National Marine Safety Committee

NATIONAL ASSESSMENT OF BOATING FATALITIES IN AUSTRALIA 1999-2004

REPORT

May 2008

National Assessment of Boating Fatalities in Australia 1999 – 2004

Prepared for the National Marine Safety Committee Inc.
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Staff from the marine safety authorities assisted in copying the extracted files and forwarding them to the author. Without this assistance, the project would not have been possible within the budget available.

Further information:

As it is not possible to anticipate all information needs, the results presented are only a sample of those that could be made available. Requests for further analysis of the available data should be forwarded to the CEO of the NMSC.

Disclaimer:

People using the information contained in the report should apply and rely upon their own skill and judgement. The data standard for the study provides a transport sector perspective on boating deaths framed around state and national transport legislation and not to other perspectives or legislation, for example, broader health, safety or occupational injury perspectives and legislation. The interpretation and conclusions drawn in this report are those of the author and are not necessarily those of the NMSC or any of its members.

The National Marine Safety Committee Inc is an Intergovernmental committee charged with achieving uniform marine safety practices throughout Australia. It is comprised of the Chief Executive of each of the marine safety agencies in Australia.

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EXECUTIVE SUMMARY

Since 1992 it can be estimated that boating fatalities have cost the Australian community in excess of one billion dollars.

The findings of the study warrant further attention. In particular, the following results are noteworthy:

1. An apparent large increase in the frequency of overpowered and overloaded vessels.

2. People can double their chances of surviving by wearing a personal flotation device.

3. Alcohol continues to be the primary risk factor. The results indicate the needs for increased surveillance and control of alcohol and drug use among the boating public. Attitudes toward alcohol use when boating need to change and should be the focus of a media campaign.

4. People killed in boating incidents are older than observed in the first fatality study. In addition, ill-health involving various co-morbidities and medication use is now more common.

5. Dinghies continue to be the most common type of vessel involved in fatal incidents. The results reflected on the inherent instability of dinghies and the risk involved in alcohol and drugs and failure to wear a PFD for the operators and occupants of dinghies.

6. Alcohol and ill-health were the dominant initial contributing factors for person overboard. After consuming alcohol or being ill, balance is often affected and people become unsteady on their feet, which is a strong risk factor for falling overboard. People need to be more effectively warned about the dangers of falls overboard, especially involving alcohol and ill-health.

No specific policy recommendations are made in this report as this is the role of the NMSC and the marine authorities. However, it is highly likely that a number of the key results and associated discussion presented in the report will further inform policy.

Background

This study constitutes the second comprehensive national level analysis of fatal injury due to boating in Australia. Data from the Australian Bureau of Statistics (ABS) was used to identify the people who had died in boating incidents so that a more in-depth analysis could be undertaken through access to the Coroners' files either directly or through the National Coroners Information System. Coroners' files provide the best available source of detailed information on boating fatalities in Australia.

It was not the intention of the study to repeat every analysis conducted in the first study (O'Connor, 2004) because many issues were thoroughly researched previously and do not need to be repeated. Rather, the intention was to see what recent data show about boating deaths and incidents. This report contains the results of some new analyses not conducted in the first study. Where relevant, contrasts between the results of the earlier and later studies will be made to highlight changing trends that could reflect the impact of legislation, standards, enforcement and compliance. Some of the analyses presented in the present report are not directly comparable with the earlier report, due to occasional different selection factors utilised in this report, these changes being designed to deliver a more precise and relevant appraisal, informed as it were by the first study and giving due consideration to the changing context and interests in boating safety in Australia. Where results are comparable, this is indicated in the text. Where results are not comparable, no comment will be made comparing current and previous results and the reader is cautioned against making such comparisons.

This study was, as with the first study, an arduous undertaking that spanned over a couple of years. The task at hand was technically simple, involving the extraction, analysis and reporting of data in a common format and according to relevant national data standards (NMSC, 2000), using information in the Coroners' files. However, the main obstacle in practice was administrative delay in accessing the required information and, in one State, identifying names of the deceased. The availability of data from the National Coroners Information System simplified the administration where the relevant files were available and coded, but offered little assistance where coverage of deaths was a problem.

It is unlikely that a future national boating fatality study would be practical without the National Coroners Information System and attention should be given to improving its coverage and timeliness.

Study aim

The aim of this report is to present information on fatal boating incidents in Australia gathered from files maintained by the Coroners[1]. The files were identified from death registration information from 1999 to 2004 recorded by the ABS. One of the planned outputs of the study was the creation of a national database of boating fatalities. The report also presents information relevant to the monitoring of fatal and non-fatal boating injury in Australia.

[1] The reader is advised to consult the NMSC (2000) data standards in order to understand the scope of interest of the report and the definition of individual data items. The data standard for the study provides a transport sector perspective on boating deaths framed around state and national transport legislation and not to other perspectives or legislation, for example, broader health, safety or occupational injury perspectives and legislation.

Methods

The study was undertaken in a number of steps[2].

Step 1: Negotiation of administrative arrangements

ABS death data was used to identify cases for in-depth assessment using Coroners' files. The names of the people killed were identified via the Registrar of Births, Deaths and Marriages in each State. Where data for any death was available on the National Coroners Information System, that information was coded first. Often that data was comprehensive. Only where the data was not comprehensive, was further data sought directly from the Coroners. The lists of names were provided to the Coroners in each jurisdiction along with a letter requesting access to the relevant files. The offices of the Coroners indicated their willingness to facilitate the study. Where necessary, the marine safety authorities assisted in providing letters of support for the study in order to ensure the best possible administrative arrangements for the study.

Access to the files took a number of different forms. All but two states/territories allowed photocopying of the full contents of the files where required. In two states, the Coroner's office required the files to be coded in their office. In some states, staff of the marine authorities visited the Coroners' offices and photocopied the contents of the files and sent them on for coding.

Step 2: Form and database design

The data collection form used was that developed during the first fatality study, framed around national and state transport legislation and NMSC data standards. The data entry and reporting facilities of the database were tested and verified.

Step 3: Data collection and data entry

Following coding, data was entered into a data file for analysis. Various crosschecks were undertaken to verify the data entry.

Step 4: Data analysis and reporting

The data was analysed using the SPSS statistical analysis software package (Norusis, 1998). The output was reported in a format that was consistent with the recent Phase 1 report (O'Connor, 2002) and other Australian boating studies.

The analysis focussed on national level aggregations of the data, presented as figures, tables and descriptive commentary.

Some of the analyses presented in the present report are not directly comparable with the earlier report, due to occasional different selection factors utilised in this report, these changes being designed to deliver a more precise and relevant appraisal. Where results are comparable, this is indicated in the text. Where results are not comparable, no comment will be made comparing current and previous results and the reader is cautioned to not make such comparisons.

[2] The reader should consult the Phase 1 report (O'Connor 2002) in order to gain a fuller appreciation of the steps involved in the project. The additional step in the second fatality study was to code data based on NCIS information first, where available, before seeking information from Coroners offices.

Results

Trends based on ABS data

Based on ABS data (ABS, 2007), there was certainly a decline in water transport deaths registered from 1992 to 1998 (Figure 1). However, registrations increased substantially in 1999 and the annual case number has not since returned to the low observed in 1998 (50 in 2004 versus 49 in 1998).

As reported in the first fatality study, ABS data provides an uncertain guide to trends in boating deaths due to differences in the scope of interest of NMSC and the ABS, discussed later.

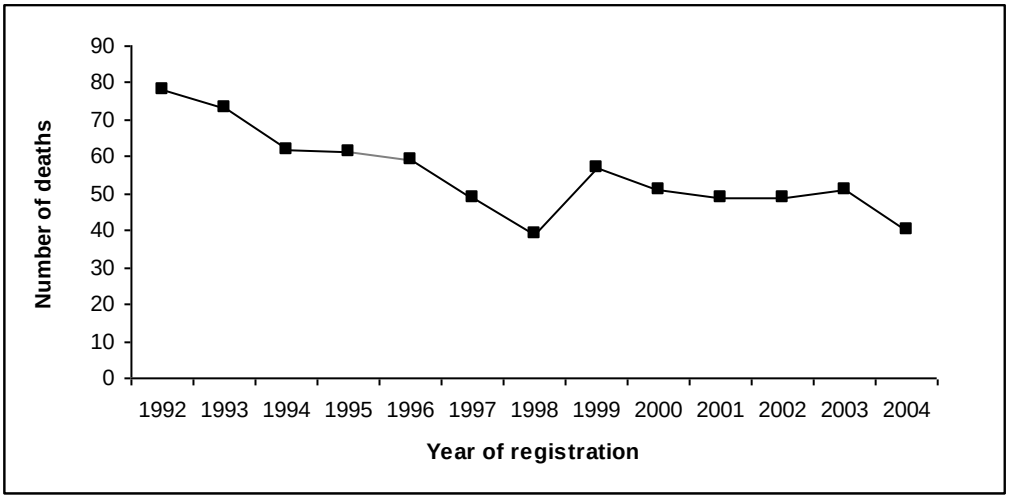


Figure 1: Number of water transport deaths by year of death registration, Australia 1992 to 2004 (ABS data).

Assessment of Coroners' files

As encountered in the first national fatality study, this assessment of the Coroners' files raised a number of issues affecting analysis based on ABS data.

In brief, the analysis showed that there were some coding errors in the ABS data, deaths prior to 1999 and deaths not registered by the ABS.

The main issue affecting the use of the ABS data was the differences in the scope of interest of the ABS and NMSC.

The ABS statistics include deaths that reflect Australia's international obligations in respect to deaths involving trading and other vessels in international water, for example, where the closest port is in Australia, the vessel is en-route to an Australian port or the incident involves an Australian resident. However, these deaths are not within the scope of interest of the NMSC[3]. The NMSC data standards make it clear that "The definition (of marine incident) applies exclusively to incidents involving small commercial and recreational vessels – but not trading vessel incidents requiring investigation under the Commonwealth Navigation Act" (NMSC, 2000, p6). Further, there are classes of activity that are not marine incidents according to the data standards and definitions of the NMSC or do not involve vessels. For example, the death of a surfboard and surf-ski rider is

[3] The reader is advised to consult the NMSC (2000) data standards in order to better understand the scope of interest of the report.

specifically excluded as are incidents involving deliberate intent. Incidents involving rubber tubes from truck tyres and home-made rafts are also excluded as they are not vessels, but are included if towed along behind a vessel by rope. The rationale for these exclusions is covered in the NMSC data standards manual which states: “this manual is intended to reflect incidents which can actually be influenced by changes in legislation or policy, either on a national basis or, for cases specific to a particular location/condition, on a jurisdiction basis.”

Whereas ABS data revealed 246 water transport deaths registered over the period 1999 to 2004, 241 deaths investigated were in the scope of interest of NMSC after unregistered cases were added and irrelevant deaths were deleted.

Boating incidents meeting NMSC criteria

Incident details

The Coroners’ files provided information on boating incidents that resulted in death. Incidents involving multiple deaths and more than one vessel can be distinguished. In addition, other non-fatal injuries in the event can be identified.

The 241 boating deaths that met NMSC criteria occurred in 196 separate incidents over the period 1999 to 2004. In these incidents, there were a further 33 people who were injured but survived. In total, 274 people were injured or killed in the 196 incidents. Of the people killed, 119 (49%) were vessel operators, compared with 50% observed in the first fatality study.

Most incidents involved only a single vessel: there were 207 vessels involved in total. The trips involving those killed were mainly for the purpose of fishing (54% of vessels compared with 48% in the first fatality study) or a leisure cruise (23%; Figure 2).

Twenty nine percent of the incidents were the subject of a Coroners inquest, which is a detailed investigation involving substantial documentation. For other incidents, the documentation is usually less extensive but sufficient to enable the Coroner to decide the causes of death without the need for an inquest.

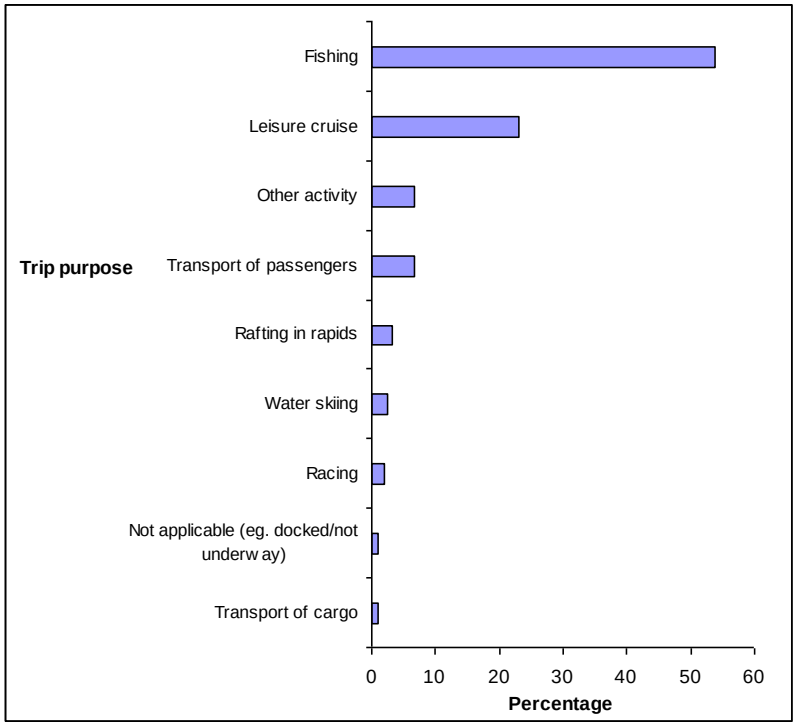


Figure 2: NMSC boating fatalities by trip purpose, Australia 1999 to 2004.

Cost of boating deaths in Australia

A recent report by the NMSC (2003, Table A.1, p. 31) presented an average cost per boating fatality of $1.5 million. Considering that there have been 241 deaths over the period 1999 to 2004, the total fatality cost was more than $360 million over the period, with an annual average cost of $60 million.

When the cost of boating deaths over the period 1992 to 1998 is added onto the above figures, it can be estimated that the total cost over the period 1992 to 2004 was more than $860 million, with an annual average cost of $66 million. Based on the accumulated total to 2004 and the annual average cost, it can be estimated that by the beginning of 2008 the total cost would have exceeded one and a half billion dollars.

Location

The NMSC data standard defines the location of the incident as follows:

Inland Waters: Any navigable water that is not tidal eg. a river, dam, lake or creek. Where a river becomes tidal, only the non-tidal section will be classed as inland waters, while the tidal section of that river will be classed as enclosed waters.

Enclosed Waters: Any navigable tidal water such as a harbour, coastal bay, estuary, tidal creek or tidal river, but does not include tidal waters identified in each State as being partially smooth.

Inshore Waters: Any open stretch of water extending laterally along the coast up to and including 3 nautical miles (nm) offshore. It also includes bar entrances and tidal waters identified as being partially smooth.

Offshore Waters: All open water more than 3nm seaward of the coast.

Thirty nine percent of the incidents occurred on inland waters, mainly rivers. This compares with 37% in the first fatality study, indicating no important change in the location of fatal incidents.

Sixty one percent occurred elsewhere, mainly on inshore waters (Figure 3).

