

The Role of Alcohol in Drowning and Boating Deaths in the Auckland Region

Boating (1980-1997) and
All Drownings (1988-1997)

An Updated Report to ALAC

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Executive Summary

A number of overseas studies have suggested that alcohol is an important factor in boating fatalities and other drownings. However little is known regarding the extent of the problem in New Zealand. The aims of this study were threefold: 1) to document the role of alcohol in all drowning deaths in Auckland for the period 1988 - 1997; 2) to provide more details specifically on boating deaths for a longer time period 1980-1997 than in an initial study; 3) to evaluate the quality of alcohol data available; and 4) to provide background data for planning appropriate programmes to reduce alcohol-related injuries associated with aquatic activities injuries such as those surrounding the America's Cup Challenge and other recreational activities.

Methods

The records of the Auckland University Department of Pathology were used to identify all possible drownings in the Auckland area between 1988 to the end of 1997. Following publication of our earlier report on this group of cases, additional case finding was performed for the years 1980-1987 and data collected on any deaths involving a boat. The Department of Pathology records contain the initial Police investigation reports, autopsy reports prepared for the coroner, and toxicology reports if blood is tested for alcohol or other drugs. Data were then entered into an Access database and analysed in SAS. In addition, in order to assess their impressions of the problem of alcohol and boating and to identify any potential hazards related to alcohol use during the America's Cup, key informant interviews were conducted with a sample of key people in the Auckland region involved in the area of boat safety,

Findings

Alcohol and Drowning



Overall, a total of 165 cases of drowning aged 15 and over were included in our study of alcohol and drowning. This excludes 78 cases under age 15, that occurred in bathtubs, or had missing records (five cases). Age was unavailable from the records for 17 cases. Among the 96 cases recovered within 48 hours of drowning (short recovery time), the testing rates for blood alcohol concentration (BAC) varied considerably by age. These short recovery time cases are the only ones in whom reliable BAC values can be considered as after this decomposition of the body can produce significant elevations in BAC. Of those with a reliable BAC, the youngest cases with positive BAC's were four 18 year olds. Among older people (65 + years), only 34.8% were tested, of which only one had a BAC of 100mg/100ml or more. The most reliable statements about the involvement of alcohol and all drownings can be made in those aged 15-64 years where testing rates were over 80% for the group as a whole. In this group, with reliable results, 40.5% had a positive BAC, 34.5% over 50mg/100ml and 29.8% were intoxicated (BAC \geq 100mg/100ml), and 31.0% were over 80mg/100ml.

Boating Related Drownings

A total of 112 boating cases were identified in the study, 51 for the initial period 1988-97 and an additional 61 for the period 1980-87. Of these, 89 would be considered classic boating "accidents" (38 falls and 51 due to sinking and other causes) and 25 of them occurred in dinghies. An additional 23 cases involved activities while boating, such as swimming off a boat, wading to shore after drinking on a boat, scuba diving from a boat or suicides jumping from a boat. One case involved an occupational incident where machinery exploded injuring the victim and throwing him overboard from a barge, and another was killed by a bomb planted on a boat.

Boating Drownings and Alcohol

The testing rates for boating cases were much higher overall than for all drownings combined (81% vs 50% for those with short recovery times). Analysis of all cases tested (regardless of time in the water), found that 50.0% had a positive BAC while if only those with short recovery times were considered, 42.6% were positive for any blood alcohol, reflecting in part the fact that bodies left in the water can produce their own alcohol from secondary fermentation of blood sugars. Eight of all boating cases had a low BAC of 1-49mg/100ml while only four of those with short recovery times had this low BAC level. The testing rate was 84.6% in ages 15-64 years of age which enabled valid estimates of BAC



involvement to be made for this group. Among boating fatalities 15-64 years of age, 43.2% had a positive BAC, 34.1% had a BAC over 50 and 27.3 % over 100mg/100ml; 27.3% were also over 80mg/100ml (the legal driving level in New Zealand).

Because of the small number of boating cases in each individual group of boating deaths it is difficult to make definitive statements about the role of alcohol in each type. However, because of the large number of falls from boats, reliable information is available for this group. For all falls overboard with reliable BAC testing and aged 15 and over, 62.5% were intoxicated. However, four deaths of these involved commercial vessels. Thus for falls overboard in recreational boating 67% (8 of 12) cases were intoxicated, which was almost two and a half times (2.44) higher than for all boating fatalities (27.3% intoxicated).

We also conducted several sub-studies to evaluate the quality of available data. Some of the findings from these were, that Police reports were not very sensitive at identifying intoxicated persons; and that not all blood tests are included in the coronial files, especially if the BAC is negative. In addition, case finding with the available pathology database is difficult and a number of recommendations are made as to how it could be improved for future research and injury prevention initiatives.

Conclusions

This study provides good evidence of the role of alcohol in drowning and boating incidents. Based on the results of our study, alcohol involvement in water-related fatalities is high and as important, if not more important, than involvement in fatal motor vehicle injuries. Falls from dinghies and recreational motor boats are of particular concern as 67% of these falls in our study were intoxicated (BAC over 100 mg/ dl or .10BAC).

These findings have important implications for policy makers responsible for safety practices and procedures for the America's Cup Challenge as there are also a number of factors that make the likelihood of alcohol involvement more of an issue than in normal boating activities. These include the fact that most people on the water will be spectators out there for long periods and with little to do, which when combined with the party-like atmosphere promoted by sponsors, is likely to encourage drinking among spectators. Based on the findings in our study, a number of recommendations are made with regard to what could be done to



improve our knowledge of alcohol involvement in water activities and how potential alcohol-related problems could be prevented on the water. A specific area of concern is falls from boats. These have been identified as a likely hazard among spectators at the America's Cup, and associated boating activities over the Millennium period

Recommendations

The following recommendations are based on the findings contained in this report. These recommendations are provided to facilitate the improvement of alcohol data collection in New Zealand and to provide information for policy makers involved in planning safety procedures and practices for the America's Cup and other aquatic activities.

1) **To improve the quality of alcohol data available on drownings it is recommended that:**

- All drownings and other injury fatalities should be tested for alcohol as part of their investigation. In addition, the results from all bloods tested should be recorded in the coroner's files even if they are negative. Future studies should also allow for resources to check directly with the BAC testing laboratory for those cases with no test results to see if any were tested and to confirm that the results were negative.
- More use should be made of death investigation data, such as that from the Department of Pathology database at the Auckland University, for epidemiological studies of fatal injuries such as drownings and boating injuries. The database is a valuable source of information covering about a third of the New Zealand population and could be made more useful for injury research by linkage with the final coroner's court findings, inclusion of coded variables such as specific causes of death and universal BAC testing.
- The establishment of a national coronial database should, however, be a long-term goal. This would provide representative information for the whole country.
- All boating drowning reports should include information on whether those involved were wearing life jackets.
- All drownings and people who incur serious injuries while boating in New Zealand should be tested for alcohol in order to better understand the problem, inform policy decisions and for the development of injury prevention initiatives.
- Consideration should be given to gaining further information regarding the circumstances surrounding non-fatal boating "accidents" by contacting those organizations suggested by the key informants. In addition, linkage of data from different organizations would provide a much more comprehensive picture of boating fatalities and should be considered in future studies.



