



# ***Drowning Prevention Auckland***

**Drowning Among Older Adults –  
Review of Literature and  
Perceptions of Water  
Competencies, Drowning Risk and  
Aquatic Participation**

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## Executive Summary

Older adults have been continuing to drown in both increasing numbers and proportion in New Zealand, despite falling drowning tolls in all other age groups (WSNZ, 2019). A review of the literature available has been completed to assist in determining risks and gaps in knowledge.

New Zealand has an aging population, like other developed countries. Aquatic participation is popular, especially in activities such as swimming, fishing, and kayaking (WSNZ, 2018a). As in all other physical activity, aquatic recreation is likely to drop off after 65 years of age.

Specific risk factors for older age drowning include age, gender and pre-existing medical conditions; activities such as an accidental immersion, boating, or swimming; and most likely to occur at beaches, offshore, in rivers, or in harbours.

Older adults are likely to have protective factors of safer boating attitudes and behaviours than younger boaties, but are more likely to perceive others at greater risk of drowning. Little is known about other competencies likely to influence the risk of drowning such as knowledge of hazards, competency in open water, and the capacity to assess risk and personal competency accurately.

A research study involving 398 adults was undertaken to measure perceptions of water competence and risk of older adults, and the aquatic recreation and activities they participate in, to inform the development of water safety education programmes for older adults.

Most adults (86%,  $n = 335$ ) reported aquatic activity in the previous year, around two thirds had swum in open water (67%) or had been boating (62%), over half had swum in a pool (59%) or had been fishing (58%), and one third had been surfing, SUPing or paddling (30%). Participants aged over 65 years (66%) were significantly less likely to participate in, on and around water ( $\chi^2 (2) = 29.999, p \leq 0.001$ ) than younger age groups (20 – 44 years 90%, 45 – 64 years 92%). Most (94%) had no known medical conditions that precluded aquatic activity.

Around two-thirds of adults perceive themselves as *good/very good* swimmers (65%) and floaters (64%,  $n = 247$ ). Respondents aged 65+ years were less likely (74%) to perceive they could swim more than five minutes non-stop ( $\chi^2 (4) = 11.900, p = 0.018$ ) than younger age groups (20 – 44 years 80%, 45 – 64 years 80%), and less likely to report they could swim ( $\chi^2 (4) = 11.900, p = 0.018$ ) or float ( $\chi^2 (4) = 10.422, p = 0.034$ ) for one hour than the younger age groups (20 – 44 years swim 26%, float 33%; 45 – 64 years swim 18%, float 39%; 65+ years swim 6%, float 19%).

Adults rated being swept off isolated rocks while fishing (88%) and being caught in a rip at a surf beach (69%) as *severe* risk, and *low* risk for engine failure in small boat 100m from shore (71%) and rescuing a person in deep water at a swimming pool (63%). Those aged over 65 years were less likely ( $\chi^2 (2) = 6.252, p = 0.044$ ) to feel confident about their safety in open water than younger age groups (20 – 44 years 63%, 45 – 64 years 66%, 65+ years 49%), or have confidence in their swimming fitness to keep safe ( $\chi^2 (2) = 7.866, p = 0.020$ ) (20 – 44 years 61%, 45 – 64 years 51%, 65+ years 41%).

New knowledge has been gained in the awareness of lower perceived swimming and floating competence, and further protective factors for older adults of their higher risk perception and their lower risk exposure due to lower frequency and levels of participation of aquatic recreation. In addition, the lower frequency and less recent aquatic participation, together with known and unknown medical conditions may put older adults at greater risk of drowning. Recommendations have been made to inform water safety education initiatives.

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## Section 1: Review of Older Adult Drowning Literature

For the last ten years the older adult age group of over 65 years has consistently been in the top three age groups most at risk of drowning in New Zealand. Despite other age groups falling, preventable fatal drownings in the over 65 year age group increased from nine in 2016 to 17 in 2018, comprising 16% of all preventable drowning for the last five years (WSNZ, 2019). In addition, the 45 – 64-year age group account for a further quarter (27%) of all drowning for the period 2014 – 2018.

### 1.1 Literature Review Introduction

Aging populations are an increasingly greater proportion of the population in many high-income countries and, while no precise universal chronological definition of it exists, the age group has been variously described using terms such as old people, seniors, senior citizens, older adults and elders. The lack of consensus reflects differences between countries, culture, history, genetics, environment, living conditions, social interactions, health and lifestyle (World Health Organisation, 2016). Generally, older adults are classified at the age one receives older age pensions, from 65 years in New Zealand (AIHW, 2018; Koopman-Boyden, 2018). Statistics New Zealand also defines older adults as those over 65 years. This research will also include younger adults in order to investigate any changes in perceptions and participation through age, as they are also a high-risk age group.

#### 1.1.1 Recent population trends

Since the second half of the 20th century, as life expectancy has increased, so has the proportion of older adults of populations in developed countries. Until that time, and still true in underdeveloped countries, less than five percent of the population was aged over 65. In 1960, the worldwide population aged over 65 years was one third of the under-five population. By 2013, the over 65 population had grown to equal the under 5 population. The over 65 population is projected to double the under-five age group by 2050 (World Health Organisation, 2016).

In the U.S. the population over 65 years tripled (from 12 to 36 million) from 1950 to 2004, growing twice as rapidly as the total population (Mitzner, Beer, McBride, Rogers, & Fisk, 2009), and expected to be about 20% of the US population by 2030 (Healthy Aging Research, 2018). In Australia, 15% of the 2017 population (3.8 million) were aged over 65 years, increasing from 1.3 million (9%) in 1977 and projected to 22% of the population (8.8 million) by 2097 (Fisher, Limprasertkul, & Pendergast, 2018).

In New Zealand, the total population numbers aged 65 years and over almost doubled between 1981 (at 310,000, 10% of population) to 2013 (610,000, 14% of total population), and is expected to increase to one quarter of total population by 2050 (Wilson, 2018). Furthermore, those aged 75-plus and 85-plus years are growing at even greater rates than younger age segments.

Worldwide life expectancy can range from 48 years to 82 years, and in most parts of the world women live longer than men. Some populations, such as Australia, include Indigenous ethnicities from 50 years as older adults due to their lower life expectancy (AIHW, 2018).

In New Zealand, non-Maori have a longer life-expectancy than Maori. In the 2013 NZ Census, most people (88%) aged over 65 years identified as New Zealand European, projected to fall to 77% of the over 65 age group by 2038 (Koopman-Boyden, 2018). Although Maori comprise 15% of the

population, only 6% of all those aged over 65 years were Maori, projected to increase to 10% in 2038. In 2013, 5% of the New Zealand population aged over 65 years were Asian (projected to increase to 13% by 2038) and 2% were Pasifika (4% by 2038) (Ministry of Health, 2019).

The number of older adults working beyond 65 years has increased to 22% in 2013, from 11% in 2004. One third of those aged 65 – 74 years were employed, dropping to 9% for 75 – 84 years and 4% for 85 years and over. Older males were more likely to be employed than older females (Koopman-Boyden, 2018).

## 1.2 Participation in Physical Activity

Physical activity declines with increased age. In England, inactivity levels sit between 15% and 29% for all ages, and increases slightly with age, then rises sharply at 75-84 years (to 47% inactive) and 85+ years (to 70% inactive) (Sport England, 2019).

In New Zealand, three-quarters of adults aged over 18 years participate in sport and active recreation (Sport New Zealand, 2018). Participation is reasonably steady throughout adulthood before dropping off at 65 years. Men and younger adults (aged 16 – 24 years) participate the most, women and older adults (50+ years) participate the least (Sport New Zealand, 2015). ‘Health and fitness’ (91%) and enjoyment (88%) are the key reasons for participation.

## 1.3 Aquatic Participation

Recreational participation in, on and around water remains popular for all ages, with swimming, fishing, kayaking and boating the most popular activities.

In Australia, swimming is the third most common activity participated by people of all ages (15%), behind walking (45%) and fitness/gym (35%), and just ahead of running/jogging (15%) (Sport Australia, 2019). Females are more likely to swim than males (17% v. 14%), and those aged 35-44 years, 45-54 years, and 55-64 years are more likely to swim than other ages. Only 12% of over 65 years swam.

Only a small percentage of the Australian population responded that they participated in fishing (1.2%). Australian fishers were more likely to be male (2% compared with 0.4% female) and aged 45-54 years (2%) or 55-64 years (3%).

Canoeing or kayaking was another activity that was more likely to be undertaken with older Australian adults. One percent of the population canoed or kayaked, although adults aged 45-54 years (2%) and 55-64 years (3%) were more likely to do so.