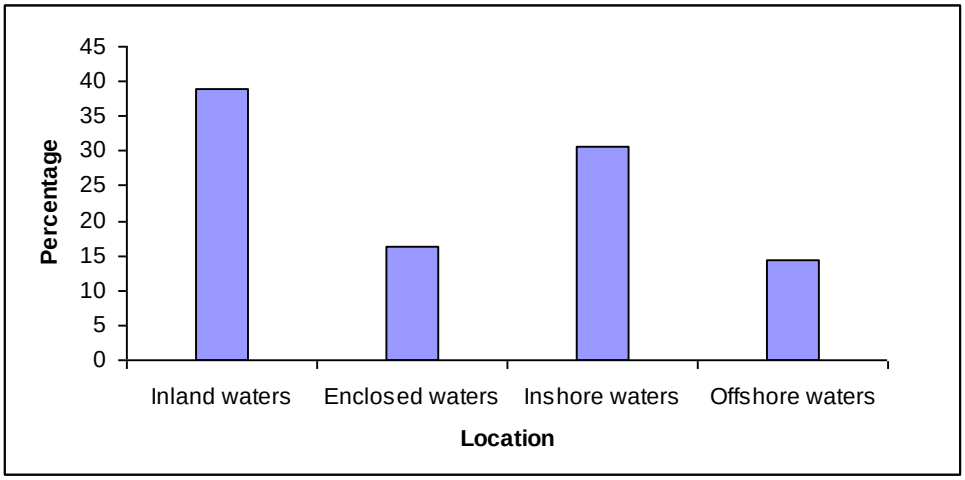


Figure 3: NMSC boating fatalities by location, Australia 1999 to 2004.

Time of day

The most common time of incident was 12 mid-day to 4pm (27%). Twenty eight percent occurred from 8pm to 8am (Figure 4).

Environmental conditions

Most of the incidents occurred in favourable environmental conditions (Figures 5 & 6) as observed in the first fatality study. Seventy one percent occurred in wind conditions classified as none to moderate and 77% occurred in calm to moderate seas.

Incident events

The sequence of events resulting in a boating death was initiated most often by capsize of the vessel (19%), a person falling overboard (19%) or swamping of the vessel (11%; Figure 7). Structural failure was rarely the initial event in a fatal incident (2%).
When all significant events were considered (a maximum of five were recorded for each incident; Figure 8), a fall overboard was the most common event (33% of the events noted). Capsize was responsible for 16% of all incident events. These results were very similar to the first fatality study, indicating common problems across time.

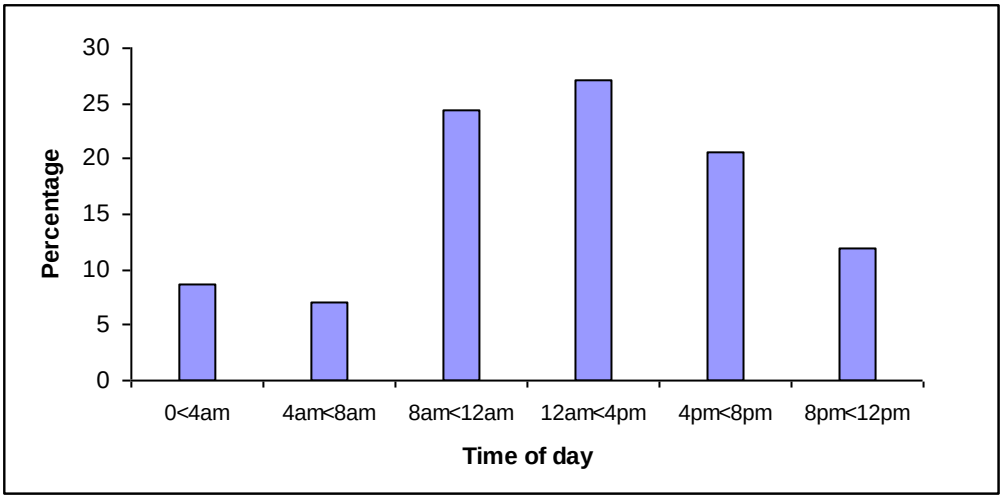


Figure 4: NMSC boating fatalities by time of day, Australia 1999 to 2004.

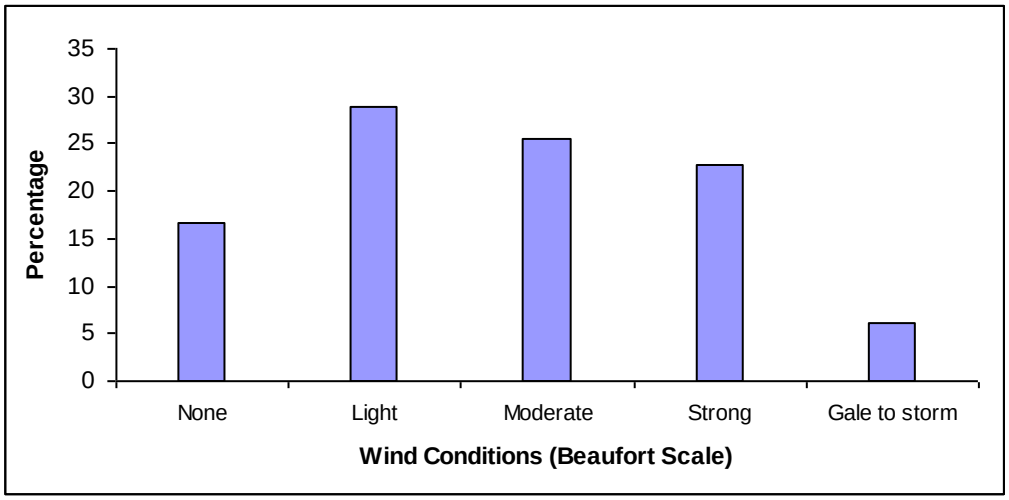


Figure 5: NMSC boating fatalities by wind conditions, Australia 1999 to 2004.

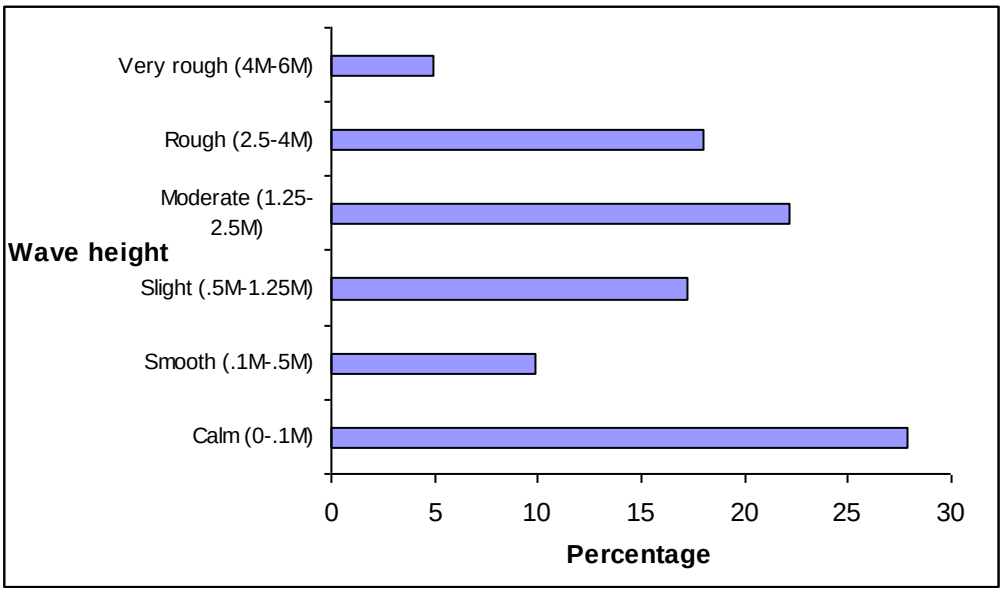


Figure 6: NMSC boating fatalities by wave height, Australia 1999 to 2004.

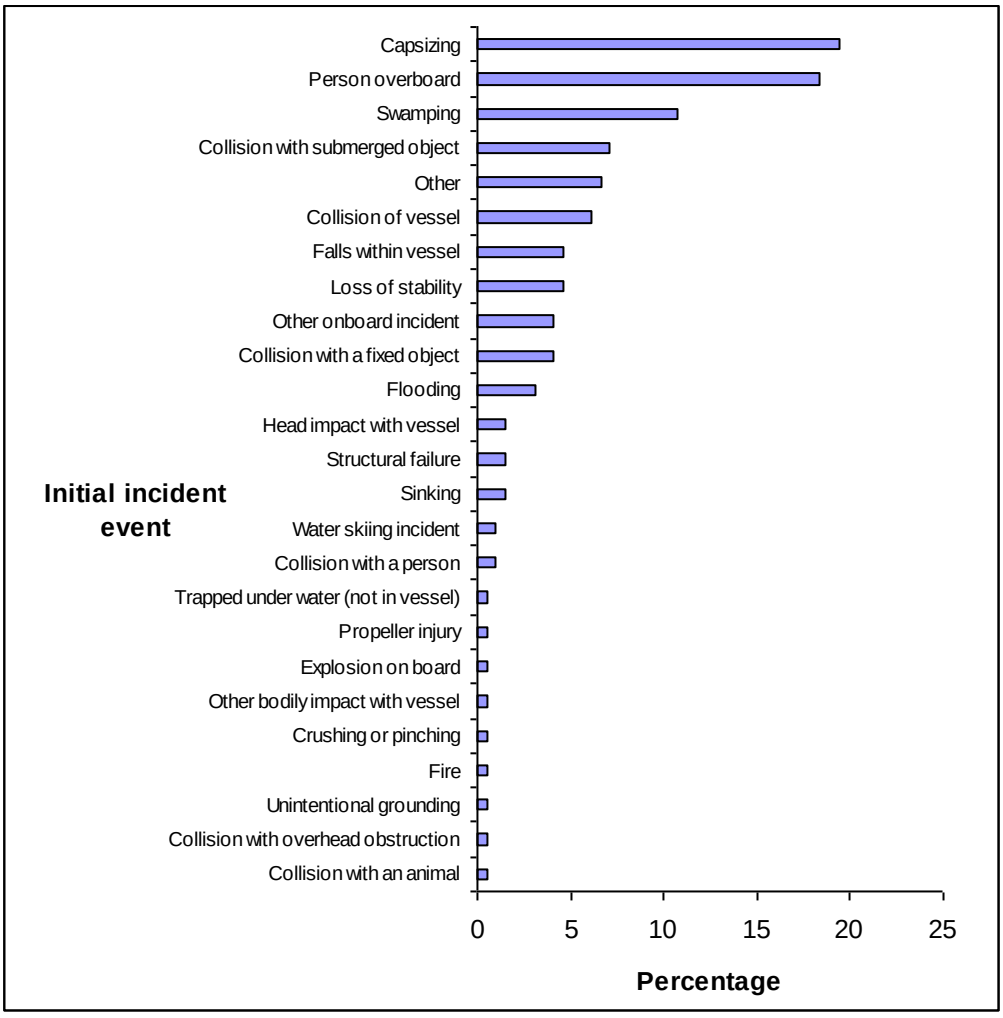


Figure 7: NMSC boating fatalities by initial incident event, Australia 1999 to 2004.

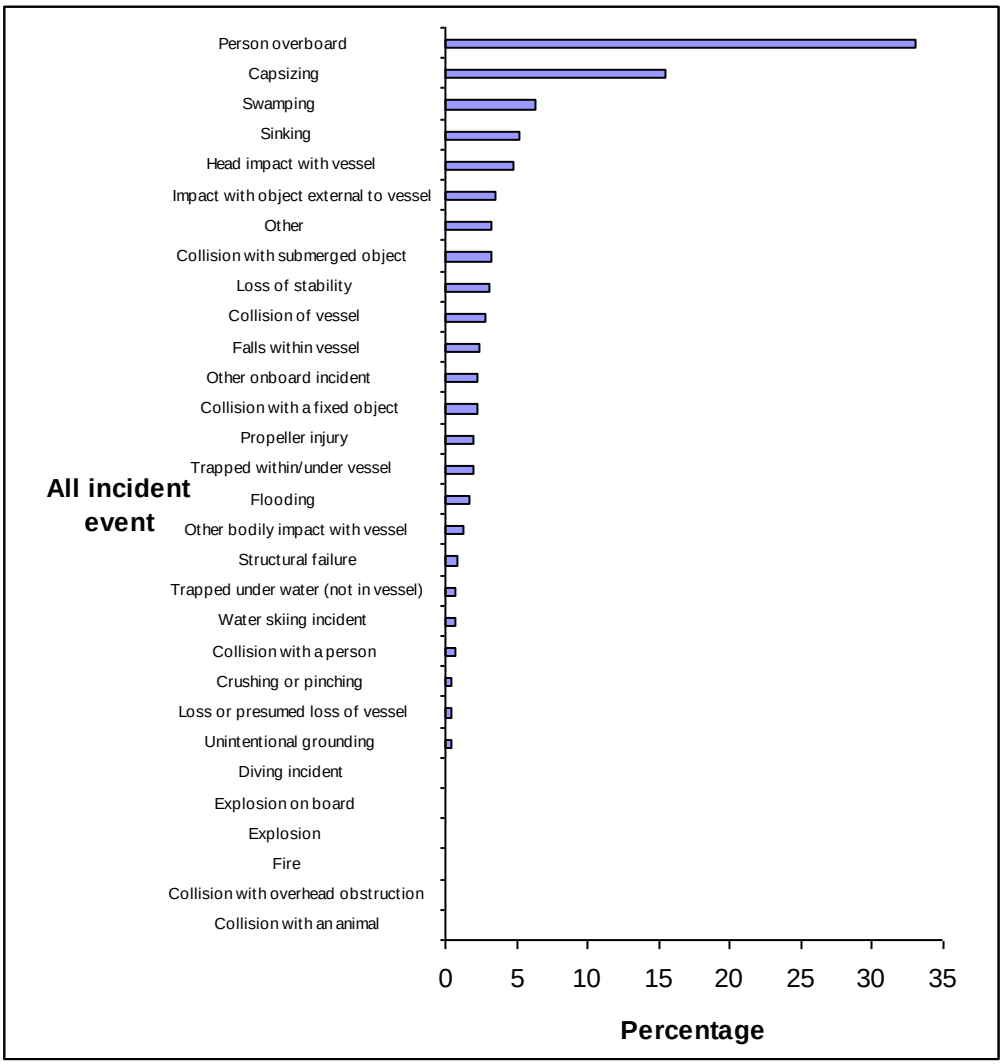


Figure 8: NMSC boating fatalities by incident events (multiple response), Australia 1999 to 2004.

Contributing factors

The initial contributing factor in 74% of incidents was a human cause, mainly alcohol (21%) or an error of judgement (10%; Figure 9). Human factors were even more common as a contributing factor than was observed in the first fatality study (63%).

The initial contributing factor was an environmental cause in 12% of incidents and a material factor in 11% of incidents, with 3% unknown cause. Hazardous wind and/or sea conditions were an initial contributing factor in 5% of incidents. Equipment failures were responsible for only 9% of initial contributing factors.

When all significant contributing factors were considered (a maximum of five were recorded for each incident; Figure 10), the top five were: an error of judgement, alcohol, failure to keep a proper lookout, hazardous wind and/or sea conditions, and failure to wear a PFD.

Of all the significant contributing factors considered, human factors most often contributed to the incidents (69% versus 17% for environmental factors and 13% for material factors). The most common human factor was an error of judgement on behalf of the vessel operator or other occupant (11% of factors noted). The failure to wear a PFD was specifically noted by the Coroner's as a factor in death and comprised 7% of contributing factors. Alcohol comprised 9% of contributing factors. Ill health (4%) and inexperience (4%) were also common factors in boating deaths, the latter of which focuses attention on the issues of competency standards and training while the former focuses attention on

fitness for vessel operation or travel.

Of all the significant contributing factors considered, the most common environmental factors noted were hazardous wind or sea conditions (8%), restricted visibility (3%), floating or submerged object (2%) and bar conditions (2%).

Of all the significant contributing factors considered, the most common material factors noted were machinery failure (2%), and engine too big for vessel (2%).

