

eurocare

**ADVOCACY FOR THE PREVENTION OF
ALCOHOL RELATED HARM IN EUROPE**

**DRINKING AND DRIVING
IN EUROPE**

A **eurocare** Report to the European Union

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PART I

Preamble	1
Recommendations	
Road transport in Europe	2
Drinking and driving on European roads	3
Safety across European roads	
Lower blood alcohol concentration (BAC)	4
Enforcement and unrestricted powers to breath test	
Penalties across Europe	5
Education, rehabilitation and treatment programmes across Europe	6
Programmes to separate driving from drinking should not be the main cornerstones of European drinking and driving policy	
Drinking and driving policy and action independent of the beverage alcohol industry	7
Informing the European public	
A monitoring system with common measures across Europe	

PART II

TECHNICAL REPORT

1. Introduction	8
2. Alcohol and road traffic accidents in Europe	9
3. Alcohol and road traffic accidents	12
4. Reducing alcohol-related road traffic accidents	
5. Deterrence and the prevention of drinking-driving	14
6. Restrictions on young or inexperienced drivers	19
7. Preventing recurrence of drinking and driving	20
8. Separating driving from drinking	23
9. Reducing alcohol consumption	28
10. Conclusions	29
References	31

DRINKING AND DRIVING IN EUROPE A EUROCARE REPORT TO THE EU

PREAMBLE

The European Union has set itself a target of halving the number of people killed in road traffic accidents from 40,000 a year in the existing fifteen countries of the Union between 2000 and 2010 through harmonization of penalties, and the promotion of new technologies to improve road safety. There is an even greater scope for improvement in the applicant countries, where the road infrastructure is less developed and where vehicles are less likely to be fitted with the latest safety technology. Nearly one third of the death and disability caused by motor vehicle accidents is due to alcohol; this can be substantially reduced by a more uniform and lower blood alcohol concentration limit, adequate enforcement through unrestricted powers to breath test, and automatic licence suspension when over the legal limit. A common playing field should be provided for the road users of Europe, including professional drivers, with equal parity and without disadvantage across countries. Road users expect strict road safety measures and strict reductions in drinking and driving. They expect to be subjected to the lowest level of risk that is in operation throughout Europe. The following Eurocare recommendations aim to achieve a target of halving the deaths and disability adjusted life years due to drinking and driving between 2000 and 2010, aim to provide European road users with a consistent European platform on drinking and driving and aim to make European roads alcohol free.

RECOMMENDATIONS

1. A maximum blood alcohol concentration limit of 0.5 g/L (and breath equivalent) should be introduced throughout Europe with immediate effect; a lower limit of 0.2 g/L should be introduced for novice drivers and drivers of public service and heavy goods vehicles, with immediate effect; countries with existing lower levels should not increase them.
2. By the year 2010, the maximum blood alcohol concentration limit should be reduced to 0.2g/L for all drivers.
3. Unrestricted powers to breath test, using breathalysers of equivalent and agreed standard, should be implemented throughout Europe; 50% of all European drivers should have been stopped and breath tested at some time by the year 2010.
4. Common penalties for drinking and driving, with clarity and swiftness of punishment, need to be introduced throughout Europe; penalties should be graded depending at least on the BAC level, and should include licence suspensions, fines, prison sentences, ignition locks and vehicle impoundment; all drivers on European roads with a BAC level greater than 0.5 g/L should have an unconditional licence suspension; based on the existing range of licence suspensions in European countries, Eurocare suggests a minimum suspension period of 6 months.

5. Driver education, rehabilitation and treatment schemes, linked to penalties, including the return of suspended licences, need to be strengthened and implemented throughout Europe for drinking and driving offenders, including those with evidence of dependence on alcohol, based on agreed evidence based guidelines and protocols.
6. Because of limited evidence for their effectiveness in reducing drinking and driving, public education efforts to persuade drinkers not to drive after drinking, programmes to encourage servers to prevent intoxicated individuals from driving, and organized efforts to make provisions for alternative transportation should not be the main cornerstones of drinking and driving policy.
7. Although the beverage alcohol industry has a responsibility in reducing drinking and driving, drink driving laws and regulations and public education campaigns should be set and implemented throughout Europe independent of the beverage alcohol industry.
8. Lowered blood alcohol concentration limits, the introduction of unrestricted powers to breath test and the introduction of common penalties, such as automatic licence suspension when over a limit of 0.5 g/l should be supported by major publicity campaigns to inform the drivers of Europe of the new measures.
9. A monitoring system, with common and standardized measures across European countries, should be put in place to produce annual reports on drinking and driving in Europe, the implementation of these recommendations, and on the progress to achieving a target of halving deaths and disability adjusted life years due to drinking and driving between 2000 and 2010.

ROAD TRANSPORT IN EUROPE

Road transport in Europe is likely to increase dramatically by the year 2010. There are two key factors behind the continued growth in demand for road transport, private cars and heavy goods vehicle traffic. The number of cars has tripled in the last 30 years, at an increase of 3 million cars each year. Although the level of car ownership is likely to stabilize in most countries of the European Union, this will not be the case in the applicant and new countries to the Union, in which the number of cars is expected to increase substantially. The strong economic growth expected in the applicant countries, and better links with outlying regions, will also increase road haulage traffic in the European Union, which is expected to increase by nearly 50% between 1998 and 2010.

Roads are a key communication network across Europe and are used increasingly by its citizens across borders. Safety on European roads is one of the major concerns of the people of Europe. Studies indicate that drivers in Europe expect stricter road safety measures, such as improved road quality, better training of drivers, enforcement of traffic regulations, including drinking and driving, checks on vehicle safety, and road safety campaigns. Europe wide road safety is a concern for all roads, but particularly for those that receive European community co-financing.

DRINKING AND DRIVING ON EUROPEAN ROADS

Although the number of road accident deaths in the European Union dropped at the beginning of the 1990s, in recent years, the downward trend has stabilized. In the year 2000, road accidents killed over 40,000 people and injured more than 1.7 million in the fifteen countries of the existing Union. The age group most affected is the 14-25 year olds, for whom road accidents are the prime cause of death. One in three Europeans will be injured in a road traffic accident at some point in their lives. This directly costs the European Union 45 billion euros. Indirect costs (including physical and psychological damage suffered by the victims and their families) are three to four times higher. The annual figure is put at 160 billion euros, equivalent to 2% of the Union's GNP.

The European Commission has estimated that one quarter of these deaths, 10000, are due to alcohol, at a cost of 40 billion euros per annum. This figure is likely to be an underestimate, since the global burden of disease study of the World Health Organization estimated in European countries that 45% of the burden of disability arising from motor vehicle accidents for men and 18% for women is attributable to alcohol. Between 1% and 5% of drivers have blood alcohol levels above their country's maximum limits, accounting for up to 20% of fatal and serious injuries, and up to 25% of driver fatalities. Fatal accidents involving large goods vehicles and buses account for about 18% of all fatal accidents. Once involved in a road accident, large vehicles have the potential to cause severe property damage, disruption, delay, and traffic congestion especially in tunnels, on bridges, on main arterial roads, or in densely populated urban areas.

SAFETY ACROSS EUROPEAN ROADS

The Maastricht Treaty provides the European Union with the legal means to establish a framework and introduce a wide range of measures in the field of road safety. Yet even today, despite these powers in the Treaty, some Member States still fail to recognise the obvious need for a proper European road safety policy, and invocation of the principle of subsidiarity makes Europe wide action difficult. However, with increased movement of peoples and goods across the roads of Europe, there is a need to harmonise the rules governing checks and penalties for both international commercial and private transport with regard to drinking and driving. This is particularly important for the trans-European motorway network, which receives Community co-financing. The network, which is used by growing numbers of people from different Member States, suffers from a lack of consistency in regulations and penalties for drinking and driving, which cause confusion and continued risk to drivers of different Member States. Each driver expects to be subjected to the lowest level of risk that is in operation throughout Europe. In January 2001, the Commission adopted a recommendation urging the Member States to prescribe a general limit of 0.5 mg/ml as the maximum permitted blood alcohol level of drivers and 0.2 mg/ml for commercial drivers, motorcyclists and inexperienced drivers.

LOWER BLOOD ALCOHOL CONCENTRATION (BAC)¹

The risk of traffic accident accidents increases exponentially with the BAC level. There is a 38% increased risk of accidents at 0.5g/L and nearly 5 times the risk at 1.0g/L. Lowering BAC levels consistently produce less drinking and driving across all BAC concentrations and reduce alcohol-related road traffic accidents. When Sweden lowered the BAC level from 0.5g/L to 0.2g/L in 1990 fatal alcohol-related accidents were reduced by 10%. Similar experiences were found in Austria, Belgium and France following lowering of their BAC levels. Lower BAC limits for young drivers can reduce fatal crashes injuries by up to one quarter.