- Follow-up studies should be conducted to improve the data available for the current cases such as through linkage with coroner's inquest findings, vital statistics records, and records from Water Safety New Zealand and the Maritime Safety Authority to fill in missing details such as age, boat type and life jacket use. In addition, information is needed on cases lost at sea and those occurring elsewhere in New Zealand.
- 2) To facilitate the development of appropriate programmes to reduce alcohol-related aquatic injuries associated with the America's Cup challenge it is recommended that:**
- Efforts be made to increase the public's perception of the hazards of alcohol use and boating.
 - Those planning activities around the time of the America's Cup recognize the potential for increased alcohol use on the water and develop appropriate strategies.
 - Consultations be held with relevant groups concerning the development of appropriate strategies to reduce boating fatalities and injuries.
 - Injury prevention programmes be developed to address the problems associated with the consumption of alcohol on boats, highlighting both the need to be as vigilant when in charge of a boat and passengers as one would be in charge of a car and the additional risk of alcohol consumption among passengers. While efforts to reduce alcohol use among boat operators are a component of programmes to reduce boating fatalities, drunk passengers are also at risk on their own regardless of the actions of the skipper.
 - Appropriate injury prevention programmes be developed to address falls from boats, especially focusing on falls from dinghies and motor boats and include the need to wear life jackets on all occasions especially if consuming alcohol. These programmes would need to highlight the dangers experienced when consuming alcohol on board and when travelling between boats and the shore. It would appear that many safety procedures observed on boats are not given the same attention in dinghies.
 - Any injury prevention programmes developed to address safety on the water are appropriately evaluated.
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1 Introduction

The aims of this study were threefold: 1) to document the role of alcohol in all drowning deaths in Auckland for the period 1988 - 1997; 2) to provide more details specifically on boating deaths for a longer time period (1980-1997) than in an initial study, 3) to evaluate the quality of alcohol data available; and 4) to provide background data for planning appropriate programmes to reduce alcohol-related injuries associated with aquatic activities such as those surrounding the America's Cup Challenge and other recreational activities.

This report begins by providing background information on the study. It then describes the evaluation methodology. Next the findings from the study including data on all drownings, as well as those specifically related to boating and information from key informant interviews are presented. A discussion of the key findings is then provided, followed by our conclusions from the evaluation. The report concludes with recommendations arising as a result of this evaluation. This report is an updated version of an earlier report and provides details of boating fatalities from 1980-1997.

2.0 Background:

A number of overseas studies have suggested that alcohol is an important factor in boating fatalities and other drownings (Howland et al, 1988, 1993, 1995; Smith et al, 1988, 1995, 1998). In New Zealand little is known regarding the extent of the problem and there are conflicting views as to the importance of alcohol and aquatic injuries in this country. While one New Zealand study has suggested that alcohol and drowning are an issue for Auckland (Cairns et al 1984), this study was conducted some 15 years ago. There is therefore a need to examine recent data on alcohol and boating and other drownings and to provide a more comprehensive review of alcohol use in different situations. Such information is essential to determine if there is a need to include programmes to reduce alcohol involvement in aquatic injuries as part of ongoing efforts to prevent drownings.

The prevention of alcohol related boating fatalities and injuries is especially important in Auckland given that the America's Cup challenger series begins in 1999. Already Police have expressed concern that an estimated 8,000 spectators will be on the water during



major competition days (Jones 1998). It is anticipated that, during this time, alcohol industry sponsorship of the America's Cup is likely to be very visible and any efforts to promote safe drinking could potentially be over shadowed. In addition, as awareness of the hazards of drinking on the water have not been widely appreciated there is likely to be controversy about the need for a campaign to reduce the hazards of mixing alcohol and boating.

The Auckland Regional Council, the Harbourmaster and Water Safety New Zealand expressed concern about the potential hazards of mixing alcohol and boating activities during the America's Cup festivities and approached the Alcohol Liquor Advisory Council (ALAC) for assistance in planning a programme to prevent alcohol-related problems on the water. However, before an effective programme can be implemented it is necessary to have reliable data on alcohol involvement in boating drownings and injuries. Although Water Safety New Zealand already collect comprehensive data on drownings they rely on coroner's files which have incomplete data or poorly recorded details on alcohol. Similar problems are likely to exist with data from the Maritime Safety Authority who have been collecting information on boating deaths and serious incidents since 1994.

In a recently completed ALAC study, (Warner, Smith & Langley 1998) one of the major findings was that the quality and completeness of coronial information on alcohol involvement in drownings is insufficient to arrive at an accurate estimate of the role of alcohol in drownings. Alcohol data is seldom recorded in the coroner's files nationally, with only 36% of drownings aged 10 or over being tested for blood alcohol concentration (BAC). The information in the New Zealand coronial files is not required to be presented in a standard format and the amount of information varies widely between records and jurisdiction. It is also unknown if alcohol test results are always sent with the files forwarded to the central repository for coronial files at the Justice Department in Wellington.

Internationally, coronial or medical examination systems have been able to produce reliable and useful studies of alcohol involvement in injuries (Smith et al 1998). One local study in Dunedin also demonstrated that individual areas in New Zealand can collect useful alcohol data on injury deaths (Gwyn 1980). It has also been suggested by forensic pathologists at the Faculty of Medicine and Health Sciences, University of Auckland, that because they regularly send bloods from drowning cases for BAC testing, more complete alcohol data would be available for drowning in the Auckland region than that available nationally. This



region covers about a third of the population of New Zealand and is served by a single coroner's court and a single pathology investigation group at the Auckland University. As a consequence, a study was designed to examine the data available on alcohol and drowning in the Auckland region with a special emphasis on drownings involving boats. In addition key informant interviews were conducted with local boating safety personnel in order to assess their impressions of the problems associated with the drinking of alcohol and boating and, in particular, to identify potential hazards related to alcohol use during the America's Cup festivities.



3.0 Methods:

3.1 Case Finding

An investigation of sources of information on drowning in the Auckland region was conducted. This region encompasses the old Auckland Police District and includes the area south of and including Wellsford and north of a line across the North Island from Port Waikato to the Firth of Thames and includes Meremere but not the Coromandel Peninsula (although sometimes cases are referred from this area). The primary data source used was records of the Auckland University Department of Pathology, Section of Forensic Pathology. Pathologists in the Department conduct death investigations for the Auckland Coroner. Additional information was also sought from local groups who collect boating injury information. The initial investigation began with files created from the Section of Forensic Pathology database. This database functions as an effective electronic record system but is difficult to analyse for statistical purposes. The system was designed some time ago for record keeping and creating autopsy reports and makes extensive use of text fields (rather than numeric codes) to store data. A copy of the files for all possible drownings in the Auckland area, between 1988 to the end of 1997, was created by the computer consultant who designed the Pathology Department's database, and put it into Microsoft Access format. Potential cases were identified by conducting a word search of the free text field "opinion of death" using the text words: drown (ing/ed), immer(sion/ed), submer(sion/sed). In addition the "place of death" field was searched for any deaths that contained the following words: boat, ocean, water, river, harbour, yacht, beach or ship.

