



**UPDATE OF ALCOHOL TIMES AS A SURROGATE  
MEASURE OF ALCOHOL INVOLVEMENT IN  
ACCIDENTS**

MONASH UNIVERSITY  
ACCIDENT RESEARCH CENTRE

1990

UPDATE OF ALCOHOL TIMES AS A  
SURROGATE MEASURE OF ALCOHOL  
INVOLVEMENT IN ACCIDENTS

by

Warren Harrison

1990

## RESEARCH NOTE

### UPDATE OF ALCOHOL TIMES AS A SURROGATE MEASURE OF ALCOHOL-INVOLVEMENT IN ACCIDENTS

Warren Harrison  
Accident Research Centre  
Monash University

#### **Introduction:**

Evaluations of drink-driving countermeasures have sometimes used surrogate measures of the involvement of alcohol in accidents (e.g. Haque & Cameron, 1987). Surrogate measures are useful because the proportion of accident-involved drivers with known Blood Alcohol Concentrations (BACs) is often quite low – especially at lower injury levels. Using an accurate surrogate measure increases the samples size and therefore the power of any statistical comparisons, and reduces the potential effects of bias in the process by which BAC data are collected and matched to accident data (Harrison, 1986).

Victorian road safety research has relied on the surrogate measure developed by South (in Haque and Cameron, 1987). South's approach was to divide the week into times associated with alcohol-related accidents ("alcohol times") and other times ("non-alcohol times"). South based his analysis on those accidents in which all driver BACs were known, or in which some were unknown and one or more were known to be over .05g/100ml.

While South's approach – that of defining times of the day which present alcohol-related problems and then using accidents or the number of injuries in those times as a surrogate measure for drink-driving – is reasonable, there are some problems which need to be addressed:

- South's alcohol times are based on 1976-82 data
- South used an accident-based analysis rather than a person-based one.

The first problem is addressed in the present analysis by using more recent accident data – namely the two years 1988 and 1989. As drinking patterns and drink-driving behaviour have changed in the last decade (South, 1988), it would be expected that the times best defined as alcohol-times would also have changed.

The second problem is more complicated. It is possible to use person-based data or accident-based data to examine the size of the drink-driving problem. In a person-based analysis, the drink-driving problem is judged to be proportional to the number of, say, drivers admitted to hospital or killed in an accident with illegal BACs. This provides a direct measure – allowing for bias in the matching process – of the proportion or number of accident-involved drivers with significant BACs and therefore of the contribution of alcohol to accidents (assuming that having an illegal BAC has contributed to the occurrence of an accident or to the potentiation of injury in the accident). In an accident-based analysis, the drink-driving problem is judged to be proportional to the number or proportion of accidents in which one or more drivers are known to have illegal BACs.

This measure provides information on the number of accidents in which alcohol was likely to have been a factor.

The accident-based approach carries with it a risk of biasing the results in favour of single-vehicle accidents as all driver BACs are more likely to be known in single vehicle accidents. Cameron (1980) has pointed out that this bias will result in an over-estimate of alcohol involvement in single-vehicle accidents and an underestimate of alcohol involvement in multiple-vehicle accidents. As the proportions of single and multi-vehicle accidents vary according to time-of-day, there is a risk that using an accident-based approach to define high-risk alcohol times will produce unreliable results. South's approach also equates accidents in which two drivers have illegal BACs with those accidents in which one driver alone has an illegal BAC. The person-based approach assumes that the former type of accident indicates a more substantial drink-driving problem than the latter, and so gives twice as much weight to them. Less important but worth noting, the accident-based approach does not allow for driver characteristics to be readily examined.

The present analysis is person-based rather than accident-based. Research using the number of persons killed or injured or the number of accidents in the alcohol times defined here as a surrogate for alcohol-involvement in accidents will be more reliable than that using the alcohol times defined by South for two reasons:

- The data used here are considerably more recent, and
- The person-based approach provides a closer surrogate for drink-driving related accident casualties than does an accident-based approach.

