to police departments on a community-wide basis to operate sobriety checkpoints.

Definition of the Target Population. There is a lengthy discussion of the potential dependent variables to use in evaluating these alcohol countermeasure programs. This discussion includes a review of the prior studies and leads to a decision to use a number of proxys such as nighttime single-vehicle accidents.

Research Design. The study makes use of three research designs the first of which treats counties within New Jersey separately but analyzes the data as a group. The second design groups the data for the state as a whole. In the third design, one county, Bergen County, is studied alone as an experimental area and compared to five "control" counties. Each design is well-described and appears appropriate to evaluating this naturalistic experiment produced by the implementation of the three programs at various times between 1980 and 1985.

Statistical Methods. See above.

Interpretation and Objectivity. The author appears quite objective in his approach to the study. The major concern with the research design and the statistical methods is that the application of multiple designs and multiple methods leads to a concern that a "fishing expedition" is being carried out on a mass of data. This allows the possibility of chance effects to be eventually found which are then interpreted as being valid results of the program's implementation. The varying methods and designs do, in fact, give somewhat different results which tends to reduce the credibility of the principle study in Bergen County. Since in the time series analysis, results can be influenced by

the modeling decisions applied to the data, it is important the test be well defined. It is clear that a number of models were considered and some abandoned because they did not appear to give as good results as those reported. This throws some shadow on the robustness of the results. The author may not have been as circumspect as might have been desirable in pointing out this threat to the validity of his conclusions.

Other Comments. Overall, this appears to be one of the better studies of a naturally-occurring countermeasure. Very sophisticated methods have been applied to the available data, and the data have been looked at through three different designs in an effort to detect significant impacts from the three alcohol countermeasure programs. While the author has the advantage of selecting the techniques that provide the best results, it is also true that those results producing the strongest effects are those that appear intuitively correct. For example, stronger results are obtained using nighttime, single vehicle accidents, rather than all fatalities or accidents as the dependent variable. The longer term effect of the enforcement countermeasure, especially compared to the two PI&E programs is particularly important considering the general finding that the effects of deterrence are ephemeral.

Levy, D; Shea, D; and Asch, P. (1989). Traffic safety effects of sobriety checkpoints and other local DWI programs in New Jersey. *American Journal of Public Health* 79(3).

Description of the Countermeasure Program and its Operational Environment. The programs evaluated in this article are the same as those in the article by Levy entitled *Methodologies for the Evaluation of Local Traffic Safety Programs.* The present article reviews the "SOBER" (Stay Off the Bottle and Enjoy the Road) and DWITF (Driving-While-Intoxicated Task Force) which were principally consciousness-raising efforts produced by public information programs and a third program, the "Strike Force" which involved the implementation of sobriety check points. In this article the three programs are somewhat better described than in the Levy article, in the sense that the funding for the programs is provided together (in the case of the Strike Force checkpoint program) with the number of hours police officers devoted to the check points, the dollar cost of these hours, the vehicles stopped and the arrests made. Similarly, the funding for the SOBER program is provided together with the number of press releases and public service announcements aired on local stations.

Definition of the Target Population. Single vehicle nighttime crashes (6:00 p.m. to 5:59 a.m.) were used as the criterion variable. The authors recognize that this variable contains a number of crashes which are not alcohol related, but they selected it because it has the advantage of being objective. They also used non-pedestrian fatalities involving a motor vehicle. These measures were

normalized based on county population for each year of observation and entered into the covariance analysis using the logarithm of the resulting value.

Research Design. The approach to the evaluation involved using covariance equations involving annual values for twenty-six counties over a six year period from 1980 to 1985 for a total sample of one hundred twenty six cells. Dummy variables were created for each county, each year and each type of intervention. Control variables were added for unspecified demographic, highway and geographic elements within a specific county. In addition, a time dummy variable for each of the six years was entered into the covariance analysis. In a separate analysis, not reported, the authors derived weights for the number of years that each of the three programs studied, SOBER, DWITF and the Strike Force, were in place. These weights obviously affected their results. Their failure to be included in the article provides some limitation in the credibility of the study.

Statistical Methods. It is clear that a relatively elaborate statistical method was used. The main limitation on the presentation of the statistical method is that the investigators obviously did a number of other investigations using different methods. Some of these are reported in the article by Levy, others in reports to the NHTSA. These procedures are not fully described in this paper. There is some question as to what extent the results of this study depend upon the results of other analysis of the same data using different statistical methods.

Interpretation and Objectivity. The authors appear to be quite objective in their approach; however, the effort to be brief in presenting their statistical procedures results in their leaving out some analysis which may be significant to this study.

Other Comments. The results of this study indicate that across all of the counties in which the three programs were applied, the Strike Force had the strongest effect, producing a reduction in nighttime single vehicle accidents of approximately ten to fifteen percent. The Driving-While-Impaired Task Force produced a reduction between six and ten percent, but that reduction was effective over a shorter period of time. The purely public information program "SOBER" did not produce a significant effect. This study differs from that of the Levy article principally in that the Strike Force which involved the use of check points is evaluated in a total of *six* counties rather than simply in Bergen county alone. One issue is that Levy found a 29% reduction in injury accidents in Bergen county alone, whereas these authors find a 10 to 15% reduction in nighttime accidents in six counties. Could this result be based on the reduction in Bergen county? Or did the other five counties show results similar to Bergen? The results of this study overall appear convincing and provide evidence for the effectiveness of sobriety checkpoints.

Liban, CB; Vingilis, ER; and Blefgen, H. (1987). The Canadian drinking-driving countermeasure experience. *Accident Analysis and Prevention* 19(3):159-181. (Jun 1987).

Description of the Countermeasure Program and its Operational Environment. Not an evaluation, but a review of evaluations in Canada. Legal countermeasures were classified as legislative, enforcement, adjudication & sanctioning, and indirect (including alcohol availability). Also reviewed PI&E countermeasures and a group called "BAC feedback countermeasures," and rehabilitation countermeasures. Individual programs within these groups were described in quite good detail for a review at this level of detail. The article (published in 1987) traces the countermeasures back to 1968. Specific programs discussed were:

Legal - Legislative

Criminal Law Amendment Act, 1968-1969. Established a .08% *per se* limit; authorized the use of breath alcohol testers by police, and penalized test refusers the same as test failers. The legislation was accompanied by an extensive PI&E campaign which was evaluated and found to have raised awareness of the code changes. An evaluation of the traffic safety impact of the changes found a small, short-term reduction in fatal accidents in seven provinces, but no overall decrease in alcohol-related crashes. This was attributed to "shortcomings in enforcement," because of the need for "reasonable and probable grounds" for requesting a breath test. This, in turn, was believed to have reduced the credibility of the legislation.

1976 Roadside Breathtesting Legislation. Empowered police officers to request a screening BAC test on the "suspicion" that the driver has been drinking. Refusal had the same penalty as the impaired driving and *per se* violation. Only the effects of the accompanying PI&E effort (a six-week TV and newspaper campaign) were evaluated. The evaluation was well-designed, involving two cities that were exposed to both the legislation and the PI&E, one city that was exposed to neither the PI&E nor the legislation, and one city that was exposed to the legislation but not the PI&E. A telephone survey of male drivers was administered one week before, one week after, and three months after the campaign. Initial awareness in campaign cities reached 86% but dropped to 67% three months later. Non-campaign cities did not exhibit such awareness of the law. There was some weak evidence that subjective risk of arrest may have increased in campaign sites but not in non-campaign sites, even though one of the non-campaign sites had enacted the legislation.

12-Hour License Suspension Law. An Ontario law that allowed police officers to engage in spot checks for drinking drivers and suspend a driver's license for 12 hours if that driver registered .05% or more on a roadside

screening device. There was no organized media campaign accompanying the law. The fatality analysis revealed a small short-term effect. There was little media coverage, the telephone surveys indicated some awareness of the law but yielded no significant pre-post law changes in perceived enforcement, and the police survey indicated minimal enforcement of the law. The authors conclude that laws to increase the celerity and certainty of the punishment will have little deterrent effect without enforcement and publicity of the new laws."

Legal - Enforcement

The Alberta CHECK-STOP Program. This program was conducted beginning in the fall of 1973 and included both enforcement and PI&E components. Random roadside spot checks were used extensively, with non-impaired drivers receiving pamphlets, drinking drivers not legally impaired receiving a 24-hour license suspension, and legally-impaired drivers receiving the usual sanctions. The PI&E program sought to increase public awareness and to inform drivers about the dangers and consequences of drinking and driving. Two campaigns were mounted, one several weeks before the enforcement effort and continuing for several months, and the second beginning in 1975 and continuing for six months. Four waves of telephone surveys were used to assess awareness and attitudes. The authors of this review cautioned that the results should be read with care because of "positive loading" of many of the survey items. Maximum awareness of the program was 79%, falling to 58% 21 months after the intervention. Attitudes increased in a positive direction, but knowledge levels about drinking and driving did not change. Traffic data suggested some favorable impact.

Reduce Impaired Driving in Etobicoke Program (R.I.D.E.). This program was reviewed elsewhere (See Vingilis, Chung, and Adlaf, 1980). The enforcement component used random spot-checks and roadside breathtesting. The spot-checks (not roadblocks!) were conducted over a two-year period starting in October, 1979. The spot-checks were intensive, being conducted seven days a week, one or two shifts per day. The PI&E component used a highly visible, electrically lit R.I.D.E. sign on the roof of the police cars. The authors concluded that there was no measurable highway safety effect, either on accidents or drivers using the road. Found through self-reported data that the program increased the perceived risk of the "average man being caught," but not of the respondent being caught. Awareness of the program and program messages was also higher in Etobicoke than in the other police districts.

Reduce Impaired Driving Everywhere Program. An extension of the R.I.D.E. program to all of Metropolitan Toronto. Found a high level of awareness was achieved (83%), but no positive effect on risk perception. Also found

little or no effect on traffic safety. All findings were questioned because of contamination from other programs.

Niagara Drinking and Driving Project. Modelled after the R.I.D.E. program but included also an intermittent publicity campaign conducted over a two-year period. Evaluation flawed by a series of methodologic difficulties but did suggest the program achieved high awareness - 96% aware of the program at 14 months post-intervention, compared to 17% pre-intervention.

British Columbia COUNTERATTACK Program. Implemented in 1977, combining three publicity campaigns with police enforcement. Media program sought to increase awareness of the seriousness of drinking and driving, to reduce public tolerance of drinking and driving, and to publicize police use of mobile breath testing units. First TV campaign (13 weeks) introduced the enforcement effort; the second ten-week TV campaign occurred in late 1978; and the third campaign was limited to radio. Enforcement activity included 14 BATmobiles at roadside spot-check locations. Evaluation of media campaign did not use a control group or pretest measures but did suggest to the reviewers that a long-term, intermittent publicity campaign could maintain program awareness over an extended period of time. A time-series analysis of alcohol-related fatal crashes showed an initial decrease followed by a levelling off.

Concluded that enforcement programs realized only a limited impact on deterring drinking and driving in Canada.

Legal - Adjudication and Sanctioning

Videotaped Sobriety Tests. Involved the use of videotaped performance of four sobriety tests in a British Columbia community in 1978. The counter-measure was accompanied by a local publicity campaign. Found that drinking-driving offenses decreased six months after the intervention compared with six months before and that there was a substantial reduction in the number of contested charges. Unfortunately, there was no control group.

Legal - Alcohol Availability

Legal Drinking Age. Gives the results of a number of older Canadian studies of this countermeasure, including studies that investigated the effect of lowering the drinking age. All of these latter studies found accidents involving young drivers increased after the drinking age was lowered. Another study of raising the legal drinking age by only one year found little or no traffic safety impact.

Alcohol Sales Policy. Examined the effect of a 1976 law allowing local control of alcohol availability. Three communities that established differing policies (on-premise outlets only, rationing, and no outlets) were compared with two control communities that did not change their policies. The study examined police-recorded arrests for public drunkenness, assault, and impaired driving for a one to two-year before period and a one-year after period. Found no changes in impaired driving that could be attributed to sales policy.

Public Information and Education Countermeasures

1971 Edmonton Campaign. The campaign stressed alcohol involvement in accidents, the effects of alcohol on driving performance, penalties for drinking and driving, and alternative behaviors to drinking and driving. There were no changes in "enforcement level." The campaign was conducted over a one-month period spanning the Christmas and New Year holidays, and was evaluated by Farmer in a 1975 report. The design involved roadside surveys in the test jurisdiction and a control jurisdiction. Found a significant decrease in the proportion of drivers above .08% in the test jurisdiction only.

1973 Ontario Campaign. This was a nine-week media campaign in nine Ontario cities during December 1973. The campaign sought to raise awareness of drinking and driving and to stimulate a local response to the problem. The campaign was comprehensive and included community involvement in providing resources. A before-and-after telephone survey found the campaign to be effective in creating a "modest" level of awareness (about 43%) in increasing knowledge of the legal maximum BAC and the jail term for drunk driving, and in reducing self-reported drinking and driving.

BAC Feedback Countermeasures

British Columbia Experiment. This involved the installation of breathtesting devices in two pubs, two lounges, and two restaurant-lounges in 1976. Patrons were asked to fill out a questionnaire and then take a BAC test. One-third of the 3,407 persons completing the questionnaires reported driving while impaired after leaving the testing location. The data indicated that the majority of the respondents did not appear to be deterred from driving by the knowledge that they were impaired; only 33% said they changed their intentions after acquiring knowledge of the BAC. Data from observers suggested that a much smaller percentage of the impaired actually changed their intentions after the test.

Dartmouth / Halifax Tavern Demonstration. This involved a test of self-regulated drinking, BAC feedback, and police spot-check activity in Nova

Scotia in the early 1980s. The self-regulation component consisted of a BAC calculator given to patrons. BAC feedback was obtained by a validated self-report of drinking activity converted to BAC and given to the patrons as they left the drinking establishment. Enforcement consisted of police spot-checks along selected routes in the vicinity of the establishments. The program was not effective in lowering the mean BAC of persons leaving the establishments or in reducing the percentage above the legal BAC limit.

Rehabilitation Programs for Convicted Impaired Drivers

Alberta Impaired Driver's Program. This program was first implemented in 1970 and involved sentencing the test group to a maximum six-month probationary period during which they had to participate in the program, and a non-probationary control group. The evaluation was flawed, but suggested that the program had a positive effect on traffic violations in general but not on impaired driving.

North Bay Impaired Drivers Program. This program was implemented in 1973 in Northbay, Ontario. It consisted of 12 weekly educational sessions and one individual therapy session. Subjects were drivers with one or more prior DWI convictions referred to the program by the courts. There was a control group of 25% of the recidivist population. Again, there were methodological flaws in the evaluation, but it did suggest that the program was effective in reducing recidivism.

Oshawa Impaired Drivers Program. This 1974 program was patterned after the Phoenix and the Alberta programs, providing nine weekly educational sessions for court-assigned multiple offenders in Oshawa, Ontario. It was found to have a positive effect on knowledge, but no effect on attitudes or a variety of recidivism measures.

Chatham Drinking-Driving Awareness Program. This was a voluntary education program for first offenders in Kent County, Ontario. The program began in 1978 and consisted of four weekly sessions. A recidivism analysis found that a larger percentage of program participants were reconvicted than non-program participants. This was partly due to a larger proportion of participants living in Kent County and therefore being more likely to be apprehended within the court's jurisdiction. There was also a question about the randomness of assignment to program and control groups.

British Columbia Impaired Driver's Course Program. This program was implemented in communities throughout British Columbia in the early 1970s. Many communities treated rehabilitation as a form of penal sanction. One evaluation of knowledge and attitudes found the program participants to

have more positive changes than did nonparticipants. Another evaluation of recidivism using non-random assignment to treatment and random assignment to control found a reduction in recidivism due to the program, but the evaluation was flawed methodologically.

Newfoundland Impaired Drivers' Program. This court referral program began in 1978 and was still active when this paper was written (1987). It included information dissemination and self-evaluation. An unpublished evaluation found significantly fewer participants crashed in the post-intervention period than in the pre-intervention period, whereas there was no change for the control group. The program had no effect on the impaired driving rearrest rate.

Saskatchewan Impaired Driver Treatment Program. This was a treatment program for incarcerated drinking-driving offenders. It began in 1979 and included an assessment and a two-week rehabilitation program in a supportive environment. The evaluation had methodologic difficulties (for example, short follow-up period and problems in matching) but did suggest that the program participants had a reduced recidivism for some offenses (for example, crimes against property). The program apparently had no effect on drunk driving recidivism.

The report concluded that Canadian rehabilitation programs have had some positive effects on knowledge, and mixed effects on attitudes and traffic safety measures. There were problems in implementation (usually not discussed in evaluation studies), including hostility and intoxication among participants resentful of their assignment to the course. The authors speculated that the limited traffic safety impact of the programs may have been due to methodologic shortcomings in the evaluations.

Interpretation and Objectivity. The review was highly objective, concluding that the impact of most Canadian programs has been limited and short-term. The authors note that Canadian legislative countermeasures have met with results similar to those in other countries, chiefly because of the low probability of detection. Videotaping was regarded as promising. One reason for the "poor outcome of legal countermeasures" was seen to be the difference between perceived and actual risk of apprehension. Intermittent publicity campaigns were regarded as promising. Countermeasures using enforcement as a component were regarded as having "inconsistent results on traffic safety outcome." Control of the legal drinking age had some effect on traffic safety, but control of alcohol sales had no observed consistent impact. Rehabilitation programs were found to have had some positive effects on knowledge, and mixed effects on attitudes and traffic safety measures. Programs involving BAC feedback had a traffic safety positive effect only when combined with enforcement. Rehabilitation programs have had "varied effectiveness." The authors

saw a need for systematic, interactionist approach to the alcohol-crash problem, involving the combined efforts of government, its agencies, and the private sector.

Lynn, C. (1984). *The effects of raising and lowering the minimum legal drinking age in Virginia. Update.* Charlottesville: Virginia Highway and Transportation Research Council.

Description of the Countermeasure Program and its Operational Environment. This report deals with the minimum legal drinking age as a countermeasure. In Virginia, the minimum legal drinking age for beer was lowered to 18 years in 1974, and the age for off-premise sales for beer was raised to 19 in 1981, but it could still be bought by 18 year-olds for on-premise consumption. The purchase age for wine and liquor remained at 21.
Definition of the Target Population. The study population is Virginia drivers, by age class, for the years 1969-1982. The population was grouped into less than 16 years old, 16-19 year olds, 20-29 year olds, and 25 and over. This grouping does not match the age groups affected by the changes, 18, 19 and 20 by the first change, 18 by the second change.