A file was then made of selected cases that contained the full text from the two free text fields, case number, name, address, time, date and place of drowning, age, gender and toxicology results, including BAC. Blood alcohol results were originally contained in a text field and had to be re-entered into a numeric field in our Access database. The time interval from drowning to body recovery was also determined for each case as blood alcohol results are generally unreliable after about 48 hours as there is a secondary fermentation of blood sugars that artificially elevate the BAC (Fatteh, 1973). Some cases also have advanced decomposition that results in blood not being able to be obtained for analysis. The free text of all selected cases was reviewed and obvious cases that were not drownings were rejected. Cases where there were insufficient details to determine if they were due to drowning or other boating injuries were included in our initial list of cases for record review.



While the pathology computerised database contained much information, more extensive descriptions of the drowning circumstances were available in the archived autopsy files. A data abstraction form was developed to collect data from the Department of Pathology records held at the University of Auckland. These data included the archived coroner's post mortem reports and the initial Police investigation reports (Form P47). Initial records of all possible drownings in the Auckland region, which had previously been identified, were reviewed and files were abstracted for valid cases. Data were then entered into the Access database and analysis conducted. For our initial definition of boat involved, we included all cases that involved a boat in any way. This included swimming off a boat, diving off a boat, as well as falls and collisions. These were all included as they represent situations where a boat could have been used as a platform for drinking.

Following publication of our earlier report of all drownings for the period 1988-1997 we wanted to increase the amount of information available on boating deaths. For the period 1980-1987 we searched an earlier version of the computerised record file for all drownings. These records were all stored in microfiche files which included details of laboratory testing for alcohol and other drugs. All drowning files were viewed, circumstances were then recorded but only those involving boats were downloaded and used as data sources for our data abstraction forms described earlier.

We also conducted a small validation study to examine the effectiveness of using the free text search to identify drownings in the pathology database. Drownings for the Auckland region were also identified from a national database of drownings covering the period 1988 - 1994 that was created from vital statistics records. The list of names from the national database was sorted by year and compared with the names of all deceased persons, regardless of cause of death, examined by the Department of Pathology. An alphabetical index of coroner's cases maintained by the Police for each year from 1990 aided this process considerably. A direct linkage of all cases was not attempted because, geographically, the regions did not correspond and the bodies of a number of drowning victims were never found. Cases with no body found would not come to the Department of Pathology for investigation, even though the coroner may have held an inquest and certified death by drowning. Our study only examined those drownings where the body was found and brought to the Department of Pathology to be investigated by the Auckland Coroner as



these are the only cases for whom blood alcohol could be assessed. Additional information was also obtained from Water Safety New Zealand to update cases with missing data. Water Safety New Zealand collect data on all drownings in New Zealand and include a review of national coroner's files as part of their DrownBase.

In order to validate the completeness of recording blood test results we examined if there were any cases that were tested for BAC, but the results were not recorded in the computer autopsy report or on the hard copy file. This involved matching our list of cases, which apparently were not tested for BAC, with names in the logbooks of bloods that were sent by the Police for testing. The Police log book lists the names of all cases where blood was sent to the Institute of Environmental Science and Research Limited (ESR) in Porirua for testing, regardless of what tests were ordered. The vast majority was for BAC. We also examined the files of cases where blood was sent off but no records of blood results were in the files to determine if there was a reason to test other substances instead of alcohol. We found no reason to test for other substances for these cases. Consequently we assumed that, in drowning cases, the blood sent was tested for BAC. Discussions with Auckland pathology staff confirmed that in some cases blood results came back that were not added to the autopsy report, but only if the results were negative and unlikely to have any bearing on the inquest. In these cases the autopsy report and findings were already complete and thus the records that were included in the coroner's files would suggest that these cases were not tested for alcohol. Based on these discussions we decided that if bloods were sent to ESR, but no results were available, that the BAC would be assumed to be zero. No logbooks were available prior to 1988 and so for the period 1980-1987 we were reliant on BAC being recorded in the microfiche records.

3.2 Key Informant Interviews

In order to provide qualitative data on alcohol's role in all boating incidents and information on potential hazards to spectators of the America's Cup Challenge information was sought from a sample of key people, involved in the area of boating safety in the Auckland region. The informants were contacted, by phone, by a member of the IPRC and all agreed to participate in the study. Telephone interviews were conducted using a semi-structured interview schedule. Themes and patterns were identified and a draft report was prepared. Informants were then given an opportunity to comment on a draft of this section of the report and their comments were incorporated into the final version of the report. While these



results cannot be generalisable to the organizations represented, they provide a useful context for the statistical data collected.



3.3 Validation of case finding and evaluation of data available

3.3.1 Case Findings

The search of the pathology database for text words in the fields “opinion of death” and “place of death” revealed a total of 776 possible cases in the period 1988-1997. After these were included in the records reviewed and obvious cases excluded, a total of 264 possible cases remained and records of these were reviewed to determine if they were in fact drownings. The search for place names was not particularly efficient at detecting additional drownings because many street names were included in our search strategy (e.g. Beach Road). Of the 243 drownings in our final study, only 14 were identified solely by the place name (i.e. not by drown, immersion etc.). The ‘opinion on death field’ was blank on seven of these and six cases had the ‘opinion on death’ listed as “cause unascertainable” with no mention of any of our key identifying words. These involved those where the body was found in the water with no other details as to what happened. One additional case had “adult respiratory distress syndrome due to inhalation of water”. The search word immer[sion] picked up seven cases and the rest were picked up by the word drown[ing]. Another case was recorded as “asphyxiation and drug overdose” occurring on a boat but on reviewing the file it was excluded as this probable suicide did not involve drowning.

Following extensive searches for the names of potential Auckland area cases identified from the national database, we initially identified a total of six cases that had been seen by the Department of Pathology but were not picked up in our initial search of drowning cases. Of these six cases, one had the opinion of death misspelled as “drowing”. Two cases had the ‘opinion of death field’ blank and the details were provided in a separate ‘notes’ field which had not been included in our searching strategy. One other case had listed “multiple injuries” in the ‘opinion of death’ field but in the ‘notes’ field had descriptions of injuries after a fall including “the absence of inhalation does not exclude drowning. The injuries are sufficient to account for death”. We later, however, excluded this case from our study as we decided it was not a drowning. Two cases had “drowning” specifically stated in the field ‘opinion of death’ in the pathology database but had not been picked up when our copy of the pathology database computer file was made. It appears that these cases were missed during the compilation of the copied file. The reasons for this are unknown but may be due



to inconsistencies in the way the text files were strung together and illustrate the difficulties of relying on text words to identify cases.

3.3.2 Blood Alcohol Validation

Review of the BAC data in the Pathology Department computer files found several areas of concern with regard to their use for epidemiological studies. The first problem was that the BAC information was recorded in a text field rather than a specific data field for BAC. As a result, drug and alcohol results were recorded in the same place as were urine and blood BAC. The specimens and testing were easily identifiable but were not recorded in a consistent manner. For example, some cases had a blank field for BAC results but under a separate comment field it mentioned “blood alcohol zero”, or “no alcohol in blood or urine”. This caused four cases to initially be recorded as not tested but later to be recorded as zero. One high profile case, on checking with pathology staff, was found to be zero but the results were not in the file. In addition, several cases had no alcohol information in the computer file but data on testing was obtained from the hard copy of the autopsy report.

