

BENEFIT-COST ANALYSIS OF A KENTUCKY DUI ACCIDENT COUNTERMEASURE PROGRAM

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Summary. The purpose of this paper is to apply a general model of driver behavior to benefit-cost analysis of DUI accident countermeasure programs and to reassess a recent program in Kentucky. The most important implication is that bottom-line analysis of the overall accident rate is essential. Analysis of only alcohol-related accidents precludes measurement of driver response and program interactions. The impact of the Traffic Alcohol Patrol in Louisville was recently analyzed for the Kentucky State Police. Adjustments to this conventional study indicate the net benefits probably were overestimated because of driving adjustments, counting fines as benefits, and overvaluation of accident reductions.

INTRODUCTION

Driving under the influence (DUI) of alcohol can cause problems for the driver and all those who share the road with the drinking driver. Alcohol-related accidents are a large enough share of severe accidents that they attract special attention for social policy. As various policies are proposed and tried interest develops in distinguishing which policies are the most beneficial and deserve the most support. In this context benefit-cost analysis can be useful because it offers a formal method for balancing the advantages and disadvantages of DUI accident countermeasures. Benefit-cost analysis can identify DUI programs which can produce gains which are large enough that the losses to net losers could be fully covered by the net beneficiaries with benefits to spare. In a world with tight government budgets, great demands on police departments and full court dockets, realistic advocacy of DUI countermeasures necessarily is restricted to programs with attractive net benefits. Net benefits indicate the increase in social efficiency due to better driver safety decisions.

The gist of this paper is that conventional benefit-cost studies tend to overestimate the net benefits of DUI countermeasures. Although there are reasons why these programs are somewhat overrated it does not follow that they are not worthwhile. Net benefits may be positive despite any overestimation, and they may be larger than alternative traffic safety measures. Benefit-cost analysis should be done for specific programs to determine their social net worth.

THE LOUISVILLE TAP PROGRAM

During the last decade Kentucky has attempted to reduce the number of traffic accidents through enhanced enforcement of DUI laws. One such attempt has been the Traffic Alcohol Patrol (TAP) program in the Louisville metropolitan area. The programs began in 1985 and entailed increased patrols for DUI during the hours 10:00 p.m. and 8:00 a.m. In 1984 a "Slammer Law" took effect and increased the fines, jail terms and loss of license for DUI convictions. The TAP program and the Slammer Law combined to increase the expected penalty a driver faces for DUI.

In a competent, conventional study for the Kentucky State Police, Pigman et al. (1988) of the Kentucky Transportation Center estimate the net benefits of the TAP program. After a diligent data collection effort they established that TAP produced an increase of over 50 percent in the DUI arrests per month. Most of the arrests were made on Saturday and Sunday. They found that the blood alcohol content (BAC) of persons arrested for DUI decreased. For example, in Jefferson County the average BAC of arrestees declined 6 percent due to TAP. They found that court outcomes were more severe after implementation of the Slammer Law and TAP. The conviction rate increased over 400 percent while cases amended decreased from 80 to 20 percent.

Pigman et al. (1988) analyzed alcohol-related accidents for the period October 1, 1982 to September 30, 1987 for the Louisville area. The five-year study period includes approximately two

years before the Slammer Law and three years before TAP. Before-and-after comparisons show a decrease in alcohol-related accidents. For example, in Jefferson County the decrease from pre-TAP to post-TAP was over 30 percent. A time-series intervention analysis yielded similar results; the estimated reduction due to TAP was approximately 26 percent.

The benefits of the TAP program are estimated based on these reductions in the alcohol-related accidents. The estimated reduction in these accidents is multiplied times the average value of an accident. These benefits and others as well as the costs of TAP are summarized by Pigman et al. (1988,p.35) as follows:

Benefits

Reduced accident costs	\$25,725,780
DUI fines and court costs	3,832,603
Total	\$29,558,383

Costs

Police enforcement, administrative and support	\$1,715,880
Jail costs	2,571,400
DUI court costs	928,986
Total	\$5,216,266

Net Benefits	\$24,342,117
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With these net benefits and a corresponding benefit-cost ratio of 5.67, the TAP program appears to be an attractive traffic safety program. While the true net benefits of the program may be positive, we should question the size of the estimated efficiency gain.

IMPROVEMENTS TO OVERCOME CONVENTIONAL LIMITATIONS

Bottom Line Analysis

Conventional analysis of DUI countermeasures focuses on alcohol-related accidents. The assumption implicit in the analysis of only alcohol-related accidents is that DUI countermeasures such as TAP do not affect traffic accidents which do not involve alcohol. If alcohol were the only factor in accidents, then this would be a good approach. However, a myriad of factors contribute to driver involvement in an accident. A more appropriate approach recognizes that multiple factors exist.

The starting point for a more general approach is the acknowledgment that drivers have some control over their own accident risks and that they have more at stake than anyone else in dealing with these risks. Drivers can affect the probability of an accident through the manner in which they chose to operate their vehicles. In this general framework, which is described more fully in Blomquist (1988, Chapter 2), individual drivers pursue safety and nonsafety goals and use their resources and arrange their activities to get as much overall satisfaction as possible. In other words, they maximize their expected utility subject to their limited budgets, technology and the traffic safety environment. Drivers balance goals and weigh actions which affect their own safety in terms of the expected private benefits and costs. The desired, or target, level of safety chosen by the driver reflects both private benefit factors and private cost factors including factors which are publicly provided. Costs will depend on prices of purchased equipment and values of time and activities involved in being safer. Benefits will depend on driver value of good health and avoidance of medical expenses, vehicle repair costs, liability lawsuits and increases in insurance rates.