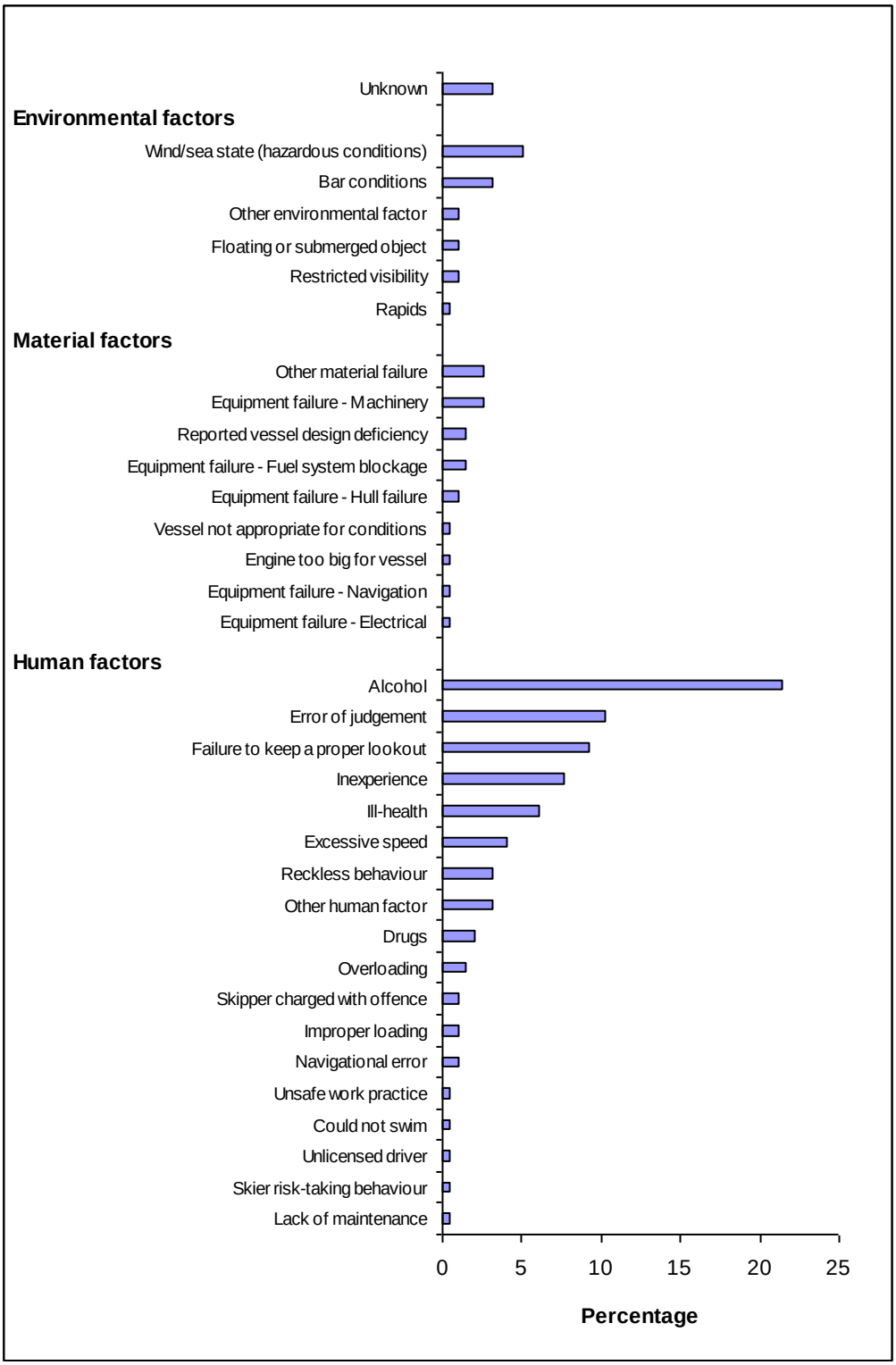


Figure 9: NMSC boating fatalities by initial contributing factor, Australia 1999 to 2004.

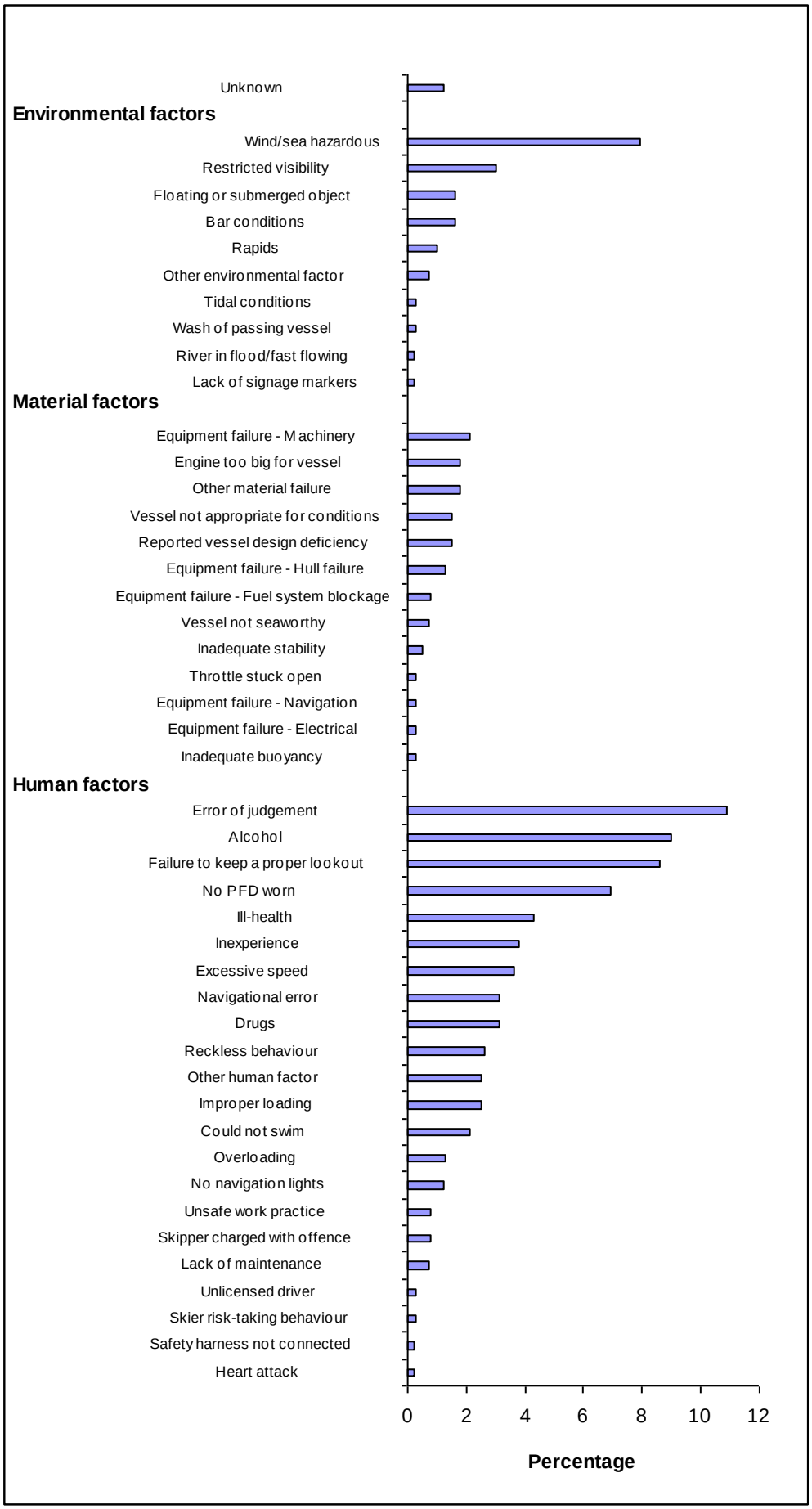


Figure 10: NMSC boating fatalities by contributing factors (multiple response), Australia 1999 to 2004.

Vessel details

Vessel type

Eighty one percent of the vessels were for recreational purposes and 19% were commercial vessels, mainly commercial fishing vessels. Thirty six percent were dinghies, 17% were other open motorboats and 11% were half cabin motorboats (Figure 11). Dinghies were involved in more fatalities in this study than observed in the first fatality study (25% in the first study).

The hulls were mostly made from aluminium (41%) and fibreglass/GRP (40%; Figure 12).

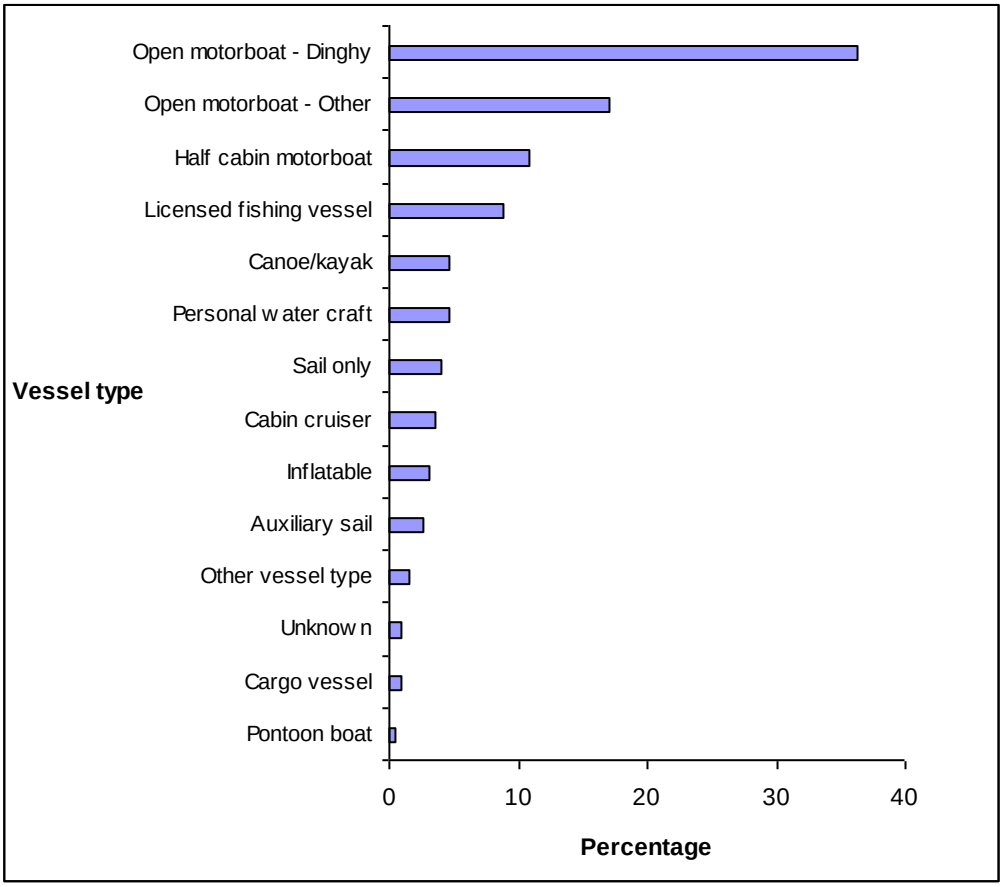


Figure 11: NMSC boating fatalities by vessel type, Australia 1999 to 2004.

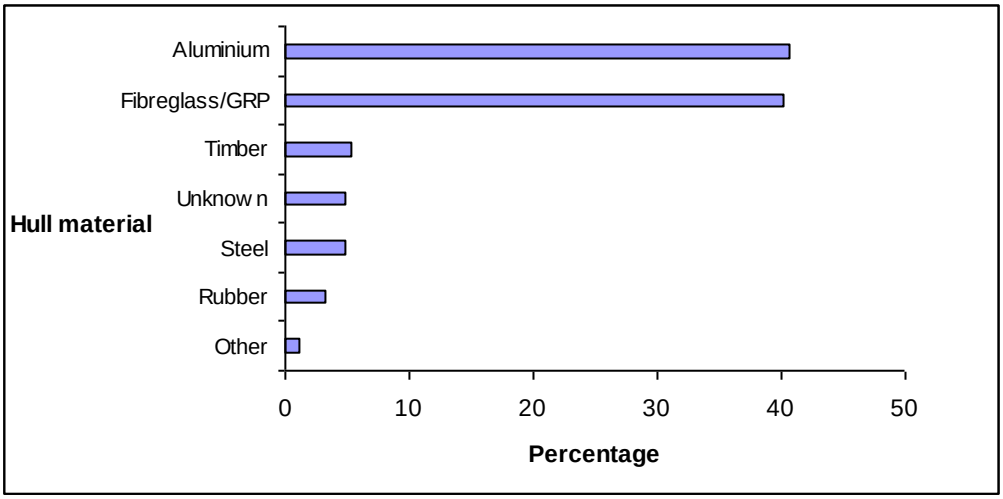


Figure 12: NMSC boating fatalities by hull material, Australia 1999 to 2004.

Vessel length

Forty four percent of the vessels were 4-6 metres in length, with 74% less than 6 metres (Figure 13). Average boat length was 5.9 metres. Average boat length has certainly increased from the first fatality study (5.6 meters) and the proportion 4-6 metres is now 44% compared to 34% in the first study and the proportion of small vessels (less than 4 metres) has reduced from 42% to 30%. This might be a chance finding or could be in response to media messages about the dangers of small vessels.

An interesting finding, albeit from small number of medium sized vessels and difficult to interpret, is the contrast that alcohol was a substantial contributing factor to fatalities in small and large vessels but not in medium sized vessels (6-10 metres; Table 1: excludes missing alcohol results).

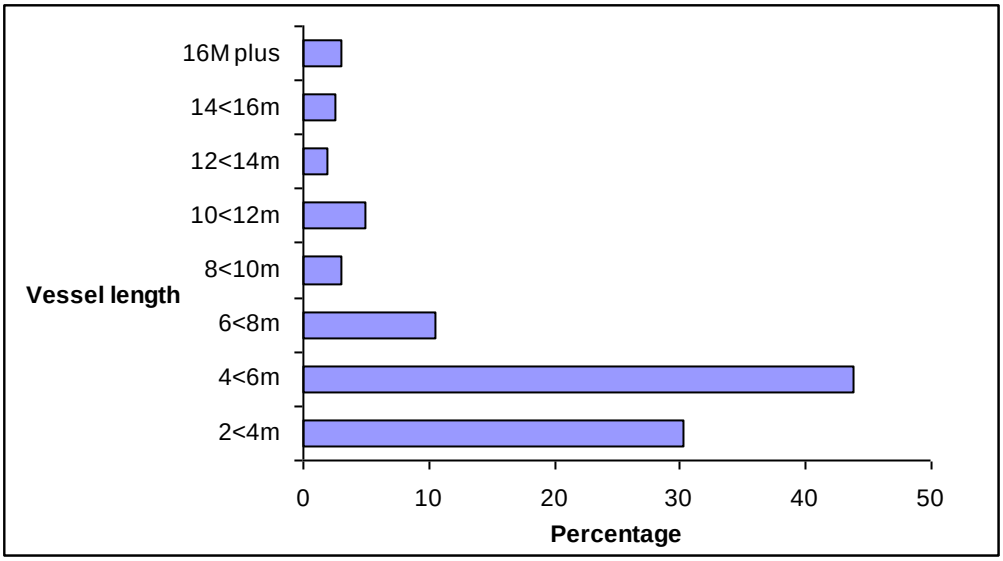


Figure 13: NMSC boating fatalities by vessel length, Australia 1999 to 2004.

Table 1: NMSC boating fatalities by alcohol as a contributing factor and vessel length, Australia 1999 to 2004.

	Alcohol contributed		Alcohol did not contribute		
Vessel length (metres)	n	%	n	%	Total
2<4m	13	27	36	73	49
4<6m	14	20	57	80	71
6<10m	2	9	20	91	22
10+	5	25	15	75	20

Means of propulsion

A propeller was the means of propulsion for 78% of vessels, mainly using outboard engines fuelled by petrol (Figure 14). Ten percent were propelled manually using oars. The vessels propelled by water jet were all jet skis (n=8, 4% of vessels).