Another problem was that not all negative blood results were recorded. A check of the Police blood book of bloods sent to ESR for testing, found seven cases from 1988 – 97 where the blood had been sent for testing by Police but no result was recorded in the autopsy report or pathology computer file. It should be noted that, for the period 28/3/96 to 24/3/97, they did not record the names for the bloods sent so we may have missed a few cases that were sent over this time (six potential adult cases and four children were not tested during this time). One additional case identified from the Police logbook had a copy of the ESR report in the file (it was negative for BAC) but did not have results recorded in the computer or on the autopsy report. Thus, there were at least eight cases that were tested for BAC but the results were not on the pathologist’s autopsy report and thus would not have been included in the coroner’s files that are eventually sent for archiving in Wellington. One case had a ESR lab report in the file and we assume, based on advice from pathology staff, that the other seven without a report in the file, were negative and because the case had already been closed the pathology report was not amended.



For the purpose of analysing alcohol data, we only examined those who were aged 15 and above and excluded those who drowned in bathtubs, as these represent a very different set of drowning circumstances. Among all drownings tested, four had urine samples only. Two of these had a body recovery time of more than 48 hours. Of the two valid cases, one was zero and the other had a urine of 350mg/100ml.

For the boating cases from 1980-1987 the same procedures for analysis of alcohol data were done. Only one case had urine sample analysed but no BAC. This case was not found until 120 hours after the incident occurred and had a urine alcohol of 186 mg/dl. For the purposes of this study, those with a urine alcohol test only were included with the blood analyses since there is a close correlation between the two, although the urine is often slightly higher (Fatteh, 1973). Conversion to a comparable BAC would not have changed the BAC group to which the case was assigned.



4.0 Results:

4.1 Number of Drownings

[Note: boating cases for the earlier period 1980-1987 are not recorded here]

A total of 243 drownings were recorded in the coronial files over the period 1988 to 1997, of which 67 were under age 15 and not included in most parts of our study of alcohol involvement. Age was unknown in 17 cases (seven cases found within 48 hours). Review of these records indicated that they were all adults, mostly people on whom little was known, some were vagrants. All, but two of the seven cases found within 48 hours, were tested for BAC, three had a negative BAC and the other two had a BAC \geq 100 mg/100ml. For analysis by age, cases with missing ages were included in those over age 15 but excluded from the specific analyses for the age group 15-64 years.

Original hard copy records were found for all but four cases where, despite multiple searches, records could not be found. Limited details on these cases were available from the computerized database, all were male, they were ages 3, 44, 51, 97 and the opinion on death only stated "drowning". One case had a BAC of 413mg/100 ml and was recovered in the Waitemata Harbour, another had a BAC of zero and the other two were not BAC tested. It appears, that in all these cases, the body was recovered within a day of the drowning happening but these cases were not included in the analysis because of the lack of any further details.

Information on the type of water where the person drowned was available on all cases. A total of 12 people died in the bathtub, of which only one case was tested for BAC (a 75 year old woman with a BAC of 82mg/100ml). Bath tub drownings were excluded from further analysis as these represent very different circumstances to most drownings and are often associated with other diseases in the elderly or occur in very young children left unattended (three cases). There was a total of ten drownings due to suicide and no homicidal drownings. Only one of the suicide cases (a case involving a boat) was tested for alcohol and it was negative. Of the drownings, 51 were reported as boat related (21%). By boat related we mean any involvement of a boat including diving and swimming off a boat as well as a fall from a boat. These were included as boat involved because the boat can serve as



a place for drinking while participating in these activities. Data on life jacket use was also collected in our study but Police reports seldom mentioned if they were worn. More detailed data may be available from other sources such as coronial files, or Water Safety New Zealand.

4.2 Alcohol and Drowning

Overall, a total of 165 cases of drowning aged 15 and over were included in our study of alcohol and drowning which covered the period 1988-1997 (Table 1). This excludes 78 cases under age 15, that occurred in bath tubs, or had missing records. Of those included in the study, 69.1% were tested for alcohol. Of these almost 80% had their body recovered from the water less than 48 hours after the drowning occurred, i.e. the BAC results are considered to be reliable. For those aged 15 and over with short recovery time 73% were tested for BAC (91/124).

Among all cases (regardless of recovery time) the testing rates varied considerably by age (Table 2). Only 8.7% of those less than age 15 were tested (none were positive). The youngest cases with positive BAC's were four 18 year olds. Among older people (65 + years), only 34.8% were tested, of which only one had a BAC of 100mg/100ml or more. For those 15-64 years of age the testing rates were much higher (range 88.5 – 78.8%). Males were more likely to be tested than females, as were those cases involving a boat (80.6 vs 50.4% for non boat cases of all ages). Those non-boat drownings involving a car going into the water were almost twice as likely to be tested than the other non-boat drownings and they were more likely to be intoxicated. The proportion of cases with a positive BAC also varied by age with the highest proportion being for the age group 15-24 years (43.5%) of which 34.8% were intoxicated (defined as BAC \geq 100mg/100ml) and 39.1% were \geq 80mg/ml. For all cases aged 15 and over recovered within 48 hours of death 29.2% were intoxicated as indicated by BAC of 100mg/100ml or over (Table 3). Among those with high BAC's many were over 150mg/100ml. The most reliable statements about the involvement of alcohol and drowning can be made in those aged 15-64 years where testing rates were over 80% for the group as a whole (Table 2 & Table 4)). In this group 40.5% had a positive BAC, 34.5% over 50mg/100ml and 29.8% were intoxicated (BAC \geq 100mg/100ml), and 31.0% were over 80mg/100ml (Table 4).

4.3 Boating Related Drownings



These drownings cover a longer period 1980-1997. A total of 112 boating cases were identified in the study, 51 for the initial period 1988-1997 and 61 for the period 1980-1987 (Table 5). Of these, 89 would be considered classic boating “accidents” (38 falls and 51 due to sinking and other causes). An additional 23 cases involved activities while boating, such as swimming off a boat, wading to shore after drinking on a boat, scuba diving from a boat or suicide/potential suicides from a boat. One case involved an occupational incident where machinery exploded injuring the victim and throwing him overboard from a barge, and another was killed by a bomb planted on a boat.

Of the nine cases drowned while swimming from a boat – four jumped in to retrieve something from the water (hat, dinghy and a shotgun) two swam to shore, and three were swimming from the boat but not specified further. Two additional cases were wading from their boat to shore and drowned (one BAC 366mg/100ml, other not tested). Six cases drowned while scuba diving from a boat, one of whom sustained a serious head injury while diving and then drowned.

There were four suicides from drowning where the person jumped from a boat. Two suicides occurred when someone jumped off a boat with weights attached to their feet (one used a potato peeling machine from a ship). No BAC testing was done for these incidents. Another case rowed out to sea in a dingy and another tied himself to the anchor chain. One suicide, that took place on a yacht, was initially identified but later excluded as the person involved never entered the water. Another incident, where a canoe belonging to a drowning victim, with a known mental illness and depression, was found floating with no one in it, could have been a suicide but no other information was available. This was coded by us as a drowning of undetermined intent. It should be noted that these opinions are based on our impression after reading the case files and not on the final coroner’s verdict.

Twelve of the boating deaths were noted to have associated heart disease that may have been related to the death but this is difficult to prove. In several cases the pathologist noted that “a heart attack may have caused the fall into the water”. In two cases, although the event was not witnessed, the possibility of epilepsy as a cause of drowning was raised (one fall from a motor boat and another swimming to shore from a boat).