In England, swimming activities are the fifth most common type of physical activity, after walking, fitness activities, running and cycling (Sport England, 2019). The recent *Active Lives Adult Survey* showed a decrease in the number of 55-plus aged adults classed as inactive, specifically due to retired people getting active. Swimming levels peaks were seen in outdoor and open water swimming during the summer heatwave of 2018.

A RNLI study has reported angling, both freshwater and sea, is another popular participation sport/activity in the U.K., with estimates of up to four million taking part (Brown, Edgar, Mellor, & Bain, 2013). An estimated 1-1.9 million recreational sea anglers fish each year, with over half (57%)

aged between 41 and 60 years. When compared with freshwater anglers (those holding rod licences), sea anglers are slightly older. Nearly half (45%) were employed, with a quarter (26%) retired.

The fishers were grouped into five types of anglers, three of which feature older anglers. The first, pleasure sea anglers (holidaymakers, dabblers and non-experts) are predominantly aged 41–70 and are more likely to go fishing on holiday with family or friends. However, they fish less regularly, are less expert and experienced, and may be more unfamiliar with local conditions. The second group were the dedicated specialists, experienced sea anglers fishing over 100 times a year. This group includes well-informed and experienced anglers, often linked with angling clubs, however their fishing frequency means that they are more likely to experience extreme events and/or accidents. The older anglers (generally 70+ years) are more likely to be experienced but not necessarily expert although they may now fish less regularly. They generally fish in better weather from a man-made shoreline rather than from rocks, but are likely to fish on their own. These anglers are less likely to be reached via websites, but may still have links to clubs, including volunteering as committee members.

An estimated 3% of the adult U.K. population participated in either kayaking or canoeing at least once during 2013 with both sports experiencing significant growth in participation (Haq, Stubington, Pannell, & Hindmarsh, 2013). Most (77%) are male and over half (55%) are aged between 35 and 54 years. In addition, in 2013 an estimated 271,000 U.K. leisure divers participated in scuba diving, snorkelling and free diving (Brown, Edgar, Mellor, Crabbe, Bain, & Stolk, 2014). Most (73%) were male and over half (57%) aged between 31 and 60 years.

In New Zealand over one third of activity (40%) occurred at a beach or by the sea and more than one quarter (29%) in or on the sea (Sport New Zealand, 2015).

The *Sport and Active Recreation in the Lives of New Zealand Adults* survey (Sport New Zealand, 2015) cites swimming as the second most popular activity for all ages. Almost one third (30%) of all adults had swum in the previous 12 months, one fifth (20%) participated in fishing, and almost a tenth (8%) in canoeing/kayaking (ranked twelfth overall). Popular aquatic activity for males was fishing (ranked second, 29%), swimming (ranked fourth, 27%), canoeing/kayaking (ranked eleventh, 10%), and surfing/bodyboarding (ranked nineteenth, 6%). Aquatic participation for females was swimming (ranked second, 33%), fishing (ranked ninth, 11%), canoeing/kayaking (ranked thirteenth, 7%), and aquarobics (ranked sixteenth, 5%).



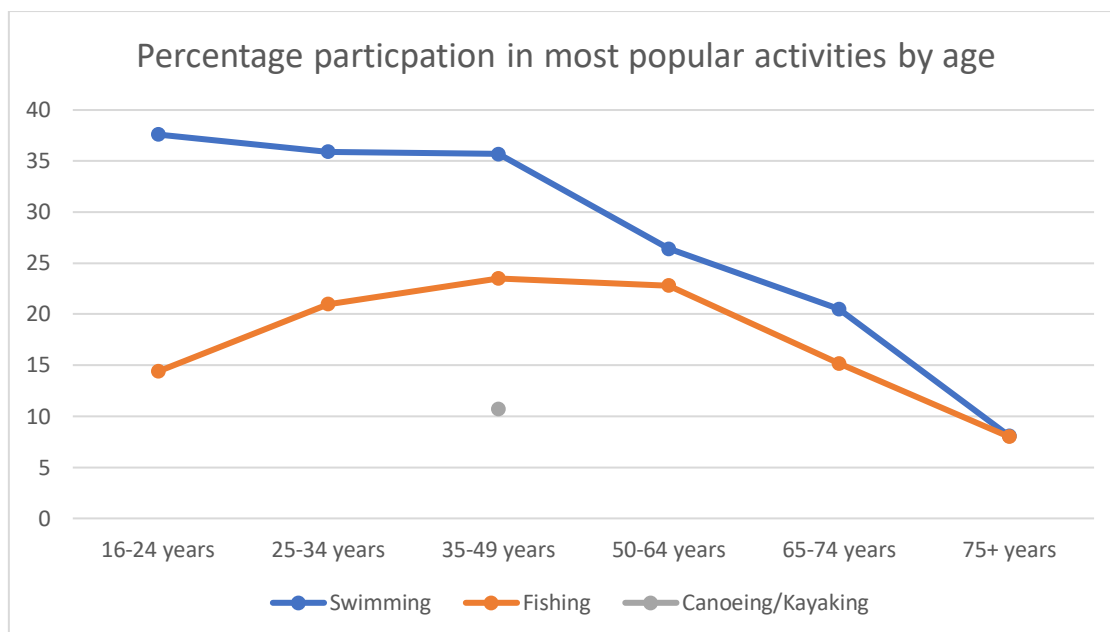


Figure 1 Percentage participation in popular aquatic activities by age.

As shown in figure 1, fishing increased in popularity from 25 to 64 years, swimming declines in popularity as people age, and canoeing/kayaking rises in popularity during the ages 35 – 49 years.

The following is a full list of aquatic sport and recreation activities and percentages that adults had participated in during the previous 12 months.

	%		%
Adventure rowing	<1.0	Outrigger canoe	<1.0
Aquarobics	2.8	Rafting	<1.0
Black water rafting	<1.0	Rowing	<1.0
Boating	<1.0	Sailing/yachting	2.1
Boogie boarding	<1.0	Snorkelling	<1.0
Canoe polo	<1.0	Stand Up Paddle boarding	<1.0
Canoeing/kayaking	8.1	Surf Life Saving	<1.0
Canyoning	<1.0	Swimming	30.2
Diving/scuba diving	3.4	Underwater Hockey	<1.0
Diving (springboard)	<1.0	Waka ama	<1.0
Dragon boating	<1.0	Wake boarding	<1.0
Fishing	19.5	Water biscuiting	<1.0
Jet boating	<1.0	Water polo	<1.0
Jet skiing	<1.0	Water skiing	2.4
Kite surfing	<1.0	Whitewater rafting	<1.0
Knee boarding	<1.0	Windsurfing	<1.0
Multisport	1.3		

The 2017 *Active New Zealand Main Report* (Sport New Zealand, 2018) also reported one third (33%) of adults had swum in the previous 12 months, but that swimming had dropped to the fifth most popular activity for adults. Other aquatic activities participated in the previous 12 months are marine fishing (15%), canoeing/kayaking (11%), and surfing/body boarding (8%).

The WSNZ 2018 Attitude and Behaviour Survey shows the aquatic activities undertaken by participants in the previous 12 months, and compared with 2016 and 2017 in figure 2 below.