Research Design and Statistical Methods. The research approach consists of time series of the number of alcohol-related crashes, of the percentage of crashes which are alcohol related, and of the alcohol-related crash rate per licensed driver. It is not indicated how "alcohol-related" is defined, presumably police report. Changes over time are compared. In some cases, time trends before a change are determined, projected beyond the change, and compared with the actual data. Whether the difference is significant is indicated, but no details of the test are given.

Interpretation and Objectivity. There are some concerns with the design of the study. First, it is questionable whether police practices on reporting alcohol involvement have remained constant over 14 years. Second, the time series used by the author show complex patterns. Though some changes coinciding with a change may suggest an effect, there are also similar changes at other times. Using linear time trends for extrapolation is risky under such conditions. The age groups studied do not match those affected by the law changes. This would dilute any real effect, though it could capture spillover effects. To look at the control groups separately makes less efficient use of the information than to include them into the analysis.

The author's conclusions are:

> The percentage of alcohol related crashes has increased significantly for persons 16, 16-19, and 20-24 years since 1976; there were no increases for adults. In 1982, percentages of alcohol-related crashes for the affected age groups dropped. (But the author does not mention that it also dropped for

those under 16 years. Also, the numbers of alcohol-related crashes was significantly lower than expected not only for the 16-19 year olds, but also for the drivers over 20.)

From 1974-82, the number of alcohol-related crashes were higher than expected from previous trends for persons under 16, 16-19, 20-29 years old. Non-alcohol-related crashes, and alcohol-related crashes for adults were unchanged. These trends for young persons were tentatively reversed in 1982.

Though the conclusions are a fair description of some features of the data, they tend to oversimplify the situation.

Lynn, C. (1985). *An evaluation of thirteen local selective enforcement projects designed to reduce drunken driving in Virginia*. Charlottesville, VA: Virginia Highway and Transportation Research Council.

Description of the Countermeasure Program and its Operational Environment. This report consists of descriptions of 13 local selective enforcement programs. Each is evaluated in terms of its stated goals. An overall evaluation is also provided. In general, the programs involve setting up special enforcement patrols for DUI detection which then patrol the locality during specific target hours; Friday and Saturday nights.

Definition of the Target Population. Target population consisted of drinking drivers driving in the local areas during the target hours.

Research Design. Each locality had stated goals in terms of increased DWI arrests and reductions in alcohol-related accidents in the project year as compared to the three previous years. For each of the four years, tabulations are presented of accidents classified by severity (fatal, injury, no injury), and cross-classified by alcohol-related or not, and by time period (target hours or non-target hours). These frequencies are also summed over localities for an overall evaluation. Results are presented locality-by-locality and overall.

Statistical Methods. No statistical tests were done within localities. Results of chi-square tests for changes in severity between the pre-project and project periods are presented for alcohol-related and non-alcohol-related accidents during target-hours and non-target hours. No other tests are reported (e.g., changes in percent of alcohol-related crashes).

Interpretation and Objectivity. Ten out of the thirteen localities met their stated goals in terms of reductions in alcohol-related accidents. It is stated that for seven of these ten, the change can be attributed to the program since alcohol-related accidents either did not decrease or decreased to a lesser extent during non-target hours.

No account is taken of the random nature of the data, nor is any consideration given to the possibility that increased enforcement during target hours might have some effect at other times as well.

Overall alcohol-related crash rates are slightly lower in the program year than in the preceding year, but very much in line with the two earlier years. Thus, there is some evidence of program effectiveness, but it is not very convincing.

This report contains an evaluation of a collection of local selective enforcement projects. It does not represent a research project designed to determine whether or not selective enforcement projects are effective. Many of the communities had previous DUI enforcement grants, some had no history of alcohol-related accident problems.

Marsh, WC. (1987). *Negligent-operator treatment evaluation system: Program effectiveness report no. 3.* Sacramento: California State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. Evaluates the effectiveness of California's Negligent-Operator (Neg-Op) Program. Neg-Op is a four level program for drivers who have accumulated points for driving-related violations, including DWI. The program operates at four levels. First, warning letters are sent to drivers who accumulate 2 points in one year. (DWI carries 2 points.) Second, a more severe letter stating an intent to suspend after the driver has one point less than the *prima facie* definition of Neg-Op (4 points in 1 year, 6 points in 2 years, or 8 points in 3 years). Third, a probation hearing is ordered for a driver who has reached the *prima facie* definition, has accumulated 2 major convictions, or has accumulated 3 alcohol-related entries (including failure to appear in court) in 3 years. Driver license sanctions for violation of the probation conditions are imposed at the 4th level of the program. Alcohol-related incidents received are treated differently than other incidents, for example, different warning letters, different kinds of probation conditions in the hearing, etc.

Definition of the Target Population. Implicit in the definition of the program.

Research Design. Treatment-control design with random assignment to the two groups. The first three levels of the program are evaluated. Extremely large Ns are used in the study. For example, the alcohol group at level 1 had a treatment cohort of 32,453 and a control cohort of 8,090.

Statistical Methods. Used the survival-analysis approach, in general, the most appropriate for this kind of study. (There are many variations of this approach.) Analysis covered a 2-year period.

Interpretation and Objectivity. Found that the program overall was effective both in reducing accidents of all types and in reducing traffic violation convictions. For accidents, the control group had a probability of an accident on or before 1 year of .138, compared to .121 for the treatment group, a difference of 13%. Found that the small observed effect of the warning letters on accidents was not statistically significant. Most important, found that the program's effect on the alcohol subgroup was also not statistically significant. An interesting side result was the finding that the accident risk of the alcohol group was substantially less than that of the non-alcohol group. In fact, the risk of the alcohol *control* group was significantly less than that of the non-alcohol *treatment* group. This was explained (plausibly) by the author by the alcohol group having already received relatively severe court sanctions and by the fact that the two-point assessment for a DWI probably brought more alcohol-group drivers with fewer violations and accidents into the program than did the assignment criteria for the non-alcohol group. The author's recommendation for policy changes indicated by the study findings (e.g., reinstating the 1st-level warning letter for the non-alcohol group) are appropriate.

Massachusetts Senate Committee on Post Audit and Oversight (1987). *Current drunk driving deterrence. A cause for cautious optimism.* Boston, MA: Massachusetts State Senate.

Description of the Countermeasure Program and its Operational Environment. This is one of a series of reports by the Senate Committee on Post Audit and Oversight, this study provides an annual review of the progress Massachusetts has made in their drunk driving effort. Included in this study are the following: (1) Results of nighttime fatal crashes by year and by age group focusing on the under 20 and the 20 year old as well as rates per 10,000 licensed driver; also of interest is the experience for the first eight months of 1987 representing the beginning of the Safe Roads Act passed in late 1986; (2) examination of enforcement levels at the state as well as the local level; (3) adjudication progress, particularly with respect to court backlog as well as case disposition by the 72 courts in Massachusetts; and (4) results for programs aimed at recidivists.

Definition of the Target Population. Drinking drivers in Massachusetts.
Research Design. This is a descriptive statistical study and hence there is no research design.

Statistical Methods. There is basically no statistical analysis done other than examining frequencies and rates per 10,000 licensed drivers of such things as nighttime fatal crashes by age group and arrests by police agency (state police versus local). There is one mention of a difference in rates being "not significant" but no details were provided with respect to analysis method.

Interpretation and Objectivity. The conclusions seem self-evident from the tables. They include that (1) drunk driving crashes as indicated by nighttime fatal

crashes have seen a considerable drop in the 1980's in Massachusetts; (2) the Safe Roads Act with the *per se* provision has resulted in an increase in 45 percent of refusals to take breath tests; (3) although the DWI arrest rate is reasonably high at 10 per 1,000 licensed drivers, there is a need for increased enforcement; (4) there continues to be a need for decreasing the backlog of cases in the courts; (5) with the Safe Roads Act, jail sentences are up 38 percent with generally longer sentences; (6) the state police continue to outshine the local police with respect to DWI arrests although the local agencies are showing improvement; and (7) it would appear that more appropriate sentences are being given to the recidivists with a 15 percent increase in jail sentences for these cases.

McCartt, AT; and Dowling, AM. (1985). *An impact evaluation of the New York stop-DWI program.* Albany, NY: Institute for Traffic Safety Management and Research.

Description of the Countermeasure Program and its Operational Environment. This report is an evaluation of New York's statewide Special Traffic Options Program for Driving While Intoxicated (STOP-DWI). The program began November 1981 and was continuing into 1984 at the time of the evaluation.

Definition of the Target Population. Drunk drivers in the state of New York.

Research Design. The evaluation uses basically a before-after design. Several types of comparisons are made. Before and after comparisons of quantities such as alcohol-related arrests, convictions, and alcohol abuse clinic referrals are given. Surveys were conducted which serve as a basis for comparisons of attitudes, knowledge of alcohol-related problems and laws, and perceptions of risk of arrest. Comparisons are also given in terms of accident frequencies with nighttime fatal accidents considered to be surrogates for alcohol-related accidents, and daytime fatal accident as surrogates for non-alcohol-related crashes. Thus, daytime accidents served as a comparison measure.

Statistical Analysis. Several types of analyses were used: t-tests of monthly mean numbers of accidents; Z-tests of log-odds rations of nighttime and daytime crashes; and tests based on time series models fit to the monthly accident data.

Findings and Interpretation. Virtually every analysis showed substantial positive effects associated with the program. The interpretation seems quite clear.

McKinnon, DP; and Woodward, JA. (1986). The impact of raising the minimum drinking age on driver fatalities. *International Journal of Addiction* 21(12):1331-1338. (December 1986).

Description of the Countermeasure Program and its Operational Environment. Countermeasure studied is the raising of the drinking age.

Definition of the Target Population. Study populations are drivers under 21 years of age in Illinois, Massachusetts and Michigan. Criteria for the selection of these states were: 1) there had to be at least a 2-year increase in the drinking age between 1975 and 1981 (the period of the available data); and 2) there had to be at least 250 fatalities per year in the state. A two-year increase was required to ban a larger population affected by the law; the 250 minimum for fatalities was required to exclude sites with many months of 0 fatalities. Both criteria appear arbitrary. It would have been better to include more states and determine which ones gave significant results and which ones not.

As control states, Missouri, Ohio and Connecticut were selected. No reason for the selection was given; geographical proximity appears likely.

Research Design and Statistical Methods. The research design is to compare times series of monthly numbers of driver fatalities 21 and younger, and 25 or older; for the control states, only the younger group was used. This design has some weaknesses. First, it does not account for changing numbers of drivers in the two age groups; perhaps the authors make the implicit assumption that a time trend in the model can account for such changes. That is not always the case. Then, the younger age group includes a high percentage of drivers who are not affected by the change in the drinking age. One might argue that this would capture effects on age groups adjacent to the affected groups, but it is of questionable value to design a study to capture a speculative effect, but decrease its power to detect a more likely effect. Finally, to analyze data for treatment and control groups separately is usually a weaker design than a design which combines data from treatment and control groups.

As the statistical technique, the authors use regression analysis of a time series with the intervention as only extraneous factor. The number of the year and the number of the month within the year, and its square and its cube were introduced as independent variables. The latter imposes a fairly limited pattern on the seasonal variations which can be represented. Using the number of the year, rather than the number of the month counted from the beginning of the time series, introduces an additional component in the calculated seasonal pattern, if a long-term time trend is present.

The authors present, except for the intervention term, only significant terms of their time series models. Typically, the square of the number of the month and its cube are significant, in three cases the year, and in two cases its square.

Interpretation and Objectivity. For Illinois, the authors find a significant reduction of 18% for young drivers, an insignificant decrease for older drivers, and an insignificant increase for young drivers in the comparison with Missouri.

For Michigan, the authors find a significant 11% reduction for young drivers, an insignificant reduction for older drivers, and a significant increase in Ohio. In both cases, an analysis of the change in the younger group relative to the older group would probably have shown smaller, but still significant decreases.

For Massachusetts and Connecticut, the authors note an increase in fatalities approximately 10 months before the drinking age change (they speculate "perhaps due to an increase in the number of miles traveled"), and introduce an intervention variable to account for this. With this variable included, the effect of the intervention in the drinking age is not significant. Based on the results of a telephone survey, the authors assume a linear decreasing intervention effect over 24 months following the change in the drinking age. This intervention variable shows a significant decline for young drivers, and a significant increase for old drivers, but also a significant decline in Connecticut.

McKnight, AJ; Hyle, P; and Albrecht, L. (1983). *Youth license control demonstration study*. Washington, DC: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. Evaluates the effect of a model provisional licensing program in Maryland. The program involved a number of elements. These included passing laws and adopting procedures under which (1) all applicants under the age of 18 were required to obtain a provisional license; (2) drivers operation under a provisional license were not permitted to operate a motor vehicle between 1:00 am and 6:00 pm unless accompanied by a licensed adult; (3) to qualify for a regular license, drivers had to remain violation-free for a six-month period; (4) any violation occurring under a provisional license resulted in "driver improvement" action consisting of reading a manual and passing a test; and (5) parents had to provide supervised practice to drivers before the drivers were issued a provisional license and again before they were issued a regular license.

The report provides a detailed description of pertinent laws and procedures before and after the countermeasure program.

Definition of the Target Population. All beginning drivers under the age of 18.

Research Design and Statistical Methods. Used an interrupted time series design with comparison groups consisting of Maryland drivers ages 18-21 and equivalent age groups in Virginia and the U.S. as a whole. The ARIMA technique was used in the analysis. Effects on nighttime accidents, daytime accidents, and violations were assessed. The research design and the analysis methods were strong.

Interpretation and Objectivity. Found that nighttime accidents of 16-year-olds dropped relative somewhat relative to older age groups but that this drop appeared due a long-term trend rather than curfew component of the program.

Concluded that there no evidence of an effect on nighttime accidents involving the target group of drivers, and that whatever subgroups of the drivers were responsible for these accidents seemed not to be deterred by the curfew.

Also concluded that the analysis of daytime accidents (a 5% drop was found for the 16-year-olds and the 17-year-olds) strongly suggested the requirement for six months of violation-free driving was effective in fostering somewhat more safer driving among the target group.

These interpretations appear to be completely objective and justified by the study results.

McLean, AJ. (1984). *Random breath testing in South Australia: effect on drink-driving, accidents and casualties.* Adelaide, Australia: Adelaide University.

Description of the Countermeasure Program and its Operational Environment. This study evaluates random breath testing that was introduced in South Australia in October 1981. No description of this countermeasure or discussion of other things happening in South Australia is provided.

Definition of the Target Population. All drivers.

Research Design and Statistical Methods. Data were obtained on BACs of drivers via roadside surveys, attitudes of these drivers were assessed via mailback questionnaires, and available crash data were analyzed to determine if there were changes that could be attributable to random breath testing. The roadside surveys were designed and carried out adequately. The questionnaire return rate was about 40 percent which renders the results uninterpretable as regards to the general driving population. The before-after design provides some confidence in the findings; using another Australian state for comparison, if possible, would have been a superior design.

Interpretation and Objectivity. There was an initial decrease in non-crash drivers with BACs over 0.08 percent; in the second year this proportion returned to baseline levels, although the proportion with any positive BAC was lower both post-law years.

The crash data did not yield a clear picture. The analysis was hampered by the absence of BAC information on many crash involved drivers. There may have been a brief reduction in crashes due to RBT but there was also an increase in possibly alcohol related crashes on back roads, where many drinking drivers may have been driving to avoid the roadside surveys that were on main roads.

Minnesota House of Representatives Research Department. (1983). *Analysis of the effect of recent changes in Minnesota's DWI laws. Part I: Perceptions of Minnesota's drivers.* St. Paul, MN: Minnesota House of Representatives.

Description of the Countermeasure Program and its Operational Environment. This report describes a telephone survey of 1,259 randomly selected households in Minnesota in which 975 responses were received. The survey was conducted over a three-month period starting late October, 1982, after several changes to the state's DWI laws had gone into effect in April and July of 1982. There was no comparison survey conducted prior to the implementation of the new laws. The law changes dealt primarily with procedures to improve the efficiency of processing DWI cases, more severe sanctions for repeat offenders, and measures to facilitate DWI arrests. The report contains a good description of the law changes in an historical perspective.

Definition of the Target Population. The law itself was aimed at all drinking drivers. The survey targeted "principal and co-principal drivers" in Minnesota households. Biographical characteristics of the survey sample are presented. The survey cohort differed significantly from the state population on several important variables, including age and sex, but the differences were not large.

Research Design. The survey dealt with alcohol consumption, perceived seriousness of Minnesota's DWI problem, awareness of new DWI policies, perceived crackdown under the new DWI policies, mandatory confinement and perceived severity, behavioral changes due to the new DWI policies, factors that would deter others from DWI, factors that deter oneself from DWI, and ratings of DWI mechanisms. Although the survey provides excellent baseline data, its one-shot nature makes it less than ideal for measuring changes due to the new law.

Statistical Methods. Used multi-dimensional contingency table analysis following the logit procedure.

Interpretation and Objectivity. The findings relative to behavioral changes induced by the new law are of interest here. The study found that 28% of non-abstainers who were aware of the new policies (n=692) said they had changed their drinking-driving behavior in response to the new policies. The strongest effect on self-reported behavior changes came from those who "knew others who have changed their behavior in response to the new policies." Other attributes of those with positive behavioral changes were a perception in the likelihood and severity of punishment, and being a younger and a regular or frequent drinker, as opposed to being an older and a regular or frequent drinker.

Other Comments. An excellent baseline study of supporting utility to this project.

Minnesota House of Representatives Research Department. (1985). *Analysis of the effect of recent changes in Minnesota's DWI law. Part III: Longitudinal analysis of DWI policy impacts.* St. Paul, MN: Minnesota House of Representatives.

Description of the Countermeasure Program and its Operational Environment. An extensive time-series evaluation of Minnesota's DWI law. The provisions of the law changes evaluated were classified as (1) those designed to facilitate apprehension and (2) those designed to prevent delay of license revocation. The group one changes allowed a warrantless arrest for DWI and eliminated the requirement for an officer to offer a blood test for a driver arrested for DWI. The group two changes allowed the administrative license revocation to remain in effect while the driver was awaiting a requested judicial hearing.