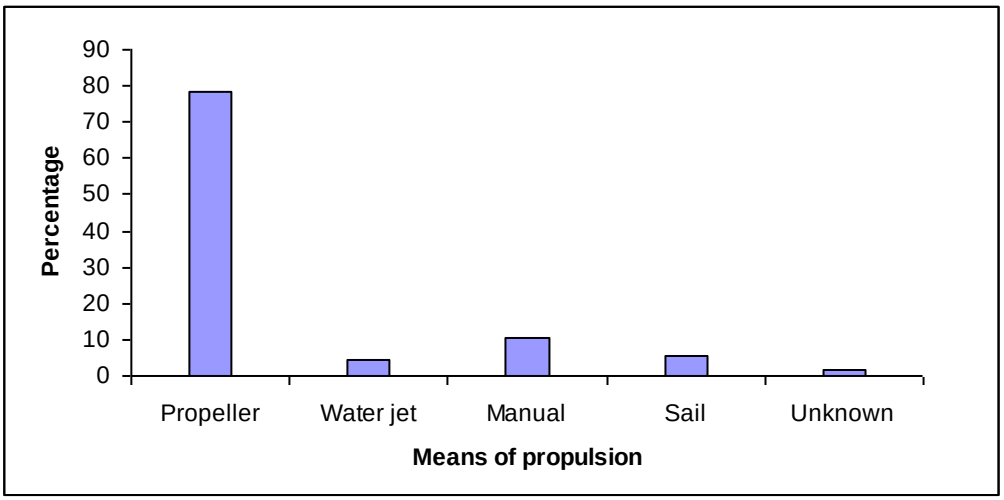


Figure 14: NMSC boating fatalities by means of propulsion, Australia 1999 to 2004.

Vessel power

For all vessels, there was only a small positive correlation between vessel power and length (Pearson correlation coefficients=.3), mainly due to outlier values readily see in Figure 15. From Figures 16 it is evident that for dinghies, there was a stronger positive correlation between vessel length and power ie. longer vessels had more powerful engines (Pearson correlation coefficient = .6). The relationship was not as clear for other open motorboats and half cabin motorboats (Pearson correlation coefficients = .4) which showed some strong outlier values indicative of overpowered vessels (Figures 17 & 18). When considered against the Australian Standard (AS 1799.1: Standards Australia, 1992) method for calculating the maximum engine power for existing vessels, which is known to be conservative, 74% of the vessels in which someone was killed were overpowered. This is certainly much higher than observed in the first fatality study (31% overpowered). It is difficult to know whether this contrast reflects are real difference in the incidence of overpowered vessels or changes in vessel design parameters (eg. relationship between vessel length and beam width) over time which might mean that AS 1799.1 is less accurate as an indicator of overpowered vessels in modern vessels.

A more precise assessment of vessel power and fatalities would require better data on a range of vessel parameters, particularly transom width which could be achieved through survey of the vessels impounded by police as a component of a coordinated and more comprehensive data collection[4].The matter could also be assessed in an exposure study involving an engineering/survey assessment of current boats for sale (new and old) to see what proportion are being sold with overpowered engines.

All but two of the half cabin motorboats and cabin cruisers and all but three other open motorboats, were considered to be overpowered according to AS 1799.1. Sixty three percent of dinghies were overpowered.

[4] A basic survey by a private surveyor has been estimated to could cost less than $500 (NMSC, 2002).

Table 2: NMSC boating fatalities by vessel type and power, Australia 1999 to 2004 (row percentages).

Vessel type	Overpowered according to AS 1799.1		Not overpowered		
	n	%	n	%	Total
Open motorboat - Dinghy	32	63	19	37	51
Open motorboat - Other	17	85	3	15	20
Half cabin motorboat & Cabin Cruiser	17	89	2	11	19
Total	66	73	24	27	90

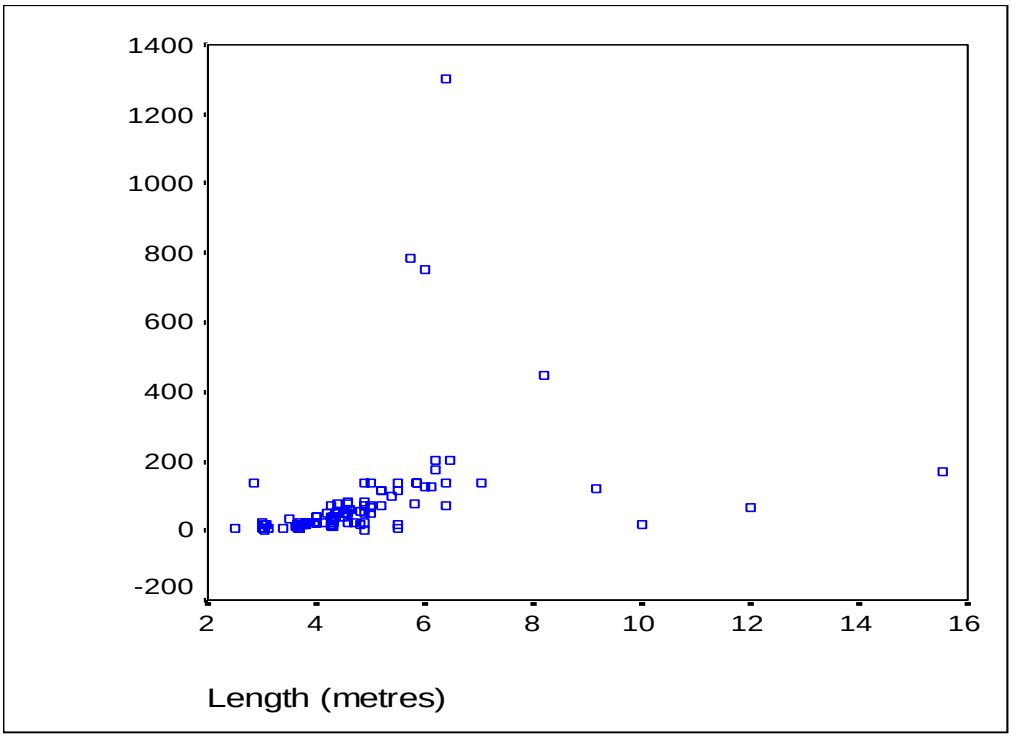


Figure 15: NMSC boating fatalities by engine power and vessel length for all vessels, Australia 1999 to 2004.

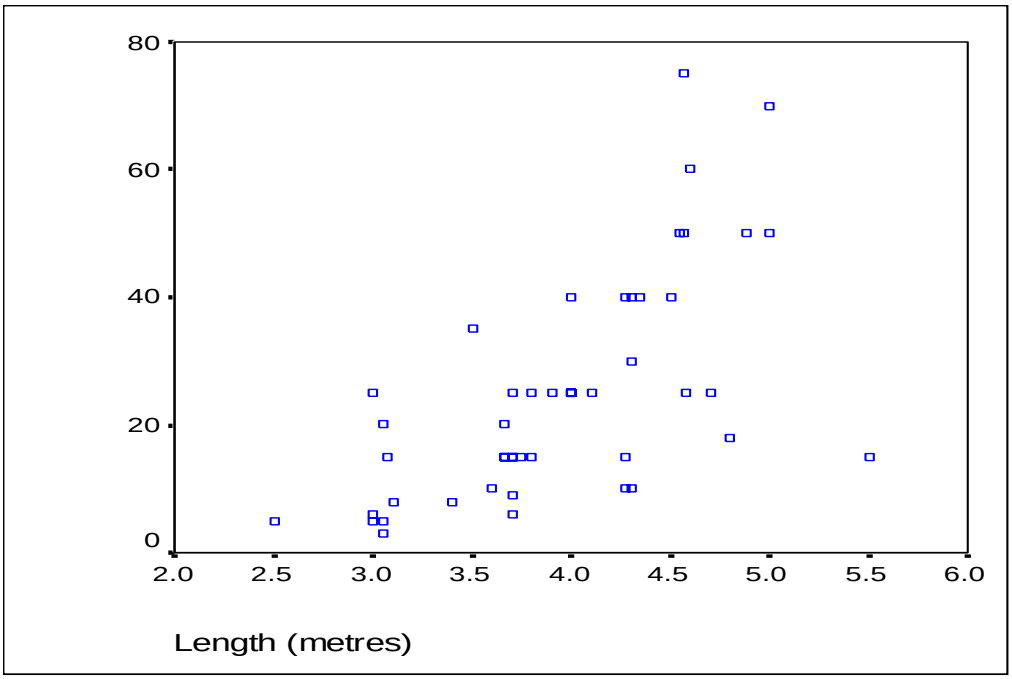


Figure 16: NMSC boating fatalities by engine power and vessel length for dinghies, Australia 1999 to 2004.

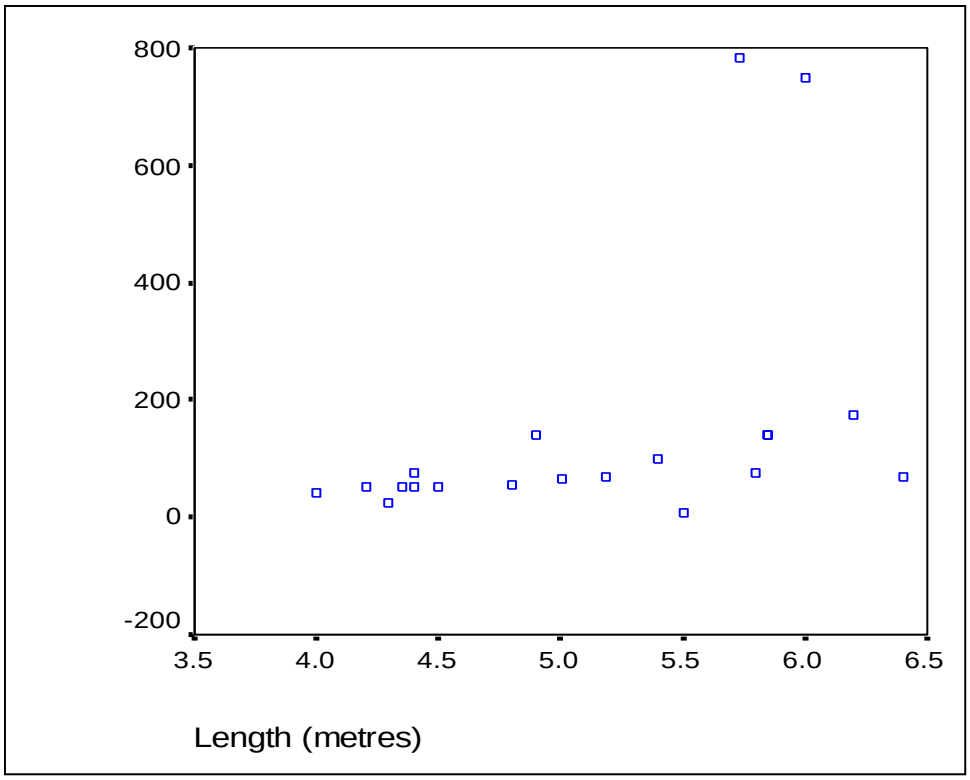


Figure 17: NMSC boating fatalities by engine power and vessel length for other open motorboats, Australia 1999 to 2004.

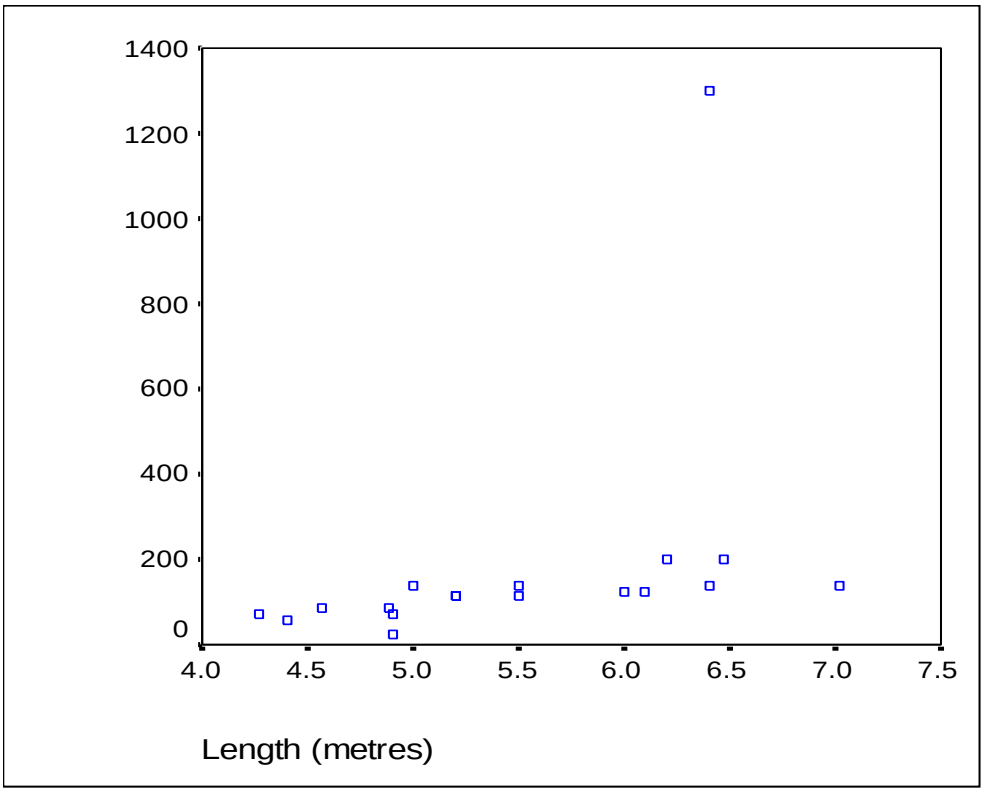


Figure 18: NMSC boating fatalities by engine power and vessel length for half cabin motorboats, Australia 1999 to 2004.

Vessel occupancy - overloading & PFDs

When the method of AS 1799.1 was applied to dinghies, other open motorboats, half cabin motorboats and cabin cruisers in which someone was killed, it was found that 49% of the vessels were overloaded (Table 3). This contrasts with 24% in the first fatality study. Once again, it is difficult to know whether this contrast reflects are real difference in overloading or changes in vessel design parameters (eg. relationship between vessel length and beam width) over time which might mean that AS 1799.1 is less accurate as an indicator of overloading in modern vessels. An on the water exposure study of occupancy relative to vessel design parameters for old and new vessels might assist in clarifying the finding.

Overloading was particularly a feature of dinghies (59% overloaded) and half cabin motorboats (47% overloaded).

Table 3: NMSC boating fatalities by vessel type and overloading, Australia 1999 to 2004 (row percentages).

Vessel type	Overloaded according to AS 1799.1		Not overloaded		
	n	%	n	%	Total
Open motorboat - Dinghy	30	59	21	41	51
Open motorboat - Other	4	20	16	80	20
Half cabin motorboat	8	47	9	53	17
Cabin cruiser	2	100	0	0	2
Total	44	49	46	51	90

Of the 185 fatalities for which the vessel occupancy and number of PFDs on board was known, 28 (15%) of the vessels had an insufficient number of PFDs for the number of

people on board. This is much lower than observed in the first boating fatality study (45%) suggesting that the messages about the required safety equipment, legislation and more active policing are getting through to the boating community.

Vessel operation

At the time of the incident, the vessels were cruising in 36% of cases (Figure 19). Nineteen percent were drifting and 11% were changing direction.