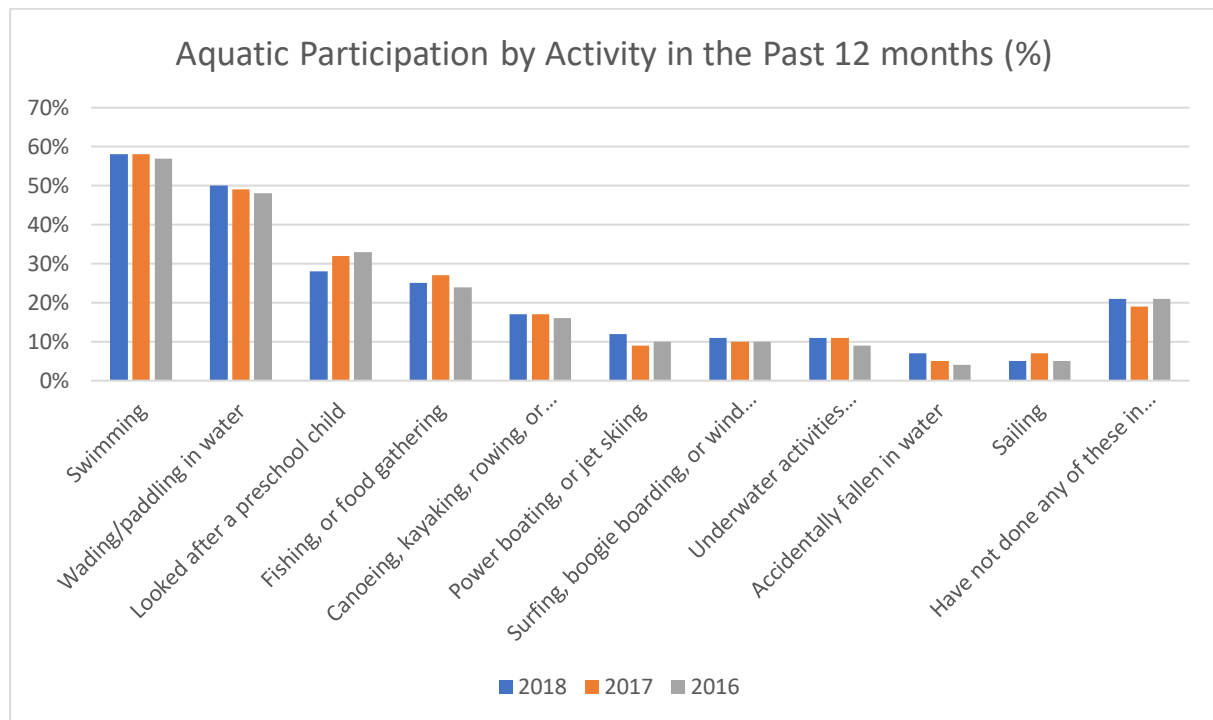


Figure 2 Aquatic participation by activity in the past 12 months. Source WSNZ, 2018a.

Participants in the Maritime New Zealand 2018 *Boating Participation Research* reported almost one half (42%) of adult New Zealanders either own or spend time on a recreational boat (Griffiths, Dodd, & Karkaria, 2018). Slightly more than half (54%) are male, and most (72%) are New Zealand European/Pakeha, with the remainder made up of Maori (12%), Pacific (2%), Chinese (6%), Indian (5%) and other (11%) ethnicities. Over half (57%) of recreational boating is carried out in the top half of the North Island (Auckland 37%, Waikato 9%, Bay of Plenty 7%, and Northland 4%).

A marginal increase in boaties aged over 35 years was reported since the two previous years, with almost one half (49%) of recreational boaties aged 35 – 64 years, and 12% aged 65+ years.

The most commonly used or owned recreational vessels include kayak/canoes (38%) power boats up to 6m (22%), dinghies (11%), and jet-skis (8%). The type of recreational vessel used varies with age (see figure 3 below). Participants aged 65+ years were more likely to own or use a powerboat 6m or less (31%) or a dinghy (22%) than boaties of all ages (powerboat 22%, dinghy 11%). Younger boaties were more likely to kayak/canoe, jet-ski, and SUP.

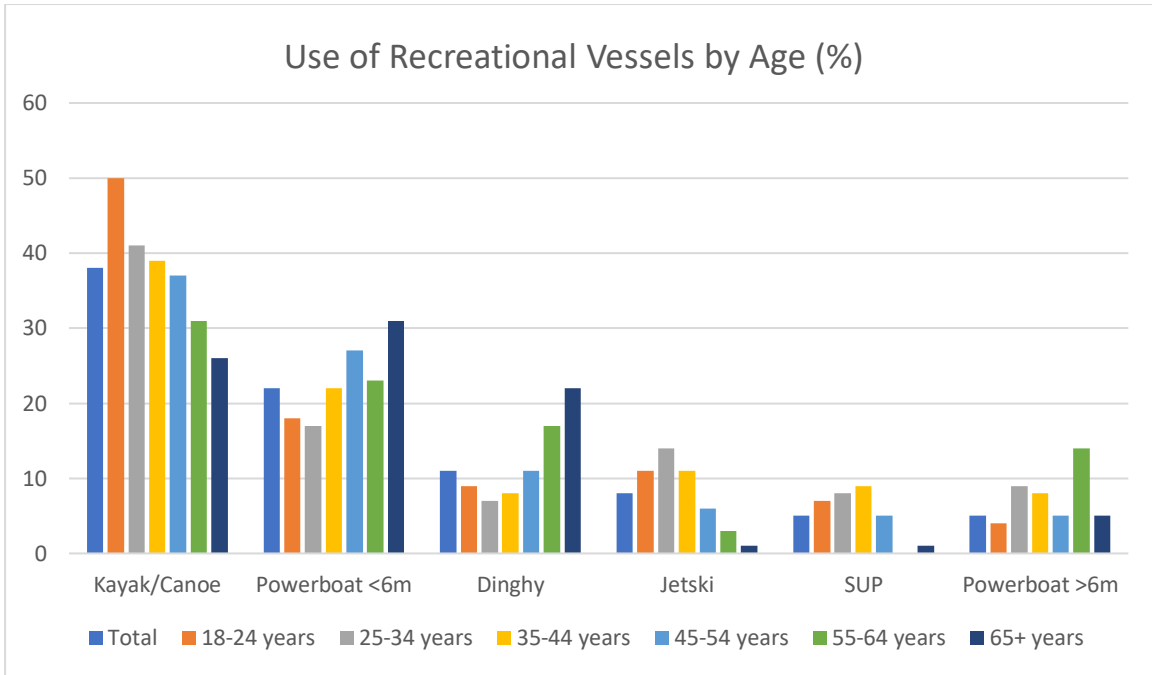


Figure 3 Use of recreational vessels by age.



## 1.4 Older Adult Drowning

The aging process includes deterioration in muscle strength, agility, balance, aerobic endurance, flexibility, and bone density (Mahony, Peden, Franklin, Pearn, & Scarr, 2017). Additional decline in lungs and heart efficiency is likely to affect our ability to perform the 15 water competencies required to prevent drowning (Stallman, Moran, Quan, & Langendorfer, 2017; Langendorfer, Moran, & Stallman, 2018).

Despite decreasing drowning rates, drowning has been increasing for older adults in a number of countries (Peden, Franklin, & Clemens, 2019). Drowning death rates for people aged 65 years and over increased significantly by 19% in the US during 2000–2006 (Hu & Baker, 2010). In Australia from the period 2002 - 2007 people aged over 55 years represented 29% of all drowning with suggested contributing factors including a reliance on competencies such as swimming skills learnt many years ago, overestimating current competencies, reduced fitness, greater exposure through increased aquatic activities and time spent near water, and the impact of medical conditions (Franklin, Scarr & Pearn, 2010). A recent ten-year study to 2014 of fatal drowning in the high-income countries of Australia, Canada and New Zealand reported similar proportions of adults over 65 years drowning; Australia 38%, Canada 39% and New Zealand 37% (Peden et. al., 2019).

### 1.4.1 Older Adult Drowning in New Zealand

In New Zealand, in the 10 years to 31 December 2017, one third (35%, n = 284) of all preventable drowning deaths were aged over 50 years and 116 (14% of total drowning) were aged over 65 years (WSNZ, 2018b). In the five years to the end of 2018, almost one third (n = 115, 29%) of the 397 preventable drowning deaths were aged over 55 years, and 63 (16%) aged over 65 years. Percentages rose for the 2018 year with over one third (n = 23, 35%) of the 66 preventable drowning victims aged over 55 years, one quarter (n = 17, 26%) over 65 years (WSNZ, 2019a).

A New Zealand Search and Rescue (NZSAR) study of rescued victims included participants from 48 boating incidents and 15 water incidents (in addition to the 161 land incidents) (NZSAR, 2018). Almost all (94%) had learned to swim but most (70%) didn't intend going into the water. Most reported they had the swimming ability needed to swim at the location (64%), the fitness required to swim at the location (57%), and appropriate level of health needed to swim at the location (69%). Most (72%) were male, and most (67%) were aged over 40 years, particularly 45 – 64 years.

A Fatality Incident Database has been kept for kayaking (including waka ama, surf skis, canoes and SUPs) in New Zealand since 1983 (KASK Incident Database, 2018). In the 37 years to 2018 there have been 59 kayaking fatalities, one third (n = 14, 24%) were aged 40 – 64 years and four (7%) aged over 65 years.

New Zealand 2018 hospitalisations as a result of drowning increased 25% from 2017 and 11% on the five year average (2013 – 2017), and the 65+ age group saw the highest amount of hospitalisations ever with an increase of 18% from 2017 and 37% on the 2013 - 2017 average (WSNZ, 2019c).

## 1.5 Risk Factors of Drowning in Older Adults

A global review of literature on unintentional fatal drowning in people aged over 50 years (Peden et.al., 2017) identified inconsistency around age groupings for epidemiological studies, a lack of consensus on risk factors and the need for the effectiveness of interventions to be evaluated. Risk factors included male gender, ethnicity, rurality, and increasing age. A subsequent Australian study covering 15 years to June 2017 and 803 unintentional drowning deaths of 65+ years (Pearn, Peden, & Franklin, 2019) highlighted new aspects of older age drowning including medications for illnesses and health, and the effect of alcohol.