Definition of the Target Population. The target population was tacitly all drinking drivers. Characteristics of various populations are presented.

Research Design. Analyzed time series of a number of surrogate measures of drinking-driving in three geographic regions. The measures were: (1) monthly counts of all fatalities, nighttime fatalities, and daytime fatalities, plus the ratio of nighttime to daytime fatalities; and (2) fatality rates per 100 million vehicle miles travelled for all fatalities, nighttime fatalities, and daytime fatalities. Attempts were made to control for seasonal variation and "historical patterns." The three geographic regions were the state as a whole, Hennepin County, and the state minus Hennepin County. Apparently, no non-Minnesota time series were used as controls, although the use of VMT as a denominator would be expected to account for some driving-related factors that might confound the results. Details of the method used by the Minnesota Department of Transportation in the computation of VMT (a critical issue given the lack of outside control groups) are not provided.

Statistical Methods. Used ARIMA models over an 81-month time period. The usage appears to have been appropriate.

Interpretation and Objectivity. The study found that the policy changes reduced the number of fatalities in Minnesota by 18% and that the decreases found implied a 32% decrease in the overall incidence of drinking and driving statewide, a 28% decrease outside Hennepin County, and a 45% decrease in Hennepin County. These differences were attributed to the Hennepin County mandatory jail policy discussed elsewhere in this volume (See Falkowski, 1984). Speculates that the positive effect was due mainly to the amendment preventing delay in license revocation and to the mandatory jail policy in Hennepin County. The findings on the overall reductions flow logically from the analysis, but the speculations about the effect of jail are based on the validity of the findings of the jail study reported by Falkowski.

Neff, RL; Landrum, JW; Windham, GO; and Miles, SM. (1983). Probation as a DUI countermeasure: Alone and combined with traditional programs. *Traffic Safety Evaluation Research Review* 2(3):5-24.

Description of the Countermeasure Program and its Operational Environment. Evaluates the effect of probation, rehabilitation, and probation plus rehabilitation on arrest recidivism of problem drinkers and non-problem drinkers in Mississippi over the period July 1975 through June 1981. The project was conducted in 11 small cities with a population of 8,875 to 46,264 and a "commitment to DUI enforcement and intervention." First offenders were allowed to retain their driver's license by participating in the program, a condition that would be likely to slightly inflate their recidivism. The paper describes the whole assignment and treatment process very clearly and concisely.

The probation treatment consisted of the subject's reporting to a probation counselor once a month for 12 months for no longer than 30 minutes per session. For problem drinkers, rehabilitation consisted of a "modified form of group therapy" in which eight to 10 subjects reported for 90-minute sessions once a week for eight weeks. For non-problem drinkers, rehabilitation was attending four weekly 2 1/2 hour sessions of a DWI school. In addition, about 100 subjects from each group were given the Current Life Status Questionnaire of the Life Activities Inventory (LAI). All entries into the various groups (not just those who completed their treatments) were retained for analysis.

Definition of the Target Population. Consisted of drivers assessed to be problem drinkers or non-problem drinkers assigned to the program. Initial screening was conducted at arrest, and assessment was made using a combination of the Mortimer-Filkins Questionnaire, prior record, and BAC at the time of arrest. There was no detailed description of the characteristics of either the problem-drinker group or the non-problem drinker group, although some of the demographic characteristics of the group as a whole and the recidivists were given.

Research Design. Involved random assignment to treatment and control groups and the examination of recidivism rate over a 24-month period following entry into treatment.

Statistical Methods. Used t-tests and contingency tables to analyze the recidivism rates of the treatment and control groups. This was appropriate for design used, provided the assignments were truly random.

Interpretation and Objectivity. Found that there was no significant differences among any of the problem drinker groups. For the non-problem drinkers, the data suggested that probation might have been slightly better than non-probation, and that probation with rehabilitation might have been slightly better than probation alone. However, rehabilitation alone was clearly ineffective for problem drinkers or non-problem drinkers.

Nichols, JL; Weinstein, EB; Ellingstad, VS; and Struckman-Johnson, DL. (1981). The effectiveness of education and treatment programs for drinking drivers. A

decade of evaluation. In: *Alcohol, Drugs and Traffic. Volume III of the 8th International Conference. Proceedings. June 15-19, 1980. Stockholm, Sweden.* Stockholm, Sweden: Almqvist & Wiksell International. 1298-1328.

Description of Countermeasure Program and its Operational Environment. The purpose of the paper was to assess the various types of information collected and analyzed by the National Highway Traffic Safety Administration from 1971 through 1980 to assess the effectiveness of drinking driver education and treatment programs in reducing subsequent drinking related driving offenses.

Definition of the Target Population. The target populations are convicted DWI offenders who are described in the various studies reviewed.

Research Design. The authors described the general adequacy of the research designs of all the studies very clearly. Their criteria were that the DWIs were classified into problem and non-problem drinkers, that the different treatment modalities were analyzed separately, and that control groups were used, preferably with randomized assignment. The results of both methodologically strong and weak studies were also compared.

Statistical Methods. The statistical methods used by the original authors of the reviewed studies seem to have been used, but it is not clear in most of the tables and figures what exact measures were used.

Interpretation and Objectivity. Many of the details of the reviewed studies were not presented but this is understandable given the nature of the presentation. The analyses of methodologically weaker and stronger studies provided a good assessment of efficacy; namely that the stronger the methodology of the study, the less likely one is to find positive results. The weak specific deterrence and non-existent general deterrence impacts on traffic safety seem well founded from the review. In all, the paper is well balanced and presents the complexities and realities of the issue of education/treatment programs.

Ogborne, AC; and Smart, RG. (1980). Will restrictions on alcohol advertising reduce alcohol consumption? *British Journal of Addiction* 75.

Description of the Countermeasure Program and its Operational Environment. The countermeasure studied is the legal restriction of advertisements for alcoholic beverages. This study deals with two entirely separate and different situations. One studies the effect of a restriction of beverage advertisements in Manitoba in 1974 and the other compares restrictions in alcohol advertising across the U.S.

Definition of the Target Population. The general public.

Research Design and Statistical Methods. The Manitoba study used monthly figures of per capita beverage sales from January 1970 through December 1977. The study of U.S. data used data from various time periods. In one case, the dependent variable was the per capita consumption of alcohol in all states in 1974, in the other, 1970 alcoholism rates. Independent variables were "availability of alcohol", which was defined only by giving a reference, per capita income, the percentage of the population living in urban centers, and the restrictions on printed media advertising, scored 0, 1 and 2 by a Congressional Committee in 1963, and found appropriate by another Committee in 1975.

Interpretation and Objectivity. With respect to the Manitoba study, a graph shows little overall change; to us, however, a closer look suggests a weak increasing trend until the middle of 1975, and a decline thereafter. The authors state that time series analysis was performed without giving details. They report an increase of 4.5% after intervention, similar to an increase of 5% in Alberta, which is similar in alcoholism and deaths from cirrhosis. Since the authors do not give any details, the validity of the conclusion cannot be assessed. The graph indicates a weak suggestion of a delayed effect, but similar data for good control states would be needed.

The regression analyses of the U.S. data find no significant effect to the restrictions. This type of regression approach is inadequate to answer the question. For a valid result, it is necessary that at least all of the more influential factors be included in the analysis.

In summary, the results allow no conclusions.

Peck, RC. (1987). *An evaluation of the California drunk driving countermeasure system: An overview of study findings and policy implications.* Sacramento: California State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. This is a summary report on the results of evaluations of several countermeasures in an overall program. The program included several countermeasures: alcohol treatment, driver license suspension, implied consent legislation, warning letters for first time DWIs, and a risk-assessment strategy for medically impaired (including alcohol problems).

Definition of the Target Population. Only summary descriptions are provided. These are appropriate here. See separate reports for details.

Research Design. Again, only summary descriptions are provided, but these are quite good. In general, the studies employed very sound research designs using treatment and control groups with random assignment.

Statistical Methods. Eliminated from this summary volume.

Interpretation and Objectivity. The evaluation of alcohol-abuse treatment as an alternative to license suspension found that the alcohol-treatment group had 70% more nonalcohol-related accidents than did the license-action recipients. Drivers receiving 3-year suspensions had fewer nonalcohol-related accidents and convictions than did those who received 1-year suspensions. However, the alcohol treatment group and the license suspension group had the same number of alcohol-related accidents. Further, the alcohol treatment group had 9% *fewer* alcohol-related accidents than did the license suspension group. Nevertheless, the license suspension group still fared better with respect to alcohol-related and nonalcohol-related accidents combined. Another evaluation of license suspension vs. treatment for second offenders showed that the former group had a subsequent crash risk close to that of the average driver, while the second group had a crash risk much higher than the average driver. Studies of first offenders showed similar results, and also showed that suspension alone was more effective than any other combination of sanctions studied, including a fine and jail only.

The implied consent (IC) study assessed both the IC system performance and IC effectiveness. The study found that about 95% of reported test refusers were sanctioned. Further, 61% of the refusers were also convicted of DWI, compared to 66% of all DWI arrestees. Refusers who were sanctioned had fewer accidents than did refusers who were not sanctioned (i.e., had their suspensions set aside as a result of the hearing).

The study of DWI offender processing found that the probability of conviction given an offense needed to be increased drastically to constitute a credible deterrent threat and recommended incorporation of system management methods into the DWI control system. The study of warning letters found no highway safety effect that could be attributed to the content or frequency of mailing of the letters. The study of strategies used to assess the accident risk of medically impaired drivers with alcohol problems found that the state's Driver Safety Referees were underestimating the risk posed by such drivers.

Pigman, JG; and Agent, KR. (1986). *Impact evaluation of the Lexington-Fayette County traffic alcohol program (1982 - 1986).* Lexington, KY: Kentucky Transportation **Research Program.**

Description of the Countermeasure Program and its Operational Environment. The countermeasure studied is the Traffic-Alcohol Program (TAP) in Lexington-Fayette County. The program includes 1) Officer DWI Training Course, 2) Deployment of officers for DWI enforcement, 3) Public information campaign, and 4) Development and administration of an effective alcohol education program. With the exception of 2), the report gives no details on the activities.

About two years into the project, the following additional steps were undertaken: 1) an accident reconstruction team was created, 2) BACs were obtained

in all fatal accidents, and 3) a working partnership developed between the division of police and the Fayette County Commonwealth Attorney. Results have been significant in terms of accident investigations that resulted in prosecutions.

The program began in May 1982. TAP enforcement was conducted from 10:30 p.m. or 11:00 p.m. to 3:00 a.m. or 3:30 a.m. on various days of the week, varying over the years. DWI arrests more than quadrupled during each of the first two years, compared with the year before; this declined to double during the fourth year. There appears to be no major changes in the adjudication of the cases. However, until 1984, about 90% of the fines were in the range from $100-$300, in 1984, 70% were over $300, and in 1985, 90%. The number of days between arrest and adjudication also showed a change: until 1984 between 9 and 15% of the cases took more than 50 days; in 1984 38%; and in 1985, 49%.

Definition of the Target Population. Potential DWI offenders.

Research Design and Statistical Methods. As indicator of the effect of the program, the authors use "reported alcohol-related accidents". They do not discuss the definition of such accidents, nor whether officers were consistent over time in judging alcohol involvement. Using this subjective indicator is the greatest weakness of the study, though it does not necessarily invalidate the findings.

The authors also mention a time series regression approach, but give no details on the analysis at all. The equations they present seem to indicate a simple step function at the time of the intervention, and an error term. There appears to be no firm trend nor seasonal variation. They find a 36.6% reduction for alcohol related accidents during TAP hours, and a 25% reduction for alcohol-related accidents during non-TAP hours.

Interpretation and Objectivity. The authors find a 30.3% reduction in alcohol related accidents for the four-years of the program compared with the two years preceding it. Using a chi-square test, they find this reduction significant. Instead of using a comparison group in this statistical test, they compare similarly all accidents, and also find a significant 9.5% reduction (they do not mention the clear time pattern in the number, reflecting the 1982/1983 recession). Without giving details, they mention a statewide decrease of 16.2% in alcohol-related accidents, and a 4.9% statewide increase of all accidents. When reporting TAP and non-TAP hours, the authors find a reduction of 37.3% for the TAP hours, and 30.3% for the non-TAP hours.

In addition, the authors present tabulations for various characteristics of alcohol-related accidents over time and discuss them. For instance, charges in alcohol-related accidents shifted from primarily "public intoxication" to DWI, especially during the last two years of the project.

As mentioned, reliance on police reported alcohol involvement should caution against accepting the results of the study, as well as the very limited use of control groups, and ignoring possible time trends. For instance, as a percentage of all accidents, reported alcohol-related accidents averaged 9.7% during the two years before the project, and were 8.3, 8.0, 7.2 and 6.5% for the four years of the projects. This suggests an effect of the project, and possibly also a greater effect of the more rigorous prosecution and more severe fines during the last two years. On the other hand, if one believes that these four years reflect only a time trend, its extrapolation back to the two years before the project gives an average of 9.4%, which compared with the actual value of 9.7% indicates only a 4% reduction in alcohol-related accidents.

Popkin, CL; Li, LK; Lacey, JH; Stewart, JR; and Waller, PF. (1983). *An initial evaluation of the North Carolina alcohol and drug education traffic schools. Volume I. Technical report.* Chapel Hill, NC: UNC Highway Safety Research Center.

Description of the Countermeasure Program and its Operational Environment. Evaluates a state-level DWI school in North Carolina for first-offense DUI and Careless and Reckless Driving After Drinking. However, many multiple offenders also attended the school. The first offenders were given a reduced driver's license suspension for completing the school, from 12 months to six months, and were given a restricted license while attending the school. Multiple offenders did not receive these reductions in their sanctions. The schools provided from 10 to 13 hours of classroom instruction on a variety of topics relating to drinking-driving. Most schools held four or more classes at weekly intervals. A lecture format with visual aids and movies was used. Some discussion also occurred. A knowledge test was administered at the beginning and the end of the course.

Definition of the Target Population. See above. Some detailed biographic characteristics of the attenders were provided, e.g., age, sex, race, BAC at arrest.

Research Design. Analyzed the recidivism (DWI, careless and reckless driving, and accidents) of the entire group of attenders and compared them with a control group that did not attend the school, but, nevertheless, got the full license suspension and seldom got a restricted license. Weighting factors were developed to adjust for differences in age, race, and BAC in the experimental and the control groups. The design was quite appropriate for the kind of program that was evaluated.

Statistical Methods. Used the GENCAT procedure for determining the weighting factors and the levels of significance of differences in recidivism between the experimental and control groups. This method was entirely appropriate.

Interpretation and Objectivity. Found that the school group had a significantly higher recidivism for all measures than the control group. Attributed this (quite reasonably) to the difference in driver license sanctions between the two groups. The follow up evaluation (see Popkin *et al.*, 1988, below) re-did the evaluation after the driver license incentives had been removed, and found that the school group did slightly better than the control group, indicating once again the importance of driver license sanctions.

Popkin, CL; Stewart, JR; and Lacey, JH. (1988). *A followup evaluation of North Carolina's alcohol and drug education traffic schools and mandatory substance abuse assessments. Final report.* Chapel Hill, NC: UNC Highway Safety Research Center.

Description of the Countermeasure Program and its Operational Environment. Evaluates the modified North Carolina law, the first version of which was evaluated in the report reviewed above. The modified law incorporated provisions requiring all persons arrested for DWI to receive a short-term license suspension. Also, the modified law did not diminish the sanctions of drivers convicted of DWI by attendance in the ADETS program.

Definition of the Target Population. Same as in prior study.

Research Design. Same as in prior study.

Statistical Methods. Same as in prior study.

Interpretation and Objectivity. Recidivism analysis showed that those assigned to ADETS had fewer subsequent DWI arrests than those not assigned to the course. Concluded that the ADETS program may beneficial.

Preusser, DF; Blomberg, RD; and Ulmer, RG. (1988). *Follow-up evaluation of Wisconsin's 1982 drinking and driving law.* Washington, DC: National Highway Traffic Safety Administration.

Description of the Countermeasures Program and its Operational Environment. The purpose of this study was to update the earlier work (above) by adding 1986 crash data extending the time perod over which convicted DWIs were tracked. In addition a 1985 publicity campaign publicizing the law was evaluated through surveys at driver licensing stations.

Box-Jenkins time series analysis was used to analyze the crash data; survival analysis was used in tracking recidivism rates.

Definition of the Target Population. All drivers and those convicted of first offense DWIs.

Research Design and Statistical Methods. Analysis of the crash data indicated that the average number of alcohol-related crashes decreased by about 25 percent in 1982 and decreased further through 1986. Repeat arrests declined during the first 18 months following conviction in comparison to recidivism rates for drivers convicted before a license suspension was required for a first offense. The publicity campaign was effective in increasing knowledge about the law. Awareness that the law requires an automatic license suspension increased from 48 percent to 75 percent.

Interpretation and Objectivity. A problem with the general deterrence analysis is that the reduction in number of "alcohol-related" fatal crashes in 1982 occurred at a time when there was a nationwide decline in fatal crashes due to economic conditions. The authors present no data from Wisconsin that would indicate if "non-alcohol-related fatals" also decreased, nor do they present data from other states for comparison.

Preusser, DF; Williams, AF; Zador, PL; and Blomberg, RD. (1983). *The effect of curfew laws on motor vehicle crashes.* Washington, DC: Insurance Institute for Highway Safety.

Description of the Countermeasure Program and its Operational Environment. Examined the effect of curfew laws in four states, Pennsylvania, New York, Maryland, and Louisiana. Such laws prohibit young drivers from operating motor vehicles during late evening and early morning hours. A table listing the provisions of the curfew laws in these states was provided. Other characteristics of the states were not provided.

Definition of the Target Population. Young drivers affected by the curfew laws. Characteristics were not provided.

Research Design. Compared reported crashes for a period of time before the law to those for a period of time after the law. The time periods varied by state in order to ensure a large enough N. Only the effects on 16 year olds were studied. Data on crashes occurring during curfew hours and outside of curfew hours were collected for 16 year olds, older drivers, and drivers in comparison states.

Statistical Methods. Not described.