4.4 Boating Drownings and Alcohol



The testing rates for boating cases with short recovery times was much higher overall than for all drownings combined (81% vs 50%, Table 2). Analysis of all cases tested (regardless of time in the water), found that 50.0% had a positive BAC while if only those with reliable BAC's are considered 42.6% were positive for any blood alcohol (Table 6). This reflects the fact that bodies left in the water can produce their own alcohol (Fatteh 1973). Eight of all boating cases had a low BAC of 1-49mg/100ml while only four of those with reliable results had this low BAC level.

The distribution of elevated BAC by age showed some excess in those boating victims aged 45-64 years (55.0% had a positive BAC compared to 42.1% for cases 25-44 years (Table 7). None of the four female victims tested were positive. The testing rate overall was high in ages 15-64 (84.6%) which enables valid estimates of BAC involvement to be made for this group. Among those 15-64 years with complete and valid BAC testing, 43.2% (19 of 44) of the boating fatalities had a positive BAC, 34.1% had a BAC over 50 and 27.3% (12 of 44) over 100mg/100ml; 27.3% were also over 80mg/100ml, the legal driving level in New Zealand).
(Table 7)

Because of the small number of cases in each individual group of boating deaths it is difficult to make definitive statements about the role of alcohol in each type, even with the increased number of boating cases. However we have a large number of falls from boats. In total we had 38 cases involving falls from boats (34%); 11 cases fell from a dingy, 4 from a kayak or canoe, 10 from sailboats and 13 from other or unspecified boats (Table 5). A total of 16 falls from boats met our criteria for reliable blood alcohol results (short recovery time) and were age 15 and over. For all falls overboard 10 of 16 or 62.5% were intoxicated. However four of those cases involved commercial craft (one was washed overboard from a large freighter, one dragged by rope on a Japanese fishing boat, one fell over the side of a large ship at Captain Cook wharf and the last case fell into the water while trying to jump onto a departing ferry). Thus if only falls during recreational boating with valid BAC are considered, 67% (8 of 12) were intoxicated.

For the period 1988-1997 we evaluated the ability of Police reports to assess alcohol involvement. The Police reports made mention that three of the cases were obviously intoxicated (BAC levels 277 & 235 mg/100ml and a urine only alcohol concentration of 396



mg/100ml). In addition they mentioned that one case had been drinking alcohol and eating but did not indicate the person was drunk (the BAC on this person was zero). In comparison we found that 10 cases had a $BAC \geq 100$ mg/100ml based on testing. Thus if we were to rely on Police reports we would only be able to pick up 30% (3 of 10) of the cases who were intoxicated, indicating that Police reports are an unreliable source of data on alcohol involvement. The only way to really tell is to measure the BAC on all cases.

4.5 Issues Raised by Key Informants

All key informants agreed to participate in this study. This group included representatives from: i) the Police Maritime Unit Auckland; ii) the Hauraki Gulf Coastguard Alliance; iii) the Harbourmaster's office and iv) the Maritime Safety Authority. Comments were requested on the four identified themes of: data collection; the incidence of alcohol in boating incidents; suggestions to address the problem; and other agencies that might have further information. All direct quotes are in italics. Firstly, they were asked if their organization collected any data on rescues from boating "accidents" on the water.

The Maritime Safety Authority has a statutory responsibility for public safety on the water. It is a requirement by law for the skipper of a craft involved in a boating accident to complete a Commercial or Pleasure Boat Accident Reporting Form and forward this to the Maritime Safety Authority where they are compiled in Wellington. However it would appear that *"these forms are only as good as the person reporting them"*. The current form being used has been in use since the beginning of the year, is compatible with the Coastguard and Police reporting requirements and was developed in consultation with these organisations and Water Safety New Zealand. *"There has been an increase in the number of these forms being received and this is gaining momentum"*. Nationally, however, only 426 reports were received at the Maritime Safety Authority for the period 1st September 1996 to 31st August 1997 for both fatalities and serious (not defined in their report) incidents.

The Police Maritime Unit Auckland has a statutory responsibility for search and rescue on the water. Attendance at all incidents is reported in a coded form but limited information is available. In addition they complete a P47 Police form if there is a death and a P130 form for serious incidents where no other Police agencies are also used to resolve the incident.



The only record of minor incidents is in an incident coding system. This information is sent to National Headquarters in Wellington. In addition, for serious incidents they fill in a form for the Maritime Safety Authority and a copy of this is kept locally. The Maritime Police consider that very little information on the incidents is gathered officially unless someone dies in the incident. Non-fatal injuries, or property damage only incidents, were considered to be greatly under reported. Mention was made of the anecdotal evidence of much boat repair work done by boatbuilders yet they have few reports. Furthermore they suggest that reliable data will not be available until there is a system in place that includes information on enforcement of boating laws, user licensing and a boat identification database. They are of the opinion that most non-fatal incidents are not reported. They also do not consider that the incident information they collect is in an easily retrievable form and it is not computerized.

The Coastguard is a voluntary group that provides rescue services, safety patrols and training in boating safety. At the site of every incident they are called to, the Coastguard skipper fills in an incident sheet and a complementary incident sheet is completed in the operations' room by those monitoring the rescue. It is estimated that approximately 1,000 to 1,100 incidents are attended to per year and all these are permanently recorded on paper in their office, although not in an easily retrievable form. From these reports an abstract is prepared and forwarded to the Royal New Zealand Coastguard Federation where they are computerised. This processing of abstracts only commenced in the past year (1998).

The Harbourmaster's office has statutory responsibility for public safety on the water: they man harbour patrols in the Waitemata and Manukau harbours and are sometimes the first at the scene of an incident. The harbour patrol hours in summer are operated essentially by volunteer organizations whose operating cost are met by the Auckland Regional Council. The Regional Council provides one Council manned and owned vessel. While occasionally these harbour patrols become involved in rescue operations, their prime task is regulatory i.e. to ensure that the bylaws are observed. In summer, between 11.00 and 17.00 hours on Saturdays, Sundays and Public Holiday, they operate six boats in the Waitemata and three boats on the Manukau. In winter they man one boat on a Sunday. During weekdays their boats are not generally out patrolling. The Harbourmaster's Office keep statistics of all incidents and would provide these for any further investigation if needed. However they stated they "*were not in any detail*".



All those contacted, apart from the Maritime Safety Authority, stated that they did not have data on alcohol involvement. The Coastguard consider that there are difficulties associated with providing data on alcohol involvement, as this would be a subjective judgment. The Police stated that they do not have the authority to breath-test on the water. In an attempt to address this the Police plan to target car drivers at launching ramps and roads about marinas for breath testing as part of the campaign against drink driving. The Maritime Safety Authority collect data on alcohol involvement but rely on the impression of the person filling in the form. They consider that, from the data they have reported to them, alcohol does not appear to be a big issue. However they are now reviewing alcohol use on the water and as the first step are preparing a discussion paper on the use of drugs and alcohol on board New Zealand ships.

The informants were also asked if they considered that the incidence of alcohol and boating was a big problem. All considered that the incidence of alcohol and boating was a problem but were divided with regard to how much of a problem this was.