The TAP program and Slammer Law change drivers' benefits of safety by increasing the

expected penalty associated with DUI. If drivers are involved in an accident, they will be cited for DUI and the expected penalty which drivers want to avoid is greater. The increased benefits will lead to an increase in the target level of safety and fewer accidents. If this change were the only effect, then analysis of only alcohol-related accidents would capture the safety gains from DUI programs.

However, drivers respond in two other ways which partly offset these gains. If the accident rate is reduced, then drivers will face a lower probability of an accident. Travel at midnight on Saturday night will not be as risky as it was in the pre-TAP period. This increase in traffic safety induces a reduction in safety effort. Drinking and nondrinking drivers may travel more at high risk times. Also, if the cost DUI is raised, drivers will produce their target levels of safety with more sobriety but they will reduce some of their other activities which produce safety. Perhaps they will stay out later and drive when they are sleepier even if they are soberer. As a consequence the overall accident rate will not decrease by the amount of the decrease in alcohol-related accidents. The importance of this result is that estimating benefits of DUI countermeasures by estimating the reduction in alcohol-related accidents only, and not the total accident rate will lead to overestimation of the net benefits. Wilde (1985) makes a similar point about estimating the effects of reducing the BAC in drivers.

Using the monthly accident data from Pigman et al. (1988, Tables 3 and 4) the effect of the DUI countermeasure programs on the overall accident rate is estimated through time series regression analysis. For the period October 1982 to September 1987 total accidents in Jefferson County were explained in the following way:

$$AJC = 359.82 + 0.2557 AKY - 0.2418 T + 132.04 SLAM - 53.47 TAP$$

$$\begin{array}{cccccc}
 (1.62) & (9.73) & (0.06) & (1.40) & (0.56) & \\
 R^2 = 0.7004 & & & & & F = 30.40 \\
 \text{Durbin-Watson Statistic} = 1.89 & & & & & n = 60
 \end{array}$$

where AJC is total monthly accidents in Jefferson County, AKY is total monthly accidents in Kentucky outside of Jefferson County, T is a time trend, SLAM is a dummy variable which is 0 before July 1984 and 1 after, and TAP is a dummy variable which is 0 before October 1985 and 1 after. The absolute t-value is shown below each coefficient. The equation is estimated using AR1 which corrects for first-order serial correlation. The only coefficient which is statistically significant at usual levels is for AKY, accidents in Kentucky outside of Jefferson County. The coefficient for TAP is not significantly different from 0, but it does have the expected negative sign. It suggests that the TAP program may have reduced total accidents, but that other factors are at work also and make it impossible to estimate precisely the impact on all accidents. It suggests the driver response to TAP may involve more than the direct effect of increasing the target level of safety. It suggests the safety gains from TAP are overestimated because the potentially mitigating indirect effects of driver response are precluded by analyzing only alcohol-related accidents.

Valuing Accident Reduction and TAP

The value of reducing the risks of accidents due to the greater expected penalties of DUI should include the driver's willingness to pay for the reduction, other's willingness to pay for the reduction. The value should include also the value the driver places on having to change behavior. Drivers are now induced to drive less while drinking and this may cause inconvenience and a loss in utility associated with consumption activities. Pigman *et al.* do use willingness to pay for the driver's value of risk reduction instead of the more conventional lost earnings. The values could be

updated, but this is just a quibble. Little is explained about the values for different types of accidents such as property damage only and minor injury. If the aggregation over accident types is crude, then benefits could be overestimated by giving the high values of fatalities avoided to fender benders avoided.

Clearly the benefits tend to be overestimated because of the incomplete treatment of the disutility costs of the TAP program. If the risk reduction is valued at willingness to pay, then conceptually the disutility cost of the change in driver behavior must be included as a cost. No attempt is made to include this cost. This disutility value may be nontrivial. An alternative to estimating this cost directly would be to count as benefits only those costs which DUI imposes on others. These cost which are external to the drinking driver become the benefits because the benefits to the individual driver are offset by the loss associated with the change in lifestyle. Although the correct estimates of the benefits would be smaller they would not be trivial. Manning et al. (1989) estimate the external costs associated with alcohol consumption are over \$1 per excess ounce. Half of these costs imposed on others are due to deaths of non-DUI drivers.

Benefits Which Are Not and Costs Which Are

Fines are classified as a benefit when in fact they are simply a transfer. As Weimer and Vining (1989) describe the theoretically appropriate treatment of transfers in social benefit-cost analysis is that they cancel. The fine is a cost to one person and a benefit to another so that there is not net gain to society as a whole.

The jail costs are estimated as \$35.70 per day. In fact the cost of jail would be higher and would include the value of lost activity. An estimate might be made by considering lost earnings. If the incarcerated driver-worker would have made \$5 per hour, then the jail costs would be double

what Pigman *et al.* estimate. Making these last two simple corrections would reduce the estimated net benefits by over \$6 million.

CONCLUDING COMMENTS

The purpose of this short paper is to encourage questioning of the conventional evaluation of DUI accident countermeasures which ignore the impact on total accident rates and to promote evaluations which better follow the practices of mainstream welfare economists who practice benefit cost analysis. The suggestions are: to pay attention to the total accident rate and do bottom-line analysis, to either include the drivers' psychic costs of being subjected to DUI programs with the full willingness to pay for accident risk reductions or counting only the costs which DUI drivers impose on others, and finally to ignore fines as social transfers which have a net effect of zero and to count lost work when in jail as a real cost. While the effect of these changes reduces the attractiveness of the Kentucky TAP program in Louisville, the net benefits may be positive still. As we in Kentucky are keenly aware because of the recent Carrollton bus crash, the external cost which one drunk driver can impose on others is enormous.

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