A key target to reduce drink driving fatalities in Europe is to lower the legal maximum BAC limits and make these consistent across Europe. Of 29 Member States, applicant and EFTA-EEA countries, five have a legal limit of 0.8g/L, 17 a limit of 0.5G/L (including Lithuania with a level of 0.4g/L), two with a level of 0.2g/L and five with a level of zero (see Table 3 in technical section of document). Logically the legal BAC limit (and breath equivalent) should be zero, which implies in practice a BAC measurement of between 0.1 g/L and 0.2 g/L, depending on the tolerance level that is allowed for. On the basis of accumulative research evidence and analysis, the maximum BAC limit of 0.5 g/L, which was first proposed by the European Commission in 1988, should be the recommended maximum legal limit within countries of the European Union. There should be a lower limit of 0.2 g/L for novice drivers and drivers of public service and heavy goods vehicles. Countries with existing lower levels should not increase them. Over time, the maximum BAC limit should be reduced to 0.2g/L for all drivers in all countries.

The main benefit of more uniform legal maximum BAC limits is to provide a clearer and more consistent message to all drivers of private cars and of passenger and freight vehicles that drinking and driving is a dangerous activity. From a driver perspective more uniform limits will also provide a standard reference for country based enforcement and Europe-wide publicity campaigns. Where drivers are driving within countries of the European Union, they should be aware of a uniform limit above which, if they are caught, they will know they have committed a drink driving offence.

ENFORCEMENT AND UNRESTRICTED POWERS TO BREATH TEST

Not only should BAC levels be reduced, but they need to be consistently enforced. Testing in connection with another motoring offence or selective testing based on drivers who have judged to have been drinking alcohol will miss most drivers who have BAC levels over the legal limit. Observation without the use of breathalyser equipment will miss at least one half of those with a BAC

¹ BAC (sometimes called BAL, blood alcohol level), represents the amount of ethanol in a given amount of blood, and is noted as “weight by volume.” The most commonly used measurements are grams of ethanol per 100 millilitre of blood (g/100ml), sometimes expressed as percentage by volume commonly used in the United States, and milligrams of ethanol per millilitre of blood (mg/ml), equivalent to grams per litre (g/L), used in much of Europe. For example, 0.05 g/100ml=0.05%=0.5 mg/ml=0.5g/L. In this paper, g/L is used.

level greater than 1g/L. Effective enforcement requires unrestricted powers for high visibility breath testing using breathalyser equipment of an agreed technical European standard.

The introduction of unrestricted breath testing is known to result in more than a 20% reduction in fatal crashes. The country with the most experience of unrestricted breath testing in the form of random breath testing is Australia. Motorists are stopped at random by police and required to take a preliminary breath test, even if they are not suspected of having committed an offence or been involved in an accident. The defining feature is that any motorist at any time may be required to take a test, and there is nothing that the driver can do to influence the chances of being tested. In 1999, 82% of Australian motorists reported having been stopped at some time, compared with 16% in, for example, the United Kingdom. The result was that fatal crash levels dropped by 22%, while alcohol-involved traffic crashes dropped by 36%. Random breath testing was twice as effective as selective checkpoints. For example, in Queensland, random breath testing resulted in a 35% reduction in fatal accidents, compared with 15% for selective checkpoints.

Drink driving laws must be publicized to be effective. If the public is unaware of a change in the law or an increase in its enforcement, it is unlikely that it will affect their drinking and driving. Studies in California demonstrated that publicity doubled the impact of new laws and new enforcement efforts to reduce drinking and driving.

PENALTIES ACROSS EUROPE

There needs to be a common penalty for dinking and driving throughout Europe, graded depending on at least the BAC level. Currently, there is a wide range of penalties in terms of length of maximum licence suspension, disqualifications and prison sentences. Penalties should include licence suspension, fines, prison sentences, ignition locks and vehicle impoundment. The key to effectiveness is clarity and swiftness of punishment.

Licence suspension can reduce fatal accidents by one quarter and can deter future offences. Although, without some form of education, counselling or treatment programme, the effects of suspension might last only as long as the period of suspension, which could be relatively short. All drivers on European roads with a BAC level greater than 0.5 g/L should have an unconditional licence suspension; based on the existing range of licence suspensions in European countries, Eurocare suggests a minimum suspension period of 6 months.

Prison sentences and fines provide a penalty for failure to conform to the probation requirements established by the courts and may provide the legal basis for referring offenders to treatment programmes, which have been shown to reduce future offences. Placing interlocks in the ignition to prevent an impaired driver from operating the vehicle can reduce drinking and driving, although usually only for the time that the interlock is in place. Interlocks can also be used as a preventive measure for drivers of public service and heavy goods vehicles.

Impounding the offender's vehicle or removing the vehicle licence plate are effective in reducing future episodes of drinking and driving.

EDUCATION, REHABILITATION AND TREATMENT PROGRAMMES ACROSS EUROPE

Convicted drinking drivers represent a heterogeneous group. Some offenders can be classified as high-risk drivers who drink; others might be classified as problem drinkers who drive. Indeed, a large segment of the patient population being treated for alcohol dependence has entered treatment because of an alcohol-impaired driving conviction. Education, rehabilitation and treatment schemes can reduce both future drinking and driving offences and alcohol-related accidents by 8-9%. In the same way, brief treatments based in accident and emergency departments can be effective in reducing subsequent alcohol-related trauma and hospitalization, although the results tend to fall off over time. Driver education, rehabilitation and treatment schemes, linked to penalties, including the return of suspended licences, need to be strengthened and implemented throughout Europe for drinking and driving offenders, including those with evidence of dependence on alcohol, based on agreed evidence based guidelines and protocols.

PROGRAMMES TO SEPARATE DRIVING FROM DRINKING SHOULD NOT BE THE MAIN CORNERSTONES OF EUROPEAN DRINKING AND DRIVING POLICY

Public education efforts to persuade drinkers not to drink before driving and not to drive after drinking, programmes to encourage servers to prevent intoxicated individuals from driving, and organized efforts to make provisions for alternative transportation, whilst all appealing, have been found to have only limited effectiveness and should not be the main cornerstones of drinking and driving policy.

Server training programmes, which attempt to prevent drinking and driving by identifying intoxication and refusing service, have not been found to be successful on their own in reducing drink driving. However, when backed up by civil liability for subsequent alcohol related traffic accidents, they can be effective in reducing drinking and driving.

There has been very little evaluation of designated driver programmes. The information that is available would suggest that they are not as effective as a measure to prevent alcohol-impaired driving as originally envisioned, and there is no evidence to date that they lead to a reduction in drinking and driving.

DRINKING AND DRIVING POLICY AND ACTION INDEPENDENT OF THE BEVERAGE ALCOHOL INDUSTRY

Although the beverage alcohol industry has a responsibility in reducing drinking and driving, the policy measures supported by the beverage alcohol industry (public education efforts to persuade drinkers not to drive after drinking, programmes to encourage servers to prevent intoxicated individuals from driving, and organized efforts to make provisions for alternative transportation) tend to be those with the least evidence for effectiveness in reducing drinking and driving². Whereas those policy options (lowering of legal blood alcohol concentration levels, introduction of unrestricted or random breath testing, and the introduction of alcohol policy measures, such as increased taxation or restrictions on legal drinking ages) with the best evidence for effectiveness in reducing drinking and driving tend to be opposed by the beverage alcohol industry. Further, there is concern that designated driver campaigns have been and can be used by the beverage alcohol industry as a vehicle to market their own products, confusing the public and losing the credibility of the campaigns, which become perceived as a direct activity of the beverage alcohol industry. Thus drink driving laws and regulations and public education campaigns should be set and implemented throughout Europe independent of the beverage alcohol industry.

INFORMING THE EUROPEAN PUBLIC

Major publicity campaigns will need to be mounted to inform the drivers of Europe of any new measures that are introduced, such as lowered blood alcohol concentration limits, the introduction of unrestricted powers to breath test and the introduction of common penalties, such as automatic licence suspension when over a BAC limit of 0.5 g/l. Information on drinking and driving, the harm that results from drinking and driving and the penalties across Europe should be included in driving lessons, driving tests and in published road, driving and highway codes.

A MONITORING SYSTEM WITH COMMON MEASURES ACROSS EUROPE

A target should be set of halving the deaths and disability adjusted life years due to drinking and driving in Europe between 2000 and 2010. A monitoring system, with common and agreed measurement and reporting procedures across European countries, should be put in place. Annual reports should be published on drinking and driving in Europe, describing the implementation of any new measures and monitoring the progress to achieving the target of halving drink driving related deaths and disabilities.