Older adults may have different physiological and clinical characteristics compared with all other adults, with reduced functional capacity and ability to cope with drowning. A Korean study of drowning victims presented to an emergency department (Lee, Park, Choi, Oh, & Wee, 2019) reported adults aged over 65 years were more likely to experience cardiac arrest and hypothermia after drowning, and they were also more unlikely to survive the drowning process. Physiological changes in the lungs may have caused the increased likelihood of respiratory diseases after drowning when compared to all adults.

### 1.5.1 Age

In New Zealand actual numbers of drowning deaths decreased with age from the period 2008 – 2017, see figure 4 (WSNZ, 2018b).

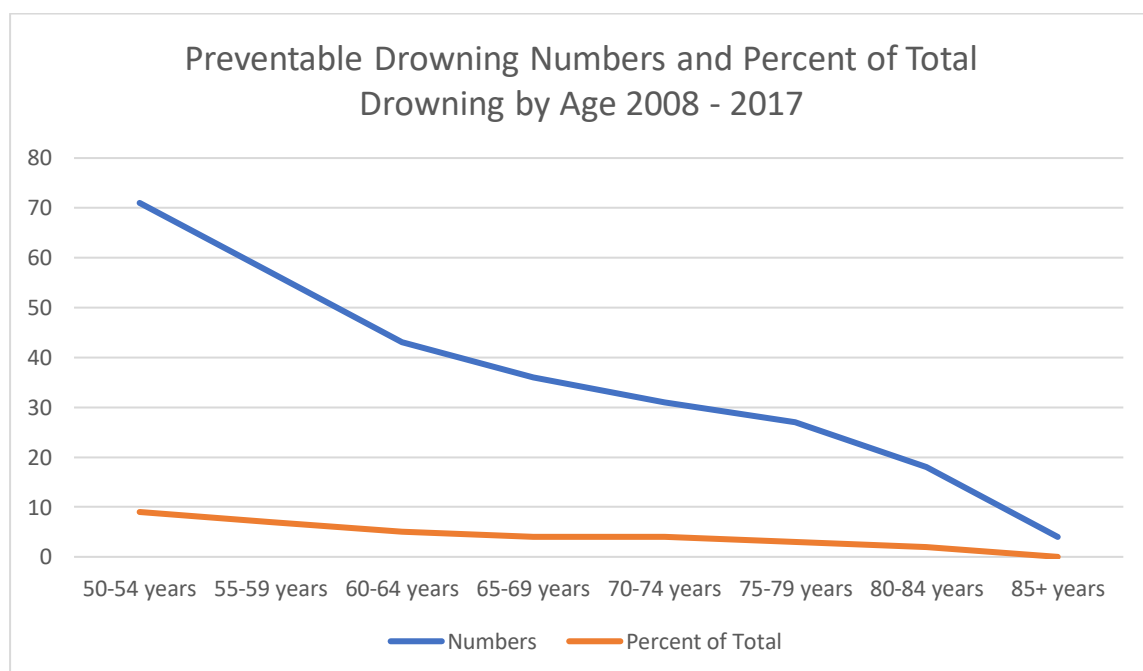


Figure 4 Preventable drowning numbers and percent of total drowning by age.

### 1.5.2 Gender

As is the case for drownings of all ages, in Australia older male adults were more likely to drown than older females (74% male), with a significantly higher proportion of males (56%) aged 65 - 74 years than those over 74 years (44%) (Pearn et. al., 2019). Males were significantly more likely to drown in the ocean and from boating incidents when compared to females, and females were more likely to

drown while bathing, in swimming pools, and due to accidental immersion. Similarly, in New Zealand most drownings (n = 284, 84%) of those aged over 50 years from 2008 – 2017 were male (WSNZ, 2018b).

### 1.5.3 Activity Prior to Drowning

The main activities for New Zealand drowning in older adults were accidental immersion (n = 80, 28%), powered boats (n = 62, 22%), and swimming (n = 44, 15%) (WSNZ, 2018b). One fifth of older Australians drowned as a result of falling in the water (accidental immersion) (23%) and swimming and recreating (19%) (Pearn et. al., 2019). Those aged 65 – 74 years were more likely to drown from a boating incident and diving, and those aged over 75 years were more likely to drown from a fall into the water.

### 1.5.4 Environments

One quarter of New Zealand older adult drownings were at beaches (n = 71, 25%), and one quarter offshore (n = 66, 23%) (WSNZ, 2018b). Other key environments were rivers (n = 42, 15%) and harbours (n = 28, 10%) (WSNZ, 2018b). The main environments for older age drowning in Australia were rivers (27%), swimming pools (17%) and beaches (15%) (Pearn et. al., 2019).

Bathtubs were the focus of a ten-year Australian study of older adult drownings (Peden, Franklin, Pearn, & Mahony, 2019) and, although only accounting for 6% (n = 32) of all over 65 year drownings (n = 510), there were a number of common factors. Almost half (n = 13, 41%) drowned after falling into the bath, most (n = 26, 81%) had a pre-existing medical condition, which contributed to the drowning in over half (n = 19, 53%) of the incidents, and one half (n = 16, 50%) lived alone.

### 1.5.5 Medical

Two thirds (64%) of older Australians who drowned in all setting in the 15 years to 2017 had a known pre-existing medical condition, although for another third (31%) it was unknown rather than not present (Pearn et. al., 2019). Pre-existing medical conditions were higher for those aged over 75 years (69%). In contrast, only a small proportion (6.3%) of the NZSAR water incidents reported an existing medical condition (NZSAR, 2018).

Pre-existing medical conditions have been found to contribute to over one third (36%) of older Australian unintentional drowning (Mahony et. al., 2017). Those with medical conditions were twice as likely to be on some form of medication when they drowned compared to those without pre-existing medical conditions, and more likely, therefore, to be affected by the medication. Pre-existing medical conditions contributed to drowning the same for both males and females, indicating that these conditions impact upon fitness, ability, and survival in the water for both genders. Those with cardiovascular disease, dementia, Parkinson's Disease and epilepsy were more at risk than other pre-existing conditions. Those with pre-existing medical conditions were more likely to drown from falling and while swimming and recreating (Mahony et. al., 2017).

Analysis of U.K. fatal incidents across 11 different ocean activities (Michalaki, Wright, & Pirapakaran, 2015) showed reasonably high incidences of medical episodes, such as heart attacks, being reported for small sailing boats (44%), yacht sailing (36%), powerboating (18%), swimming (16%), kayaking or canoeing (13%), and walking (11%).

In New Zealand, medical issues were considered a contributing factor in over one quarter (n = 76, 27%) of all over 50 years drowning 2008 – 2017 (WSNZ, 2018b), and almost three-quarters of these (n = 55, 72%) were a cardiac event or heart disease. In 2018, two thirds (n = 11, 65%) of the 17 over 65-year drownings were from accidental immersion (WSNZ, 2019c) and home pools (5), baths, and

spas pools, where the victim was unlikely to be supervised, were common older age drowning environments, supporting evidence of the high risk of pre-existing medical conditions and solo bathing and swimming.

One fifth (n = 3, 21%) of the fatal kayaking incidents in New Zealand in the past 37 years for those aged 40 – 64 years suffered a medical incident. For those aged over 65 years the likelihood of a medical incident contributing to a fatality rose to 50% (n = 2) (KASK, 2018).

### 1.5.6 Alcohol

Alcohol was involved in 16% (n = 45) of New Zealand aged over 50 years drowning (WSNZ, 2018b). In comparison, one quarter of older Australians who drowned had consumed alcohol, 10% with a blood alcohol level (BAC) above .05%, and of those, most (74%) were aged 65 – 74 years (Pearn et. al., 2019) with concern around the implication of the effect of alcohol on those taking prescribed medications.



## 1.6 Aquatic Safety Behaviour and Attitudes

Participants in the *Boating Participation Research* reported safer attitudes and behaviours as adults aged (Griffiths et. al., 2018). Awareness of safety messages or activities is higher for those aged 65-plus years when compared with all ages (45% vs. 41%), and 35-44 years were less likely to recall safety messages.