Interpretation and Objectivity. Concluded that the laws substantially reduced the number of crash involvements of 16 year olds in all of the four states studied. These reductions amounted to 69% in Pennsylvania, 62% in New York, 40% in Maryland, and 25% in Louisiana. The effects of the laws were clearly greater in New York and Pennsylvania than they were in Maryland and Louisiana. Maryland law had a provision for an unrestricted license after six months of crash- and violation-free driving, and Louisiana's law was believed to

have less awareness, compliance, and enforcement than the laws in New York and Pennsylvania.

Reis, RE. (1982). *Traffic safety effectiveness of education programs for first offense drunk drivers*. Sacramento, California: Sacramento County Health Department.

Description of the Countermeasure Program and its Operational Environment. The countermeasure program was an education program for first offense drunk drivers. The home study program consisted of an organized set of reading materials designed as a self-study, self-paced package. The program was introduced to the clients in a 1-hour session which included a pretest. The client returned in 4 weeks for a 5-minute interview and a posttest. The in-class program consisted of four weekly sessions of 2 1/2 hours each with same content as the home-study course. Each class had about 18 clients. It was described in the report as a more or less typical alcohol education program being used in conjunction with court treatment programs at the time (*circa* 1980).

Definition of the Target Population. The target population was first-offense DUIs.

Research Design. Treatment and control groups were used with random assignment. Care was taken to ensure that the assignments were truly random. Each of the three groups contained approximately 1,500 subjects who were tracked for up to 22 months, depending upon how near to the end of the project they began the program. Traffic safety outcome measures involved subsequent convictions for DWI and reckless driving (because of the common practice of charge reduction), subsequent alcohol-related accidents, and subsequent non-alcohol related moving violations. Two submeasures were used for the accidents, measure one being a police-reported alcohol-related accident or a nighttime injury/fatal accident or a nighttime single-vehicle accident, and the second being police-reported alcohol-related accident or a nighttime accident or an injury accident. The non-moving violation measure was used as a control measure.

Statistical Methods. Used a variety of techniques based on the survival-analysis approach. The methods were appropriate and apparently carefully applied.

Interpretation and Objectivity. The conclusions were objective and the interpretation was appropriate. The author concluded that the education program was effective, reducing the one-year rearrest rate for DWI from 14% to 12%, the second-year rate from 23% to 20%, and the third-year rate from 28% to 25%. There was no effect on non-alcohol related moving violations. No differential rate was found for the home-study or the in-class programs. However, no effect was found for alcohol-related accidents, a result that was attributed to a small number of subsequent accidents. Also, the evaluation

found no evidence of program-induced changes in client life status. Recommendations were made for improving the courses.

Robinson, CD. (1981). Effectiveness of random breath testing as a countermeasure. In: *Alcohol, Drugs and Traffic. Volume III of the 8th international conference. Proceedings. June 15-19, 1980. Stockholm, Sweden*. Stockholm, Sweden: Almqvist & Wiksell International. 1354-1363.

Description of the Countermeasure Program and its Operational Environment. In Victoria, Australia, a law introduced in June 1976 empowered police officers to set up mobile breath testing stations on highways to conduct alcohol screening tests on motorists. Prior to this, overt evidence of impaired driving had been a prerequisite for testing. At the end of the second year of operations, Victoria police data indicated that 1.8 percent of those tested had BACs in excess of 0.05 percent. It was argued that these were not disappointingly low figures and did not mean the measure was not cost effective, as the primary goal was general deterrence. The present study was intended to address the question of general deterrence.

Definition of the Target Population. Victoria drivers.

Research Design and Statistical Methods. A questionnaire was sent in the fall of 1978 to about 600 drivers in the Melbourne area. The response rate was 59 percent. The response rate is too low to provide meaningful results.

Interpretation and Objectivity. The results, following two years of random breath test operations in Victoria indicated that 32 percent had seen a random breath test unit in operation, 7 percent had been tested, and 2 percent had been tested and were over 0.05 percent BAC. Almost half were "anxious" about the possibility of being breath tested if they drove after drinking, although most said they continued to do so. Respondents also said they thought themselves more likely to be caught by a routine mobile police patrol than by a random breath test unit.

The authors suggest that the results "provide a qualified indication that random breath testing is effective" but that the deterrent effect is "less than adequate". The low response rate, and the absence of pre-law measurements detract from potential confidence in the results of this study.

Ross, HL. (1987). Administering license revocation in New Mexico: an evaluation. *Law & Policy* 9(1):5-16.

Description of the Countermeasure Program and its Operational Environment. Evaluates the general deterrent effect of administrative license revocation in New Mexico. The law came into effect on July, 1, 1984, and stipulated a 90-days mandatory license revocation for failing a BAC test and a one-year

revocation for refusal to take the test. The revocation was imposed 30 days after the arrest and could be contested by requesting a hearing.

Definition of the Target Population. Presumably, all potential drunk drivers. No data are provided on the characteristics of this population in New Mexico.

Research Design. Impact analysis employed an interrupted time series analysis of fatally injured drivers with a BAC of 0.05% or more. No details are provided. This is valid approach if performed properly, but the lack of details makes such an assessment impossible.

Statistical Methods. No details are provided (See above).

Interpretation and Objectivity. Found that the law resulted in a reduction of 10% percentage points (from 66% to 56%) in the number of fatally injured drivers with a BAC of 0.05% or more. Also found that there had been no tendency of the initial reductions in such fatalities to increase later on. However, no effect was found on the total number of traffic fatalities, and self-reports of drinking-driving indicated no lasting change in drunk-driving behavior. Concluded that the New Mexico experience supports the wider adoption of measures aimed at increasing the swiftness of punishment and, specifically, of administrative license revocation.

Ross, HL. (1987). Britain's Christmas crusade against drinking and driving. *Journal of Studies on Alcohol* 48(5):476-482.

Description of the Countermeasure and its Operational Environment. Great Britain's 1983 "Christmas Crusade" against drunken drivers, during which the police of England and Wales administered an average of 1,350 breath tests daily, is discussed. Although not deliberately planned and organized, the campaign, fueled by press reports, was perceived by many observers to be a nationally organized effort.

Definition of the Target Population. Not described explicitly. Presumed to be all drivers using the road during the program.

Research Design. Several measures of effectiveness were used, including all fatalities, weekday fatalities, weekend fatalities, and nighttime weekend fatalities. Other aspects of the research design were discussed rather sketchily. Design did not employ a control group. Unfortunately, does not report Ns.

Statistical Methods. Not explained in any detail. Referenced a book by McCleary and Hay. Probably adequate for the design used.

Interpretation and Objectivity. Concludes that this program combining enforcement and PI&E was effective in deterring drunk driving for the short period

during which it was in effect. Found a reduction in all fatalities in December 1983, of 22.7% compared to a trend of 1.6% ($p<.05$). A non-significant residual effect of 11.0% was observed in January of 1984. Found a non-significant *increase* in weekend nighttime fatalities during the treatment period, which was dismissed because of a small N (not specified). Speculates that emphasis on certainty rather than severity of punishment was probably responsible for the decrease in all fatalities.

Ross, HL; McCleary, R; and Epperlein, T. (1982). Deterrence of drinking and driving in France: an evaluation of the law of July 12, 1978. *Law and Society Review* 16(3):345-374.

Description of the Countermeasure Program and its Operational Environment. This article evaluates the impact of the passage by the French parliament on July 12, 1978 of a law which provided for random testing of drivers using a preliminary breath test at the roadside. The background to this law and the elements of the law itself are well described in this article. In addition, the authors present information on the police enforcement procedures so that, overall, the reader has a good understanding of the program being implemented.

Definition of the Target Population. The authors use a number of dependent measures varying from all crash-related injuries and crash-related deaths to more refined alcohol-related measures such as crash-related deaths on weekend nights. The authors provide a good discussion of the relative validity, for measuring alcohol involvement, of the measures they utilize.

Research Design. This is an attempt to evaluate a naturally occurring experiment and the authors are limited to archival data available through the time period of the application of the new law. They have clearly worked hard to find as many possible sources of evaluation data as are available. Field data from telephone and roadside surveys would have been of great interest but were not within the scope of the research undertaken by these evaluators.

Statistical Methods. The basic method utilized by the authors is time series analysis. Where sufficient data is available over a number of years, a time series with seasonal variations removed is used for analysis of the impact of the intervention. The procedures used permit the authors, both to estimate the number of injuries or deaths saved by the intervention, as well as the period of time over which the intervention appeared to produce the reduction in injuries.

Interpretation and Objectivity. The authors present a straightforward, clear approach to their investigation which is persuasive. While they use time series analysis, the procedure is relatively simple and does not appear to involve extensive modeling which opens the way to biases based on the investigator's expectation of the nature of change expected. The authors provide a full

technical appendix which describes all of the parameter estimates and permits the investigator familiar with time series to evaluate the procedures used.

Other Comments. Overall, this article provides convincing evidence that the passage of the random testing law in France produced a temporary reduction in crash-related deaths and injuries. This reduction was apparently not accounted for by any reduction in the number of miles driven, but may partly be accounted for by (or have caused) a reduction in wine sales. It is questionable whether this experience can be applied to the United States because of the cultural differences between France and the U.S. In particular, because France is a viticulture country which has quite a different consumption pattern from countries such as Scandinavia, Britain, the U.S. and Australia.

An important feature to keep in mind in the interpretation of these data is that the disappearance over time of the apparent deterrent effect was at least in part due to the failure of the French police to take full advantage of the new law. In this way it was similar to the case of the British Road Safety Act of 1967 where the police also did not take full advantage of the powers provided by the new law. In France, the public came to recognize that the police were not arresting a lot of drivers at check points and therefore the initial reduction in alcohol-related crashes appears to have disappeared over a period of months. To the extent that the American public comes to find that sobriety check points result in few arrests, a similar loss in deterrent impact might be expected.

Ross, HL; and Voas, RB. (1989). *The new Philadelphia story: the effects of severe penalties for drunk driving.* Washington, D.C.: AAA Foundation for Traffic Safety.

Description of the Countermeasure Program and its Operational Environment. Employed roadside surveys of nighttime weekend drivers to measure general deterrent effects of the much more severe penalties imposed in the experimental jurisdiction, New Philadelphia, Ohio. The sanctions included a mandatory jail term of 10 days initially, and 15 days later, for first offenders; heavy fines ($750); a six-month driver license suspension (soft); special license plates; and no plea bargaining. Provides a good description of the jurisdiction and its implementation of the severe sanctions policy.

Definition of the Target Population. Evaluated primarily as a general deterrence countermeasure targeted against all drunk drivers and potential drunk drivers. No characteristics are provided.

Research Design. Drivers' BACs were measured on five weekend nights, and questionnaires were administered asking drivers about their perceptions of risk of arrest and severity of sanctions. Results were compared with those from a nearby jurisdiction (Cambridge, Ohio) that did have the severe sanctions of New Philadelphia. The BAC-test substudy sample sizes were 335 for New Philadel-

phia and 278 for Cambridge. The sample size was not large enough to be able to detect any but the most gross differences in percent of drinking drivers.

Statistical Methods. The nature of any statistical tests was not reported.

Interpretation and Objectivity. Though persons surveyed in the experimental jurisdiction consistently reported perceptions that the sanctions there were more severe, the BAC survey results indicated no significant difference between the jurisdictions, nor were differences in recidivism rates observed. Because their sample size was so small and other potential threats to validity were present, the authors were tentative about rejecting the hypothesis that severe penalties may deter impaired driving. For example, they pointed out that the stringent jail penalties were not consistently carried out because of a lack of jail space, that their roadside surveys were publicized and that a street fair in a nearby community may have differentially affected the survey results from the comparison community. Nonetheless, they hypothesized that if the deterrence model is valid, its application in their study, though elevating the perception of risk of arrest and subsequent imposition severe sanctions, may not have had the desired effect because the actual risk of punishment was not high enough.

Russ, NW; Geller, ES; and Leland, LS. (1989). Blood-alcohol level feedback: A failure to deter impaired driving. *Psychology of Addictive Behavior* 2(3):124-130.

Description of the Countermeasure Program and its Operational Environment. In an attempt to decrease the incidence of driving under the influence of alcohol, some alcohol-serving establishments have placed devices on their premises that enable patrons to receive immediate feedback on their blood/alcohol level. The purpose of this paper is to integrate the results of several international studies regarding the response of patrons to these blood alcohol level feedback mechanisms. A secondary goal is to suggest a more effective means of preventing DUI, namely, education of alcohol servers about techniques they can use to prevent DUI.

Definition of the Target Population. Drinking patrons at alcohol serving establishments that have these devices that provide feedback on customer BACs.

Research Design. Each of the eight studies summarized had its own research design. This article does not go into much detail on the designs. Generally, the studies report on the subsequent driving decisions of individuals who were provided feedback on their BACs. Also, generally the subjects are categorized with respect to moderate drinking versus excessive drinking.

Statistical Methods. In this brief article, the statistical techniques for each of the studies are not described in any sort of detail. Generally, it would appear that tests for differences in proportions were used. Statistical significance is not reported on in this study.

Interpretation and Objectivity. The studies from the U.S., Canada, and New Zealand find in general, that BAC feedback did not decrease the incidence of moderate or excessive drinking nor did it decrease the proportion of the intoxicated individuals who drove from the drinking situation. Moreover, some studies suggested that this BAC feedback may actually increase alcohol consumption, thereby undermining its potential for DUI prevention.

Ryan, BE; and Vasquez, JE. (1981). An appraisal of San Diego county SB-38 participant DUI recidivism and traffic accident involvement. *Abstracts & Review in Alcohol & Driving* 2(8):3-5. (August 1981).

Description of the Countermeasure Program and its Operational Environment. The program evaluated was the San Diego County SB-38 Convicted Drinking Driver Program, a year-long treatment program for multiple DUI offenders. Little information is given about the program except that individuals who enter the program retain their license if they successfully complete it. License suspension is mandated for individuals who chose not to enter the program. Noncompliance with program regulations (e.g., a subsequent DUI during the treatment period) results in a return to court and license suspension.

Definition of the Target Population. The target sample consisted of 144 individuals who successfully completed the SB-38 program in 1978. This sample was narrowed to 133 because of lack of information available or the index conviction was not a DUI. The sample was further narrowed by eliminating those participants who were first time offenders (n=10) and those who had three or more convictions (n=10). It is unclear how the first offenders entered the program. Third offenders were defined as those whose index conviction was the third or more in seven years. Second offenders were defined as those whose index conviction was the second within five years. The distinction between second and third offenders is not mutually exclusive, and there is no description of how individuals meeting both criteria were classified.

A comparison was made between the above sample and a 10% random sample of all California DUI offenders convicted in 1974 who received the license suspension. The actual sample size of this comparison group is unclear; the results section reports survival rates which suggest the sample size is either 1,597 or 1,694. The comparison sample was statewide while the target sample was selected from San Diego County only. Further, the comparison sample included only those second offenders convicted in 1974 while the target sample included those from 1978. Potential differences between these groups were not mentioned.

Research Design. Survival rates were calculated for the target sample using DUI recidivism and accident involvement, respectively as the "failure" criterion. Rates for the target group were then compared to the control group for each measure using a chi-square analysis. This approach is inappropriate given the

differences between the two groups described above and the difference in sample size.

Statistical Methods. The statistical analyses conducted were inappropriate as described above.

Interpretation and Objectivity. Although the differences between the two groups were both nonsignificant, the authors conclude that the SB-38 program has a positive impact. This conclusion is not warranted. The authors do discuss some limitations to the evaluation, including sample size and generalizability, however, the conclusion drawn is not valid.

Sadler, DD. (1986). *An evaluation of the process efficiency and traffic safety impact of the California implied consent program. Volume 4: An evaluation of the California drunk driving countermeasure system.* Sacramento: California State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. Addresses the efficiency, effectiveness and impact of California's implied consent program using 1982 data. Does a process analysis and an impact analysis. Describes the law and associated procedures for dealing with refusers. The law provides: a six-month suspension for drivers with no prior DWIs alcohol-related reckless driving convicts; 12 months suspension for one prior; and three years for two or more priors.

Definition of the Target Population. All drinking drivers and potential DWIs. Gives a breakdown of refusers and non-refusers by age, prior accidents and prior offenses.

Research Design. Collected three samples from IC case files of test refusers. Sample 1 (n = 2,050) was a 10% random sample of those who did not request a hearing. Samples 2 and 3 were those who requested a hearing and either had the suspension upheld or had the suspension set aside, respectively. Sample 2 was 20% of the upheld group (n = 1,364), and sample 3 was all of those whose suspensions were set aside (n = 1,050). These samples were selected for the case processing part of the study. The traffic safety impact study used samples from groups 2 and 3 (888 and 533, respectively).

Statistical Methods. Traffic safety impact analysis used analysis of covariance techniques with repeated measurements (three at six-month intervals). Interaction effects (treatment x time, treatment x age, and treatment x time x age) were tested at the .10 level, and each hypothesis of no treatment effect was tested at the .05 level.

Interpretation and Objectivity. Results demonstrated that suspending refusers is an effective countermeasure for the studied subgroup of the DUI population.

During the six month suspension period, refusers whose suspensions were reinstated after an administrative hearing had significantly fewer alcohol-related accidents (63.7%), nonalcohol-related accidents (76.5%), and total accidents (72.2%) than did refusers whose suspensions were set aside. Also found that refusers were only slightly less likely to be convicted of their DWI charge than were non-refusers (61% vs. 66%).

Sadler, DD; and Perrine, MW. (1984). *Evaluation of the California drunk driving countermeasure system. Volume 2. The long-term traffic safety impact of a pilot alcohol abuse treatment as an alternative to license suspensions.* Sacramento, California: Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. A study of the effectiveness of an alcohol treatment program for multiple-offender DWIs given in lieu of driver license suspension. The treatment program lasted for 12 months and was multi-faceted. The report references a document providing a more detailed description of minimum treatment standards. The license suspension is also for 12 months.

Definition of the Target Population. The target population was multiple offenders.

Research Design. The program was implemented in four counties. There were treatment and control groups with random assignment in each county. In addition, there were four carefully matched control counties that did not implement the program. The subjects were 7,820 drivers who received a second or subsequent DWI conviction between January, 1976, and February, 1977. Of these, 2,534 were from the four program counties and received treatment; 2,420 were from the program counties and received the license suspensions instead of treatment; and 2,866 were from the matched counties and received license suspensions but no treatment.

Statistical Methods. Used analysis of covariance and z-test methods. Methods were appropriate for the data analyzed.