² See Eurocare report, The beverage alcohol industry's social aspects organizations: A public health warning

DRINKING AND DRIVING IN EUROPE EUROCARE TECHNICAL REPORT

1. INTRODUCTION

In the existing fifteen countries of the European Union, the number of deaths in road accidents dropped significantly at the beginning of the 1990s. In recent years, the decline has been less marked. In the year 2000, road accidents killed over 40,000 people and injured more than 1.7 million at a direct measurable cost of 45 billion euros, equivalent to 1.5% of GNP (Commission of the European Communities, 2001). The indirect costs (including the physical and psychological harm suffered by the victims and their families) are probably three to four times higher. The age group most affected is the 14-25 year olds, for whom road accidents are the prime cause of death. One person in three will be injured in an accident at some point in their lives.

The European Commission has estimated that at least one quarter of these deaths, 10 000, are due to alcohol, at a cost of 10 billion euros per annum (Official Journal of the European Communities, 2001). This is likely to be an underestimate, since the global burden of disease study of the World Health Organization estimates in European countries that 45% of the burden of disability arising from motor vehicle accidents for men and 18% for women is attributable to alcohol (World Health Organization 2002). Between 1% and 5% of drivers have blood alcohol levels above their maximum country limits, accounting for up to 20% of fatal and serious injuries, and up to 25% of driver fatalities. In the existing fifteen countries of the European Union, fatal accidents involving large goods vehicles and buses account for about 18% of all fatal accidents. Once involved in a road accident, large vehicles have the potential to cause severe property damage, disruption, delay, and traffic congestion especially in tunnels, on bridges, on main arterial roads, or in densely populated urban areas.

The Maastricht Treaty provided the European Union with the legal means to establish a framework and introduce measures in the field of road safety. Article 152 of the Treaty sought to ensure that a high level of human health protection shall be ensured in the definition and implementation of all Community policies and activities; Community action in the field of public health shall be directed towards improving public health, preventing human illness and disease and obviating sources of danger to health, such as drinking and driving.

The European Union has set itself a target of reducing the number of people killed in road traffic accidents by half between 2000 and 2010, through harmonization of penalties, and the promotion of new technologies to improve road safety. If all the countries of the European Union were to achieve the same results as the countries with the lowest road fatality rates (United Kingdom and Sweden), the numbers killed would be cut by 20,000 a year. There is also huge scope for improvement in the applicant

countries, where the road infrastructure is less developed and where the vehicles are less likely to be fitted with the latest safety technology.

A key target to reduce drink driving fatalities is to achieve a common and lower legal maximum blood alcohol concentration BAC limits³. The main benefit of more uniform legal maximum BAC limits is to provide a clearer and more consistent message to car drivers and to drivers of passenger and freight vehicles that, above a certain limit, drinking and driving is a dangerous activity. From a driver perspective more uniform limits will also provide a standard reference for national enforcement and Europe-wide publicity campaigns. Where drivers are driving within countries of the European Union, they should be more aware of a more uniform limit above which, if they are caught, they will know they have committed a drink driving offence.

Available statistics indicate that at least 10,000 lives could be saved annually if drink driving was eliminated. However, the extent to which this ideal state could be achieved depends critically upon the level of enforcement (both roadside testing and technological driver restriction) and driver compliance with the law. Logically the legal BAC limit (and breath equivalent) required to support this goal should be zero, which implies in practice a BAC measurement of between 0.1 g/L and 0.2 g/L, depending on the tolerance level that is allowed for. On the basis of accumulative research evidence and analysis, the maximum BAC limit of 0.5 g/L, which was first proposed by the European Commission in 1988, should be the recommended maximum legal limit within countries of the European Union. There should be a lower limit of 0.2 g/L for novice drivers and drivers of public service and heavy goods vehicles. Countries with existing lower levels should not increase them. Over time, the maximum BAC limit should be reduced to 0.2g/L for all drivers.

2. ALCOHOL AND ROAD TRAFFIC ACCIDENTS IN EUROPE

Table 1 summarizes the reported rates of alcohol involvement in fatal crashes as well as the different parameters that are used for measurement in a number of European countries. As can be seen from the table, reported alcohol involvement in fatal crashes varies widely from rates of less than 10 percent (based on either illegal alcohol levels or the detection of any alcohol) to rates of more than twenty per cent.

In Australia and in the Scandinavian countries there are relatively few drinking-drivers on the roads (Andenaes, 1988; Ross, 1993). Moderate to

³ BAC (sometimes called BAL, blood alcohol level), represents the amount of ethanol in a given amount of blood, and is noted as “weight by volume.” The most commonly used measurements are grams of ethanol per 100 millilitre of blood (g/100ml), sometimes expressed as percentage by volume commonly used in the United States, and milligrams of ethanol per millilitre of blood (mg/ml), equivalent to grams per litre (g/L), used in much of Europe. For example, 0.05 g/100ml=0.05%=0.5 mg/ml=0.5g/L. In this paper, g/L is used.

high levels of blood alcohol are found among less than 1% of drivers in these countries, even at peak driving times. In the United States, Canada, France and the Netherlands between 5% and 10% of drivers during night time leisure hours have moderate to high blood alcohol levels. These patterns are broadly consistent with overall road fatality rates for different countries. When drivers are asked at random about their personal behaviour, a considerable percentage acknowledges driving after drinking. For example, a 1988 study found that 28% of Australians, 24% of Americans, but only 2% of Norwegians admitted to driving in the past year after four or more drinks (Berger *et al.*, 1990).

In analyses of the blood alcohol levels of drivers killed, even the Scandinavian countries have found that more than a quarter of drivers had been drinking (Andenaes, 1988). More generally, all countries have the problem of hard-core drinking-drivers, characterized by persistent heavy drinking before driving. Although small in number, they account for a high proportion of drink related fatal crashes. A surprisingly high percentage of these heavy drinking-drivers have no prior drinking-driving convictions. Only one quarter to one third of all drinking-drivers or riders killed in Canada, the United States, Australia and New Zealand had prior offences (Ross, 1992).

Table 1 Alcohol involvement in fatal crashes in a number of European countries.

Country	Percent of Alcohol Involvement	Definition of Alcohol-Involved	Percent of Drivers Tested	Percent of Pedestrians Tested
Austria	8.5% at 0.5g/L or higher (1998)	<ul style="list-style-type: none"> ▪ Illegal BAC for Driver ▪ Illegal BAC for Pedestrian 	Unknown - no systematic testing of drivers	Unknown
Belgium	8.9% had any alcohol (1998). Illegal BAC is 0.5g/L	<ul style="list-style-type: none"> ▪ Any Alcohol in Driver ▪ Any Alcohol in Pedestrian 	24.7% of drivers and pedestrians	□
Denmark	20.2% (1995) at 0.5g/L or higher	<ul style="list-style-type: none"> ▪ Illegal BAC for Driver 	49% of drivers in fatal accidents (1996 data); 75% of fatally injured drivers	47% of pedestrians in fatal accidents; 49% of fatally injured pedestrians. 28% of cyclists in fatal crashes; 31% of fatally injured cyclists
Finland	24% of fatally injured drivers at 0.5g/L or higher	<ul style="list-style-type: none"> ▪ Illegal BAC for Driver ▪ Alcohol Measure Only for Driver Fatality ▪ Alcohol Measure for All Drivers 	Compulsory	□□
France	19% at 0.5g/L or higher (1998)	<ul style="list-style-type: none"> ▪ Illegal BAC for Driver ▪ Alcohol Measure for All Drivers 	Approximately 90%	Unknown
Germany	17% at 0.3g/L or higher (1997) The illegal BAC is 0.5g/L.	<ul style="list-style-type: none"> ▪ Alcohol Measure for All Drivers 	Unknown - each State may determine testing rules. Testing only takes place if alcohol is suspected by police.	Unknown - not obligatory, State may determine
Netherlands	7.8% had any alcohol (1998) Illegal BAC is 0.5g/L.	<ul style="list-style-type: none"> ▪ Alcohol in Driver ▪ Alcohol Measure for All Drivers 	68.3% (mostly non-injured drivers, some injured drivers, very few dead drivers)	Few cyclists; no pedestrians
Spain	41% had any alcohol. 29% over illegal limit (0.8g/L) (Jan. and Feb., 1998)	<ul style="list-style-type: none"> ▪ Any Alcohol in Driver ▪ Any Alcohol in Pedestrian ▪ Illegal BAC for Driver ▪ Illegal BAC for Pedestrian ▪ Alcohol Measure Only for Driver Fatality 	17.5%	Unknown
Sweden	3.3% were suspected by police of alcohol involvement (official statistic). 18% had alcohol based on fatally injured drivers autopsied (1998)	<ul style="list-style-type: none"> ▪ Police Suspicion ▪ Alcohol Measure Only for Driver Fatality 	> 90% autopsied. Official statistics based on police suspicion only	> 90%
United Kingdom	10% of motorcyclists; 19% of cars and other motor vehicles at 0.8g/L or higher (1998)	<ul style="list-style-type: none"> ▪ Illegal BAC for Driver 	68% (48% by police, 20% by coroner's courts)	39% of pedestrians; 39% of cyclists

Source: US National Highway Traffic Safety Administration, 2001

In the last two decades there has been a general decline in the incidence of drinking-driving across European countries, where dramatic reductions were experienced in most countries during the 1980s and early 1990s. The indicators stabilized and then reversed direction in a number of countries in the late 1990s.