**Method:**

The data used were 1988 and 1989 accident data from the Roads Corporation accident system. The data were person-based and included all accident casualties. Analysis was conducted using SPSSx for initial tabulation and then spreadsheet software on a personal computer for final computations.

Drivers were selected from the database who had been killed or admitted to hospital as a result of an accident in the two year period of interest. The BACs of these drivers were tabulated by day of week and time of day. Time was categorised in two-hour blocks, commencing at midnight.

Alcohol times were defined as those time-periods where the proportion of known driver-BACs was greater than 0.15. As was the case with South's original formulation, the criterion proportion (here 0.15) was chosen so as to split the total driver-pool into two approximately equal groups.

**Results:**

In 1988 and 1989, 9243 drivers were killed or admitted to hospital as a result of accidents. Of these, matched BAC information was available for 7057 (76.3%). Using

the time of day/day of week tabulation and a 0.15 criterion for the proportion of drivers over 0.05g/100ml, the revised alcohol times are:

- Sun. 4 pm – 6 am Mon.
- Mon. 6 pm – 6 am Tue.
- Tue. 6 pm – 6 am Wed.
- Wed. 6 pm – 6 am Thu.
- Thu. 6 pm – 6 am Fri.
- Fri. 4 pm – 8 am Sat.
- Sat. 2 pm – 10 am Sun.

Ninety-eight hours (58%) of the week are defined as alcohol times. The alcohol data for drivers in the two times are given in Table 1. The numbers do not sum to 7057 – the number of drivers with matched BAC data – as a small number of drivers did not have recorded accident times.

TABLE 1:  
BAC DATA FOR KILLED AND ADMITTED  
DRIVERS IN ALCOHOL AND NON-ALCOHOL  
TIMES, 1988 AND 1989.

|         | NUMBER<br><.05 | NUMBER<br>>.05 | TOTAL<br>NUMBER | PROPORTION<br>OVER .05 |
|---------|----------------|----------------|-----------------|------------------------|
| ALCOHOL | 2151           | 1337           | 3484            | .38                    |
| NON-ALC | 3385           | 159            | 3544            | .04                    |

**Discussion:**

The alcohol times defined here are mostly consistent with those suggested by South on the basis of earlier data and an accident-based analysis. The times defined here extend his times by two hours on each of Sunday and Monday mornings, and by two hours on Friday evenings. The Sunday and Monday changes are consistent with the changes in drinking patterns that would be expected to result from the introduction of Sunday bar-trading in recent times. The Friday change is less easy to account for, but may similarly reflect small changes in drinking habits.

The proportion of drivers with illegal BACs in the two groups differs substantially. Drivers seriously injured in accidents in alcohol times are nearly ten times more likely to have BACs over .05 g/100ml. This difference suggests that evaluations concerned with drink-driving and accidents could reliably use frequencies of injured people or accidents in the alcohol times as a surrogate for actual BAC data. Statistical reliable changes in the number of accidents or involved drivers in alcohol times compared with non-alcohol times as a control are likely to be associated with changes in alcohol-related accidents, with the caveat that there may be other differences between alcohol and non-alcohol times which are unrelated to the incidence of drink-driving which need further investigation.

**References:**

Cameron, M.H. (1980). Identification of Alcohol Involvement. ROSTA Internal Report.

Haque, M.O. & Cameron, M.H. (1987). Evaluation of the Effect of the Victorian Zero BAC Legislation: July 1984-December 1985. Road Traffic Authority Report GR/87/11.

Harrison, W.A. (1986). Bias in the Matching of Accident and Alcohol Data. Road Traffic Authority Report RN/86/11.

South, D.R. (1988). Changes in Alcohol Involvement in Accidents in the Ten Years 1977-1986, and the Factors that May Have Been Responsible. Road Traffic Authority Report GR/88/4.