Interpretation and Objectivity. Concludes that the alcohol-treatment group had 70% more nonalcohol-related accidents than did the license-action recipients. Drivers receiving 3-year suspensions had fewer nonalcohol-related accidents and convictions than did those who received 1-year suspensions. However, the alcohol treatment group and the license suspension group had the same number of alcohol-related accidents. Further, the alcohol treatment group had 9% *fewer* alcohol-related convictions than did the license suspension group. Nevertheless, the license suspension group still fared better with respect to alcohol-related and nonalcohol-related accidents combined. Another evaluation of license suspension vs. treatment for second offenders showed that the former group had a subsequent crash risk close to that of the average driver, while the second

group had a crash risk much higher than the average driver. These interpretations were reasonable and completely objective.

Saffer, H. and Grossman, M. (1986). *Endogenous drinking age laws and highway mortality rates of young drivers.* Cambridge, MA: National Bureau of Economic Research, Inc.

Description of the Countermeasure Program and its Operational Environment. This paper is an estimate of the effects of raising the drinking age and differences in beer taxes on young driver crashes.

Definition of the Target Population. Drivers age 15-24 are the target group. Characteristics are not provided.

Research Design. This paper has in common with the previous paper models for motor vehicle death rates for persons 15-17, 18-20, 21-24 years old (per capita rates). The authors use the following logical model: motor vehicle death rates are a function of the drinking age, an unobserved variable measuring sentiment against drinking, and various exogenous factors affecting the motor vehicle death rate. A second relation expresses the sentiment against drinking as a function of exogenous variables, and a third describes the pressure to pass a 21 drinking age law as a function of the sentiment against drinking, and of the motor vehicle fatality rate for young drivers. The actual drinking age is used as an indicator of this unobservable pressure.

Statistical Methods. The authors combine these models into two equations, one expressing mortality rates as functions of several exogenous variables and of the drinking age, the other expressing the drinking age a function of the same variables with coefficients which are related to those of the first.

The authors use data for the 48 contiguous states for the years 1975-81. Independent variables are the beer tax (state and federal excise tax combined) in real terms, a variable describing whether the state is bordering a state with a lower drinking age, the real per capita personal income, vehicle miles travelled per licensed driver, the number of licensed drivers aged 24 or less or a fraction of the population 15-24, inspection of motor vehicles, fractions of the population who are Mormons, Southern Baptists, Catholics and Protestants (excluding Southern Baptists and Mormons), and the fraction of the population residing in dry counties. An obvious objection is against using overall motor vehicle fatality rates without distinguishing accidents which are more likely, and those which are less likely to involve alcohol. If one used separate models for nighttime accidents (more likely to involve alcohol) and daytime accidents (less likely to involve alcohol), one is better able to assess whether any apparent effect of the beer price or drinking age variables is likely to be a causal effect or an effect caused by correlated factors.

Interpretation and Objectivity. To use the drinking age as an endogenous variable is plausible. In fact, public pressure for raising the drinking age followed the experience that fatal motor vehicle accidents for young people increased after the drinking age was lowered. However, it is questionable whether the authors treated this effect in a realistic manner. It is not quite clear, how they treat this relation; they describe it so that the drinking age is a function of "the youth highway mortality rate when the drinking age is not 21." A realistic model would try to establish a relation between a historical increase in the youth fatality rate and a rise in the drinking age.

The choice of variables is sometimes puzzling. It is not clear why the fatality rate is used. It would be more plausible to use the rate of driver involvement in fatal accidents because that includes fatal accidents where the driver was not killed. Other factors associated with fatal crash rates, such as relative distribution of urban and rural roads are not included.

The authors present results based on only the first of their equations, excluding the equation expressing pressure to raise the drinking age. The authors compare these coefficients with those of the two equation model and discuss the differences in the magnitude and significance of the coefficients. However, they ignore the fact that in no case does the difference between the coefficients of the two models even approach significance. Thus, the discussion is moot.

Regarding the equation for the drinking age, the authors mention that the coefficient of the "border age" has the expected sign and is significant. This coefficient is indeed extremely significant ($t = 11.89$), and indicates that the drinking age is higher if the state borders a state with a lower drinking age. This appears to be a tautology, and it is not clear how this may effect the other coefficients of this equation or its overall significance.

In sum, the models used are in some aspects speculative, don't use the most appropriate variables, and omit important variables. The authors do not utilize available opportunities to make the models more detailed which would have offered opportunities to assess the findings for their validity. One cannot place great confidence in the study findings.

Saffer, H; and Grossman, M. (1987). Beer taxes, the legal drinking age, and youth motor vehicle fatalities. *Journal of Legal Studies* 16:351-374. (1987).

Description of the Countermeasure Program and its Operational Environment. The main objective of this paper is to study how motor vehicle death rates for people aged 15-24 vary with the cost of beer. Also examined are effects of an increase in the legal drinking age. Estimates are made how death rates would be changed by certain increases in alcohol taxes, and by a uniform drinking age of 21 years.

Definition of the Target Population. Drivers aged 15-24.

Research Design. The paper is based on data from the 48 contiguous states for the years 1975-1981. As dependent variables, the authors use per capita motor vehicle death rates for the age groups 15-17, 18-20, and 21-24. Rates of involvement in fatal accidents would have given a more comprehensive picture of the role of young drivers in fatal accidents. Very critical is the authors' choice of the overall death rate, rather than a rate for nighttime or nighttime single vehicle fatal accidents. Their discussion of this aspect is unconvincing. It is true that alcohol countermeasures will also affect daytime and daytime multi-vehicle accidents, however, since they involve alcohol to a much lesser degree, any effect found for alcohol countermeasures should be smaller for those types of accidents. By not separating these types of accidents, the authors forego an opportunity to check whether the effect they find may plausibly be alcohol-related, and thereby reduce the credibility of their findings.

Statistical Methods. The authors use several models with these death rates as dependent variables, and the following as independent variables: real beer tax, legal minimum drinking age for beer, an indicator for different drinking ages in adjacent states, real per capita income, vehicle miles travelled per licensed driver, the proportion of the population 15 to 24 licensed to drive, inspection of motor vehicles, dummy variables accounting for year-to-year differences, in several analyses, the proportions of Mormons, Southern Baptists, Catholics, Protestants, the fraction of the population living in totally or partially wet counties, and dummy variables for the states.

One striking feature of this model is that it uses the beer tax as a critical independent variable, and not the beer consumption, or the price of beer. The authors argue that the beer tax is a policy variable which can be changed. They do not ignore that the beer price can vary independently of the beer tax, but their discussion is unconvincing, especially since the tax is only a small fraction of the retail price of beer. This wide leap, bridging the intermediate steps, beer tax/beer price, beer price/beer consumption, beer consumption/ alcohol-related accidents is the greatest weakness of the paper. Data on beer consumption are readily available. Therefore, one could easily study whether beer consumption is related to beer taxes, and whether fatal accidents are related to beer consumption. Omission of this intermediate step reduces the credibility of the results further.

To include real income is plausible because it may affect the consumption of alcohol, and because there is a well established empirical relation between per capita income and traffic death rates (which may be influenced by, if not due to educational level, and the higher incomes in the more urban states). Vehicle miles travelled per driver is obviously an important factor where death rates per capita are studied. The fraction of persons 15-24 licensed to drive is by itself an implausible factor, but it may well compensate for the unfortunate choice of

death rates per capita, rather than per driver in age groups where practically not everybody is licensed. This independent variable, however, is not a good substitute for more appropriate rates because the fraction licensed varies widely from the 15-17 age group to the 21-24 age group.

More serious is the omission of important variables, the most important being the degree of urbanization. Death rates per VMT are strongly correlated with the proportion of travel on rural highways. They are also strongly negatively related to travel density (VMT per highway mile), and this effect is different from the urban/rural distinction. Omitting such highly important variables has the well known effect of biasing variables which are included in the model. There are other, less easily quantifiable factors: the accessibility of emergency medical services; the intensity of traffic law enforcement; the mix of vehicle types, etc. To some extent, such state-specific factors can be accounted for in a summary fashion by dummy variables representing the states which the authors use in one of their analyses. As to be expected, nearly all of the variables used by the authors become less significant, if not insignificant when the state-specific dummy variables are included in the model. The authors note that this model may be "overdetermined and plagued by multicollinearity". Nevertheless, they use it to draw the conclusion, "Thus, the negative tax effects cannot be attributed to unmeasured state-specific variables, indicating that the state excise tax has an independent effect on the motor vehicle accident mortality rate of youths."

The authors fail to establish that there is a link between beer taxes and fatality rates, though it would easily have been possible to analyze the beer consumption, and they fail to distinguish death rates for accidents more likely and less likely to involve alcohol, which would establish whether any relations are likely due to alcohol. Therefore, one must have less confidence in the findings.

Interpretation and Objectivity. Because the results are of questionable validity, the calculation of potential effects of changes in beer taxes and in the drinking age are not credible either.

Salzberg, PM; and Paulsrude, SP. (1984). An evaluation of Washington's driving while intoxicated law: Effect on drunk driving recidivism. *Journal of Safety Research* 15(3):117-124.

Description of the Countermeasure Program and its Operational Environment. Evaluated the effect of Washington's 1980 drunk driving law which mandated a one-day jail sentence for 1st-offense DWI and established a *per se* limit. The law also required that 1st offenders attend a DWI school and authorized a suspended sentence of 180 days, conditional upon non-repetition. The authors appear to doubt whether the jail sentence was actually imposed and served by many offenders. The authors report that the jail requirement placed heavy

burdens on the court system in the form of backlogs, delays in jailing offenders after their convictions, etc.

Definition of the Target Population. Examined both the general deterrence and specific deterrence impact of the new law. For the former, the target group was tacitly all potential drunk drivers. Specific deterrence subjects were persons with a valid Washington driver's license, and who were convicted for 1st-offense DWI or multiple-offense DWI. The mean age of the subjects was about 35, and about 85-90% were male. No other characteristics were provided.

Research Design. Used a before-and-after design with a comparison group. The before time period was 1978, and the after period was 1980. The comparison group was composed of drivers convicted of a non-alcohol offense during one of the two study years, and who had no alcohol-related convictions prior to that offense. Ns were as follows:

Group	1978	1980
1st DWI	3724	4411
Mult. DWI	197	189
Comparison	2977	2254

A time series design would have been preferable.

Statistical Methods. Pairwise comparisons were made (before and after the law) for each of the three groups for recidivism as measured by alcohol-related violations, and for accidents. T-tests were used for comparing the per-subject means of the before and after groups. Methods were generally appropriate for the design used.

Interpretation and Objectivity. Found that recidivism actually increased slightly for all three groups. The increases were non-significant at the .01 level. Accidents rates increased for the two DWI groups, but decreased for the comparison group. Only the comparison group decrease was significant. Tempered the finding of no effect of the new law by speculating that the jail sentence may not have been imposed on many offenders; that enforcement increased overall after the new law; and that the 1978 offenders might have differed from the 1980 offenders because many of the high-risk offenders in 1978 had their charge reduced or were acquitted. Cites a 1983 time-series study by O'Connell and Chadwick that suggested that alcohol-related accidents overall decreased beginning in 1981, suggesting a time lag in effect caused by an awareness gap.

Salzberg, PM; and Klingberg, CL. (1983). The effectiveness of deferred prosecution of driving while intoxicated. *Journal of Studies on Alcohol* 44(2):299-306. (March 1983).

Description of the Countermeasure Program and its Operational Environment. Evaluates the effect of Washington's deferred prosecution law which allowed a person charged with a misdemeanor or gross misdemeanor to have that charge dismissed if that person successfully completed an approved treatment program. Provides a good description of the law but not of the operational environment.

Definition of the Target Population. Did not provide any explicit description of the targets of this countermeasure. Gives some biographical and driving attributes of the study group and the comparison group.

Research Design. Compared various measures of recidivism for the deferred prosecution (DP) group with those for a control group that did not receive DP. The analysis was retrospective, so random assignment could not be used. Covariance analysis was used to control for predeferral differences between groups. Covariates were age, sex, and driving performance (e.g., accidents and traffic violations).

Statistical Methods. See above.

Interpretation and Objectivity. Found no positive effect for the DP program, and if anything, a small negative effect. Discussion was entirely objective.

Other Comments. A solid study.

Salzberg, PM; and Klingberg, CL. (1981). *License revocation and alcoholism treatment programs for habitual traffic offenders.* Olympia, Washington: State Department of Licensing, Research and Technology Division.

Description of the Countermeasure Program and its Operational Environment. Evaluates the Washington habitual offender act which required a five-year license revocation for drivers who had accumulated three or more major traffic violations or 20 or more total violations. The law permitted a "stay" of revocation for alcoholic drivers who undertook an approved alcoholism treatment program. The major violations included DWI. Stayed drivers did not receive the revocation at all unless the driver subsequently was convicted of one of the major offenses. During the time period of this evaluation, the program was administered by the courts rather than administratively. No description of the operational environment was provided.

Definition of the Target Population. Habitual offenders as defined above. Various characteristics of subgroups of habitual offenders were provided. Of all the habitual offenders studied, 87% had at a least one DWI on their record.

Research Design. Subjects were male habitual offenders (HO). The law was evaluated with respect to the effect of its two major provisions, revocation and stay of revocation, on subsequent driving records, including accidents and traffic violations. The subsequent driving records of drivers receiving these sanctions were compared with those of control groups of drivers. There were three such groups:

1) Subjects selected for HO prosecution who were apparently not prosecuted;

2) Subjects the court could not locate; and

3) Subjects who had their case dismissed.

Subsequent alcohol-related accidents were analyzed separately. Data came from the DMV files and covered the time period from January, 1969, through October, 1979. The prosecuted group of subjects (N=548) were in three subgroups, license revoked (N=186); revocation stayed (N=248); and dismissed (N=114). The not prosecuted group were in two subgroups: can't locate (N=161), control group number 2; and no action (N=392), control group number 1.

Statistical Methods. Compared the post conviction records of the experimental group with those of the various control groups. The means of the accidents and violations were used in the comparisons. Statistical methods were not described, but apparently used ANOVA techniques. Survival analysis methods would have been more appropriate for the type of data analyzed.

Interpretation and Objectivity. Of interest to this project are the findings with respect to DWI. There were no group differences, all groups averaged nine DWI convictions per hundred per year. A separate analysis examined an early-reinstatement subgroup (N=55) and found no significant differences with respect to driving performance in the revoked period and driving performance in the reinstated period. Also analyzed were the stayed drivers who subsequently had their license revoked because of another violation. During the stayed period, these subjects had 83 DWIs per 100 drivers per year, compared to 9 violations per 100 drivers per year during the revocation period that followed. Concluded that license revocation is an effective countermeasure, and that there was no evidence that either stay of revocation or treatment is effective.

Shore, ER; and Maguin, E. (1988). Deterrence of drinking-driving: the effect of changes in the Kansas driving under the influence law. *Evaluation and Program Planning* 11:245-254.

Description of the Countermeasure Program and its Operational Environment. Evaluates the impact of a countermeasure based on a new Kansas DWI law that

went into effect on July 1, 1982. The law eliminated plea bargaining, adopted a *per se* limit for BAC, made refusal to take a chemical test evidence of DWI, and mandated jail penalties for multiple-offense DWI. The law was accompanied by a "large scale advertising campaign and extensive news coverage." The focus of the PI&E campaign was the plea bargaining provision and the "mandatory" 48-hour jail term for first offenders. (Jail was not really mandatory for first offenders because they could be diverted to a rehabilitation program and avoid jail.)

Definition of the Target Population. The target population was all potential DWIs in the state of Kansas. Characteristics of the target group were not provided.

Research Design. Analyzed a monthly time series of all fatal accidents. The period studied was January 1975 through December 1983. As intervention function they use a step function with the step at July 1, 1982. Submodels incorporating unemployment, retail sales, and VMT were also used to account for other factors that might have influenced accident frequency in the period studied. No comparison states were used.

Statistical Methods. Used the SAS ARIMA procedure exclusively. Usage appears to be appropriate.

Interpretation and Objectivity. Concludes that new law (and, presumably, the accompanying PI&E program) was responsible for a 20% reduction in fatal accidents (eight per month), and that the effect prevailed throughout the 18-month period during which it was evaluated. Found that there was no relationship between VMT and the reduction in fatal accidents, nor between either or both measures of economic conditions in the state.

They find a significant effect of 8.1 fatalities per month less, after the intervention. Since the timing of the law coincided with the 1982 recession, they analyzed indicators of economic activity: unemployment and retail sales. They found that the unemployment rate was related to VMT, but that neither VMT nor unemployment was related to fatalities. Neither were retail sales. Thus, the authors concluded that the entire observed effect is due to the law.

Though the work is correct in a purely statistical-technical sense, the conclusions are not fully justified. At least part of the effect must be due to other factors, and one cannot say how large, or how small the part due to the law is. While the law took effect with the third quarter of 1982, quarterly fatalities had begun to drop in the third quarter of 1981, compared with the previous year. The decline continued through 1983; early in 1984 fatalities began to increase, relative to the previous year. A very similar pattern holds for national fatalities. The decline, relative to the preceding year begins in May 1981, continues toward the end of 1983 when it levels of, and begins to rise early in 1984. Data in

adjacent states (Colorado, Missouri, Nebraska, Oklahoma) show also a very similar pattern, with an even later time of the increase, the fourth quarter of 1984.

Considering these clear patterns, there is a very strong suggestion that some factor began to have a nationwide effect about the middle of 1981, and ceased about early 1984. The obvious factor is the economy: the unemployment rate began to rise rapidly in the middle of 1981, and it reached a peak in 1983 and fell until early 1984 when it levelled off. Since many economic factors are closely correlated, one can not single out unemployment as *the* potentially causal factor and ignore others. The fact that the authors did not find an effect of the unemployment rate, nor of retail sales, on fatalities in Kansas does not mean that there is no effect of economic factors; the authors may have selected one which is less appropriate for Kansas.

Skinner, D; and Hoxie, P. (1989). *Effects of minimum drinking age laws on highway fatalities*. Cambridge, MA: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. An evaluation of the effects of raising the minimum legal drinking age (MLDA).

Definition of the Target Population. Deals with drivers age groups targeted by the various states. These groups are defined by state.

Research Design. Measure of effect was percentage change in per capita fatalities involving 18 to 20 year old drivers. Used a pooled, cross-sectional, econometric model controlling for "such factors as economic effects and seatbelt adoption among the fatal population generally." Used a control group consisting of drivers aged 21 and over. Defined a LMDA change as any change affecting anyone in the 18 to 20 age group to purchase *beer.* References earlier report for details (Hoxie and Skinner, 1987).