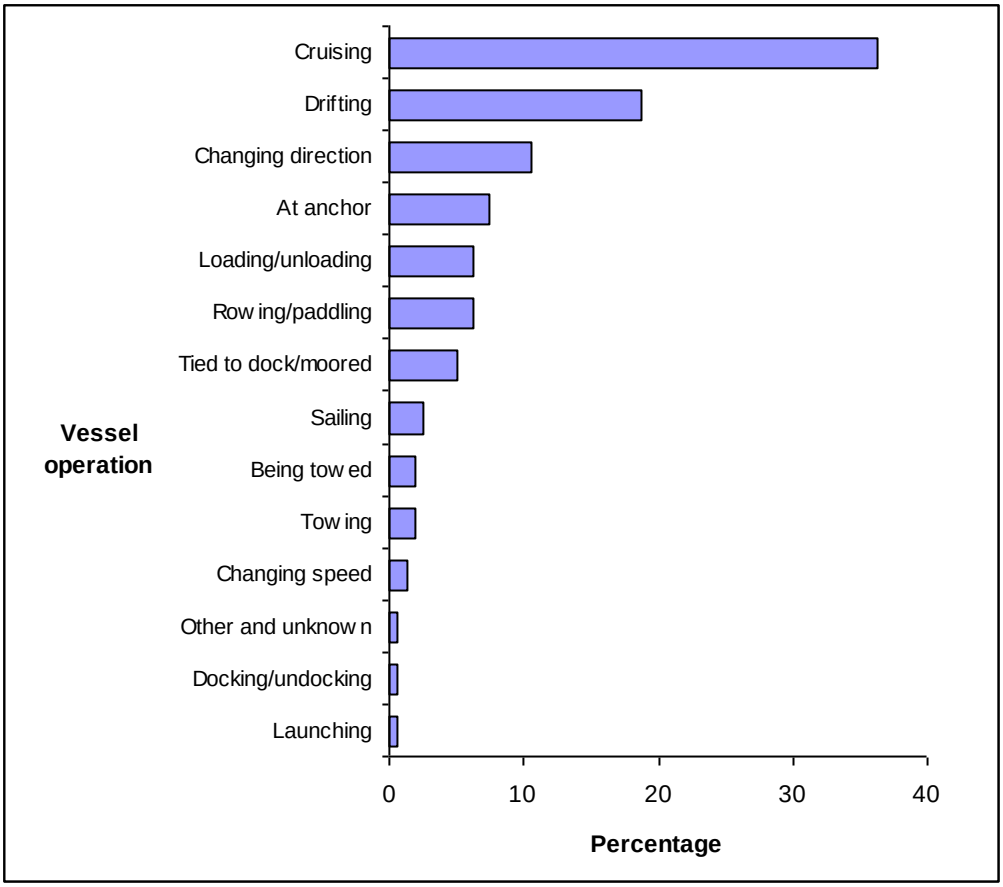


Figure 19: NMSC boating fatalities by vessel operation, Australia 1999 to 2004.

Vessel damage

In the boating incidents investigated, 59% suffered no damage and relatively few were lost (10%; Figure 20).

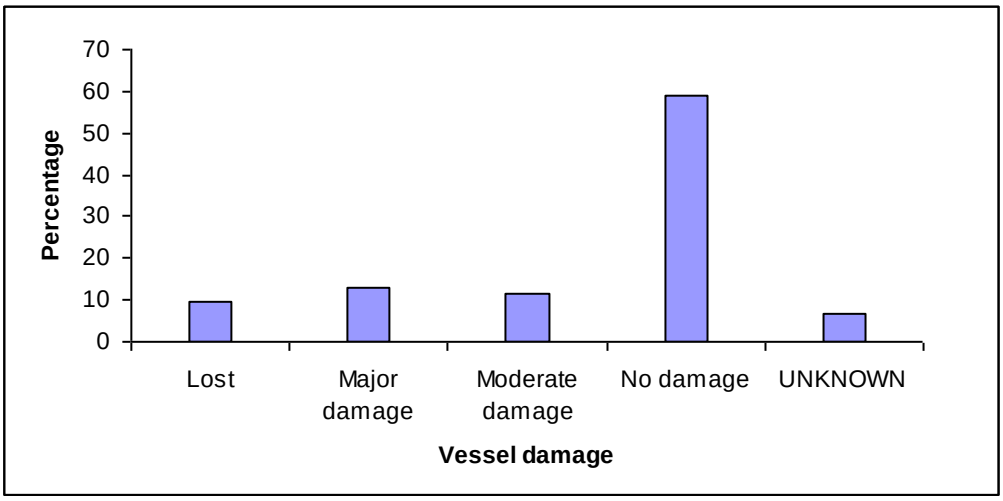


Figure 20: NMSC boating fatalities by vessel damage, Australia 1999 to 2004.

Vessel operator details

Operator age and sex

Operators were most commonly in the age groups 50-54 years and 45-49 years (Figure 21), and 94% were male. Age of operator has increased. Forty eight percent were over 50 years compared to 36% in the first fatality study. The peak in the 25-29 yea olds observed in the first study (14%) is not as marked in the second study (8%). These results might suggest that a new subpopulation of older operators has taken up boating, possibly reflecting early retirement recreation trends.

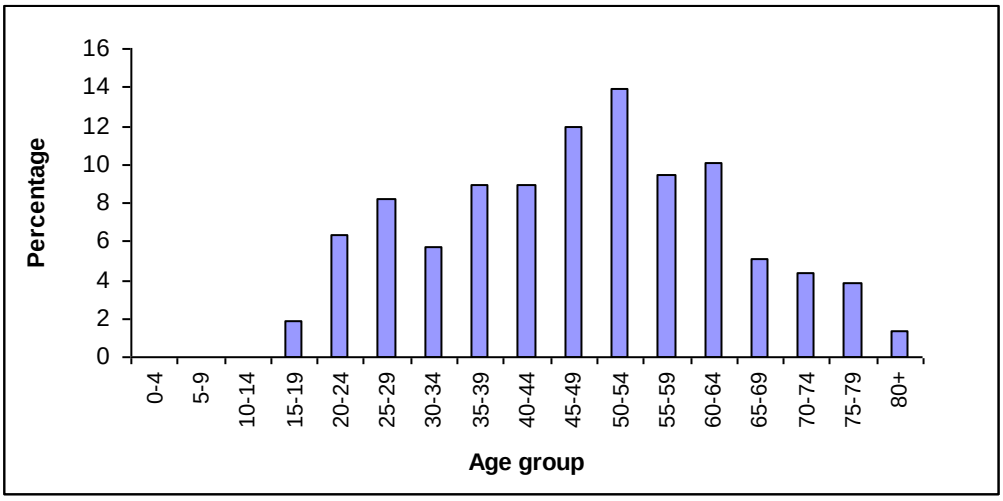


Figure 21: NMSC boating fatalities by age of operator, Australia 1999 to 2004.

Operator testing for alcohol and drugs

Of the 196 operators of the vessels from which someone was killed, 52% were blood or breath tested for alcohol and/or other drugs, which is a little higher than observed in the first national fatality study (45%: Statistically significant). When test results and reported usage were considered, 47% were positive for alcohol. Thirteen percent of the 88 tested for a drug were positive, which is a little higher than observed in the first national fatality study (9%).

These contrasts suggest the needs for increased surveillance and control of alcohol and drug use among the boating public.

Details of person killed and circumstances of death

Age and activity at the time of death

Those killed were most often aged 50-54 years (12%; Figure 22). Those killed were older than observed in the first fatality study with the peak in the 25-29 year olds observed in the first study being replaced by a peak in an older cohort.

Eighty eight percent were engaged in a sporting or recreational activity at the time of the incident.

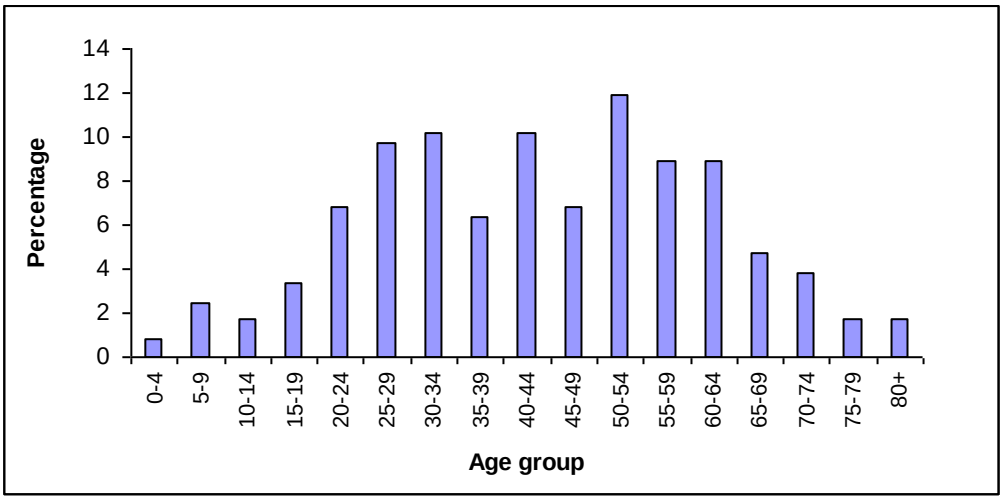


Figure 22: NMSC boating fatalities by age group of person killed, Australia 1999 to 2004.

Gender and marital status

Ninety three percent were male. Fifty seven percent were married (Figure 23).

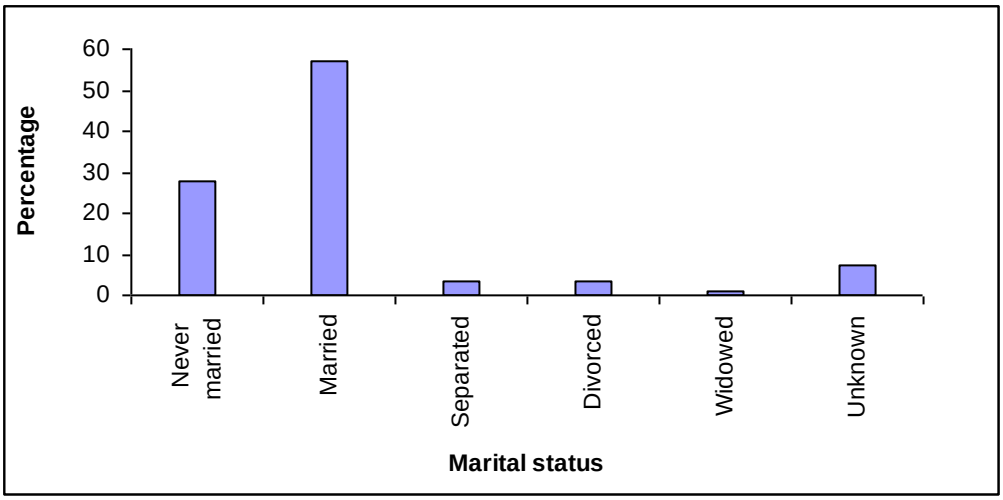


Figure 23: NMSC boating fatalities by marital status of person killed, Australia 1999 to 2004.

Employment status

Of the 207 people killed for whom employment status was known, 66% were employed and 18% were retired (Figure 24).

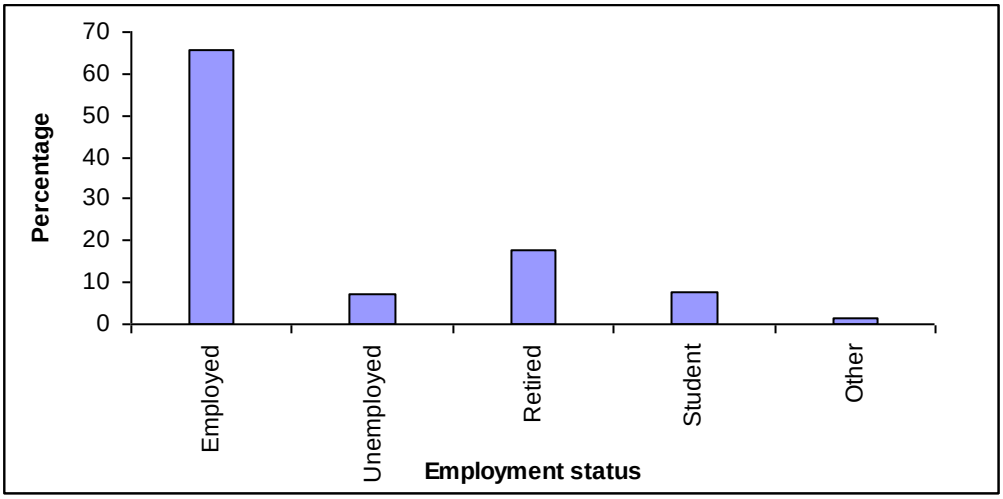


Figure 24: NMSC boating fatalities by employment status of person killed, Australia 1999 to 2004.

Results of blood testing for alcohol and drugs

Blood was taken for analysis for 69% of fatalities (n=166) and evidence of alcohol use was available in a further 8 cases, totalling 174 fatalities.

When test results and reported usage were considered, forty percent (n=70) of the 174 fatalities were positive for alcohol: 22% (n=38/174) in excess of 0.05 gm/100ml demonstrating that alcohol is as much a factor in boating deaths as it is in road deaths (26%: ATSB, 2001).

Of the 154 tested for drugs, 25 (16%) were positive, mainly for Cannabis (n=21). The involvement of drugs is greater than observed in the first national study (9%) but is still overwhelmingly an issue of Cannabis use rather than other drugs.

Cause of death and contributing causes

Drowning was the stated cause of death in 85% of boating deaths, mainly salt water drowning (55%; Figure 25).

Co-morbidities and medication could have played a part in the deaths. There were significant co-morbidities in 32% of deaths and 15% were reported to be on medication for a disease, higher than observed in the first fatality study (24% with co-morbidities and 5% on medication) which probably reflects the older age profile of deaths in the current study.

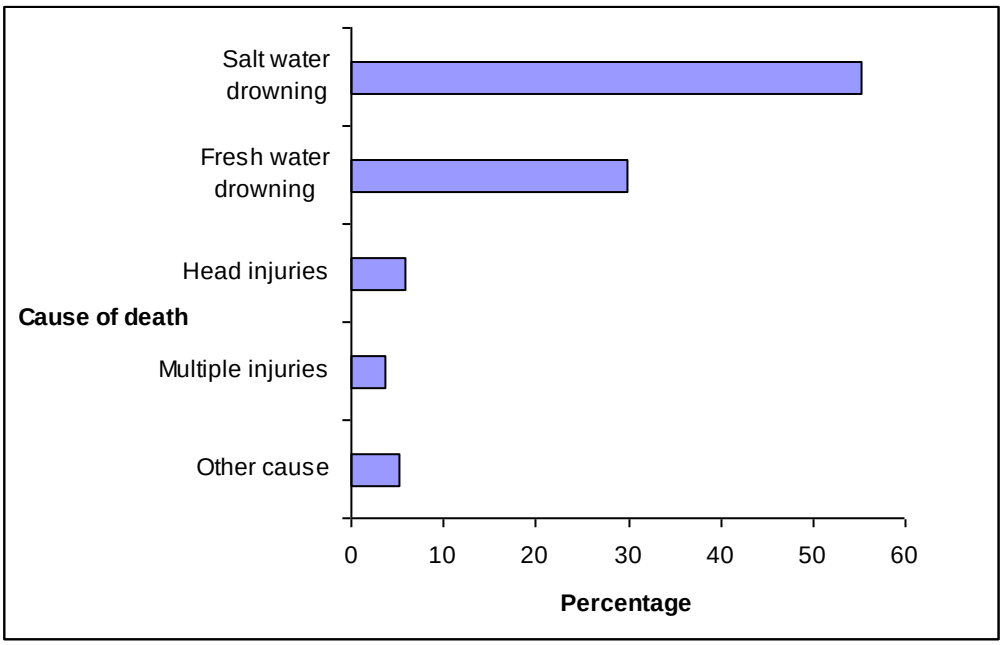


Figure 25: NMSC boating fatalities by cause of death, Australia 1999 to 2004.