The Harbourmaster's office considered that at present "*there are very few incidents where alcohol is a contributing factor*". However they have "*grave concerns about the America's Cup when the sheer numbers and circumstances, hot sunny days, long periods without any activity will mean that there will be many people out on the water who have consumed alcohol*". They believe this situation will be very different to the current situation and will pose very different problems. It should be noted that the Harbourmaster's office only patrol between 11.00 and 17.00 at the weekend in summer at present and agree that there could well be boat skippers and crew who are under the influence of alcohol outside these hours.

The Coastguard consider that alcohol use is a difficult question to answer due to the lack of data. They feel that the incidence of alcohol related boating accidents would probably be less than that of road crashes and "*whilst an inebriated person in either circumstances is unacceptable the consequences in a boating environment are likely to be less because there is more room out there*". There is a feeling that many alcohol related incidents are not reported, yet they hear of them over the radio. Mention was made of the incidence of men falling overboard while urinating over the side of the boat and it was stated that "*the others who are also inebriated, laugh and think that it is a great joke and let him struggle*". It was mentioned that "*a prominent boating tutor always includes the dangers of this practice in his*



lectures". Mention was also made of "some accidents that have occurred on the harbour with people in boats where death has not been from drowning and alcohol has probably been involved".

The Police consider that many of the more serious boating accidents have alcohol as a contributing factor. Concern was expressed that "now that there are many waterfront pubs and restaurants, there is a growing trend of boaties using their boats as an alternative means of transport". They consider that there is a potential danger for all those on a boat if it sinks or is overturned, not just for those who have been drinking. They are also concerned that there are now 38 commercial vessels with liquor licenses and there is the potential for intoxicated patrons to become disruptive while consuming alcohol on board.

Thirdly, respondents were asked what they thought should be done to address the situation regarding boating and alcohol, both for their organization and for others.

The main issue identified was the difficulties associated with identifying boats and their skippers when there is no system in place for user licensing and boat registration. This prevents clear identification of individual vessels. Other countries have a formal boat registration system similar to motor vehicle registration with clear registration numbers being displayed on boats. The Police have no powers to conduct BAC testing and there is no real method of dealing with those that are excessively drunk. However they sometimes arrest people and charge them with other offences – such as section 65 of Police law which includes offensive behavior and taking unnecessary risks. This could change as, in a lead into the America's Cup, there has been a proposed amendment to the Maritime Transport Act relating to offences of intoxication whilst appearing to be in charge of a craft. This amendment has been to the select committee and it is anticipated that legislation will be in place by the end of the year. Police have also been given equipment to carry out licensing visits to charter vessels.

However, there were others we interviewed who considered that the registration of craft and skippers was unnecessary, that attempting regulatory action to address the situation regarding boating and alcohol was impossible and that education was the main factor to improve the alcohol related behavior of skippers and their crew. "The problems need to be highlighted. Boaties need to realize that it isn't a laugh and hoot when someone falls out of



a dinghy or falls overboard urinating". Another respondent stated that *"Skippers and crew need to consider the reality of not being able to step out and walk away"*.

Lastly the informants were asked if there were other organizations we should be talking to and it was suggested that it might be helpful to talk to representatives from: Watersafe Auckland; the Small Boat Safety Committee; the Boating Industries Association; the Auckland Yachting and Boating Association; local policemen in shore areas; the Rodney District Council; the Outboard Boating Club; the Royal New Zealand Squadron; and marina management at Half Moon Bay, Pine Harbour, Gulf Harbour, West Park and Bayswater; and the Insurance Council of New Zealand.



5.0 Discussion:

The findings of this study confirm that alcohol appears to be an important factor in both boat and non-boat drownings, especially among those falling from dinghies and powered boats. Among those aged 15-64 years (the group with high rates of BAC testing) and reliable results i.e. recovered within 48 hours of drowning, 40% of all drownings had a positive BAC (Table 4), 35% had a BAC over 50mg/100ml, 30% were intoxicated (BAC \geq 100mg/100ml) and 31% were over the legal New Zealand driving limit of 80mg/100ml. Alcohol involvement was a little higher in the same group of boating cases with 43% having a positive BAC, 34.1% over 50mg/100 ml and 27.3% being intoxicated, with the same proportion also being above the legal New Zealand driving limit. An important addition to this updated report is that we were able to collect data on an additional 61 boating cases that occurred in the period 1980-1987. The increased numbers enable us to make a more definitive statement about the role of alcohol in boating fatalities.

Both the proportion of adult drownings and boating fatalities with alcohol involvement in Auckland are similar to that for drivers killed on New Zealand roads. The Land Transport Safety Authority (LTSA) estimate that about 30% of the drivers killed in motor vehicle crashes in 1995 had a BAC above the legal limit of 80mg/100mg (LTSA, 1996). This is only an estimate because, even for the fatally injured drivers in that year, only 75% of drivers were tested for BAC. Of those tested, 34% were above the legal limit. These figures are comparable to that for both drowning and boating fatalities, and demonstrate that alcohol use is as much a problem for drowning and boating as it is on the highway.

Drowning due to falls from dinghies and powered boats were much more likely to involve alcohol, with 67% of victims being intoxicated. It is interesting to note that the other boating incidents seem to have much less alcohol involvement. The boating activities that we found to be most involved with alcohol, both from the statistical analysis and from the key informants, are those most likely to be important in events around the America's Cup, namely falling from boats. A concern, highlighted by this study, is the danger associated with falling from a powered boat or from a dinghy. In particular it would often appear that small dinghies, used as tenders to move between yachts and motor boats or to the shore, are being manned by persons who are intoxicated. There is also a concern regarding intoxicated people moving about on powered boats. Unfortunately the Police reports give



little further detail on the type of boat involved although we were able to get additional data from Water Safety New Zealand and the Maritime Safety Authority. The activities related to falls from dinghies and powered boats often occur after normal boating activities such as sailing and fishing and may be more related to drinking of alcohol on the boat after a day on the water. All the key informants commented on the activities between boats that involved alcohol and felt concerned that the normal safety procedures observed on the larger boats were relaxed when using dinghies. They also considered that the small dinghy type boats were often stretched beyond their capabilities. Thus alcohol appears to be an important problem in certain activities on boats and key informant interviews indicate that these activities are more likely to occur in events surrounding the America's Cup.

Our findings on alcohol involvement in drowning and boating injuries are similar to those found overseas (Howland et al 1988, 1993, 1995, Smith et al 1988, 1998), where alcohol is increasingly being recognized as an important risk factor for deaths from aquatic activities. Our present study of all drownings, covering 1988-97 and boating for 1980-1997, also updates and supports those of an earlier published study of drownings in Auckland from 1979-82 (Cairns et al, 1984). This study reported that at least half the "accidental" drownings among those aged 16 years and older had evidence of consuming alcohol and the measured BAC's were over 100mg/100ml in 37% of cases. The authors also report that "It is remarkable that the most dramatic finding was that in 75% of boating fatalities and 50% of the falls (into the water) the BAC was well in excess of 100mg per 100ml of blood". However, detailed analyses of the data in the tables suggest some inconsistencies in the data. The 12 persons with intermediate alcohol levels are not reported in the table of alcohol involvement making the true proportion of cases intoxicated by activity difficult to determine. In addition, for the boating cases the table suggests that 43% (9 of 21) boating cases were intoxicated compared to 75% reported in the text of the paper (see original paper in Appendix 1 of this report). Despite these limitations the paper provides strong evidence of the role of alcohol and drowning.