3. ALCOHOL AND ROAD TRAFFIC ACCIDENTS

Laboratory research has demonstrated that tasks related to driving performance are affected at BAC levels much lower than those normally associated with legal intoxication. Deterioration in performance occurs at BACs of between 0.2g/L to 0.3g/L and becomes quite marked between BACs of 0.5g/L and 0.8g/L (Loomis and West, 1958; Moskowitz and Robinson, 1988).

The most persuasive data comparing the BACs of drivers in accidents with the BACs of drivers not involved in accidents generate risk curves with a 38% increased risk of accidents at 0.5g/L and nearly 5 times the risk at 1.0g/L (Blomberg et al. 2002). During heavy daytime traffic, when there is a greater need of concentration, attention, and awareness, a comparatively low BAC of 0.1g/L to 0.4g/L can be associated with an increased risk of accidents (Borkenstein et al., 1974). The risk curves are steeper for serious and fatal crashes, for single-vehicle crashes, and for young people (Jonah, 1986; Mayhew *et al.*, 1981; Zador, 1991). Young as well as older drivers have been found to be over-represented in both fatal and non-fatal accidents, in addition to drivers cautioned for driving while intoxicated (Waller *et al.*, 1967). The use of alcohol increases both the possibility of being admitted to hospital from injuries and the severity of the injuries (Borges *et al.*, 1998).

4. REDUCING ALCOHOL-RELATED ROAD TRAFFIC ACCIDENTS

Measures to reduce alcohol-related road traffic accidents include:

- deterrence through lowering the legal BAC limit for drinking and unrestricted powers for breath testing;
- restrictions on young or inexperienced drivers;
- preventing the recurrence of drinking and driving among drink-driving offenders;
- separating drinking from driving; and
- reducing alcohol consumption by reducing alcohol availability.

The measures are summarized in Table 2. The most effective measures to reduce alcohol related road traffic accidents are lowering the legal level of blood alcohol concentration, deterrence through unrestricted powers for breath testing and reducing the availability of alcohol. Licence suspension and vehicle actions can be effective when combined with remedial programmes. Separating drinking from driving through educational programmes alone, server interventions alone and alternative transportation programmes are the least effective.

Table 2 Summary of measures to reduce drink driving, with an estimate of their effectiveness

Measure			Impact
Lowering legal BAC limit and unrestricted breath testing	Reducing legal BAC limit		Reduces drink driving and fatalities across all levels of BAC
	Identifying vehicles	General traffic offences	Very low detection rate; in US drivers with BACs >1.0g/L stopped 1 in 2000 trips
		Random stops	Highly effective if coupled with right to breathalyse
	Detecting impairment	Observation	Identifies <50% of those with BAC >1.0g/L
		Breathalyzers	Highly effective and use reduces alcohol-related accidents
	Unrestricted breath testing	High visibility	Can reduce drink driving fatalities by between one third and one half
	Severity of punishment	Jails and fines	As a general deterrent, little impact, but fines can help finance unrestricted breath testing
	Swiftiness of punishment	Administration licence suspension without court hearing	Reduces fatal crashes
Media		Essential for effective programmes	
Restrictions on young or inexperienced drivers	Education programmes	School based programmes	Largely ineffective, although may be effective for peers
	Lower BACs for young drivers		Reduces fatal crashes in young drivers by up to 24%
	Licensing restrictions	Graduated licensing schemes	Reduces crash involvement of young drivers
Preventing reoccurrence of drinking and driving	Jail sentences and fines	Specific deterrent	Ineffective, but jail sentences allows legal basis for referral to treatment
	Remedial and treatment programmes	Remedial programmes	Can reduce alcohol related accidents by 8-9%
	Licence suspension		Reduces fatal accidents during period of licence suspension, but easily overcome and effects confined to period of suspension, unless accompanied by remedial programmes
	Vehicle actions	Ignition interlocks	Effective when applied, but once removed, limited impact
Vehicle impoundment		Effective in reducing recidivism of multiple drink driving offenders by up to one third	
Separating drinking from driving	Public education campaigns	Public education programmes	Largely ineffective if implemented alone; important for publicizing drink driving laws
		Comprehensive community based programmes	Can lead to a cost effective reduction in drink driving fatalities
	Interventions by servers and hosts	Servers	Largely ineffective, even when mandated as a condition of licensing; can be effective as part of comprehensive community campaigns
		Legal liability of servers	Can decrease alcohol related traffic accidents
		Hosts	Ineffective
	Alternative transportation programmes	Designated driver programmes	Limited evidence suggests ineffective
Safe ride programmes		Limited evidence suggests ineffective	
Reducing availability of alcohol	Increasing the price of alcohol	Tax increases	10% increase in price can reduce drinking and driving by 7%-8%
	Regulating sales	Minimum drinking ages	Increase drinking age from 18 to 21 in US reduced traffic accidents by 5%-28%
	Regulating the conditions of sale	Trading hours	Extending trading hours increases traffic accidents and shifts timing of accidents
	Intervention programmes in accident and emergency departments		Can reduce subsequent alcohol-related trauma, although impact falls off with time

A concerted effort to reduce inappropriate drinking and driving in the countries of the European Union, based around a regime of uniform European wide BAC limits supported by national enforcement and publicity, could reduce drink driving fatalities by about 10%, saving some 1,000 lives annually in the existing countries of the European Union (Official Journal of the European Communities, 2001). About two thirds of the lives saved would be drivers over the relevant BAC limit and the remaining third would be sober drivers and vehicle occupants and other road users. Although the appropriate mix of the many measures available to reduce drinking and driving might vary from country to country, they are best arranged around a more uniform regime of BAC limits. Even in countries such as the United Kingdom, which have been successful in reducing fatal drink-drive accidents, further reductions are possible by moving towards a lower maximum legal limit of 0.5 g/L and extending other measures. Furthermore, significant reductions are also possible in those countries which have already adopted a legal maximum limit of 0.5 g/L, by lowering the limit further, by expanding enforcement activity and adopting more rigorous penalties for drivers convicted of inappropriate drinking and driving.

5. DETERRENCE AND THE PREVENTION OF DRINKING-DRIVING

Although an immediate goal of enforcing drinking-driving laws is to remove dangerous drivers from the road, the ultimate objective is to deter potentially impaired drivers from driving after drinking. Deterrence depends upon both an effective enforcement system with penalties, and sufficient media coverage to make the public aware of the enforcement effort and the likelihood of being apprehended.

5.1 Lowering BAC Limits

Given the strong relationship between BAC and risk, countries have established drinking-driving laws, that is, a specific BAC level at which a driver could be arrested, Table 3. The evidence for the general deterrent impact of such drinking-driving laws is strong, although the effects tend to erode over time (Ross, 1982). This success has led many countries to set increasingly stringent BAC levels.

Lowering BAC levels consistently produce positive results across all BAC concentrations and to further reductions in alcohol road traffic accidents (Jonah *et al.*, 2000). Lowering the BAC level from 0.5g/L to 0.2g/L level in Sweden in 1990 led to a reduction of fatal alcohol-related accidents by between 8% and 10% (Norström, 1997; Lindgren, 1999). The impact of the 0.5g/L BAC limit in four Australian states between 1976 and 1992 reduced fatal accidents from 8% in New South Wales to 18% in Queensland (Henstridge *et al.*, 1997). Roadside survey data in South Australia found a

14% decline in drivers with a positive BAC (Kloeden and McLean, 1994). The introduction of low BACs of 0.2g/L for young or inexperienced drivers in the US and Australia led to reductions in fatal crashes of from 9% to 24%.

Reducing the limit to 0.5g/L in France reduced road traffic fatalities by 4%. In Belgium, where the limit was reduced to 0.5g/L in 1994, there was a 10% reduction in fatalities in 1995 and a further reduction of 11% in 1996. Lowering the limit in Austria from 0.8g/L to 0.1g/L for novice drivers, led to a fall in accidents for novice drivers by 32 %, compared to 9 % for other drivers.