Topical issues

Personal flotation devices

Of all people killed in boating incidents, 12% were wearing a PFD of any sort.

Of the 185 fatalities for which the vessel occupancy and number of PFDs on board was known, 28 (15%) of the vessels had an insufficient number of PFDs for the number of people on board. This is much lower than observed in the first boating fatality study (45%) suggesting that the messages about the required safety equipment, legislation and more active policing are getting through to the boating community.

Comparison of the odds of PFD use among those killed with the odds among those not killed indicates the extent of the effect of PFDs for or against death. An odds ratio (OR) significantly above 1 would in this case indicate a protective effect of the PFD against death. An OR significantly below 1 would in this case indicate a facilitative effect of the PFD for death. An insignificant OR would indicate that there was no demonstrated protective or facilitative effect of the PFD on death.

From Table 4 it can be seen that the proportion wearing a PFD was higher among those who survived compared with those who died. The odds ratio was 1.9, indicating that people who were alive were nearly two times more likely to have been wearing a PFD. The result was statistically significant, as indicated by the 95% confidence interval of the odds ratio (1.1 to 3.3). When the results of the first and second studies are added to increase statistical power, the odds ratio was 2.0 (confidence interval of 1.3 to 3.0). It can therefore be concluded that PFDs are highly effective in preventing death in boating incidents: a

person can effectively double their chances of surviving just by wearing a PFD.

Table 4: NMSC boating fatalities by PFD status and survival status, Australia 1999 to 2004.

	Survival status						
	Dead		Alive				
PFD Status	n	%	n	%	Total	OR	95% CI
Wearing PFD	30	14	38	25	68	1	Referent
Not wearing PFD	180	86	117	75	297	1.9	1.1-3.3
Total	210	100	155	100	365		

Alcohol

While alcohol has been mentioned a number of times already, it is worth re-stating some of the results in order to hit home the message that alcohol use among boaters needs to be better controlled.

Alcohol is one of the main contributing factors to boating death. Forty seven percent of vessel operators were positive for alcohol and 40% of those killed were positive for alcohol. Twenty two percent of those killed had a BAC in excess of 0.05 gm/100ml demonstrating that alcohol is as much a problem in boating deaths as it is in road deaths.

Attitudes toward alcohol use when boating need to change and should be the focus of a media campaign.

Jet-ski's

Nine of the vessels involved in fatal incidents were jet skis, less per year than observed in the first fatality study, which is good news. The numbers are now too small for further breakdowns and analysis. Evidently, the internationally expressed concerns about a potential explosion of fatalities due to jet ski's has not arisen in Australia, reflecting well on authorities, suppliers and users.

Over-involvement of dinghies

As observed in the first fatality study, dinghies were the most common vessel involved in fatal incidents. As there is some concern about the applicability of AS 1799.1 to the assessment of vessel power and occupancy in modern vessels, the analyses of the first study comparing overloading and power by vessel type are probably no longer robust and will not be repeated.

Forty six percent of fatal incident involving dinghies occurred on inland waters.

It is interesting to observe that while capsize was the main initial incident event for all vessels (Figure 7), for dinghies the initial event was mainly a person falling overboard (Figure 26) and, in addition, loss of stability is a much more frequent event in dinghies than all vessels. These results both reflect on the inherent instability of dinghies.

Alcohol was a much stronger initial contributing factor to dinghy fatalities (36%) than it was to all vessel fatalities (21%; Figures 9 and 27). Thirty two percent of dinghy fatalities had a BAC in excess of .05, compared with 22% for all vessel fatalities. Ten of the 25 all vessel fatalities that tested positive for a drug, were dinghy operators or passengers. Therefore, alcohol and drug use is a substantial problem associated with dinghy use among fatalities.

Ninety percent of dinghy fatalities were not wearing a PFD.

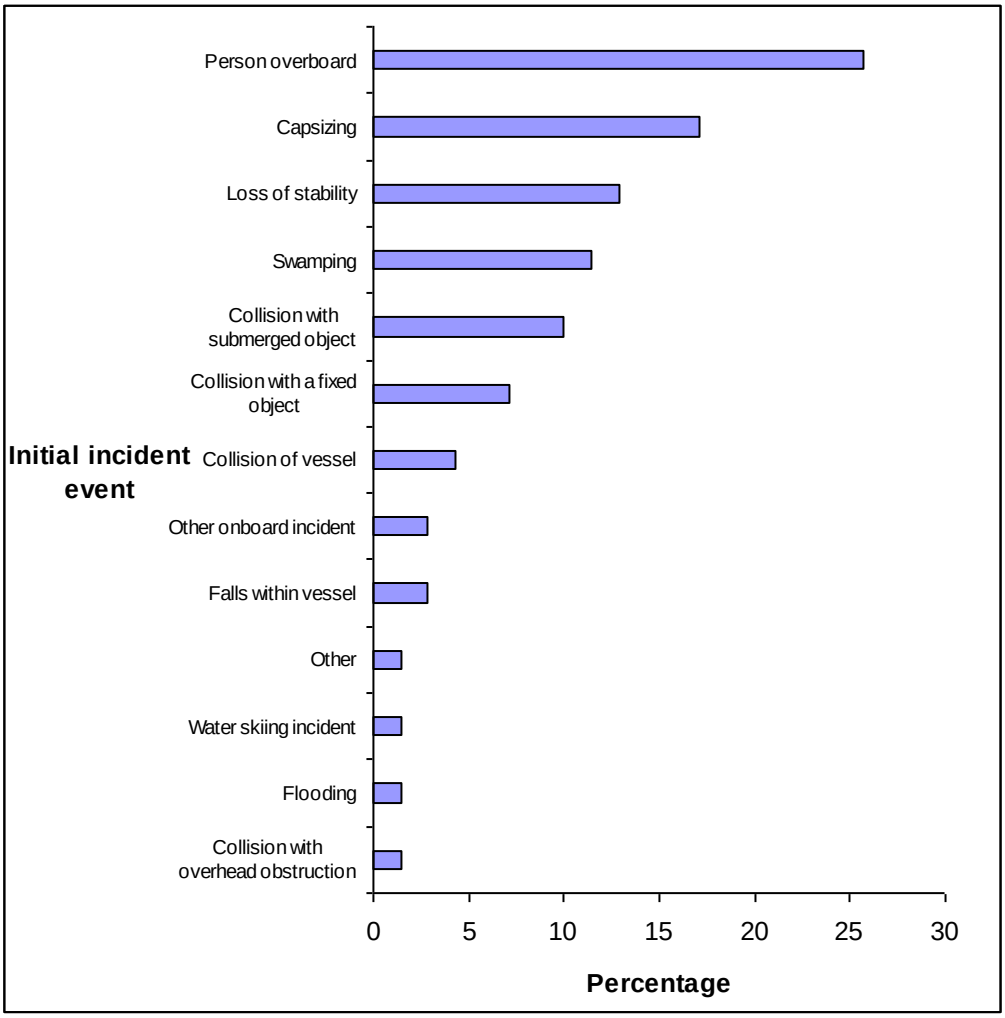


Figure 26: NMSC boating fatalities by initial incident event for dinghies, Australia 1999 to 2004.

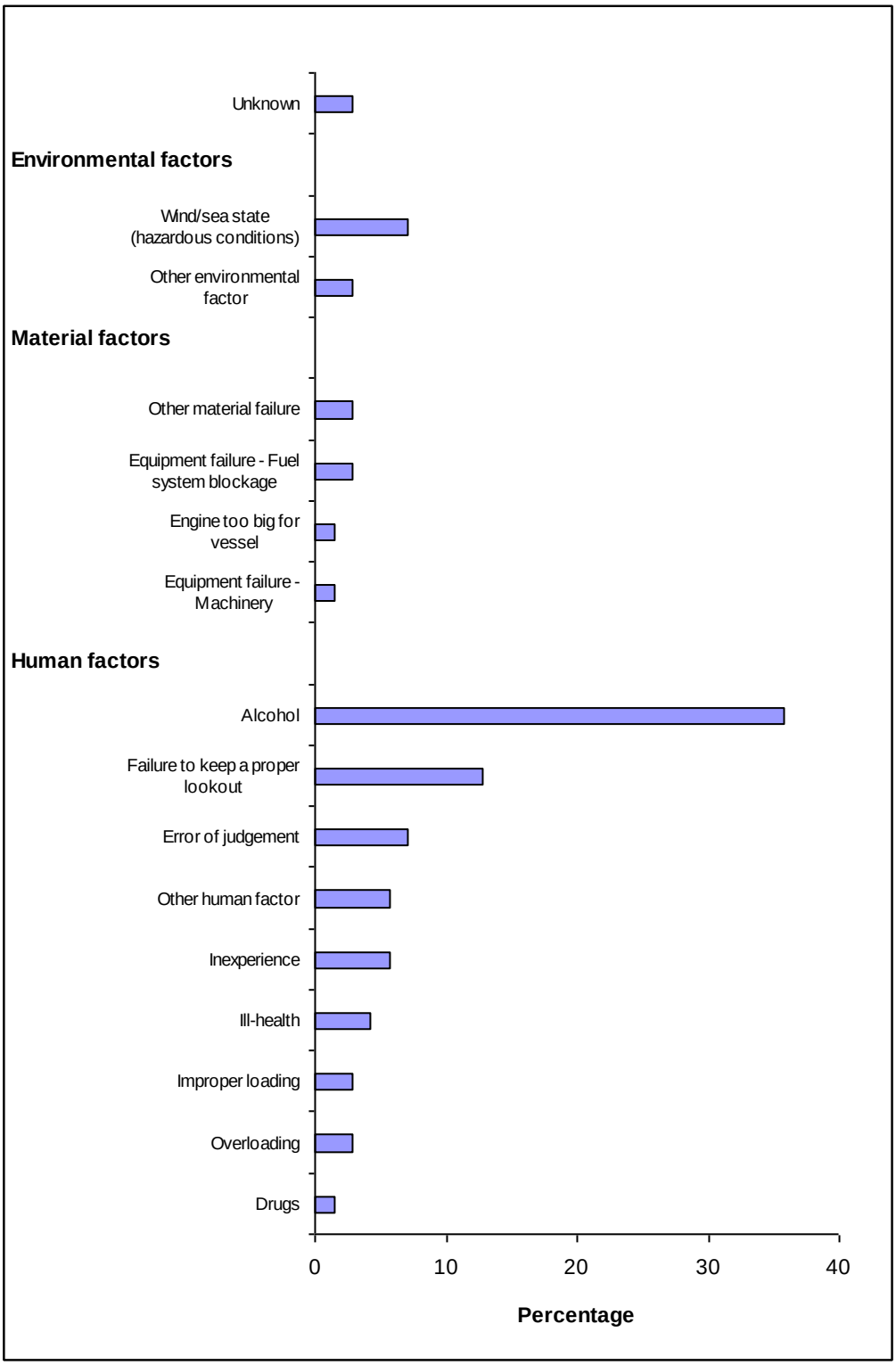


Figure 27: NMSC boating fatalities by initial contributing factor for dinghies, Australia 1999 to 2004.

Capsize and person overboard

The first fatality study presented a detailed assessment of capsize and person overboard. There is no need to repeat those analyses. However, is it useful to compare the factors involved in these two different types of initial incident event.

Capsize more often occurred on inshore waters whereas person overboard occurred mainly on inland waters.

Capsize more often occurred in light winds whereas person overboard occurred more often in strong winds.

Capsize more often occurred in moderate to rough seas whereas a high proportion of person overboard occurred in calm seas.

The distributions of vessel length were different for capsize (mainly 4-6metres) and person overboard (mainly 2-4 metres). In very small vessels, very often the first thing that happens, leading to death, seems to be that a person falls overboard, whereas capsize is the more dominant factor for somewhat larger vessels.

The first fatality study (O'Connor, 2004) stated "it is not entirely clear what specific human factors cause a person to fall overboard in the absence of some prior event such as a collision, capsize or loss of stability. The causes need to be further investigated because falls overboard is an important initial event in boating deaths". The second study appears to have found the answer. Alcohol and ill-health were the dominant initial contributing factors for person overboard. After consuming alcohol or being ill, balance is often affected and people become unsteady on their feet, which is a strong risk factor for falling overboard. People need to be more effectively warned about the dangers of falls overboard, especially involving alcohol and ill-health.

Contributing factors for capsize are inexperience, failure to keep a proper lookout, error of judgement and also alcohol but to a lesser extent than observed for person overboard. Loading of the vessel was not as strong a factor in capsize in this study compared to the first fatality study.

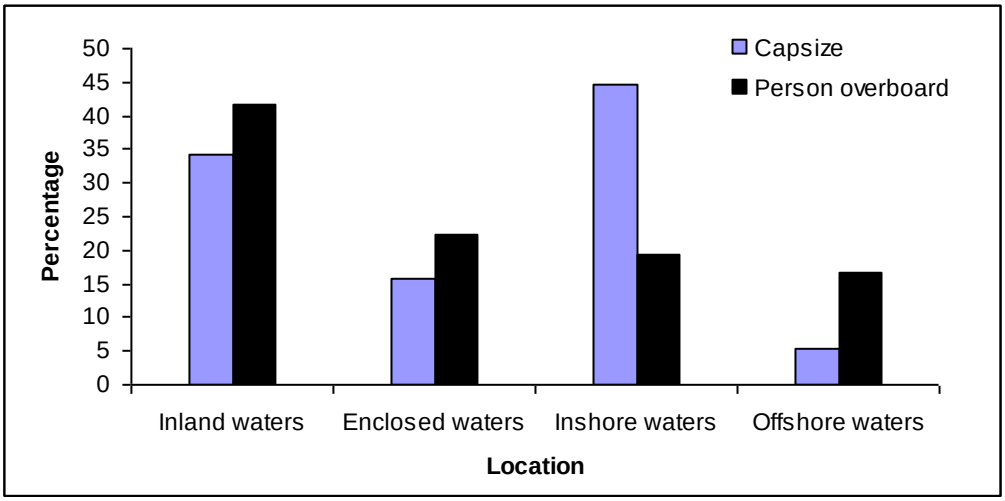


Figure 28: NMSC boating fatalities by location for capsize and person overboard, Australia 1999 to 2004.

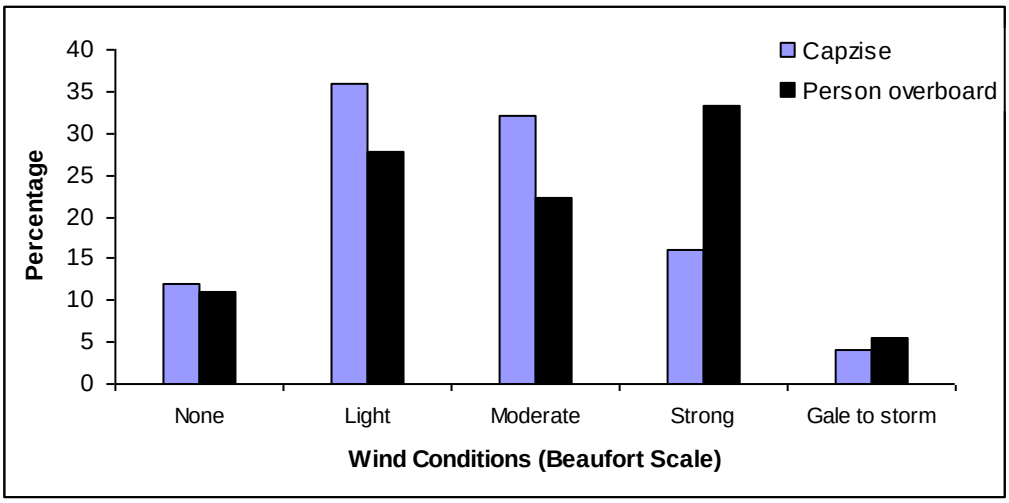


Figure 29: NMSC boating fatalities by wind conditions for capsize and person overboard, Australia 1999 to 2004.