Another strength of the earlier Auckland study by Cairns et al., was its high BAC testing rate. Of the 150 drownings, 36 were in the water too long for valid testing and of the remaining 114 cases, BAC data were available for 97 cases (85%). Our overall testing rate for reliable BAC data was somewhat lower (67%) but was higher among people 15-64 years of age. One potential reason for the recently found lower testing rates is the current high cost of



BAC testing at ESR and the concerns of pathologists to conserve the scarce resources allocated to the coroner. This problem could be overcome in future studies if bloods were tested locally for those cases where legal evidence was not required. The cost of medicolegal testing by ESR is over \$40 while they could be tested at Auckland Hospital for about a quarter of the cost. For our study we used a cut off of 48 hours for determining the reliability of BAC results. The time was not mentioned in the earlier article, but relied on the impressions of the examining pathologists. The different approaches to considering valid cases for studying BAC are likely to have minimal influence on the findings.

A limitation of the present study is that it relied on the records in the Department of Pathology and did not examine the full findings from the coroner's inquest. These records are not kept in Auckland but, once the final inquest reports are completed, are forwarded for archiving by the Department of Justice in Wellington. While we did not have the benefit of the detailed statements by witnesses (if any) or family members, our records did include the initial Police investigation report (P-47) which provided details of the event, or, if no details were available, how and where the body was found. Unfortunately the Police forms contain little detail on lifejacket use despite their proven lifesaving capacity. Follow-up studies are needed to collect more information on many of the missing details from other sources. In addition, drownings where no body was found are not part of our study as an autopsy could not be performed. Thus our study will probably underestimate the true incidence of drowning. In addition we did not analyze drownings in those less than 15 years of age as they represent different causes, of which swimming pools are an important cause especially in younger ages (Cairns et al 1984, Langley 1983).

Our findings on alcohol involvement however, represent as complete a picture as possible because a missing body is not available for BAC testing. Our study also relied on the Police report to determine intent, i.e. homicide, suicide or "accidental" and this may differ from the final coroner's verdict. Records in Wellington would need to be examined to determine the verdict and funds were not available to enable this to be done. For boating cases, the intent is usually clear, but non-boat related drownings include a number of suicides. The coroner's inquest however, could provide valuable additional information for boating cases such as more detailed circumstances surrounding the boating incidents. Our earlier study had only a limited number of cases of boating incidents (51 cases) and the addition of a further 61



cases in this new study improves our ability to estimate alcohol involvement in boating but only for the Auckland region.

A review of national data would provide a larger, more representative sample of cases, and would provide a more comprehensive picture of boating incidents in the country. However, the low rate of alcohol testing nationally would prevent any reliable statements being made on alcohol use. Linkage with data from Vital Statistics, Water Safety New Zealand and the New Zealand Maritime Safety Authority would enable identification of cases where the body was never recovered. Follow-up studies are needed which link information available from the other sources. More work is also needed to investigate the cases with missing ages or missing details in the files at the Department of Pathology. These details could easily be obtained from a review of national coroners' files in Wellington but would require additional resources.

The Department of Pathology database has been a valuable tool for their purposes over the years since it was created. However, as our study found, it has some limitations with regard to its use for epidemiological studies. The database's extensive use of free text is very useful for record keeping and obtaining details on individual cases. However relying on free text to identify cases is difficult due to inconsistencies in the way data are recorded. The system is especially difficult when used to identify specific causes such as boating instead of using broad causes of death such as drowning. Future searches should also include the 'notes' field as some cases of drownings were only noted in this field. Similar problems were encountered in abstracting free text alcohol information. The addition of coded 'cause of injury' variables and other coded fields would aid considerably the use of this valuable resource for epidemiological studies. In addition, causes of death are reliant on the initial Police report and do not have the benefit of information obtained from the full coroner's inquest. A number of overseas studies have demonstrated the value of using data from the coroner's files and linking them to other sources of data such as that from the Pathology Department (Bennett 1978, Johnstone 1992, 1998, Moller 1992, 1998, Selby 1992, 1998). Efforts are currently underway to develop such a system for Auckland and funding for this is being sought.

One important feature of the present study is that, in the Auckland region, testing of drowning victims is much more complete than at a national level. An earlier study



that reviewed national coroners' files for the three-year period 1992 – 94 found that only 36% of the drownings aged 10 and over were tested for BAC (Warner, et al 1998). Our comparable figure for those aged 15 and above in the Auckland region for all drownings 1988-1997 is that 69% were tested. In the earlier national study if only those tested were examined, about 50% of the cases tested would have been found positive for alcohol. However, because investigators are much more likely to test those they suspect of drinking alcohol the true figure probably lies between a high of 50% to a low of 12%. The earlier review also suggested that testing practice may vary by coroner's court. Because of the Auckland Department of Pathology's interest in testing BAC for drowning cases, a much higher proportion of drowning cases had reliable results. We found that over 69% of all drowning cases were tested. This resulted in a much more representative sample of drownings with reliable BAC for this study. This is especially true for the age group 15-64 years where most people were tested for BAC (83% for all drownings and 85% for boat involved cases). Testing was much less complete in other age groups. Even if we assume that all the cases not tested in our study were negative (an unlikely scenario) the proportion of drownings age 15-64 years that were positive for alcohol would only range from 34 - 41%. The lower sensitivity range reflects our high testing rate. Similarly, for boating deaths, the range would be 37-43% positive in ages 15-64 years of age because of the high testing rate.

Our study also confirms the suspicion raised in the earlier evaluation of alcohol testing for drownings at the national level, that some cases may have been tested for alcohol but this is not recorded in the coroner's records. Discussions with Auckland Pathology staff confirmed that this does happen sometimes if the results are negative and arrive after the autopsy reports have been typed. As mentioned earlier, we found that eight cases, over the time period we analysed, had had a blood sent off for testing, but the results had not been recorded on the autopsy report (one case did have a hard copy report in the files). While we do not know how widespread this practice is nationally, it does reveal an area where recording of test results for BAC could be improved.



All key informants contacted were committed to the concept of safety on the water and keen to implement changes to reduce the incidence of boating “accidents” on the water. However they noted that collecting information on these “accidents” is fraught with difficulties due to the very nature of the conditions at the time. Thus it would appear that the requirement for filing reports with the Maritime Safety Authority is not routinely complied with. Data provided by Maritime Safety Authority for the period 1994 to 1997 noted three alcohol related deaths for the Auckland region whereas for the same period 1994-97 we were able to locate seven alcohol related boating drownings. Another important issue, identified by some of those interviewed, was the value of implementing a boat registration system. Such a system is in widespread use in many countries and has proven useful for the enforcement of boating laws and the identification of stolen boats. It was beyond the scope of the study to investigate this issue. A review by the Water Safety Council in 1994 (Budge 1994a) could find no evidence that boating registration improved boating safety. The Maritime Safety Authority is currently revisiting the need for boat registration. Opinions are clearly divided with regard to the need for registration of boats and it is not clear whether, if this was introduced, this would cover dinghies especially dinghies associated with larger vessels. Many boating registration systems exclude the smaller boats which our study found to be the most frequently involved in boating fatalities.