Norway introduced a BAC level of 0.2g/L in 2001. Police data from road side tests shows a significant 22% drop in violations of the limit compared with the year 2000. The decrease was across the entire range of illegal blood alcohol levels. Lowering the limit had a highly preventive effect for BACs above 0.5g/L, with the greatest increase occurring above 1.0g/L. Although the police spent more time on road side tests, fewer drivers were taken in for blood tests, less time was spent on investigating, prosecuting and judging them, and fewer drivers were criminalized.

Table 3 BAC levels in the European countries

Country	Standard BAC (in mg/ml)	Country	Standard BAC (in mg/ml)
Austria	0.5	Lithuania	0.4
Belgium	0.5	Luxembourg	0.8
Bulgaria	0.5	Malta	0.8
Czech Republic	0	The Netherlands	0.5
Denmark	0.5	Norway	0.2
Estonia	0	Poland	0.5
Finland	0.5	Portugal	0.5
France	0.5	Romania	0
Germany	0.5	Slovak Republic	0
Greece	0.5	Slovenia	0.5
Hungary	0	Spain**	0.5
Ireland	0.8	Sweden	0.2
Israel	0.5	Switzerland	0.8
Italy	0.5	Turkey	0.5
Latvia	0.5	United Kingdom	0.8

**The limit for drivers of heavy goods vehicles and public transport vehicles is 3g/L.

It does appear that some of the impact of lowering BAC levels wears off over time because initially drivers grossly exaggerate the certainty of apprehension in response to the publicity, but gradually become used to the new law and realize that their chances of detection are in fact not very high. Making motorists uncertain about the real risk of detection may paradoxically be the key to cost-effective deterrence (Homel, 1988; Nagin, 1998).

Whereas decreasing the limit for legal BACs decreases drink drive fatalities, increasing the BAC level leads to an increase in the number of fatalities. When Portugal raised the BAC level from 0.2g/L to 0.5 g/L in 2002, alcohol-related fatalities increased by 10%.

5.2 Enforcement: Unrestricted Versus Selective Breath Testing

The first problem for enforcement is to identify the vehicles driven by over the limit drivers. Traditionally, traffic patrol officers have come across drinking drivers in the course of enforcing speeding and other traffic regulations. However, without specialized training, they generally miss half or more of the high BAC drivers with whom they come in contact (Taubenslag and Taubenslag, 1975). Consequently, apprehension rates are low. It has been estimated that drivers with BAC greater than 1.0g/L were apprehended only once in 2000 trips by officers trained to detect the special impaired driving cues developed by the US National highway and Traffic Safety Administration (McKnight *et al.*, 1997). One strategy for increasing certainty of apprehension and punishment is to increase the frequency and visibility of drinking-driving enforcement. The traditional way of doing this is simply to intensify police enforcement. Such short-term campaigns do generally reduce accidents, but their effects are generally temporary (Ross, 1982).

It is also very difficult to estimate alcohol impairment in relation to legal BAC limits with observation alone. Physicians examining suspected drinking drivers in Scandinavia identified as impaired only about 50% of those with BACs greater than 1.0g/L. And even the police trained in the task have been found to be highly inaccurate (Taubenslag and Taubenslag, 1975; Jones and Lund, 1985). The breathalyzer, which can be operated by police officers with minimal training has increased the availability and ease of BAC measurement and extended the utility of the definition of impaired driving. An econometrics study showed that American states that allowed the use of breathalyzers had lower alcohol-related fatality rates than those states that did not (Saffer and Chaloupka, 1989).

One approach to strengthening enforcement is to use sobriety or selective checkpoints. However, at sobriety checkpoints, only motorists who are judged by police to have been drinking are asked to take a breath test. This approach greatly weakens the deterrent potential since experienced offenders believe (with some justification) that they can avoid detection. In

Australia alcohol impaired drivers were fewer than 10% of those pulled over (Watson and Fraine, 1994).

An alternative to such selective testing of drivers is Unrestricted Powers for Breath Testing or Random or Compulsive Breath Testing as it is practiced in Australia, New Zealand, and some European countries. Motorists are stopped with no restrictions by police and required to take a preliminary breath test, even if they are in no way suspected of having committed an offence or been involved in an accident. The defining feature of Unrestricted Breath Testing is that any motorist at any time may be required to take a test, and there is nothing that the driver can do to influence the chances of being tested. Testing varies from day to day and from week to week, and is not announced publicly in advance. Nevertheless, it is always highly visible and publicized in the news media. Refusal to submit to a breath test is equivalent to failing. In 1999, 82% of Australian motorists reported having been stopped at some time, compared with 16% in the UK and 29% in the US (Williams *et al.*, 2000). The result was that fatal crash levels dropped 22%, while alcohol-involved traffic crashes dropped 36%, and remained at this level for over four years (Homel, 1988; Arthurson, 1985). In Victoria, the proportion of drivers killed over the legal blood alcohol level (5g/L) declined from 49% in 1977 when random breath testing was introduced to 21% in 1992.

In the Netherlands, the implementation of experimental random breath testing resulted in a reduction of drivers with alcohol in their blood systems, but especially drivers with BAC levels above 0.5 g/L, the national legal limit (Mathijssen and Wesemann, 1993). In this system all drivers, or a random sample of drivers are stopped, thereby ensuring that drivers who are over the limit but show no evidence of impaired driving will be detected, as well as those who show signs of impairment.

Twenty three studies of Unrestricted Breath Testing and selective testing have found a decline of 22% (range 13%-36%) in fatal crashes, with slightly lower decreases for non-injury and other accidents for such enforcement strategies (Shults *et al.*, 2001). A time series analysis for four Australian states found that Unrestricted Breath Testing was twice as effective as selective checkpoints (Henstridge *et al.*, 1997). For example, in Queensland, Unrestricted Breath Testing resulted in a 35% reduction in fatal accidents, compared with 15% for checkpoints. Moreover, there was a measurable deterrent effect of Unrestricted Breath Testing on the whole population of motorists ten years later, an effect which was periodically boosted for individual motorists by exposure to Unrestricted Breath Testing, whose presence was remembered and acted upon up to 18 months later (Sherman, 1990). The deterrent impact of Unrestricted Breath Testing also provides heavy drinkers with a legitimate excuse to drink less when drinking with friends Homel (1988).

5.3 Severity of Punishment

Penalties such as prison sentences and fines have been proposed as a general deterrent effect on those not yet convicted of impaired driving.

Punishment for a drinking-driving conviction has typically been increased either by changing the maximum penalties or by introducing mandatory minimum penalties. There is limited evidence for the general deterrent effectiveness of prison sentences for reducing impaired driving by the public as a whole (Nichols and Ross, 1989; Jones *et al.*, 1988). Indeed, their effects could be counter productive if the judicial system is overburdened, or if prosecutors fail to pursue these cases. Severe punishments do not appear to produce fewer accidents than less severe penalties (Homel, 1988; Ross, 1992).

5.4 Swiftmess of Punishment

Swiftmess of punishment is the proximity of punishment to the drinking-driving event. One example is administrative licence suspensions or revocations for drinking-driving, where licensing authorities can suspend licences without a court hearing, quickly and closer in time to the actual offence. The mechanism seems to be general deterrence, with an average reduction of 5% in alcohol-related crashes and a reduction in fatal crashes of 26% associated with administrative licensing revocation (Ross, 1992; McKnight and Voas, 2001). Miller *et al.*, (1998), in a study on novice drivers, concluded that the benefit-to-cost ratio was \$11 per dollar invested, when violators receive a 6-month licence suspension.

5.5 Deterrence and the media

Drink driving laws must be publicized to be effective. If the public is unaware of a change in the law or an increase in its enforcement, it is unlikely that it will affect their drinking and driving. Studies in California demonstrated that publicity doubled the impact of new laws and new enforcement efforts (Voas and Hause, 1987). The programme, which paid for a tenfold increase in police patrols dedicated to enforcement on weekend evenings, began on January 1 1976. From late 1975 to the end of 1976 the novelty of the programme produced considerable local media coverage. During this publicity phase the accident rate declined by 25% as the public perception of perceived risk of arrest increased. The following year the publicity dropped off, and the driving public was left to test its expectations from its actual contacts with police on the roads. In this reality testing phase the number of night-time crashes increased, but did not return to pre-program levels. During the adjustment phase spanning the last eighteen months of the program when publicity continued to be sparse, the weekend night-time crash rate levelled off at about 10% below the pre-program period. The presence of the extra patrols had produced a reduction in drinking and driving, independent of the initial publicity (Voas and Hause, 1987).