Statistical Methods. Does not discuss the statistical methods used other than to indicate the general type of model used. References previous report.

Interpretation and Objectivity. A very careful analysis of LMDA laws, updating a previous study. Controls for such factors as economic effects and seatbelt adoption. Concludes that LMDA laws reduced fatalities involving 18 to 20 year olds by 10.3 to 12.8% in the 1983-1987 time period. Does not specify the level of significance associated with these reductions. Differences in the effectiveness for the five year period were not statistically significant, so time trends in law effect could be estimated. Found no spillover effect on 14 to 17 year olds (mainly because of relatively small sample size) or on 21 to 23 year olds.

Smart, RG; and Adlaf, EM. (1987). Age of majority cards and drinking among young people. *Journal of Alcohol and Drug Education* 32(3).

Description of Countermeasure Program and its Operational Environment. The purpose of the research was to study use of age of majority cards by students about two years after the law passed. The data were drawn from a province-wide survey conducted in 1981.

Definition of the Target Population. A sample of 3,600 students enrolled in grades 7, 9, 11, and 13 in Ontario Public and Separate school systems. The sampling design was a single-stage cluster design stratified by grade and geographic region.

Research Design. Data were analyzed from the survey. The survey queried about the use of a variety of drugs, alcohol use, problems, demographics and the possession of an age of majority card (either legally or illegally).

Statistical Methods. Chi-square comparisons were used.

Interpretation and Objectivity. "The most prominent finding is that, in comparison to those with no card and those who possess one, those who are compelled to use the card illegally represent a relatively deviant group. They are significantly more likely to: 1) drink more frequently; 2) report more alcohol problems; 3) drink at a friend's home; 4) drink in pubs or taverns; 5) drink in cars; and 6) drink at school activities. It appears that age of majority cards are a poor device for controlling the drinking of young people. They may, in fact, enable some underage drinkers better access to alcohol than they have without them" (pp. 63). The last sentence seems to be an overstatement as we do not know if the drinking habit would be worse without them. Also the study is correlational so the cards in fact may have nothing to do with "enabling" drinking.

Smart, RG; and Adlaf, EM. (1986). Banning happy hours: the impact on drinking and impaired-driving charges in Ontario, Canada. *Journal of Studies on Alcohol* 47(3):256-258.

Description of the Countermeasure Program and its Operational Environment. The purpose of the study was to examine how a ban on happy hours (promotional low cost sales of alcoholic beverages) affected: 1) drinking in a bar with happy hours; 2) overall sales of alcoholic beverages in Toronto; and 3) the number of charges of impaired driving. The drinking driving Christmas spot-check program was coincident with the banning of happy hours.

Definition of the Target Population. There were 3 target populations; bar patrons, drinking drivers and alcohol consumers.

Research Design. The first data set was a direct measure of alcohol use by patrons of bars both pre and post ban. Five drinking establishments were selected for observations. Two observation periods were employed. One conducted 2 days prior to the banning of happy hours and another conducted 4 weeks later. Establishments were selected to be: 1) as heterogeneous as possible; 2) dispersed throughout Metropolitan Toronto; and 3) as places where drinking rather than eating was the focus of patrons. Therefore, as the authors state, the sample may not necessarily be representative. Each of five observers collected both pre and post ban observational data within the same establishment and at the same time of day. The observers gathered information on both situational and the complete drinking of two tables. Aggregate alcohol consumption data (absolute alcohol sold) for metropolitan area of Ontario was also examined. The study period covered a duration from approximately Oct. 1984 - Feb. 1985, representing five 28-day periods with a comparison period covering the same time interval one year prior. The daily number of impaired charges were categorized to form two periods. The study period during which the happy hour intervention occurred, was from November 1, 1984 to January 31, 1985, translating to about 45 pre-post data points. The comparison period was the same time period for the year prior to the ban.

A greater number of bar observations would have enhanced the study, as would having comparison bars that had no happy hours or comparison times in the same bar. Also 5 data points for alcohol consumption seems small.

Statistical Methods. The observational data were subjected to ANOVAs; 2x5 pre-post x establishments, type of alcohol one-way and repeated measures with the five establishments on the situational variables. The alcohol consumption data and impaired driving charges data were subjected to chi-square analyses.

Interpretation and Objectivity. The study showed no evidence of a decline in alcohol consumption subsequent to the policy change on both the individual and aggregate level. The authors present the proper caution and interpretations of the data, namely that the data sets were small, the reductions in impaired driving charges could also be confounded by the Christmas spot-checks and drinking driving campaigns, and by weather conditions.

Smith, **RA**; Hingson, RW; Morelock, S; Heeren, T; Mucatel, M; Mangione, T; and Scotch, N. (1984). Legislation raising the legal drinking age in Massachusetts from 18 to 20: Effect on 16 and 17 year-olds. *Journal of Studies on Alcohol* 45(6):534-539. (November 1984).

Description of the Countermeasure Program and its Operational Environment. This paper examines the effect of raising the minimum drinking age of 16 and 17 year olds, a group for whom it was illegal to drink even before the minimum drinking age was raised.

Definition of the Target Population. Concentrates on drivers 16-17 years old, who are not directly affected by the law, but may be affected by a "spillover" effect.

Research Design and Statistical Methods. This study involved an analysis of telephone survey data and fatal crash data in Massachusetts and New York (as a comparison). The approach is described in more detail in the review of Hingson et al above.

Interpretation and Objectivity. Drinking patterns showed several significant changes; self-reported driving after drinking declined significantly, and self-reported accidents also.

No significant change was found for single vehicle nighttime accidents or for total fatal accidents.

The conclusions of the paper, "that raising the drinking age had minimal effects on the drinking behavior of Massachusetts 16-17 year-olds", and that there was no decline in nighttime single vehicle fatal crashes, and in all fatal crashes, appear defensible.

Stewart, JR. (1985). Estimation of the effects of changes in drinking and driving laws on alcohol related automobile crashes. In: *American Statistical Association. Annual Meeting. Proceedings. Aug. 6, 1985. Las Vegas, Nevada.*

Description of the Countermeasure Program and its Operational Environment. Contains *preliminary* analyses of Florida, Nevada, and North Carolina traffic-accident time series to determine the effects of various countermeasures, including enforcement/PI&E (Florida), administrative *per se* license revocation (Nevada), and the comprehensive re-write of North Carolina's DWI laws. The final analyses of these programs are contained in the respective reports for the projects. Gives only very cursory descriptions of the countermeasures.

Definition of the Target Population. No explicit descriptions, except in the North Carolina program which was evaluated for a general-population effect as well as an effect on 18 year olds. Presumed to be all drivers except for North Carolina.

Research Design. Discusses measures of effectiveness used in the three studies. In the Florida study, the measures were ratio of alcohol-related crashes or nighttime crashes in the treatment sites to alcohol-related or nighttime crashes in the treatment and control sites. In North Carolina and Nevada, the measure was ratio of alcohol-related crashes to all crashes. Some possible confounding factors were discussed.

Statistical Methods. Described in reasonable detail. Used several different procedures, including Box-Jenkins and the SAS ARIMA procedure.

Interpretation and Objectivity. Concludes that (1) the Florida intervention probably had a favorable effect; (2) the North Carolina intervention was not effective; and (3) the Nevada data did not show an effect. Conclusions were objective.

Stewart, K; Epstein, L; Gruenewald, P; Laurence, S; and Roth, T. (1987). *The California first DUI offender evaluation project.* Walnut Creek, CA: Pacific Institute of Research & Evaluation.

Description of the Countermeasure Program and its Operational Environment. An evaluation of a model first offender DWI rehabilitation program. The program "resembles traditional programs in many respects but has several important features that distinguish it from most other programs." The first of these features was a two-step approach consisting a of six-week educational program followed by a seven-week counseling program. A second feature, which was said to be unique, had each subject prepare a specific strategy for avoiding that person's drinking-driving situations, and third unique feature was assessing a subject's drinking and other life problems and referring those subjects to appropriate community resources.

Definition of the Target Population. The target group was all DUI first offenders. A breakdown of this group by some demographic variables (e.g., age and sex), driving variables, and drinking variables was given. A sample of about 50% of the subjects in the two case-study counties was interviewed, but the results of the interviews were presented only in general terms (e.g., "Sex ratios and age were similar at the two sites.") Provides a much better description of the target population than that found in most evaluation studies.

Research Design. Random assignment to treatment and control groups. Four groups were involved: (1) the traditional program in the county; (2) the 6-week education-only model program; (3) the 13-week education-plus-counseling program; and (4) a community service "control" group with minimal programmatic content. Departures from a pure random assignment procedure (as described) were minimal. The major weakness of the design was the relatively small sample sizes for the various groups, ranging from 181 for the education-only group to 340 for the traditional group (Total N=971). This results in an inability to detect effects of a magnitude that might be expected from an intervention of this type. Another weakness is the short follow-up period (only 5 months for those entering the program last) that was available for the recidivism analysis.

Statistical Methods. Outcome measures were frequency and quantity of drinking, number of drinking-driving incidents in the past nine months, and frequency of

drinking-driving compared to that of others, and whether or not they had driven within two hours of their last drinking episode. Used ANOVA methods for the study of drinking and drinking-driving patterns, and a probit analysis for the study of driving after two hours of drinking. Used probit method for analyzing recidivism rates. Methods were appropriate.

Interpretation and Objectivity. Found no significant differential program effects of drinking patterns and drinking-driving, but concluded that there was a small decline in heavy drinking and drinking-driving regardless of type of program. Because the differences between programs were so small, concluded that the lack of differential effects was probably not due to small sample size. Also, no differential program effects were found in arrest recidivism, but this finding was inconclusive because of the short follow-time available for tracking subjects.

The interpretations of the results were appropriate and objective.

Stewart, K; Gruenewald, P; and Roth, T. (1988). An evaluation of the specific deterrence effects of administrative license revocation. In: *Proceedings of the Section on Alcohol, Drugs and Traffic Safety. 35th International Conference on Alcohol and Drug Dependence. July 31-August 6, 1988. Oslo, Norway.* Rockville, MD: National Clearinghouse on Alcohol and Drug Information.

Description of the Countermeasure Program and its Operational Environment. Assesses the effect of Mississippi's administrative *per se* law. No discussion of the operational environment.

Definition of the Target Population. No explicit discussion. Appears to be all drivers arrested for DWI.

Research Design. Compared DWI and other traffic law recidivism rates before and after the administrative *per se* law. The before cohort (n=1171) was drawn from drivers arrested during a one-year period starting in September, 1979, and the after cohort (n=1143) was drawn from drivers arrested during a one-year period starting in September, 1982. Follow-up time ranged from two years and four months to three years and four months.

Statistical Methods. Analysis of DWI recidivism was carried out using Kaplan-Meier estimates of survival functions. These survival functions were converted to failure functions to indicate recidivism.

Interpretation and Objectivity. In both pre and post law groups, after 100 days, approximately 9% had been convicted of a second offense. However, it is reported that after the law, offenders were inhibited from committing other traffic offenses for a longer period of time than before the law changed. This same inhibiting pattern appears when the time from the first traffic offense to the second traffic offense is examined.

Quotes a study of Louisiana pre law arrest records (not driver records) that indicated 44% of arrested offenders who tested over the legal limit or refused test received no penalty or were not convicted. In the post law period, only 10% of arrested drivers escaped without penalty. Implementation of administrative license suspension in Louisiana has greatly increased the probability that once arrested, offenders will be penalized.

Surla, LT; and Koons, SM. (1989). *An evaluation of the elimination of plea bargaining for DWI offenders*. Washington, D.C.: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. Examined the effect of eliminating plea bargaining on court operations, DWI recidivism and general deterrence in communities in Arkansas and Kentucky, two states that had adopted anti-plea bargaining legislation. Provides a synopsis of legislation and Traffic Law System operations in the two states.

Definition of the Target Population. Implicitly, all impaired drinking drivers.

Research Design. For recidivism analyses, examined recidivism rates before and after the law changes. Did not reveal how significance of changes was determined. For general deterrence analysis, examined a tabulation of accident data by year on alcohol-related accidents (not defined).

Statistical Methods. See Research Design.

Interpretation and Objectivity. Compared experience before and after adoption of such laws and found that convictions on the original DWI charge increased dramatically with implementation of the laws. Despite fears that the time required to process a case would be increased, the opposite occurred. Convictions for the original charge increased from 71.7 percent to 88.3 percent in Fort Smith, Arkansas, after the no plea bargaining law was passed. In Lexington, Kentucky, a community that had an anti-plea bargaining *policy* before a state law was adopted, the conviction rate changed little from 97.5% to 98.2%. In contrast, Louisville, Kentucky, a community without such a policy before the law, saw its DWI conviction rate increase from 20.8% to 63.7%. The study also found an increase in the severity of the penalties imposed for DWI, but this effect was confounded by a concurrent change in the law that increased penalties. Thus, the extent to which increased sanction severity depended on reduced plea bargaining could not be determined. Decreases in DWI recidivism and alcohol-related crashes were also reported in the no plea bargaining states, but these changes could not be attributed to the lack of plea bargaining alone because of other alcohol-crash countermeasures implemented at the same time as no plea bargaining.

Swenson, PR; and Clay, TR. (1980). Effects of short-term rehabilitation on alcohol consumption and drinking-related behaviors: An eight-month follow-up study of drunken drivers. *International Journal of the Addictions* 15(6):821-838. (August 1980).

Description of the Countermeasure Program and its Operational Environment. This study is not an impact study, in that it did not attempt to determine the effect of the program on traffic crashes. Instead, it measured the program effects on outcomes more related to drinking behavior (three measures) and to behaviors related to problem drinking (two "indices of adjustment"). Two rehabilitation modalities were evaluated: *DWI Prevention Workshops*, a four-session, 10-hour program designed for social drinkers designed to impart information about the effects of alcohol on driving and interpersonal relationships; and *DWI Therapy Workshops*, a six-session, 15-hour program for problem drinkers that included the educational component, but used small group interaction and confrontation to develop personal awareness.

Definition of the Target Population. Subjects were 436 individuals arrested for DWI in Phoenix, Arizona, 241 of whom were social drinkers, and 195 problem drinkers. General biographical attributes of these subjects were provided.

Research Design. Program effects were determined through a Current Status Questionnaire (STQ) and a shortened version of the Life Activities Interview (LAI). The two instruments were administered at program entry and eight months later. A comparison group of subjects assigned to a home study course was also used. Selection of participants was made through (1) a diagnostic screening test and a pre-sentence investigation consisting of a search for prior arrests and prior convictions for DWI; (2) random assignment of those determined from (1) to be problem drinkers or social drinkers; and (3) selection of a subset of the total sample for follow-up. Five "scales" were used in the analysis, each scale containing responses to a set of items classified as: I. current quantity/frequency status; III. current physical health problems; IV. social interaction; V. current drinking problems; and VI. marital problems. Another scale (scale II) was discarded because of low internal reliability among the items of that scale.

The weakness of this design is the reliance on self-reported data and interview responses, and using unvalidated assessment instruments for determining whether a subject was a social drinker or a problem drinker. Using only two classifications of drinking behavior (social and problem) is also a weakness. Nevertheless, the social-problem dichotomy undoubtedly resulted in the selection of two very different groups not necessarily reflecting drinking practices alone.

Statistical Methods. Univariate analysis of variance was used as the statistical technique, appropriate for this design.

Interpretation and Objectivity. The study concluded that the workshops had no more effect than the home study course in improving the quality of social or problem drinkers' life situations. In fact, the workshop group fared worse than the home study group on scale I (non-significant). The authors concluded that short-term rehabilitation interventions either may not work at all or need to be strengthened to make them work. Given the results of the interventions evaluated, the home study course was much more cost effective.

Swenson, PR; Struckman-Johnson, DL; Ellingstad, VS; Clay, TR; and Nichols, JL. (1981). Results of a longitudinal evaluation of court-mandated DWI treatment programs in Phoenix, Arizona. *Journal of Studies on Alcohol* 42(7):642-653. (July 1981).

Description of the Countermeasure program and its Operational Environment. The study evaluated rehabilitation activities of the Alcohol Safety Action Project in Phoenix, Arizona over an 18 month period. In particular, 3 types of programs were compared: Power Motivation Training, therapy workshops and home study for DWIs assessed as "social drinker", "mid-range problem drinkers" or "advanced problem drinkers".

Definition of the Target Population. Of the 6,022 defendants classified into one of three categories, only the 1,242 individuals classified as mid-range problem drinkers were eligible for inclusion in the study. "Inappropriate" individuals were excluded. The subjects were men, 18-55, with at least an eighth grade education, who were free to attend weekend PMT sessions and did not have serious physical or emotional problems. The subject pool was 351 subjects who were randomly assigned to the treatment and control alternative.

Research Design. The research design called for an initial data collection session and periodic follow-ups at 6, 12, and 18 months for the three programs: Power Motivation Training, a four-week program involving 32 hours of therapeutic contact over two consecutive weekends with experimental exercises on risk-taking, goal-setting and interpersonal communication during stressful situations; DWI therapy workshops consisting of 15 hours of therapeutic contact with small group setting; and a home study course. The tests used were Life Activities Inventory (Current Status Questionnaire, the Personality Assessment Scale, and Life Activities Interview). Four measures were used, 1) number of days abstinent, 2) average quantity of alcohol consumed during the prior week, 3) typical quantity on typical day, and 4) index of drinking behavior from LAI.

Statistical Methods. A multivariate ANOVA was used for treatment and time main effects.

Interpretation and Objectivity. "Men in the three types of short-term treatment programs showed few differences in drinking patterns, drinking-related behavior and social adjustment at 6 months, 12 months and 18 months after treatment"

(p.642). The results were well qualified with reasons as to why the null hypothesis was not rejected.

Tashima, HN; and Peck, RC. (1986). *An evaluation of the specific deterrent effects of alternative sanctions for first and second DUI offenders. Volume 3: An evaluation of the California Drunk Driving Countermeasure System. Final report.* Sacramento: California State Department of Motor Vehicles.