As noted in our review, the mention of the person being intoxicated in Police reports is unreliable – only three boating fatalities from 1988-97 had Police reports that noted that the person was drunk while a total of 10 cases in our study had a BAC \geq 100mg/100ml (three were in the water more than 48 hours but their high levels indicate having been drinking alcohol prior to death). This confirms earlier studies that relying on reports of victim alcohol use or intoxication by Police or others are unreliable and that the only way to reliably assess alcohol involvement is to test all cases.

A limitation of our study is that it only looks at fatal drowning and boating injuries. It would appear from the opinions expressed by the key informants that many other “accidents” on the water are not reported. It would also appear that more information on the range and extent of boating “accidents” could be gained from conducting interviews with those organizations listed at the end of the findings section of this report as likely to be able to provide useful information. However, although we have no statistical data, it is apparent from the key informants that many people consume alcohol on their boats. One major area



of concern relates to the use of dinghies; using them beyond their capacity; and failing to observe the safety procedures observed on larger vessels.

One approach used to address the issue of alcohol and boating is to concentrate largely on the driver or skipper of the boat. Similar programmes have been successful at reducing drunk driving and alcohol-related motor vehicle fatalities (NIAAA, 1997). At present no boating legislation in New Zealand addresses drunk boating (Budge 1994b). Overseas, increasing efforts are being made to encourage sober skippers with appropriate accompanying regulatory enforcement such as legal permissible BAC levels and random breath testing on the water (Howland, Smith et al, 1993). These strategies are an important part of reducing the risk of fatalities from boating. However it must also be realised that simply applying interventions used on the highway to combat drunk driving may not always be fully effective on the water. Unlike the highway setting, a sober boat driver cannot always protect their intoxicated passengers. Many boating drownings occur regardless of the action of the skipper and occur from incidents such as falls overboard while fishing, retrieving anchors, transferring from boats, or swimming off boats.

These drownings are important to consider in evaluating the value of promoting a designated skipper programme similar to that promoted for designated drivers on the highway. We are concerned that such programmes may be “missing the boat” and ignore the fact that many passengers drown irrespective of the actions of a skipper (Howland, Smith et al, 1993 see Appendix 2 for copy of article). Furthermore an implicit message of designated driver programmes is that it is okay for passengers to drink as the driver will get them home safely. Adoption of such programmes on the water may put large numbers of passengers at risk of alcohol-related drownings. While it is easier to restrict drinking among boat operators there is a need for a broad multi-faceted approach that also addresses drinking among passengers. Rather than promoting designated skipper programmes it may be better to promote ideas such as “if you drink alcohol, wear a life jacket”. More work is needed to determine the most effective programmes to reduce the risk of alcohol-related drownings and boating fatalities. These programmes will involve collaboration with a wide variety of organizations involved in water safety including Water Safety New Zealand, The Maritime Safety Authority, Coast Guard, Maritime Police, Harbourmasters and many other groups.



6.0 Conclusions:

Alcohol use is an important and under recognized risk factor for many injuries. This study provides good evidence of the role of alcohol in drowning and boating incidents. Based on the results of our study, alcohol involvement in water-related fatalities is high and as important, if not more important, than involvement in fatal motor vehicle injuries. Falls from dinghies and motor boats are of particular concern as 67% of these falls in our study were alcohol related. These findings have important implications for all policy makers responsible for safety practices and procedures on the water and especially those involved in developing safety practices and procedures for the America's Cup.

There are a number of factors that make the likelihood of alcohol involvement more of an issue around the America's Cup than in normal boating activities: firstly, most of the boats out on the water will be spectators and not likely to be as active as they would be during normal boating activities; secondly, key informants estimate that the average small spectator craft will spend about five hours in the water, most of that time anchored in areas outside but near the race course; thirdly, the number of boats are likely to run into thousands on key days which could result in a poor view of the event, the likelihood of boredom, and the subsequent consumption of liquor; and fourthly, there will be an additional potential hazard of falls from the marinas, wharves and other spectator areas. In addition the whole event has a party atmosphere with liquor industry promotion and sponsorship of at least some events. This is an important consideration as liquor industry promotion and sponsorship without a similar promotion of safe drinking of alcohol on the water could result in unnecessary tragedies.



7.0 Recommendations:

The following recommendations are based on the findings contained in this report. These recommendations are provided to facilitate the improvement of alcohol data collection in New Zealand and to provide information for policy makers involved in planning safety procedures and practices for the America's Cup.

7.1 To improve the quality of alcohol data available on drownings it is recommended that:

- All drownings and other injury fatalities should be tested for alcohol as part of their investigation. In addition, the results from all bloods tested should be recorded in the coroner's files even if they are negative. Future studies should also allow for resources to check directly with the laboratory at ESR for those cases with no test results to see if any were tested and to confirm that the results were negative.
- More use should be made of death investigation data, such as that from the Department of Pathology database at the Auckland University, for epidemiological studies of fatal injuries such as drownings and boating injuries. The database is a valuable source of information covering about a third of the New Zealand population and could be made more useful for injury research by linkage with the final coroner's court findings, inclusion of coded variables such as specific causes of death and universal BAC testing.
- The establishment of a national coronial database should however be a long-term goal. This would provide representative information for the whole country.
- All boating drowning reports should include information on whether those involved were wearing life jackets.
- All drownings and people who incur serious injuries while boating in New Zealand should be tested for alcohol in order to better understand the problem, inform policy decisions and for the development of injury prevention initiatives.
- Consideration should be given to gaining further information regarding the circumstances surrounding non-fatal boating "accidents" by contacting those organizations suggested by the key informants. In addition, linkage of data from different organizations would provide a much more comprehensive picture of boating fatalities and should be considered in future studies.
- Follow-up studies should be conducted to improve the data available for the current cases such as through linkage with coroner's inquest findings, vital statistics records, and records from Water Safety New Zealand and the Maritime Safety Authority to fill in missing details such as age, boat type and life jacket use. In addition, information is needed on cases lost at sea and those occurring elsewhere in New Zealand.



7.2 To facilitate the development of appropriate programmes to reduce alcohol related aquatic injuries associated with the America's Cup challenge it is recommended that:

- Efforts be made to increase the public's perception of the hazards of alcohol use and boating.
- Those planning activities around the time of the America's Cup recognize the potential for increased alcohol use on the water and develop appropriate strategies.
- Consultations be held with relevant groups concerning the development of appropriate strategies to reduce boating fatalities and injuries.
- Injury prevention programmes be developed to address the problems associated with the consumption of alcohol on boats highlighting both the need to be as vigilant when in charge of a boat and passengers as one would be in charge of a car and the risks of alcohol consumption among passengers. While efforts to reduce alcohol use among boat operators are a component of programmes to reduce boating fatalities, drunk passengers are also at risk on their own regardless of the actions of the skipper.
- Appropriate injury prevention programmes be developed to address falls from boats, especially focusing on falls from dinghies and motor boats and include the need to wear life jackets on all occasions especially if consuming alcohol. These programmes would need to highlight the dangers experienced when consuming alcohol on board and when travelling between boats and the shore. It would appear that many safety procedures observed on boats are not given the same attention in dinghies.
- Any injury prevention programmes developed to address safety on the water are appropriately evaluated.



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