5.6 Insurance Systems

Insurance systems can be used to discriminate against drinking and driving (Lindgren 1999). For example, the compulsory third party insurance in Sweden reduces compensation for personal injuries for the driver by

between one third and one half, if the driver has been driving over the legal limit. Passengers and injured people outside the vehicle are fully compensated from the insurance. Voluntary motor insurance which covers material damage to the motor vehicle is not valid if the insured cannot show that the damage came about independently of drinking and driving.

6. RESTRICTIONS ON YOUNG OR INEXPERIENCED DRIVERS

Young drivers are at risk for traffic crashes, including alcohol-involved crashes, as a result of their limited driving experience and their tendency to experiment with heavy or binge drinking. Driver education courses for the prevention of drinking-driving, which have been delivered in secondary education to driving-licensed teenagers, have led to only limited improvements in measures of knowledge, attitude and self-reported behaviour (Mann *et al.*, 1986). One area in which education has been effective among teenagers is their subsequent intervention in the drinking or driving of other teenagers at events where alcohol is available. Although secondary school alcohol programs generally find that those completing the program reported no less drinking-and-driving behaviour they appeared to be more likely to intervene in the drinking and driving of their peers (McKnight *et al.*, 1979), by driving others home, preventing them from driving, telling them not to drive, having someone else drive, offering to follow them, and threatening to prevent them from driving. Instructions in undertaking peer interventions have been found to be successful (McKnight *et al.*, 1984).

6.1 Lower BAC Limits for young drivers

Lower BAC limits for young drivers set BAC limits at the minimum that can be reliably detected by breath testing equipment (i.e., 0.1g/L to 0.2g/L). Lower BAC limits for young drivers also commonly invoke other penalties such as automatic confiscation of the driving licence. An analysis of the effect of lower BAC limits for young drivers in the first 12 states enacting them in the United States found a 20% reduction in the proportion of single vehicle night-time fatal crashes among drivers under 21, compared with nearby states that did not set lower BAC limits for young drivers (Hingson *et al.*, 1991, 1994). Reviews have found that lower BAC limits for young drivers reduce injuries and crashes (Zwerling and Jones, 1999), with reductions of between 9% and 24% for fatal crashes (Shults *et al.*, 2001). A national study of US states found a net decrease of 24% in the number of young drivers with positive BACs as a result of lower BAC limits for young drivers (Voas *et al.*, 1999).

6.2 Licensing restrictions

While the minimum driving age in Sweden and some other European countries is 18, minimum ages for drivers' licences have traditionally been lower in most English-speaking countries, sometimes as low as 14. On the basis of careful comparisons of US states with differing ages of licensing, it

was concluded that between 65% and 85% reductions in 16-year-old driver fatal crash involvement could be achieved by raising the legal age of driving to 17 (Williams *et al.*, 1983). However, such laws are unpopular in the United States, so night-time curfews for teenage drivers have been implemented in some parts of the United States in order to achieve some of the benefits of delayed licensing. It has been found that the crash involvement of 16 year-old drivers during curfew hours was reduced between 25% and 69%, with very beneficial effects relative to their costs (Preusser *et al.*, 1984).

Graduated licensing schemes which have incorporated lower BAC limits, delayed access to a full licence, and curfews for young drivers have been well accepted where implemented, and have been found to have safety benefits (Ulmer *et al.*, 2000).

7. PREVENTING RECURRENCE OF DRINKING AND DRIVING

Four areas can be considered to try to prevent the recurrence of drinking and driving: deterrence through prison sentences and fines; remedial and treatment programmes; licence suspension; and vehicle action. There are mixed impacts of their effectiveness. Whilst there is evidence for an impact of remedial and treatment programmes, the separation of the driver from driving is only effective as long as the separation can be maintained. Once punishment is finished, drink driving commonly reoccurs, unless accompanied by remedial and treatment programmes. Many drink drivers continue to drive even though their licences are suspended.

7.1 Licence suspension

Although most drivers in fatal crashes do not have records of alcohol-impaired driving, being convicted of a prior offence increases the risk of being involved in an alcohol-related fatal crash. The effectiveness of licence suspension as a way to reduce drink driving recidivism and alcohol-related crashes among individuals convicted of impaired driving is only partially effective because without some form of education, counselling or treatment program, the effects of suspension upon alcohol-impaired driving last only as long as the driver is incapacitated by the licence suspension, and these periods can be relatively short (McKnight and Voas, 1991; Ross, 1992).

A second offence is considered indicative of a fundamental alcohol problem and is typically accompanied by a much longer suspension. Further, multiple offences can result in revocation of the driver's licence, thus requiring drivers to seek licences as new drivers. Yet even the longer suspension and revocation periods may not be sufficient to provide an opportunity for treatment interventions to have an impact on impaired driving. Driving on a suspended licence is common because it cannot be detected by the police unless drivers are apprehended for another infraction. Even where special insurance coverage is required for licence

reinstatement, it can still be common for drivers to continue operating on a suspended licence rather than seek reinstatement.

The deterrent effect of any penalty is benefited by certainty and immediacy (Ross, 1984). Licence suspension through the court system often involves extensive delay. To overcome this problem, many jurisdictions have passed laws allowing the drivers' licensing agency to suspend licences administratively for drivers showing blood alcohol levels greater than the legal limit. Some jurisdictions allow police to confiscate licences on the spot. In some jurisdictions, the suspension is immediate; in others, the drivers are permitted to continue driving for a short period. A review of 46 studies on licence suspension found that suspension was followed by an average reduction of 5% in alcohol-related accidents and a reduction of 26% in fatal accidents (Zobeck and Williams, 1994).

7.2 Deterrence through prison sentences and fines

There is little evidence that prison sentences or fines have a specific deterrent effect on offenders currently suffering the penalties by promoting avoidance of future offences (Voas, 1986). Nevertheless, the availability of prison sanctions is an important motivational tool for the courts. It provides a penalty for failure to conform to the probation requirements established by the court (Voas *et al.*, 1999). Finally, the authority to impose a prison sentence may provide the legal basis for referring offenders to treatment programs, which have been shown to reduce recidivism of drink driving in first and multiple offenders (Voas and Tippetts, 1990).

There is no reliable evidence that fines have any deterrent effect on impaired driving. However, they can play an important role in helping to finance some essential enforcement activities such as breath testing. Yet, many fines are either uncollected or paid over a long time as courts tend to accept defendants' pleas that they do not have the funds to pay the fines. Further, fines are frequently waived to allow the offender to pay for any required treatment programmes.

7.3 Educational, remedial and treatment programmes

Convicted drinking drivers represent a heterogeneous group. Some offenders can be classified as high-risk drivers who drink; others might be classified as problem drinkers who drive. It has been hypothesized that some first offenders are apprehended for drink-driving because they lack an understanding of the effect of alcohol on performance and they lack knowledge of the law. Other offenders are apprehended principally because they are dependent on alcohol and have little or no control over their drinking. Because of the variations in the characteristics of first offenders, it is possible for courts, on the basis of interviews and questionnaires to separate first offenders into two broad classes: social drinkers and problem drinkers (Lapham, Skipper and Simpson, 1997). Those identified through this assessment process as social drinkers can be assigned by the courts to a relatively brief educational program. Offenders assessed to be problem drinkers are assumed to require more intensive treatment to overcome their

alcohol dependence (Wells-Parker and Popkin, 1994). Indeed, a large segment of the patient population being treated for alcohol dependency has entered treatment because of an alcohol-impaired driving conviction.

Drivers not previously found guilty of an alcohol offence are generally given the opportunity to participate in programs involving some combination of education or counselling to avoid or shorten the period of licence suspension. A meta-analysis of 215 independent evaluations of remedial programs found them to yield an average reduction of 8-9%, both in recidivism for alcohol-impaired driving offences and in alcohol-related accidents (Wells-Parker *et al.*, 1995).

An alternative type of intervention is victim impact panels (Shinar and Compton, 1995), or more generally, restorative justice conferences, where several people representing victims of drinking-driving meet with the offender in a structured situation controlled by a trained facilitator (Latimer *et al.*, 2001). The conferences collectively determine a penalty. Although such programs can decrease the recidivism of offenders when compared to more traditional criminal justice responses (i.e., imprisonment or probation), there is little evidence that this works for drink drive offences (Shinar and Compton, 1995).

7.4 Vehicle Actions

Efforts to prevent high-risk, impaired driving offenders from driving on public roads by suspending their driving privileges are not so effective, as demonstrated by the large number of suspended drivers who are apprehended while operating a vehicle illegally and who do not reinstate their licences when eligible to do so.