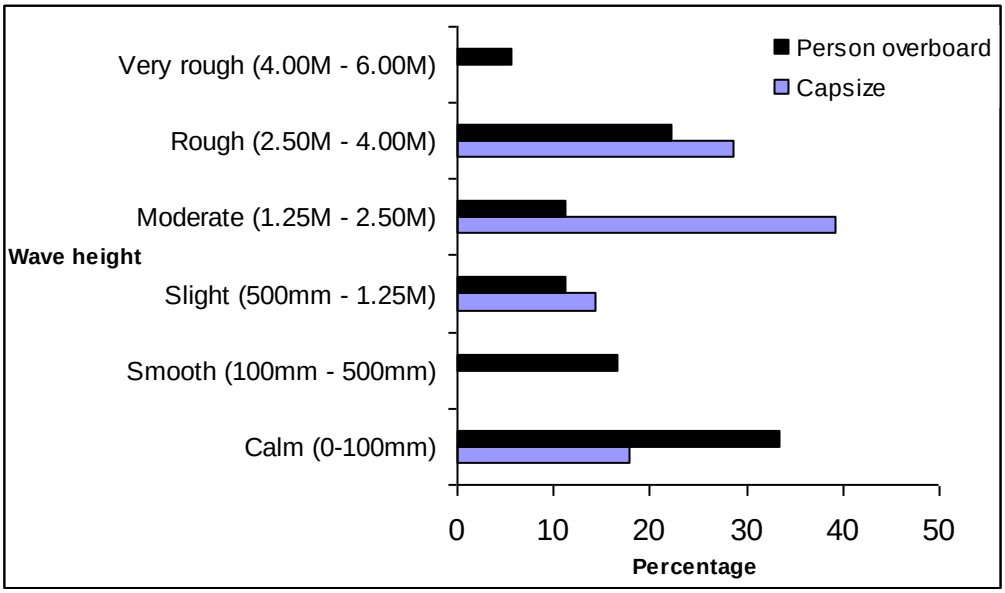


Figure 30: NMSC boating fatalities by wave height for capsize and person overboard, Australia 1999 to 2004.

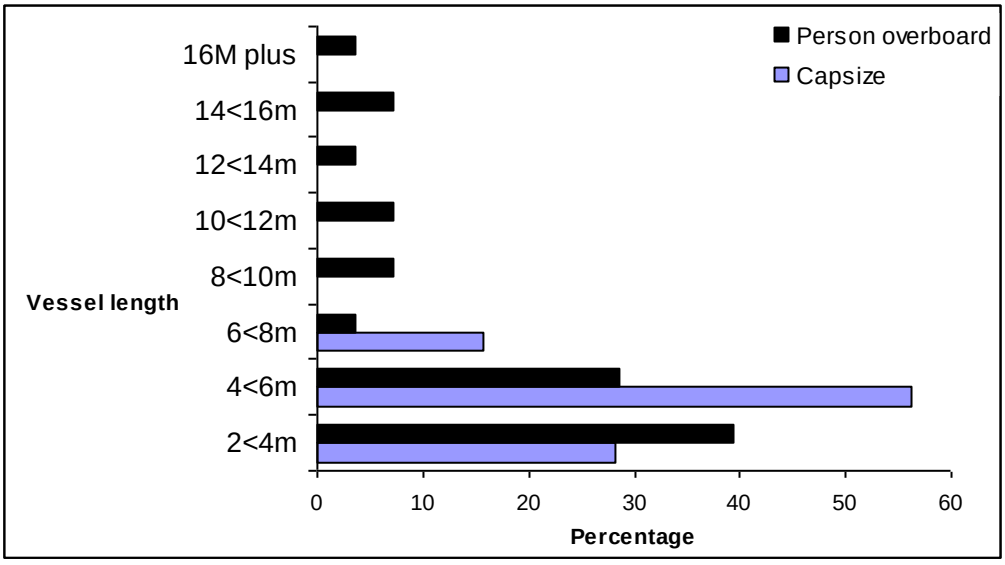


Figure 31: NMSC boating fatalities by vessel length for capsize and person overboard, Australia 1999 to 2004.

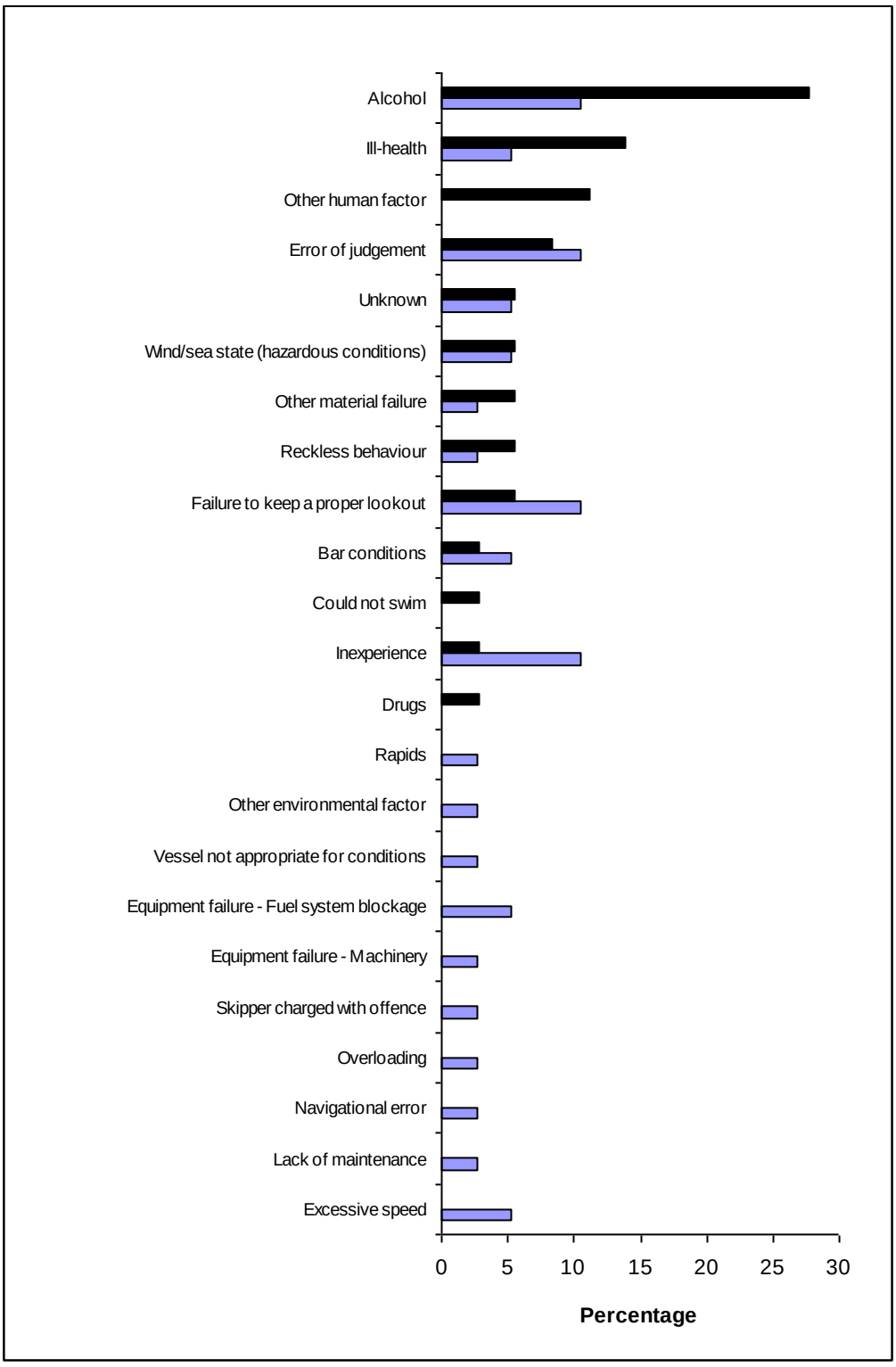


Figure 32: NMSC boating fatalities by initial contributing factor for capsize and person overboard, Australia 1999 to 2004.

Commercial vessel incidents

Of the 36 commercial vessel incidents, 5 involved commercial hire vessels. The following results exclude commercial hire vessels.

Three were Class 1 vessels, 3 were Class 2 vessels, 23 were Class 3 vessels and 1 vessel

was of unknown class. The Coroners records specified the exact vessel Class for only 6 of the Class 3 commercial fishing vessels: 1 each of Class 3b, d, e and 3 of Class 3c.

Crew size was mainly between 1 and 3 persons.

Commercial vessel fatal incidents occurred mainly in offshore waters (Figure 34). Thirty six people were killed and 5 injured in the 31 incidents. The vessel was lost in 16% of commercial vessel incidents with a further 19% suffering major damage.

Seas were less favourable for commercial vessel fatalities compared to all vessel fatalities: 48% occurred in moderate to very rough seas.

In thirty two percent of the fatal incidents the initial event involved a person being lost overboard and in 16% the initial event was the sinking of the vessel.

The initial contributing factor was alcohol in 19% of fatal incidents of commercial vessels. Hazardous environmental conditions, error of judgement, inexperience, and failure to keep a proper lookout were each 13% of initial contributing factors.

None of those killed was wearing a PFD at the time of death. Cause of death was salt water drowning in 75% of fatalities. Twenty five percent suffered from co-morbidities and these could have played a role in death. Fourteen percent were taking medication at the time of death.

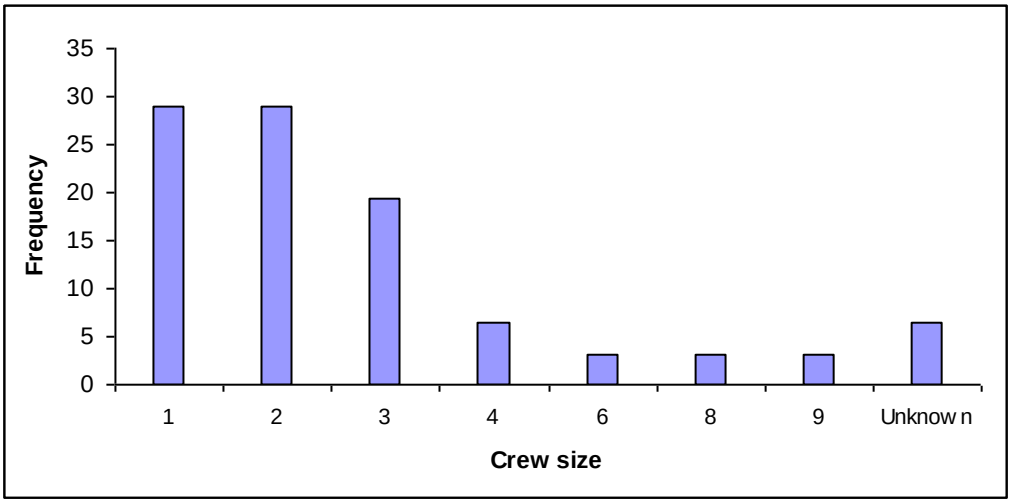


Figure 33: NMSC boating fatalities by crew size for commercial vessels, Australia 1999 to 2004.

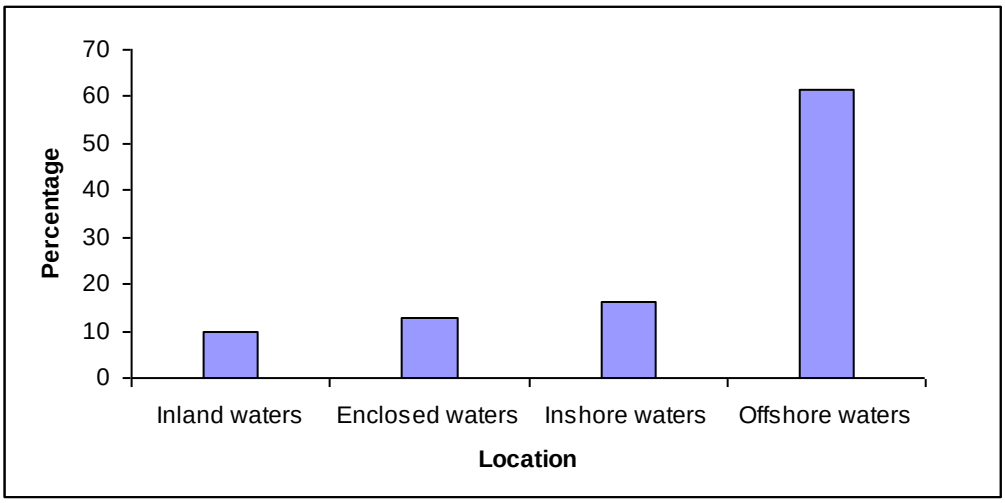


Figure 34: NMSC boating fatalities by location for commercial vessels, Australia 1999 to 2004.

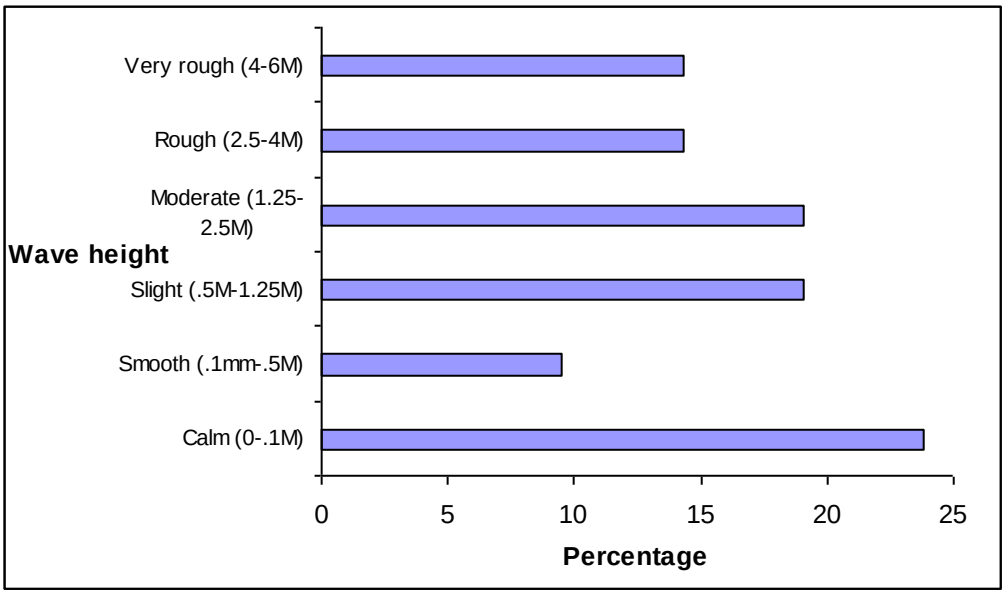


Figure 35: NMSC boating fatalities by wave height for commercial vessels, Australia 1999 to 2004.