Description of the Countermeasure Program and its Operational Environment. Examined the driving records of convicted first and second offense DWIs who received various combinations of traditional and non-traditional sanctions in California. The bulk of the study dealt with two groups, a "suspended group" that received driver license suspensions, and a "restricted group" that received a restricted license plus treatment. Gives only a very cursory description of the countermeasure program ("an alcohol-related driver improvement course for most first offenders and an approved 12-month treatment program [for second offenders].") By contrast, the method through which study subjects were selected was described in considerable detail, indicating that great care was exercised in selecting subjects.

Definition of the Target Population. As indicated above, the target population were first and second offense DWIs in California. The attributes of the subjects were examined in considerable detail to help adjust for the lack of random assignment in the study (see below).

Research Design. Used a quasi-experimental design. Random assignment to the various treatment groups was not possible, but attempts were made to adjust for any difference among the subjects in the various groups through analysis of covariance methods. Covariates included age, sex, prior driving-related variables, and "ZIP-code related variables" such as rate of injury accidents associated with each subject's ZIP code.

Statistical Methods. There were two separate types of analyses, each using a different set of analysis techniques. Study A analyses compared the driving records of each of the treatment combinations. The comparisons were made at two post-treatment time periods conducted at six-month intervals. Study B analyses compared the recidivism of those convicted prior to certain reforms in the DWI laws with the recidivism of those convicted after the law became effective. The comparisons made in Study A used analysis of covariance methods and also examined the possible effects of any regional differences in study outcomes. Study B used a technique employing a log-linear analysis with odds ratios. Both methods are appropriate for the study design and study objectives.

Interpretation and Objectivity. The major conclusions were summarized as follows:

"Among second offenders, the suspended group had significantly lower rates compared to the SB 38 [restricted] group on the 1-year posttreatment nonalcohol, fatal / injury, and total accident measures. On alcohol accidents, the rates between the two groups did not differ significantly. On subsequent major convictions (including DUI), the restricted SB 38 group had a significantly lower rate than that of the suspended group.

"In the first offender analysis, there was a significant overall difference among the groups with the following pattern of results. First offenders who were given stronger license control sanctions incurred accident and conviction rates that were lower than those of offenders given lesser penalties. The suspended group had the lowest total and nonalcohol one-year accident rate, while the restricted program group had the lowest six-month alcohol related accident rate. The restricted plus program group and the restricted-only groups had the lowest rates for one-year major convictions.

"Findings from the pre-post AB 541 analyses indicated that AB 541 had an impact in lowering alcohol accident, total accident and major conviction rates among DUI drivers."

The authors also observed that the evidence continues to show that license suspension is more effective than license restriction plus treatment for reducing the net accident risk of multiple offenders, but that the picture is less clear for first offenders. They note that the study suggests that first offenders are either more responsive to treatment or less responsive to suspension than are repeat offenders. However, first offenders in both the suspended and the restricted groups had more accidents and minor traffic violations than did multiple offenders. The explanation is offered that there is an "overlapping" of alcohol-related driving behaviors among first and repeat offenders. With respect to major violations, the second offenders had higher rates than did first offenders, but the percent reduction in major violations was greater among repeat offenders in the restricted group than among first offenders in the restricted group. It was hypothesized that this may be due to the more extensive treatment given to the repeat offenders.

These conclusions and observations flow logically from the analyses reported and are completely objective.

Temer, RG; Peck, RC; Perrine, MW; and Borok, LS. (1987). Study of the relative effectiveness of disulfiram vs. Alcoholics Anonymous participation in the treatment of drinking driver offenders. In: *P. C. Noordzij and R. Roszbach (Eds.). Alcohol, drugs and traffic safety - T86.* Amsterdam: Elsevier.

Description of the Countermeasure Program and its Operational Environment. Examines post-treatment DWI recidivism and major-offense recidivism of 1,914

persons referred by the court to an outpatient treatment program conducted by Occupational Health Services, Inc., of Oakland, CA, during the period January, 1981 though February, 1983. The program had a mandatory one-year attendance requirement. The program components were 13.5 hours of educational classes; 58.5 hours of group therapy; 8 hours of individual counseling; and attendance at 20 AA meetings. In addition, Disulfiram was required of all participants not contra-indicated entering the program before March 8, 1982. After that date, participants could choose between the Disulfiram and an additional 24 AA meetings.

Definition of the Target Population. Multiple DWI offenders. The criteria and procedures for referral were not described.

Research Design. Compared records of those completing the program to those not completing the program. The reasons for non-completion were not discussed. The analyses showed no correlation between completion or recidivism and several socio-economic and alcohol use items. Nevertheless, one cannot be reasonably sure that the completers were not somehow different from the non-completers.

Statistical Methods. Used analysis of variance.

Interpretation and Objectivity. Concluded that those who completed the program had lower recidivism than those who did not complete the program, and that the recidivism rates of those who attended AA and those who took Disulfiram were about the same. (Note that it was not necessarily due to the program but could be due to different types of persons in the completer and non-completer groups.) Further, those who had the opportunity to choose between treatments did better than those who could not choose their treatment. However, among those given the opportunity to choose between treatments, the AA group did better than the Disulfiram group. Concluded that it was the act of given the right to choose that made the difference, rather than the type of treatment that was responsible for the effectiveness of the program.

U.S. Department of Transportation, NHTSA (1987). *Research on driving while under the influence of alcohol: An evaluation of the North Dakota system.* Washington, DC: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. Evaluates the effect of North Dakota's 1983 law which required prompt license suspension and mandatory sentences, and established an illegal *per se* standard. The mandatory sentence for first offense was relatively weak, requiring only a $250 fine and referral to an addiction facility for evaluation. The "prompt license suspension" was actually administrative suspension for having a BAC of .10% or more. The report gives an excellent analysis of the North Dakota law before and after the 1983 changes.

Definition of the Target Population. All alcohol-impaired drivers, including juveniles.

Research Design. Analyzed various accident times series, including total crashes, total injuries, and total fatalities. Injuries and fatalities were broken down into daytime and nighttime. There were no control groups nor were there any terms in the series that might account for socio-economic influences known to effect traffic crashes. HBD or BAC criteria were not used.

Statistical Methods. Used Box-Jenkins time series methods, both in SAS ARIMA version, and in a separate software package, AUTOBOX. Use was appropriate.

Interpretation and Objectivity. Found a non-significant decrease in total crashes; no significant decrease in injuries; a significant decrease in fatalities; a significant decrease in single vehicle nighttime injuries; no significant decrease in single vehicle daytime injuries; a significant decrease in nighttime fatalities; and no significant decrease in daytime fatalities. States that these findings strongly support the conclusion that the new law has had a positive impact on ND drivers. While this may be true, other hypotheses about declines in the various types of crashes were not sufficiently explored to justify an attributing causal relationship to the law. The use of FARS data from nearby states and the use of other time series (e.g., unemployment) would have strengthened the study.

Utah Highway Safety Division (1981). *Evaluation of the Utah juvenile court alcohol school.* Utah Highway Safety Division.

Description of the Countermeasure Program and its Operational Environment. Describes the results of an evaluation of a "DWI school" for juveniles in Utah. The school curriculum consisted of a one-hour lecture followed by group discussion involving the juvenile subjects and their parents. The group sessions were constructed so that none of the parents were in the same group as their children.

Definition of the Target Population. The target population was composed of juveniles convicted of drunk driving and "other alcohol-related offenses" and assigned to the school, apparently prior to conviction. If they are convicted, they then enter the program, apparently as a condition of probation.

Research Design. The design was before-and-after with random assignment to treatment and comparison groups. Two comparison groups were used, one called the "contact group", which attended a similar school without the group sessions, and another called the "regular group", which used traditional sanctions such as fines, probation, and referral to other agencies. Subjects were randomly assigned to these groups. Accident and reconviction data were collected for all subjects (the process is not described). Two phases of operation appear to have

been evaluated. The sample size for the first phase was: school group, 91 juveniles; contact group, 32; and regular group, 24. For the second phase, the sample size was: school group, 231; contact group, 133; and regular group, 47.

Statistical Methods. Used one-way analysis of variance. Unacceptably high significance level was chosen for phase I (.15).

Interpretation and Objectivity. Data show no significant differences between the three groups for either phase at the .05 level. Authors did not claim any effects in the conclusions section of the report.

Vingilis, ER; Blefgen, H; Lei, H; Sykora, K; and Mann, R. (1988). An evaluation of the deterrent impact of Ontario's 12-hour license suspension law. *Accident Analysis and Prevention* 20(1):9-17. (Feb. 1988).

Description of the Countermeasure Program and its Operational Environment. On December 17, 1981 Ontario introduced a law permitting the police to conduct random spot checks to detect drinking drivers, and to suspend a driver's license for 12 hours if a driver registered 0.05 percent or more on a roadside screening device or evidentiary breath tester. The purpose was to provide a swift and certain punishment that would not tie up police or the court system. The authors note that celerity of punishment is one aspect of deterrence theory that has received little study. This was the only countermeasure of significance known to be introduced during this period; it was described clearly.

Definition of the Target Population. All drivers.

Research Design and Statistical Methods. This was a before-after study (January 1, 1979 - December 31, 1982) based on the proportion of fatally injured drivers with positive BACs among all those tested; comparison data from Saskatchewan - Manitoba were used. These data were analyzed by time series methods (Box and Taio intervention analysis). In addition, an assessment of print media coverage was made, telephone surveys of Toronto drivers were made before and after the law, and a questionnaire survey of police chiefs and uniformed officers concerning the law and its enforcement was carried out.

The BAC measure is not ideal but it is appropriate and the best one can do with the data available.

Interpretation and Objectivity. The fatality analysis revealed a small, short-term effect. There was little media coverage, the telephone surveys indicated some awareness of the law but yielded no significant pre-post law changes in perceived enforcement, and the police survey indicated minimal enforcement of the law. The authors conclude that laws to increase the celerity and certainty of the punishment will have little deterrent effect without enforcement and publicity of the new laws.

The authors note that they cannot make a definitive statement concerning the effect of the law on reducing alcohol-related crashes because their time series was too short. This article was submitted in 1986. It is not clear why post-1982 data were not added to the analysis.

Vingilis, ER; Chung, L; and Adlaf, E. (1981). An evaluation of a prevention programme for drinking-driving called Reduce Impaired Driving in Etobicoke (RIDE). In: *Alcohol, Drugs and Traffic. Volume III of the 8th international conference. Proceedings. June 15-19, 1980. Stockholm, Sweden.* Stockholm, Sweden: Almqvist & Wiksell International. 1259-1270.

Description of the Countermeasure Program and its Operational Environment. The evaluation deals with a DWI enforcement / PI&E program in Etobicoke, Canada, a borough of Metropolitan Toronto. The program used the acronym R.I.D.E. (Reduce Impaired Driving in Etobicoke). The enforcement component used random spot-checks and roadside breathtesting. The spot-checks were conducted over a two-year period starting in October, 1979 and were intensive, being conducted seven days a week, one or two shifts per day. Note that these checks were not roadblocks, but were random stops without the requirement for probable cause as would be the case in the U.S. During the period of the evaluation (September 1979 through April 1979), 180,185 stops were made, and 2,051 breath tests were given. Of these, 451 drivers (22%) failed the test, and 14% were charged with an alcohol-related offense.

The PI&E component used a highly visible, electrically lit R.I.D.E. sign on the roof of the police cars. The sign was about 1.5 feet high and as wide as the roof of the car. (A subsequent survey found that 30.6% of the respondents first learned about the program through "police activity.") Print and electronic media were used, along with a pamphlet that was distributed to stopped drivers. There was no paid advertising except for the pamphlet. Forty-one percent of the respondents to the survey reported media as the prime source of information about the program.

Definition of the Target Population. This was a general deterrence program aimed at drivers in general.

Research Design. Highway safety impact was assessed by comparing alcohol-related accidents (based on police judgement) in Etobicoke with those in the four other police districts in Toronto. Also, there was an independent roadside survey that provided data for 1974 and part of 1979 for three Toronto police districts, including the study district. Fatal accident data could not be used because of the small sample sizes for the jurisdiction studied. It was not clear why other surrogates (e.g., nighttime accidents or nighttime injury accidents) were not examined.

Statistical Methods. Not described in any detail, except that t-tests and time series analyses were used. They appear adequate for the data available.

Interpretation and Objectivity. Concluded that there was no measurable highway safety effect, either on accidents or drivers using the road. Found through self-reported data that the program increased the perceived risk of the "average man being caught," but not of the respondent being caught. Awareness of the program and program messages was also higher in Etobicoke than in the other police districts. The results were reported with complete objectivity.

Voas, RB. (1986). Evaluation of jail as a penalty for drunk driving. *Alcohol, Drugs, and Driving: Abstracts and Reviews* 2(2):47-70.

Description of the Countermeasure Program and its Operational Environment. This is a review of sanction-severity literature with emphasis on the jail sanction. The brief descriptions of the various programs reviewed are adequate for this purpose.

Definition of the Target Population. See above.

Research Design. See above.

Statistical Methods. Statistical methods are not described for most of the studies discussed.

Interpretation and Objectivity. Concludes that jail alone has not been shown to be an effective countermeasure for DWI. However, jail plus license suspension may be better than suspension alone. Observed that jail may serve as a long-term conditioner of public opinion and therefore of value. Stresses the need for more research and better control of covariates that may influence evaluation results.

Voas, RB; and Hause, JM. (1987). Deterring the drinking driver: The Stockton experience. *Accident Analysis and Prevention* 19(2):81-90. (Apr 1987).

Description of the Countermeasure Program and its Operational Environment. Examined the deterrent effect of increased DWI patrol activity in different sections of Stockton, California, during a 3-1/2 year period starting in January, 1976. The experiment involved adding 10 extra patrol cars to the normal traffic law enforcement activity on Friday and Saturday nights between 8 p.m. and 4 a.m. Enforcement procedures were traditional, not involving roadblocks or PBTs. In 1976, arrests for DWI during the enforcement period increased by a factor of seven over the 1975 baseline year. High arrest rates were maintained throughout the study period during the times of the year when the patrols were operating. The paper provided no detailed description of the operational environment in Stockton.

Definition of the Target Population. Implied to be all potential DWIs in the Stockton area. No characteristics were given for the target group.

Research Design. Analyzed accident time series for the period 1973-1981. The time series were reported accidents of all levels of severity occurring during (1) Friday and Saturday night, (2) weeknights, and (3) daytime. Also analyzed the results of four roadside surveys in which driver BACs were measured. Accident data were compared with those from four similar cities in California; Fresno, Bakersfield, Modesto, and Riverside.

Statistical Methods. Accident analysis used ARIMA methods following the approach of Box and Taio. Analyzed Stockton alone and also compared the Stockton data with the aggregate of the control city data over a 1973-1980 time period. The details of the analysis were not discussed.

Interpretation and Objectivity. The analysis of the accident data found statistically significant decreases in the number of nighttime accidents occurring in Stockton. The authors found that this reduction amounted to 10% to 15% during the 3-1/2 year period of the project and that there was no similar reduction in daytime accidents in Stockton or in nighttime accidents in comparison cities. Further, the study found that the number of drinking drivers on the roads during weekend evenings decreased during the project period: during the baseline period, 8% of the drivers stopped had a BAC of .10% or more, compared to 5% stopped during the project. The program's effect was found to be greatest during the early part of the program when there was more publicity about the projects; an effect was also noted after the publicity died out.

Voas, RB; Rhodenizer, E; and Lynn, C. (1985). *Evaluation of Charlottesville checkpoint operations.* Washington DC: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. Evaluates the Driver's License and Sobriety Checkpoint program operated by the Charlottesville, Virginia, Police Department during December 30, 1983, to December 31, 1984. A total of 94 checkpoints were conducted during this period. A total of 23,615 vehicles were stopped in this period, and 290 were arrested for DWI, and another 386 were given "safety advisories" when their BAC was below 0.10% and they did not show any visible signs of impairment. Describes the program in considerable detail, and provides some information about the operational environment.

Definition of the Target Population. Drunk drivers in general. Age and sex of those stopped are given.

Research Design. Analyzed time series of alcohol-related accidents and nighttime accidents in Charlottesville and compared them to all accidents in Charlottesville and alcohol-related accidents and nighttime accidents in the state as a whole. The series included 36 months of data prior to the intervention and 12 months of data during the intervention.

Statistical Methods. Used the Box and Tiao time series analysis method. No details are provided, but the application appears appropriate.

Interpretation and Objectivity. The data indicated a significant decrease in *alcohol-related* accidents in Charlottesville during the checkpoint operations. The decrease amounted to roughly 15%. However, the same measure also declined in the remainder of the state, so that when the Charlottesville data were compared with data for the rest of the state, the decrease in Charlottesville was not statistically significant. The data also showed that while there was also a decline in *nighttime* accidents in Charlottesville, the decline was not significant. The authors reported these findings.

Votey, HL. (1984). Recent evidence from Scandinavia on deterring alcohol impaired driving. *Accident Analysis and Prevention* 16(2):123-138. (Apr. 1984).

Description of the Countermeasure Program and its Operational Environment. Evaluates the overall effect of drunk-driving legal-system control actions and alcohol consumption in Sweden and Norway. The nature of these actions is not described, nor is the operational environment.

Definition of the Target Population. No description provided. Presumably all drunk drivers and potential drunk drivers.

Research Design. Used time series and cross-sectional models. In Sweden, two time series were apparently used, one describing "accidents" as a function of drunk-driving convictions, per capita consumption of alcohol, and traffic density, and the other describing drunk-driving convictions as a function of total police manpower and accidents. The time series covered the period 1954-1977.

The cross-sectional studies in Sweden used data from 24 counties. Two separate analyses of these data were performed. The first analysis used data from 1972 and involved the use of four models. All models used fatal accidents, all motoring offenses prosecuted, and DWI prosecutions as independent variables. The first model used police patrol manpower, alcohol consumption, distance driven, and traffic density as independent variables. The dependent variables for the second model were the same as the variables for the first model except that police patrol manpower was replaced by total police manpower. The dependent variables for the third model were the same as the variables for the first model except that alcohol consumption was replaced by cirrhosis of the liver for the year following the year studied. Finally, the dependent variables for the

fourth model were the same as those for the third model except that police patrol manpower was replaced by total patrol manpower.

The second Swedish analysis used pooled data from the years 1971-1978 incorporated into a model with a single dependent variable, fatal accidents per capita, written as a function of total police manpower, per capita alcohol consumption, annual distance driven, and traffic density.