Ignition Interlocks

One action to prevent drink driving offenders from driving while impaired is to place interlocks in the ignition to prevent an impaired driver from operating the vehicle. Before the engine can be started, the driver must provide an alcohol-free breath sample. After the initial test to start the vehicle, the system can be designed to require tests every few minutes, thus preventing a colleague from starting the engine for an alcohol-impaired driver.

Eight studies of interlock programs conducted under the authority of a local court or a motor vehicle department has found them to be more effective than full licence suspension in preventing recidivism among alcohol-impaired drivers (Voas *et al.*, 1999). However, seven of the studies found that, once the interlock is removed, offenders have the same recidivism rate as suspended offenders. Interlocks can also be used as a preventive measure, when fitted to public service and heavy goods vehicles. Based on its experience in reducing recidivism, when backed up by educational programmes, Sweden is undertaking a country wide trial of alcohol safety interlock devices, to be completed in 2009.

Vehicle Impoundment

A more severe form of vehicle action is impounding the vehicle of an offender so that it cannot be operated by either the offender or anyone else. Vehicle impoundment laws are generally applied to multiple alcohol-impaired driving offenders or to those convicted of driving while suspended and have been demonstrated to reduce recidivism of multiple drink driving (DeYoung, 1997, Voas, Tippetts and Taylor, 1997, 1998).

A law enacted in the US State of Minnesota permits the police officer to seize the vehicle licence plate when an individual is apprehended for their third alcohol-impaired driving offence, immobilizing the car without actually taking possession of it. The plate is destroyed and offenders cannot register another vehicle or obtain a plate until they can demonstrate that their drivers' licences have been reinstated. This law has been demonstrated to reduce recidivism among third-time offenders (Rodgers, 1994)

8. SEPARATING DRIVING FROM DRINKING

It is possible for individuals to drink alcohol and not be exposed to causing alcohol-related accidents if they do not have access to a vehicle. Such programs can include: public education efforts to persuade the drinkers themselves to take steps to avoid driving after drinking; programs to encourage servers and hosts to prevent intoxicated individuals from driving; and organized efforts by alcohol outlets and community organizations to make provisions for alternative transportation.

8.1 Public education and community based programmes

Although commonly used, public information programs that disseminate information about drinking and driving through the mass media have, by themselves not demonstrated any benefit in reducing alcohol-related accidents (Haskins, 1985). However, where public information is of value is publicizing alcohol safety efforts that depend upon public awareness for their implementation, such as enactment and heightened enforcement of laws and regulations for which the general deterrence value obviously depends on public awareness. Information on drinking and driving, the harm that results from drinking and driving and the penalties across Europe should be included in driving lessons, driving tests and in published road, driving and highway codes.

Although not effective on its own, public information is effective when part of broad based community prevention programmes. For example, the Saving Lives Project conducted in six communities in Massachusetts, USA was designed to reduce alcohol-impaired driving and related problems such as speeding (Hingson *et al.*, 1996). In each community a full time coordinator from the local government organized a task force representing various city departments. Programs were designed locally and involved a host of activities including media campaigns, business information

programs, speeding and drunk driving awareness days, speed watch telephone hotlines, police training, high school peer-led education, Students Against Drunk Driving groups, college prevention programs, and other activities. During the five years that the program was in operation, sites that received the Saving Lives intervention produced a 25% greater decline in fatal crashes than the rest of Massachusetts, a 47% reduction in the number of fatally injured drivers who were positive for alcohol as well as a 5% decline in visible crash injuries and an 8% decline in crash injuries affecting 16-25 year olds. In addition, there was a decline in self-reported driving after drinking (specifically among youth) as well as observed speeding. The greatest fatal and injury crash reductions occurred in 16-25 year old age group (Hingson *et al.*, 1996).

Comprehensive community programs have been shown to be effective in reducing alcohol involved traffic crashes, under age sales, increased implementation of responsible beverage service, increased adoption of local laws and increased support and awareness of alcohol problems (Holder *et al.*, 2000). The community trials project in California noted that for every dollar invested in the project \$2.88 was returned in savings, just from reduced traffic crashes alone (Holder, Saltz *et al.*, 1997).

8.2 Server training

The leading sources of intoxicated drivers are licenced drinking places, such as bars and restaurants, where the proportion of arrested drivers can range from one-third to one-half. The most significant risk factors for alcohol related accidents are the amount of alcohol consumed and whether obviously intoxicated customers continued to be served (Rydon, Lang and Stockwell, 1993). What makes a licenced place an attractive target for reducing drinking and driving is that the sale of alcohol is under the control of servers who are sober and, therefore, in theory, in a position to identify seriously impaired drivers.

The 1980s saw the rise of server training as a way to reduce the harm resulting from irresponsible service of alcohol. Typically, training programs address: (a) the safety, health, and economic problems of irresponsible service; (b) the laws and regulations governing service; (c) the prevention of alcohol problems through better serving practices, age identification and alternative beverages; and (d) the prevention of impaired driving by identifying impairment, refusing service and providing transportation. Programs for managers also include instruction in promotion, service and transportation policies.

Training programmes for servers and bartenders for preventing impaired driving by identifying impairment, refusing service and providing transportation in North America, Australia, and the Netherlands have been demonstrated to lead to significant improvement in server knowledge and attitude, as well as intervention in the form of discouraging over-consumption and encouraging alternative beverages particularly when coupled with a change in the serving and sales practices of the licenced

place, and with training for managers (Rydon *et al.*, 1996; Saltz, 1997). However, success in reducing the risk of drink-driving has not been found. Service to intoxicated customers and "pseudo-customers" simulating signs of intoxication has not been reduced. A responsible server training programme conducted in Australia found no significant reductions in customers with blood alcohol concentrations greater than 1.5g/L (i.e. those who were very intoxicated) or in the number of drinking and driving offences from the intervention sites (Lang *et al.*, 1998). A number of jurisdictions have mandated the training of servers as a condition of licensing. The results have been no more encouraging than those of optional training. Legislation mandating server training has generally been tied to a reduction in licensee liability for damages resulting from illegal service by trained servers. To the extent that it relieves management of liability for harm resulting from illegal and harmful service, it cannot be viewed as a step toward the responsible sale of alcohol.

However, when implemented as part of more comprehensive community based programmes, responsible server programmes have been found to be more effective, particular for night time crashes for young people (Holder and Wagenaar, 1994; Wagenaar *et al.*, 2000).

The 1980s saw the widespread introduction of legal sanctions against sellers who dispense alcohol irresponsibly. Sanctions have taken two forms: (a) civil liability laws that allow victims of irresponsible service of alcohol to collect financial damages from sellers; and (b) alcohol control laws imposing administrative and criminal penalties for the illegal sale of alcohol to the under aged and intoxicated.

The civil liability of alcohol retail establishments who serve alcohol to intoxicated customers has been established in a number of countries, often based upon common law. This liability has been primarily reactive, that is, as a means of legal redress after service to an intoxicated person resulted in personal loss or injury (Mosher, 1979, 1987). This may for instance occur when an intoxicated driver, served by a retail establishment, crashes and injures or kills an innocent bystander. However, more recently server liability has being proposed as a preventive policy to encourage safer beverage serving practices and to prevent drink driving (Mosher, 1983 and, 1987; Holder *et al.*, 1993). States that hold bar owners and staff legally liable for damage attributable to alcohol intoxication have lower rates of traffic fatalities (Chaloupka *et al.*, 1993; Ruhm, 1996; Sloan *et al.*, 1994a) and homicide (Sloan *et al.*, 1994b), compared to states that do not have this liability. When Texas deliberately distributed publicity about the legal liability of servers, there was a 12% decrease in single-vehicle night-time injury-producing traffic crashes, a statistically significant change when compared to trends in other comparison states (Wagenaar and Holder, 1991). Several studies suggest that these changes are mediated by the effects of legal liability on the attitudes and behaviour of bar owners and staff (Holder *et al.*, 1993; Sloan *et al.*, 2000).

In many jurisdictions, it is illegal to sell an alcoholic beverage to purchasers, including the underage and the intoxicated, considered to be at risk of injury. Violations can result in criminal actions and fines against sellers and administrative action, such as fines and licence suspensions, against the establishments. Service of alcohol to already-intoxicated customers occurs almost entirely in on-premises bars and restaurants. Enforcement of laws prohibiting service to an intoxicated customer is rarer than enforcement of laws prohibiting sales to an underage customer. Most actions against servers appear to occur when the illegal service resulted in some form of harm, rather than from routine enforcement activity.