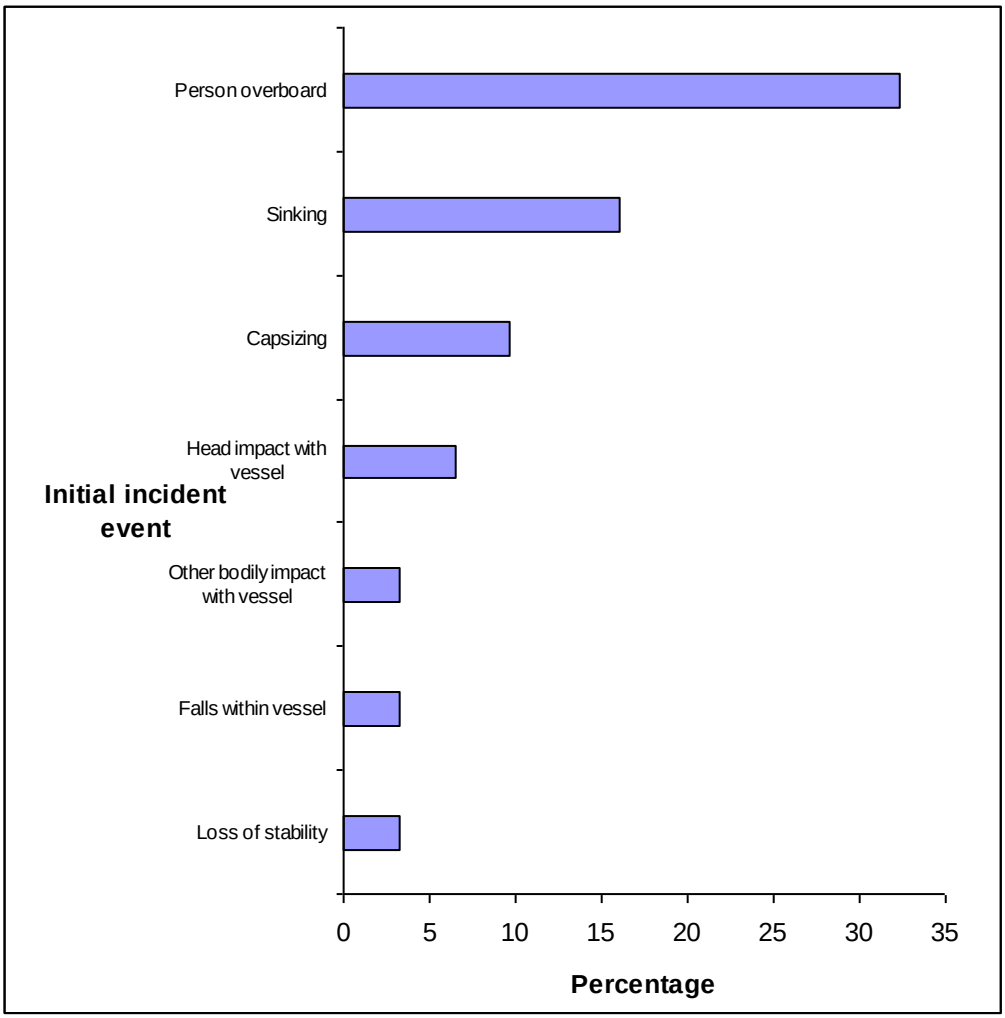


Figure 36: NMSC boating fatalities by initial incident event for commercial vessels, Australia 1999 to 2004.

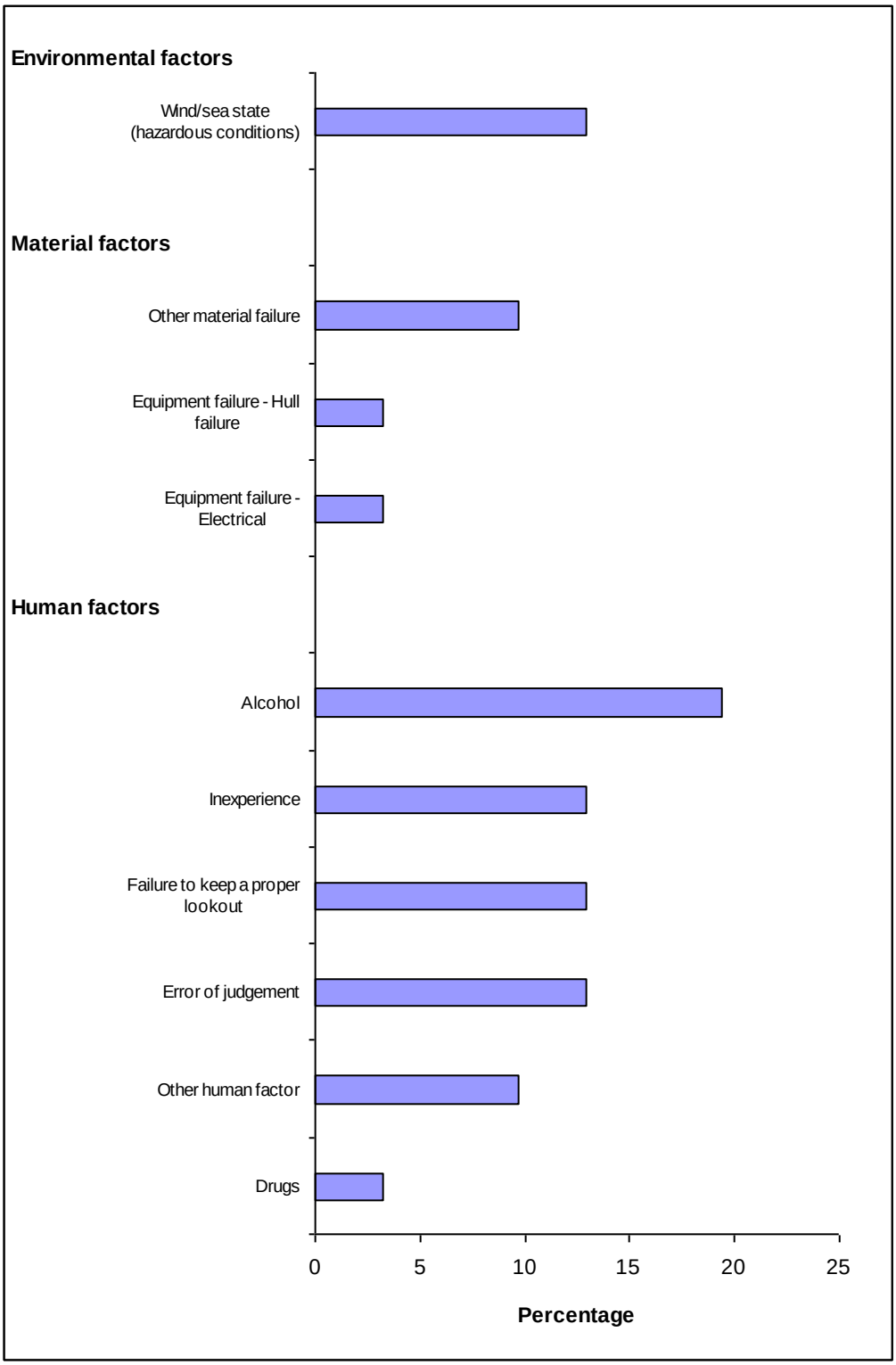


Figure 37: NMSC boating fatalities by initial contributing factor for commercial vessels, Australia 1999 to 2004.

Discussion

This study constitutes the second comprehensive national level analysis of fatal injury due to boating in Australia. It was, as with the first study, an arduous undertaking that spanned over a couple of years. The task at hand was technically simple, involving the extraction, analysis and reporting of data in a common format and according to relevant national data standards (NMSC, 2000), using information in the Coroners' files. However, the main obstacle in practice was administrative delay in accessing the required information and, in one State, identifying names of the deceased. The availability of data from the National Coroners Information System simplified the administration where the relevant files were available and coded, but offered little assistance where coverage of deaths was a problem.

It is unlikely that a future national boating fatality study would be practical without the National Coroners Information System and attention should be given to improving its coverage and timeliness.

Since 1992 it can be estimated that boating fatalities have cost the Australian community in excess of one billion dollars.

While recent trends in water transport deaths published by the Australian Bureau of Statistics have not been favourable, this report has shown that ABS statistics on boating deaths cannot be used directly for NMSC surveillance purposes as some of the deaths included in their statistics do not fit within the scope the interests of the NMSC. In addition, much of the interest in boating deaths relates to the characteristics of the incident, and this cannot be effectively determined without the analysis of Coroners' data and the specialised coding undertaken in the present study.

The report presents new information, much of it unique even in world terms. While many of the patterns evident in the data are predictable and have not changed much over time, some changing trends were evident. For example, it showed that human factors were even more common as a contributing factor in the second study. Another example is an apparent large increase in the frequency of overpowered and overloaded vessels and this needs to be further assessed. It is difficult to know whether these contrast reflect real difference or changes in vessel design parameters (eg. relationship between vessel length and beam width) over time which might mean that the Australian Standard AS 1799.1 is less accurate as an indicator of overpowered vessels in modern vessels.

The study has also shown where problems have been controlled. For example, internationally expressed concerns about a potential explosion of fatalities due to jet ski's has not arisen in Australia, reflecting well on authorities, suppliers and users. Also, the lower incidence of vessels with an insufficient number of PFDs for the number of people on board in the current study compared to the first study suggests that the messages about the required safety equipment, legislation and more active policing are getting through to the boating community.

The study has reinforced many of the findings of the first fatality study. For example, people can double their chances of surviving by wearing a personal flotation device. In addition, it has highlighted risks associated with alcohol, ageing and ill-health, drug use, and unstable dinghies.

Alcohol continues to be the primary risk factor. Forty seven percent of vessel operators were positive for alcohol and 40% of those killed were positive for alcohol. Twenty two percent of those killed had a BAC in excess of 0.05 gm/100ml demonstrating that alcohol is as much a problem in boating deaths as it is in road deaths. Alcohol was the main factor explaining why people fall overboard. The results indicate the needs for increased

surveillance and control of alcohol and drug use among the boating public. Attitudes toward alcohol use when boating need to change and should be the focus of a media campaign.

People killed in boating incidents are older than observed in the first fatality study. In addition, ill-health involving various co-morbidities and medication use is now more common and these finding are probably related to the age shift. The results suggest that a new subpopulation of older operators has taken up boating, possibly reflecting early retirement recreation trends.

Dinghies continue to be the most common type of vessel involved in fatal incidents. Indeed, dinghies were involved in more fatalities in this study than observed in the first fatality study. It is interesting to observe that while capsize was the main initial incident event for all vessels (Figure …), for dinghies the initial event was mainly a person falling overboard (Figure …) and, in addition, loss of stability is a much more frequent event in dinghies than all vessels. These results both reflect on the inherent instability of dinghies. In addition, involvement of alcohol and drugs and failure to wear a PFD are risk factors of the operators and occupants of dinghies.

Falls overboard and capsize were frequent initial contributing factors to boating deaths. The first fatality study stated “it is not entirely clear what specific human factors cause a person to fall overboard in the absence of some prior event such as a collision, capsize or loss of stability. The causes need to be further investigated because falls overboard is an important initial event in boating deaths”. The second study appears to have found the answer. Alcohol and ill-health were the dominant initial contributing factors for person overboard. After consuming alcohol or being ill, balance is often affected and people become unsteady on their feet, which is a strong risk factor for falling overboard. People need to be more effectively warned about the dangers of falls overboard, especially involving alcohol and ill-health.

Commercial vessel deaths are not as common as recreational vessels deaths. They involve less favourable seas and the risks of falling overboard. PFDs were not worn by any of those killed. Alcohol, co-morbidities and medication use were all factors in the commercial vessel deaths.

No specific policy recommendations are made in this report as this is the role of the NMSC and the marine authorities. However, it is highly likely that a number of the key results and associated discussion presented in the report will further inform policy.

References

Australian Bureau of Statistics (2007), *Year Book Australia*, ABS, Canberra.

Australian Transport Safety Bureau (2001), *Alcohol and Road Fatalities: Monograph 5*, ATSB, Canberra.

National Marine Safety Committee (2000), *National marine safety data collection reference manual: Data standards and definitions for marine incidents*, NMSC, Sydney.

National Marine Safety Committee (2003), *National standard for the Australian builders plate for recreational boats. Final regulatory impact statement*, NMSC, Sydney.

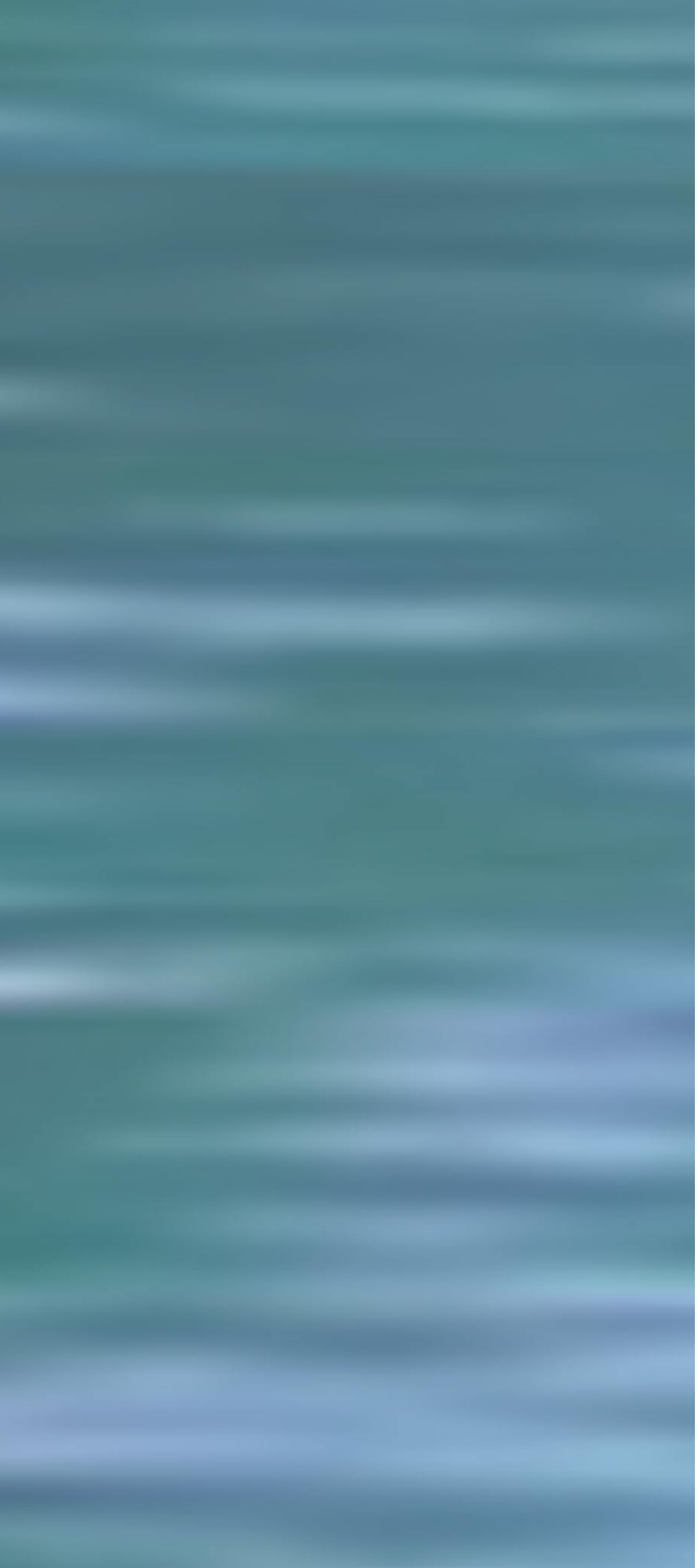
Norusis MJ (1998), *Statistical Package for the Social Sciences. V8.0.1*, SPSS, Chicago.

O'Connor PJ (2001), *Assessment of Fatal and Non-Fatal Injury in Boating*, Transport SA, Adelaide.

O'Connor PJ (2002), *Assessment of Fatal and Non-Fatal Injury due to Boating in Australia*, NMSC, Sydney.

O'Connor PJ (2004), *National Assessment of Boating Fatalities in Australia 1992-1998*, NMSC, Sydney.

Standards Australia (1992), *Australian Standard 1799.1. Small pleasure boats code; Part 1: General requirements for power boats*, SA, Sydney.



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