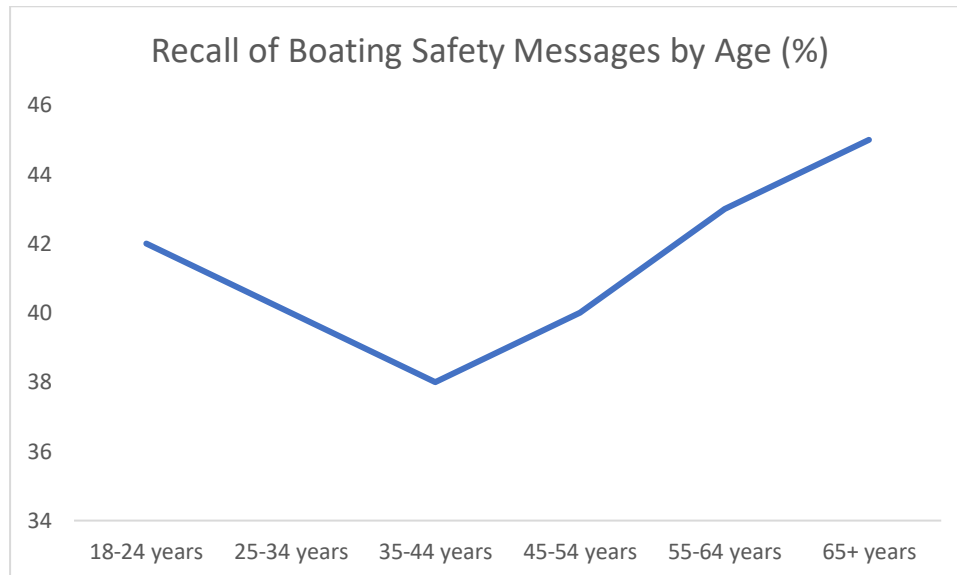


Figure 5 Recall of boating safety messages by age.

Safety behaviour was also more likely to improve with increased age when reported for carrying lifejackets (87%), carrying a cell phone in a waterproof bag (55%), and carrying flares (27%) on board, see figure 6.

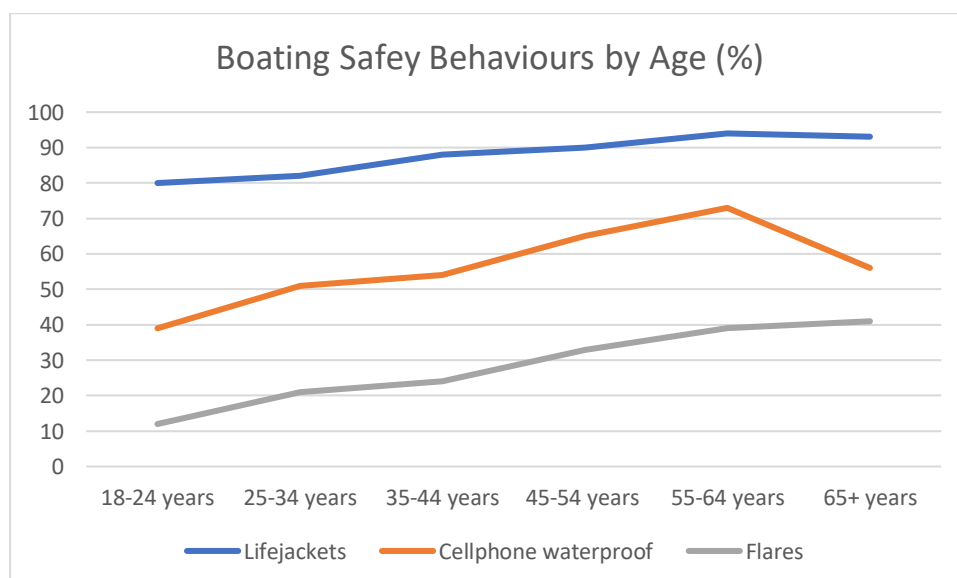


Figure 6 Boating safety behaviours by age.

Further research should be undertaken to investigate age correlations to change in attitudes and behaviours for other activities such as swimming or at the beach.

## 1.7 Risk of Drowning Perceptions

Females are consistently reported as being more risk averse, and males more confident in the water, (Howland, Hingson, Mangione, Bell, & Bak, 1996; Gulliver & Begg, 2005; Moran 2003; Moran & Stanley, 2013; Stanley & Moran, 2017), however little is known about the perception of aquatic risk for various age groups. One study has reported younger adults as less likely than older adults, to agree that injuries in or on the water are preventable, and that they could personally do anything to improve their safety (Titchener, Haworth, & Lennon, 2011).

The WSNZ *Attitudes and Behaviour* research (WSNZ, 2018a) shows that most age groups perceive other ages groups as high drowning risk. Figure 7 shows that children aged under 5 years and youth 15 – 24 years are perceived by all ages as the highest risk of drowning, although in effect those over 65 years are actually the highest risk.

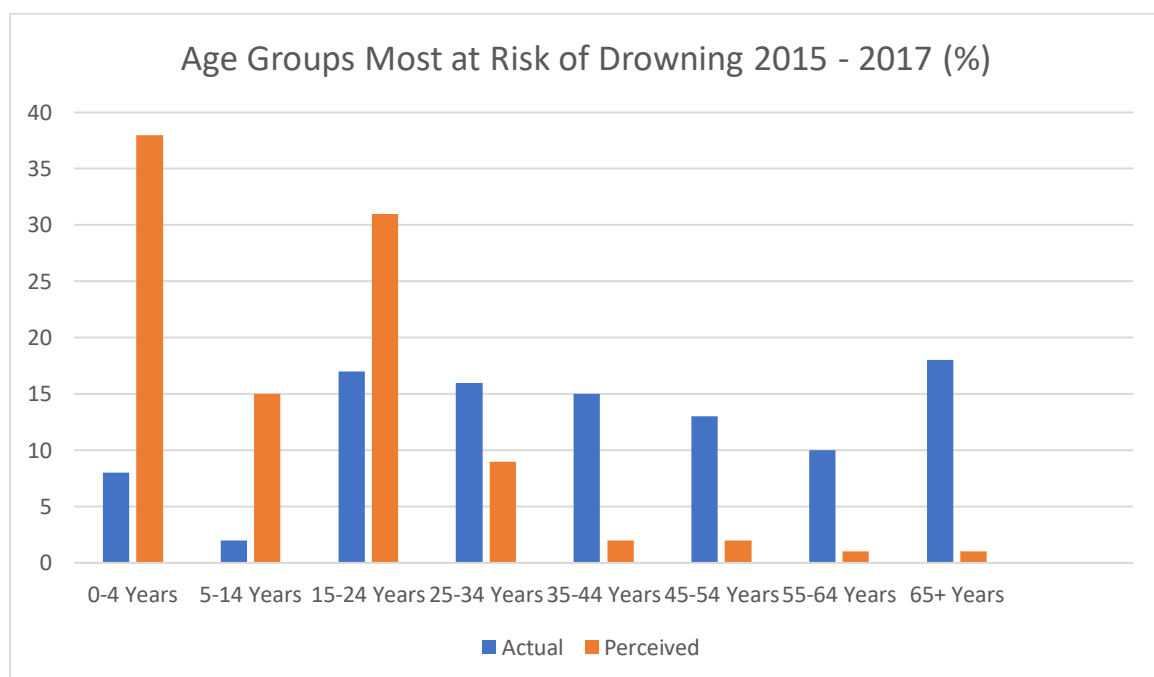


Figure 7 Age groups at risk of drowning. Source: WSNZ, 2018a.



The graph below (figure 8) shows those aged over 65 years are incorrectly, and the most likely to, perceive 15-24 years as the highest risk of drowning, rather than acknowledging themselves as the highest risk.

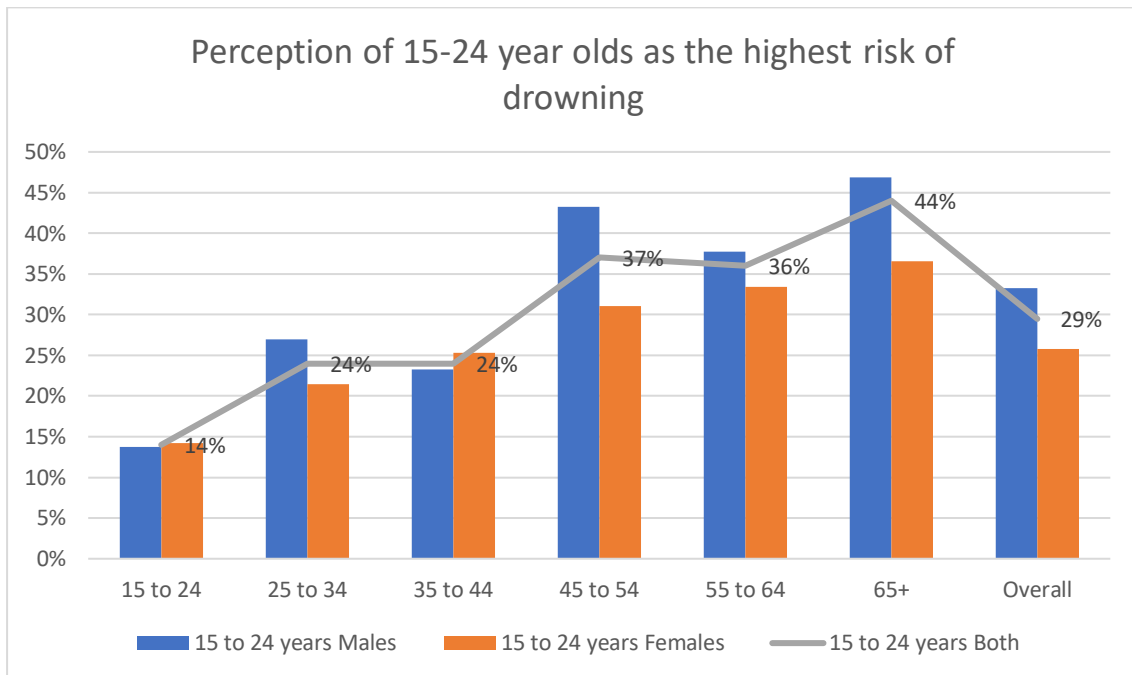


Figure 8 Participants who perceive 15-24 years as the highest risk of drowning. Source: WSNZ, 2018b.