An enforcement activity in which plain clothes officers visited licenced establishments that were serving visibly intoxicated customers showed a three-fold increase in refusals of service to pseudo-customers simulating signs of intoxication and a one-fourth drop in the percentage of arrested drivers coming from bars and restaurants (McKnight and Streff, 1994). The savings in accident costs were estimated at \$90 for each dollar cost of enforcement. The efficiency of alcohol-control efforts can be enhanced by focusing enforcement on establishments that are the most persistent violators. Arrested drivers queried for the sources of their last drink can identify the greatest sources of trouble.

8.3 Host responsibility

Private gatherings rank second behind licenced places as sources of drivers arrested for drinking, which account for about a quarter of all those arrested for driving while intoxicated. Drivers intoxicated from unlicenced drinking locations are relatively more likely to be involved in accidents than those from licenced establishments (Lang and Stockwell, 1991). Efforts to ensure responsible service of alcohol by social hosts have lagged behind those directed at servers in licenced establishments. First, efforts to encourage host intervention need to be communicated through the mass media. Second, social hosts are not subject to the same legal sanctions as licenced places. Social host liability suits are rare and do not appear to gain public support.

One program, which evaluated prevention programs for social hosts found that the pattern of behaviour change was similar to that found among servers; that is, significant gains were reported in alcohol service practices but not in preparation for or subsequent dealing with intoxicated guests (McKnight, 1987). There was a general disinclination of hosts to interfere with the drinking of adult guests.

8.4 Alternative Transportation Programs

Drivers who are too impaired to operate a motor vehicle safely must find another way to get home or to another destination. Forms of alternative transportation include designated driver programs and safe ride programs. Although such programmes may be popular among people who presumably would otherwise drive while intoxicated, are able to reach

high-risk groups for drinking-driving (young, male heavier drinkers), and could generally increase awareness of the risks of drinking-driving, there is limited evidence for their effectiveness and, because they account for a only a small percent of drivers, no overall impact on alcohol-involved accidents has been demonstrated.

Designated Driver Programs

Any vehicle driven to a drinking event is a potential source of alcohol-impaired driving. McKnight *et al.*, (1995) conducted in-depth interviews of 600 individuals convicted of drink-driving and retraced the decisions involving the event leading to their arrest. They found that once the individuals left home, impaired driving became almost inevitable. This finding indicates the importance of having a designated driver available when the possibility of heavy drinking exists.

However, whilst a large proportion of the public may be aware of the designated driver concept and there is an increased use of designated drivers (Fell, Voas and Lange, 1997), over one quarter of those familiar with the term in the United States did not require a designated driver to be identified before the planned drinking event or to avoid consuming alcohol during the event. Many who agreed to serve as designated drivers reneged after drinking, even though it meant becoming a designated intoxicated driver (McKnight *et al.*, 1995).

There is some evidence that the presence of a designated driver encourages the non-drivers to drink more than they would otherwise, making them a greater danger if either they or the designated drivers changed their minds and increasing their risk of intentional or unintentional injuries to themselves or others (Harding and Caudill, 1997). Therefore, it would appear that a designated driver program is not as effective as a measure to prevent alcohol-impaired driving as originally envisioned. It seems to work best when designated drivers are non-drinkers and drive their own cars to drinking events, thus helping to ensure that they will indeed do the driving. The impact of on-premise designated driver programs appears to be very small and even intensive promotions produce only modest increases.

Safe Ride Programs

Several communities have organizations that provide free rides largely to individuals who drive while being alcohol impaired. A survey of 335 ride services in response to calls from passengers or the drinking places serving them found the biggest obstacle to be the inability of more than 15% of the programs to transport the driver's vehicle (Harding, Apsler and Goldfein, 1998). Drivers were reluctant to leave their vehicles behind or return to the drinking location to collect their vehicles. Ross (1992) suggested that one approach to individuals could be to provide them with free taxi rides to drinking places. This would ensure their inability to drive away and, consequently, a heavy drinker would be forced to find alternative transportation to return home, as the vehicle would not be at the drinking location.

9. REDUCING ALCOHOL CONSUMPTION

Reducing alcohol consumption to prevent alcohol related road traffic accidents can take three forms, increasing the price of alcohol, reducing availability by regulating sales and regulating the conditions of sale. All three measures have an impact in reducing alcohol related road traffic accidents. In addition, intervention programmes based on emergency departments in hospital have decreased subsequent accident rates.

9.1 Increasing the price of alcohol

Increases in beer taxes can significantly reduce drinking and driving as well as youth (Saffer and Grossman, 1987a,b) and adult motor vehicle fatalities (Chaloupka *et al.*, 1993). It has been estimated that a 10% increase in the price of alcoholic beverages in the United States would reduce the probability of drinking and driving by about 7% for males and 8% for females, with even larger reductions among those 21 years and under (Kenkel, 1993).

9.2 Reducing the availability of alcohol

Some of the best evidence for the relationship between availability and alcohol-related road traffic accidents is provided by the minimum legal drinking age laws in the United States. Enactment of the minimal legal drinking age laws by the individual states was stimulated by federal legislation withholding highway funds from states failing to lower the limits for drivers under age 21. Although not strongly enforced, the combination of prohibitions against alcohol sales to those under age 21 and sanctions for possession by underage individuals have appeared to reduce significantly underage alcohol-related road traffic deaths.

Studies have generally found that a lowered age limit produced greater alcohol-involved traffic accidents for the age groups affected by the change, while increased age limits reduced such accidents. The U.S. General Accounting Office (US general Accounting Office, 1987) in reviewing 32 relevant studies concluded that increasing the minimum age for purchasing alcohol reduced the number of alcohol-involved traffic accidents for young people below 21 years of age by between 5% and 28%. The National Highway Traffic Safety Administration concluded that the minimal legal drinking age laws had saved 17,000 lives between 1982 and 1997 (See Edwards *et al.*, 1994).

9.3 Variations in trading hours

Variations in the hours of trading also have an impact on alcohol related road traffic accidents. Small alterations in trading hours in Australia have been shown to shift the pattern of road traffic accidents, so that a peak occurs shortly after the new closing time. In some instances they show a significant increase in accidents on the day when extended trading hours occur, when compared with control communities (Smith, 1988). What the

alterations do not show, however, is an overall increase in the total numbers of accidents across all times. Thus, it seems that, as a result of relaxation in trading hours, peoples' drinking and driving habits were shifted or redistributed across the whole week.

More recent Australian studies have examined the impacts of extensions of trading hours of bars and pubs in Perth, Western Australia (Chikritzhs *et al.*, 1997). In comparison with premises that did not apply for permits for extended hours, those granted extended trading were followed by substantial increases in alcohol sales, assaults on or near their premises and alcohol-related road crashes involving customers who had last drunk there.

9.4 Intervention programmes based in accident and emergency departments

Brief interventions based in accident and emergency departments can be effective in reducing alcohol consumption and subsequent alcohol-related trauma and hospitalization, although the results fall off over time (Monti *et al.*, 1999; Longabaugh *et al.*, 2001; Gentilello *et al.*, 1999).

10. CONCLUSIONS

Although the prevention of drinking-driving has been described as one of the public health success stories of the last quarter of the 20th century, the downward trends stabilized or increased at the end of the 1990s, and there is clearly considerable room for improvement.

Of all modes of transport, driving on roads is the most dangerous and the most costly in terms of human lives. Drivers in Europe expect stricter road safety measures, such as improved road quality, better training of drivers, enforcement of traffic regulations, checks on vehicle safety, road safety campaigns, and strict reductions in drinking and driving.

The most effective measures to reduce alcohol related road traffic accidents are lowering the legal level of blood alcohol concentration, supported by deterrence through unrestricted powers to breath test. Lower legal levels of blood alcohol concentrations are effective for young and inexperienced drivers.

The Maastricht Treaty provided the European Union with the legal means to establish a framework and introduce measures in the field of road safety as well as obviating sources of danger to health, such as drinking and driving.

Although logically the legal drink driving limit should be zero, a concerted effort to reduce drink driving in the countries of the European Union based on a uniform blood alcohol concentration limit of 0.5g/L and of 0.2g/L for novice drivers and drivers of public service and heavy goods vehicles, supported by national enforcement and publicity, could reduce drink

driving fatalities by at least 10%, saving some 1,000 lives annually. Eventually, the limit should be reduced to 0.2g/L for all drivers.

Licence suspension and vehicle actions can be effective in reducing reoccurrence of alcohol related road traffic accidents, when combined with remedial programmes. Comprehensive community based programmes that combine media campaigns, educational campaigns and responsible serving practices, although expensive, can lead to further reductions in drink driving fatalities.

Policies that reduce the availability of alcohol for example through price increases, and minimum legal drinking ages also reduce alcohol related road fatalities.

The least effective policies are those that attempt to separate drinking from driving through educational programmes alone, server interventions alone and alternative transportation programmes.

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