In Norway, two time series models were studied for the years 1956-1972, the first being concerned with personal injury accidents and the second with fatal accidents. Each model used four equations: convictions as a function of drunk driving, police manpower, and traffic density; drunken driving as a function of the probability of conviction and alcohol consumption; accident rate as a function of drunk driving, traffic density, and road quality; and demand for police patrol as a function of accident rate and per capita income.

Five cross-sectional models were used for Norway incorporating pooled county data for 1970-1975. The models were concerned with all injury accidents, fatal accidents, all accidents attributed to alcohol, fatal accidents attributed to alcohol, and all accidents, respectively. Each model incorporated two equations. The first equation wrote the pertinent dependent variable (for example, all injury accidents) as a function of prosecutions, license withdrawals, and an alcohol index. The second equation wrote the number of cases concluded for driver violations as a function of police patrol and the pertinent accident odds.

None of the models incorporated any controls, since they were concerned with data for entire countries.

Statistical Methods. The statistical methods were not described in any way, although references were given to sources that presumably do describe the methods.

Interpretation and Objectivity. The general conclusion was that the study supports the hypothesis that increases in alcohol consumption are associated with higher accident levels and that increases in law enforcement effort leading to a greater probability of sanctions will reduce fatal and serious accidents. The conclusion about the effects of law enforcement effort appear to be borne out by the results in both countries, but the conclusion about the effects of consumption are supported only by the Norwegian study. Some of the effects found were quite large, for example, a one percent reduction in accidents for a one percent increase in convictions in Sweden.

Other Comments. More is needed on the details of this study in order to assess its validity. Also, the lack of any controls makes it difficult to establish a cause and effect relationship among the various risk management measures and alcohol-crash risk.

Wagenaar, AC. (1982). Aggregate beer and wine consumption - effects of changes in the minimum legal drinking age and a mandatory beverage container deposit law in Michigan. *Journal of Studies on Alcohol* 43(5):469-487.

Description of the Countermeasure Program and its Operational Environment. Assessed the effects on aggregate beer and wine consumption of lowering and then raising the legal minimum drinking age in Michigan. In January 1972, Michigan lowered the drinking age from 21 to 18 years. In December 1978, it was raised from 18 to 21 years. Also, in December 1978, a 5 cent deposit per bottle or can of beer was introduced. Provides an extensive review of the literature on the subject and a description of pertinent statutes and policies in Michigan.

Definition of the Target Population. Drivers affected by the LMDA. Characteristics are not provided.

Research Design. Analyzed time series of beer and wine distributions to wholesalers from breweries and wineries in the 1969-1980 time period. No control series were used. These models include implicitly a linear time trend and several variations, and explicitly several intervention variables and autocorrelated residuals. The model for wine uses as intervention variables step functions in January, 1972 and January, 1979, and in addition a stepfunction in October, 1970, to represent an unexplained increase. The models for total beer and packaged beer have the intervention terms for January, 1972 and 1979. The model for draft beer includes the intervention term for 1979, but for 1972 a pulse function rather than a step function. In addition, a step function for January, 1980 is added to accommodate a further increase in draft beer distribution.

Statistical Methods. Used ARIMA time series analyses which was appropriate.

Interpretation and Objectivity. Found that wine distribution did not change significantly in 1972 after the LMDA was lowered, or in 1979 after the LMDA was raised and a mandatory container deposit law was implemented. Also found that total beer distribution and package beer distribution did not change significantly in 1972, but that a significant decrease began in 1979. Concluded that part of the decline in package beer sales was offset by a decline in draft beer sales. Explored other hypotheses for the changes in distributions. Noted the inconsistency of the conflicting findings on beer and wine in supporting the "availability hypothesis" and provided some plausible explanations for them, which he then dismissed as "informed speculation."

A careful look at a graph of twelve-month moving averages of draft beer distribution shows that it was essentially constant through 1973, increased in 1972, and decreased somewhat early in 1973. However, from the middle of 1973 through 1977 it was essentially constant, at a higher level than before 1972.

Therefore, it appears likely that the higher level is the more important feature than the slight decline in early 1973. It is plausible that lowering the drinking age had an effect on draft beer. As Wagenaar notices, draft beer is the least expensive alcoholic beverage, and might therefore be more attractive to younger people than packaged beer. Also, it is usually drunk on premises where the seller can exert some control on who consumes the beer, whereas there is practically no control on the consumption of packaged beer, once it is sold. Thus, the author appears overly cautious.

The 1979 intervention variable shows a significant decrease of packaged beer (-11.5%), and of total beer (-7.3%), but a significant increase in draft beer (+19.8%), and a very small, nonsignificant increase in wine. The author notes that the deposit law increased the real price of packaged beer by about 10%. He is careful not to interpret too strongly the decline in overall beer consumption as a result of limiting availability of beer for younger people, and of shifting from packaged to draft beer for older people. A closer look at his graphs for total beer and for packaged beer distribution shows that the decline did not begin in January 1979, but might have started late in 1977 or early 1978. The author mentions an economic recession in Michigan, but does not give its dates, and does not attempt to quantify its impact.

In sum, the author's data seem to provide stronger support than he thinks for the hypothesis that lowering the drinking age had an effect on draft beer consumption. The effects of raising the drinking age cannot be separated from those of the deposit law. Our interpretation of his data is that the deposit law had greater effect. However, how large its effect was remains open, since a decline due to other factors might have started earlier.

Wagenaar, AC. (1983). *Alcohol, young drivers, and traffic accidents: Effects of minimum-age laws*. Lexington, MA: Lexington Books.

Description of the Countermeasure Program and its Operational Environment. An extensive treatment of the effects of minimum drinking age laws in the U.S. Gives detailed results of the author's own studies for Michigan and Maine. Used New York and Pennsylvania as comparison states. Concludes that about 20% of all alcohol-related crashes involving young drivers could be prevented by eliminating legal access to alcohol.

Definition of the Target Population. Indicates the target age groups by state.
Research Design. Provides a very detailed, excellent description of the research design. In general, the design was a sound one, employing a quasi-experimental time-series design with comparison series. Also, describes data collection procedures in some detail.

Statistical Methods. Descriptions of statistical methods are detailed and complete. Used Box-Jenkins approach and ARIMA models.

Interpretation and Objectivity. The conclusion that "20% of all alcohol-related crashes involving young drivers can be prevented by removing access to alcoholic beverages" (page 101) is based on the Michigan findings on property damage crashes and injury crashes. The Maine study showed an effect only for property damage crashes. Also, it is a long jump from conclusive findings in one state to all states, even though the reader is cautioned not to assume that any state raising its LMDA will be rewarded with the 20% decrease. Despite this impropriety, the conclusions chapter is generally objective and reasonable in its interpretations.

Walsh, BM. (1987). Do excise taxes save lives? The Irish experience with alcohol taxation. *Accident Analysis and Prevention* 19(6):433-448. (Dec. 1987).

Description of the Countermeasure Program and its Operational Environment. The author studies the chain of potential effects: alcohol taxes, alcohol prices, alcohol consumption, and alcohol-related deaths. He studies both deaths from cirrhosis and motor vehicle accidents. This review discusses only the latter ones. The description of the "countermeasure" and its operational environment are sketchy. However, the countermeasure is the increase of taxes on alcohol.

Definition of the Target Population. The population studied is Ireland over the years 1950-1984.

Research Design. First, the author studies the relation between alcohol taxes and prices for beer, and for spirits. Regression models were derived which describe the relation between prices and taxes in real terms. Next, the author reviews price elasticities for alcoholic beverages in Ireland, as published in the literature. Finally, the author studies the traffic death rate per 1,000 registered vehicles.

Statistical Methods. Regression analysis.

Interpretation and Objectivity. He finds that, in real terms, prices have varied less than taxes over time. The traffic death rate shows an overall downward trend, but with fluctuations (and from 1965-1972 the trend is upward; reviewer). The author mentions two, "potentially significant" measures which may affect the trend: the re-introduction of the breath test in August 1978; and the passage of a law making the wearing of front safety belts compulsory in February 1979. Later he mentions that six months later there was a severe shortage of motor fuel. He does not mention the first fuel crisis in 1973, and the subsequent dramatic increase in fuel prices.

The author performed several regressions with the road fatality rate on dependent variable, and all or some of the following independent variable: alcohol consumption per person over age of 14; time; time square; and dummy variables to account for the potential disturbances in 1978 and 1979. The

coefficients of these variables are not significant by common standards, though the author states only that "this statistical significance is low." The coefficients of alcohol, and the time trend are significant.

For the years 1968-1984, separate data for fatalities during the hours 2100-0300 were also available. Here, the coefficients of alcohol consumption are again significant, but the coefficients of the dummy variables have the wrong sign.

The author makes a strong argument that "there is always the possibility that the influence attributed to alcohol consumption is really due to some other factor with which alcohol consumption is highly correlated over time." He mentions that replacing alcohol consumption by total personal consumption expenditures, gives only marginally worse results; also the unemployment rate would give almost as good a fit as alcohol consumption.

Though the author includes a non-linear time trend in his analysis, this might not be sufficient to eliminate an effect due to the fact that alcohol consumption also shows a time trend, though not a smooth one.

One cannot confidently interpret the findings as indicating a causal relationship. Therefore, the author's estimates of how much certain increases in the beer and spirit taxes would reduce the traffic death rate, must be considered speculative.

Williams, AF. (1983). *Laws and regulations applicable to teenagers or new drivers: Their potential for reducing motor vehicle injuries.* Washington, DC: Insurance Institute for Highway Safety.

Description of the Countermeasure Program and its Operational Environment. Not an evaluation *per se*, but a review and synthesis of prior IIHS studies. Reviews in some detail the highway safety effects of three types of laws aimed explicitly at teenage drivers: minimum legal drinking age (MLDA), minimum legal licensing age (MLLA), and night driving curfews (NDC). Various other laws aimed at this target group are discussed in less detail.

Definition of the Target Population. Teenage drivers.

Research Design. The three studies reviewed varied in their research design, but two of them (MLLA and NDC) relied heavily on comparisons with other states chosen mainly on the basis of their geographical proximity.

Statistical Methods. Not discussed in this paper.

Interpretation and Objectivity. The author concludes that the three countermeasures reviewed "are known to be very effective in reducing motor vehicle injuries to themselves and others involved in their crashes." Actually, only one

of the three (MLDA) is clearly known to be effective based on a large number of studies conducted by a wide range of investigators from different organizations; the effects of the other two were determined from IIHS studies.

Williams, AF; Zador, PL; Harris, SS; and Karpf, RL. (1983). The effect of raising the legal minimum drinking age on involvement in fatal crashes. *Journal of Legal Studies* 12:169-179.

Description of the Countermeasure and its Operational Environment. Countermeasure is the raising of the legal drinking age, from 18-19, 18-20, 18-21, and 19-21 in nine states.

Definition of the Target Population. The population studied are drivers from ages 15 through 20; drivers of 21 were included in control groups. In addition to the nine states, nine nearby states were used as control states.

Research Design. The research design is essentially a 2x2x2x2 table: accidents more/less affected by alcohol x before/after law change x affected/not affected age group x treatment/control state. Two ways to distinguish those accidents more, and those less affected by alcohol: nighttime versus daytime, or nighttime single-vehicle versus daytime multi-vehicle fatal accidents. The authors also present data for "all types" of fatal accidents, without describing how that analysis was performed. Treatment groups were the age groups directly affected by the law as control groups, drivers of older age, up to 21, not affected by the law change were used. The authors also mention briefly results for drivers younger than those affected by the law change.

Statistical Methods. The statistical approach is essentially testing the logarithms of the odds ratio in the multi-variate table.

The authors perform various analyses. They estimate reductions for each of the states, and they estimate overall effects by combining the states in three ways. One way is combining the actual accident numbers and performing one analysis. Another is to simply average the effect for the nine states, and the third is averaging the effects, weighted with the case numbers.

Interpretation and Objectivity. Overall, the results appear credible, and the alternative analyses give a good idea of the uncertainty of the results.

Williams, RL; Hagen, RE; and McConnell, EJ. (1984). A driving record analysis of suspension and revocation effects on the drinking - driving offender. *Accident Analysis and Prevention* 16(5-6):333-338.

Description of the Countermeasure Program and its Operational Environment. Studies the recidivism of (1) DWI first offenders who received no driver license suspension; (2) second offenders who received a 12 month suspension; and (3)

offenders who received a 36 month revocation in the index year of 1974. The data were all from the California driver records system. There is no description of the operational environment of the California license action program in place at the time of the study.

Definition of the Target Population. See above. Age and sex statistics of the target groups were provided.

Research Design. Compared the recidivism of the three target groups. The total number of drivers studied was 4,488, including 1,769 first offenders, 1,808 second offenders, and 911 third offenders.

Statistical Methods. Compared the numbers of surviving drivers for each of four years after their index conviction, where "surviving" was defined as not having received a DWI conviction, not having been involved in a reported accident, and not having been cited for a failure to appear in court or a failure to pay. Proportional tests using a Z statistic were conducted annually to compare the percentages of surviving drivers among the three target groups.

Interpretation and Objectivity. The authors found that first offenders not receiving any driver license action had the lowest DWI survival rate, followed by third offenders. The one-year DWI survival rate of the second offenders was significantly higher than that of the other two groups, but the rates of the second and third offenders began to catch up and then surpass those of the first offenders as time passed. However, even after three years, the rates of the first and second offenders were almost identical, and there was only a small difference between the rates of these two groups after the fourth year. The accident survival rate of first offenders was even worse in comparison with that of second and third offenders and remained so even after four years. The authors concluded that the first offender represents a significant crash threat and suggested that driver license actions be taken for this group. We note here that the study also provided support for the validity of license actions, in many cases, less than that of the first offenders who did not receive such sanctions.

Wolfe, AC; and O'Day, J. (1984). *Evaluation report on the 1979-1983 Oakland County alcohol enforcement/education project.* Ann Arbor, Michigan: University of Michigan, Highway Safety Research Institute.

Description of the Countermeasure Program and its Operational Environment. This is an evaluation of a four-year project which combined selective enforcement and education in Oakland county.

Definition of the Target Population. Oakland county drivers, in particular, drinking drivers.

Research Design. Special police patrols were deployed in 10 target areas selected on the basis of having large numbers of alcohol-related accidents. Project goals were established in terms of increased enforcement (e.g., alcohol arrests), increased public awareness of drunk driving problems and increased knowledge of laws and enforcement efforts, and decreased alcohol-related accidents.

Statistical Methods. Many tabulations of frequencies and percents were presented, but no statistical analyses were reported.

Interpretation and Objectivity. The stated goals in terms of increased enforcement and increased public awareness were met. It should be noted, however, that increases in alcohol arrests in Oakland County were still quite similar to increases occurring in surrounding counties. Frequencies of alcohol-related accidents at all levels of severity decreased in Oakland County during the project period, but so did accidents that were not alcohol-related. Very similar trends were also seen in other large counties and statewide. Alcohol-related accidents as a percent of total accidents showed very little change and did not meet the stated goal. Thus, although alcohol-related accident frequencies decreased, particularly in the target areas, there was little evidence to suggest these changes were due to the program.

Womble, K. (1989). *The impact of minimum drinking age laws on fatal crash involvements: An update of the NHTSA analyses.* Washington, DC: National Highway Traffic Safety Administration.

Description of the Countermeasure Program and its Operational Environment. Increase of the minimum legal drinking age from 18 years to higher ages.

Definition of the Target Population. Drivers 18 through 20 years old in 13 states during the years 1975-1986.

Research Design and Statistical Methods. For each state, the driver age groups affected by the change are combined for the years before the change, and the years after the change (the year of the change is apparently omitted). The other ages in the bracket 18-23 years are similarly combined into a control group. For each treatment group and each control group, the ratio of fatal accident involvements to licensed drivers is calculated and the ratios of these rates to those of the control groups compared "before" and "after".

In principle, this approach is plausible, but it is subject to potential subtle confounding effects. For instance, in 11 of the 13 states the 18 year olds were affected by the change, 5 of the 19 year olds, and only 2 of the 20 year olds. If for some other reason the fatal accident involvement changes over time differently for different age groups, this would confound the findings; more control states where the 18 year olds are not affected would be needed.

Standard errors of the percentage changes of the relative rates are shown in a graph, but it is not indicated how they were calculated (this might perhaps be in the original report of which this is an update).

The estimates for the 13 states are combined by calculating a weighted average. This is correct if one assumes that the effect of the change in drinking age is the same in all states, and that the differences among the states are due only to random variations. If in addition to the random variations resulting from the limited case numbers, there are apparently random differences among the states, this could lead to biased estimates.

Interpretation and Objectivity. The conclusions appear as a fair interpretation of the numerical results obtained. Though the approach is simple, there is no reason to suspect that it would bias the results.

Zador, PL; Lund, AK; Fields, M; and Weinberg, K. (1988). *Fatal crash involvement and laws against alcohol-impaired driving.* Washington, DC: Insurance Institute for Highway Safety.

Description of the Countermeasure Program and its Operational Environment. Studies the effect of three law changes on alcohol-related crashes in states that adopted such laws. The laws were providing for: a *per se* limit for BAC, administrative *per se* suspension of the driver's license, and mandatory jail or community service for first-offense DWI. Gives an adequate description of the significant provisions of the laws studied.

Definition of the Target Population. All potential drunk drivers over the age of 20 years. Younger drivers were excluded to avoid possible effects from the 21 minimum legal drinking age. Motorcycle crashes were also excluded because of helmet laws or changes in the types of motorcycles being used. Other classifications included time of day, day of week, types of vehicles involved in multi-vehicle crashes, driver age category, driver sex, and urban/rural.

Research Design. Primary design was to compare the crash frequency change in each treatment state with that in a contiguous state without the law changes. This paired comparison approach resulted in some strange bedfellows, e.g., Delaware and Pennsylvania, New York and Vermont.

Statistical Methods. Used a log-odds ratio model, with a modification that leads to a set of regression equations for estimating the coefficients in the model. An appropriate and ingenious method for the design used.

Interpretation and Objectivity. Some results are very odd. For example, jail had only a small negative impact on single-vehicle accidents, but a large, positive impact on pedestrian accidents. *Per se* had a small positive impact on single-vehicle, but a very large positive impact on multi-vehicle accidents. Neverthe-

less, the authors seem to accept the results at face value. The results show that only the administrative license suspension law produced a statistically significant reduction in fatal crashes overall.

ALCOHOL COUNTERMEASURES

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