With the limited data on aquatic risk perception available, it is recommended that research is undertaken to determine any differences in how various age groups perceive aquatic risks.



## 1.8 Assessing Personal Competency

Previous studies by the authors focussing on adult assessment of personal water competency reported although most adults perceived they could swim well, male parents were twice as likely as females to estimate they could swim more than 200m, and more likely to feel safe when swimming in open water (Stanley & Moran, 2017), and more male adults than females were confident of their ability to rescue (Stanley & Moran 2018).

Lack of knowledge on age-related personal water competency assessment suggests future research focus on determining any differences in personal water competencies by age.

## 1.9 Water Safety Knowledge

Inadequacies in youth surf and boat safety knowledge have been reported despite frequent youth participation in aquatic recreation (Moran, 2003; Moran, 2008a), and regardless of frequent surf recreation and their high confidence in their ability to cope with risk, the lack of surf safety knowledge of most New Zealand youth signifies a higher risk of drowning (Willcox-Pidgeon, Moran, & Kool, 2017).

Furthermore, there is evidence to show that adult surf knowledge is not much better. A study of New Zealand residents and international tourists reported less than one half of both groups could identify a rip current at a surf beach (Moran & Furner, 2017) and the *2017 WSNZ Benchmark Survey* reports just over one half (56%) of adults recall seeing or hearing a safety message in the past year (Blank, Major, & Muller, 2017), most likely to be wearing lifejackets when boating (20%), swimming between flags (14%), or supervising children (6%).

There is no data found to report adult water safety knowledge by age groups. In light of this, and due to the poor adult water safety knowledge already reported, it is recommended further studies be conducted.



## 1.10 Conclusion of Literature Review

Comparable with other developed countries, New Zealand has an aging population, together with a growing number of older adults drowning.

Activities such as swimming, fishing, and kayaking are popular with older adults with participation figures ranging from 33% (Sport NZ, 2019) to 57% (WSNZ, 2018a) swimming in the previous 12 months and 20% (Sport NZ, 2019) to 24% (WSNZ, 2018a) participating in fishing activities. Almost one half of participants in the Maritime New Zealand 2018 *Boating Participation Research* owned or spent time on a recreational boat or watercraft. As in other physical activity, aquatic recreation is likely to drop off after 65 years of age.

The 2018 fatal and non-fatal drowning numbers for over 65 years in New Zealand, similar to other developed countries, have continued to trend upwards, despite overall lower rates of drowning.

Specific risk factors for older age drowning include age, gender and pre-existing medical conditions; activities such as an accidental immersion, boating, or swimming; and most likely to occur at beaches, offshore, in rivers, or in harbours.

Older adults are likely to have protective factors of safer boating attitudes and behaviours than younger boaties, but are more likely to perceive others at greater risk of drowning. Little is known about other competencies likely to influence the risk of drowning such as knowledge of hazards, competency in open water, or the capacity to assess risk and personal competency accurately.



## Section 2: Perceptions of water competencies, drowning risk and aquatic participation among older adults

### 2.1 Study Introduction

In recent years there has been increased incidence of drowning among older adults (WSNZ, 2019a, 2019c; Peden, Franklin, & Queiroga, 2017). It is unknown if this is a consequence of any or all of the following factors: increased numbers of older adults (baby boomers); greater disposable income and leisure time leading increased exposure to drowning risk; changing health and medical conditions; greater length of time since undertaking any water safety education or skill development; over estimation of competence, or underestimation of risk.

Despite this age group being at high risk of drowning, there are no specific water safety interventions targeting older adults. Little is known about the aquatic behaviours of older adults, what they participate in, or how often, how they perceive their risk in relation to their practices and their competence to keep themselves safe.

### 2.2 Aims and Objectives

On the basis of what has been reported in the previous section, the aim of the study is to determine the perceived water competencies, risks and aquatic activities of older adults so as to inform future drowning prevention interventions in New Zealand.

Specifically, the study hopes to answer the following research questions:

- Does older adult aquatic participation differ from other population groups?
- What are the drowning risks for older adults relating to their drowning incidents and participation?
- Do older adults differ from other population groups in their perceptions of water safety and risk of drowning?
- What are the water safety attitudes and behaviours of older adults, and do they differ from other age groups?
- What are the perceptions of water competencies among older adults, and how does this relate to risk perception and aquatic participation?

## 2.3 Methodology

### 2.3.1 Participants

Adult customers visiting six Mitre 10 stores in Waikato and Auckland, or attending the 2019 Auckland Hutchwilco Boat Show were asked to complete an anonymous electronic survey about their perceptions of their water competencies and risks, and the type and quantity of their aquatic recreation. A total of 389 adults completed the survey, 172 at Auckland Mitre 10 stores (Takanini, Glenfield, Henderson and Albany), 64 at Mitre 10 stores in Waikato (Matamata and Cambridge), and 152 at the Auckland Boat Show.

The research was granted ethical approval by the University of Auckland Human Participants Ethics Committee (Reference No. 016725).

### 2.3.2 Incentive

Participants were invited to enter a draw for \$1000 Mitre 10 voucher as appreciation of completion of the survey. Names and contact details were recorded separately. The winning participant, a customer at Glenfield Mitre 10, was drawn by the manager of Matamata Mitre 10.

### 2.3.3 Survey Instrument

The questionnaire, designed to be completed in 5-10 minutes, consisted of 27 closed and two open questions based on previously validated studies (Moran, 2003; Moran, 2006; Moran, 2008b; McCool et. al., 2009; Moran & Stanley, 2013; Stanley & Moran, 2018). A copy of the survey is attached in Appendix A.

The first six questions (Ques 1 – 6, Appendix A) assessed socio-demographic characteristics including gender, age (*20-44 years, 45-64 years, 65+ years*), self-identified ethnicity (*New Zealand European, Maori, Pasifika, Asian, Indian, and "other" ethnic groups*), length of residency (*<1 year, 1-4 years, 5-9 years, >10 years*), state of employment (*employed, unemployed, retired*), and whether or not they had a medical condition that precluded participation in aquatic recreation.

Participants were asked four questions to determine participation in aquatic recreation (Ques 7 – 10, see Appendix A). The first questions asked whether or not they had participated in an recreation around water in the past year, the second asked what type of recreation (*swimming in a pool, swimming in open water, surfing SUPing or paddling, boating, fishing or "other"*) they had engaged in. Two further questions sought information on how often they participated around water in summer months (*never, monthly, weekly, daily*), and whether or not it had increased recently, and if so, why.

Seven questions (Ques 11 – 17, Appendix A) sought information on swimming and floating competencies by asking participants whether they could swim or float, and, if so, how they would rate their swimming competency using four response categories (*poor, fair, good, very good*), and how far and how long they estimated could swim non-stop or float without moving and without flotation aids (Moran, 2003; Stanley & Moran, 2018). In addition, information was sought on when they had swum the distance (*last month, last year, last 5 years, last 10 years*), how easily they thought they could swim the distance estimated, or float the estimated time, in open water (*very easily, easily, with difficulty, with great difficulty*), if they swam for fitness (*never, occasionally, often, very often*), and how often they swam in open water during summer months (*daily, weekly, about once a month, less than once a month, never*).

To determine water safety attitudes, participants were asked a series of seven statements (Ques 18, Appendix A) with *agree or disagree* response options (Moran 2008b, McCool et al., 2009). Perception of the risk of drowning was determined using a series of five statements (Ques 19, Appendix A) (for example, when being caught in a rip current at a surf beach or being swept off isolated rocks by a wave while fishing) with a four-point response scale (*extreme risk, high risk, slight risk, no risk*) (Moran, 2008b, Moran et.al., 2012). Participants were asked about their confidence in open water on a four-point response scale (*very anxious, anxious, confident, very confident*). Finally, participants were asked for any further comments.

The survey was uploaded onto Survey Gizmo, and was completed by participants on tablets, either self-complete by the individual, or led orally by the researcher, depending on the preference of the participant.

#### 2.3.4 Data Analysis

All data was downloaded onto SPSS Statistics Version 25 (Armonk, NY, USA) for statistical analysis. Frequency and percentages were created to report categorical variables such as demographic data and perceptions of competence and risk. Chi-square tests were used to determine the association between dependent variables (such as perceived swimming or floating competency and risk) and independent variables (such as gender, age, and ethnicity). Where multiple responses were included (for example, swimming and floating competency), results were dichotomized for ease of interpretation with *poor* and *fair* grouped as *poor/fair*, and *good* and *very good* grouped as *good/very good*.



## 2.4 Results

### 2.4.1 Demographics

A total of 389 adults participated in the survey. Over one half (55%, n = 213) were male (female 45%, n = 176). Almost all participants (90%, n = 351) had lived in New Zealand for 10 years or more with only four (1%) of the total having lived in New Zealand for less than one year. Three-quarters (77%, n = 300) identified as European New Zealander, 7% (n = 27) as Maori, 4% (n = 15) as Indian, 3% (n = 12) as Pasifika, 3% (n = 11) as Asian, and 6% (n = 24) as “other”. Participants were categorized into three age brackets; 20 – 44 years 39% (n = 153), 45 – 64 years 43% (n = 166), and over 65 years 18% (n = 70). Most participants (94%, n = 366) reported no medical conditions to limit their aquatic participation, with no differences in medical conditions by age. Most participants were employed, either full or part-time, (81%, n = 313), a small proportion were unemployed (6%, n = 22), and the remainder retired (14%, n = 54).

Due to small numbers in some categories (Asian ethnicity and under one-year residency) Indian and Asian categories have been dichotomised into “Asian” and less than one year, and one to nine years residency have been dichotomised into “less than ten years”.

Chi-square tests were undertaken to check the point of completion of survey was representative of the cohort. There were no statistical differences for gender, ethnicity, or medical conditions when analysed by point of survey completion. Statistical differences were found when analysed by age ( $\chi^2(4) = 36.739, p \leq 0.001$ ), residency ( $\chi^2(2) = 13.844, p \leq 0.001$ ), and employment status ( $\chi^2(4) = 18.180, p \leq 0.001$ ).

As shown in figure 9 below, participants at the Boat Show were more likely to have lived in New Zealand for less than ten years (16%, n = 25) compared with participants from the Mitre 10 stores (Waikato 9%, n = 6; Auckland 4%, n = 7).

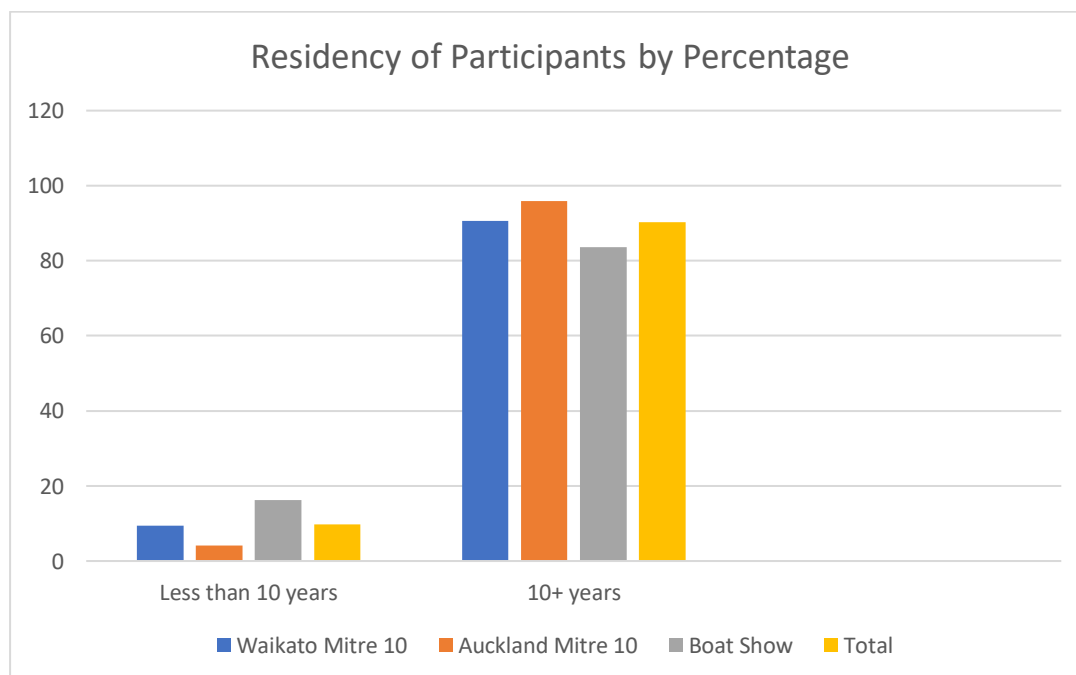


Figure 9 Residency of participants by survey point completion.

Figure 10 below shows the Boat Show participants (52%, n = 80) were more likely than Mitre 10 participants to be aged between 20 – 44 years (Waikato 36%, n = 23; Auckland 29%, n = 50), the Mitre 10 participants in the Waikato more likely to be aged 45 – 65 years (52%, n = 33) compared with the Boat Show (41%, n = 71) and Auckland Mitre 10 (41%, n = 71), and Auckland Mitre 10 stores having more participants over 65 years (30%, n = 51) when compared with the other points of completion Waikato 13%, n = 8; Boat Show (7%, n = 11).

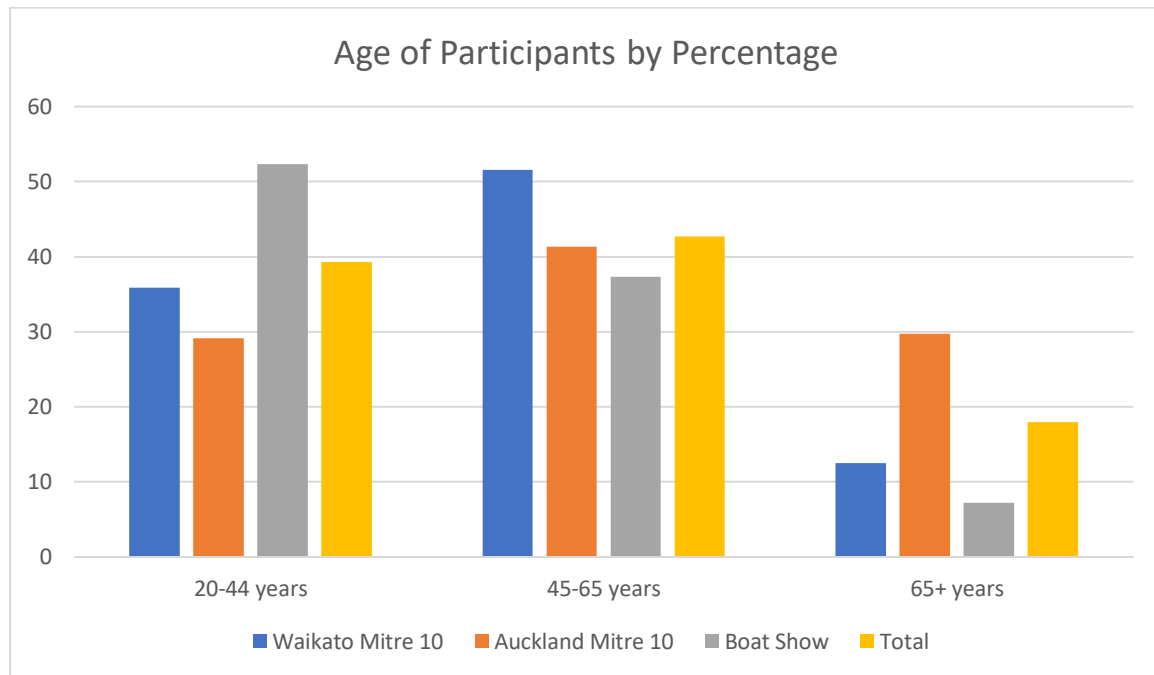


Figure 10 Age of participants by survey point completion.

Participants at the Boat Show (83%, n = 127) and Waikato Mitre 10 (89%, n = 57) were more likely that at Auckland Mitre 10 (75%, n = 129) to be employed, although those at the Boat Show were also more likely to be unemployed (9%, n = 14) than those from the Mitre 10 stores (Waikato 0%, n = 0; Auckland 5%, n = 8). Higher percentages of retirees completed the survey at Auckland Mitre 10 stores (20%, n = 35) compared with the Boat Show (8%, n = 12) and Waikato Mitre 10 stores (11%, n = 7). This is shown in figure 11 overleaf.

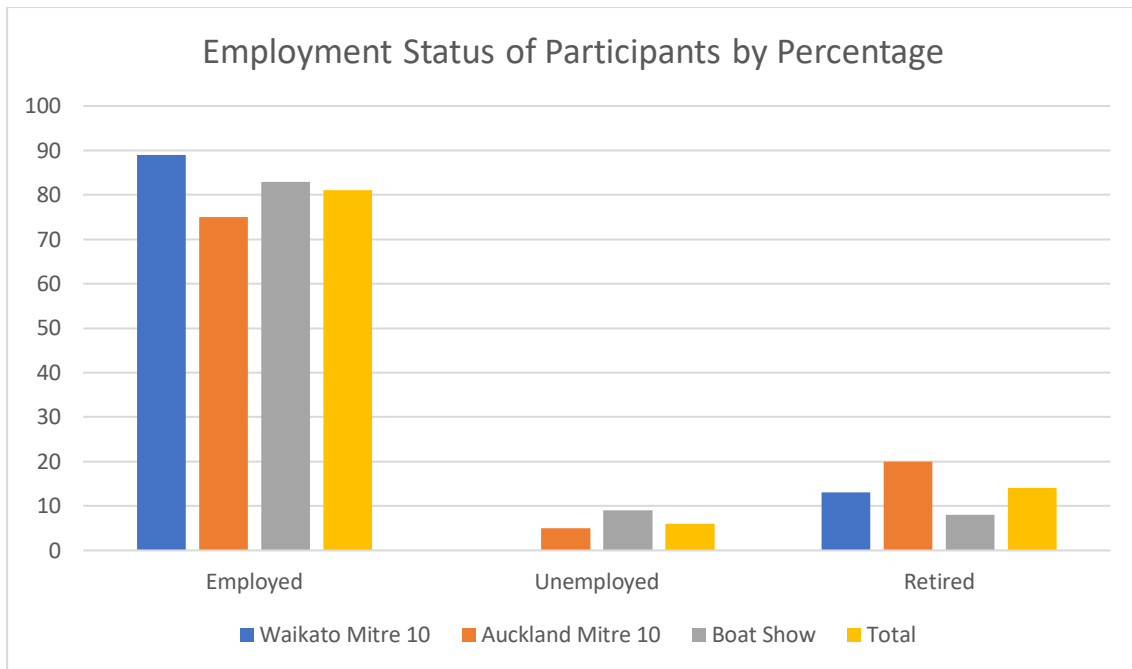


Figure 11 Employment status of participants by survey point completion.

#### 2.4.2 Aquatic Participation

Most participants (86%, n = 335) reported aquatic activity in the previous year. Of the total cohort, around two thirds had swum in open water (67%, n = 262) or been boating (62%, n = 242), over half had swum in a pool (59%, n = 231) or been fishing (58%, n = 224), and one third had been surfing, SUPing or paddling (30%, n = 118), see figure 12. Other activities were diving (underwater) (1%, n = 5) and jet-skiing (1%, n = 4).

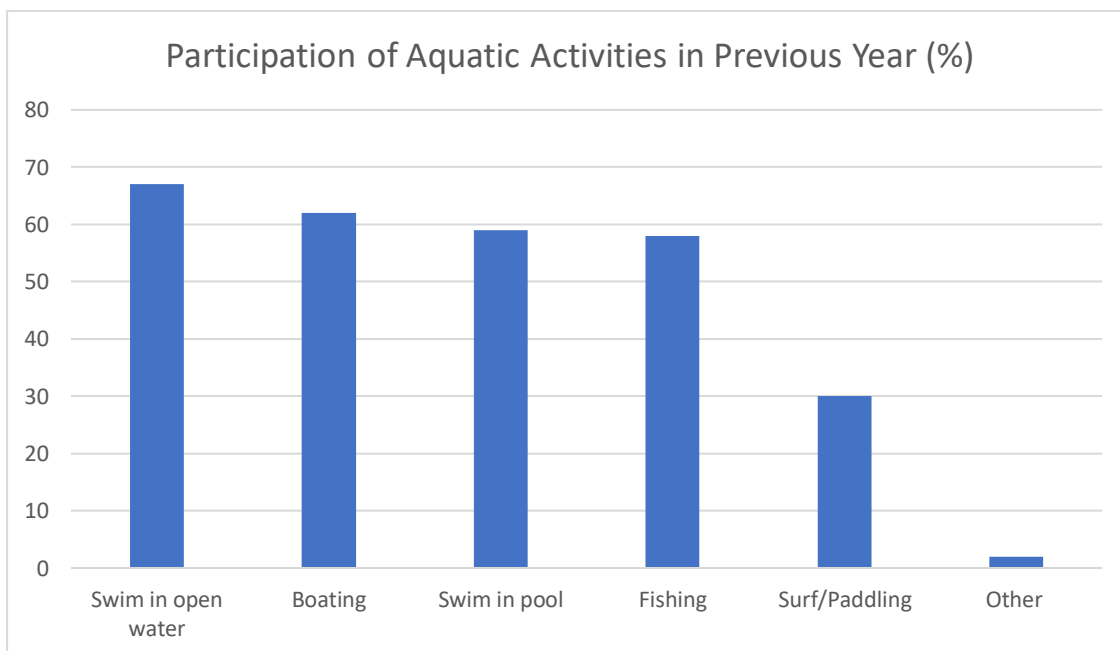


Figure 12 Participation of aquatic activities (%).

Over two thirds (68%, n = 266) reported participating in aquatics at least weekly (weekly 43%, n = 167; daily 25%, n = 99), as shown in figure 13.

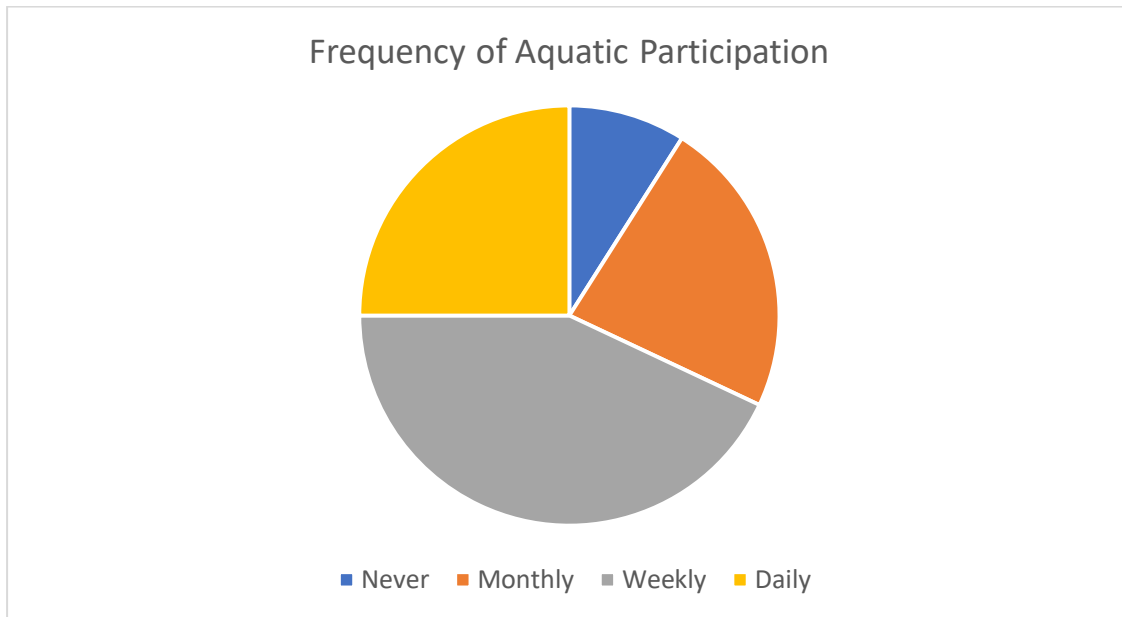


Figure 13 Frequency of aquatic participation.

Almost one half of participants (46%, n = 178) reported their aquatic activity had increased recently. Although one quarter cited the weather for this, other reasons were increase accessibility (35%, n = 53), increased leisure time (23%, n = 34), and fitness, safety, recreation, health and enjoyment (18%, n = 27) (See figure 14).

Increased accessibility includes moved closer to water or beach, new beach house, boat, pool, craft or lifejacket, and less constraints such as children older (n = 7).

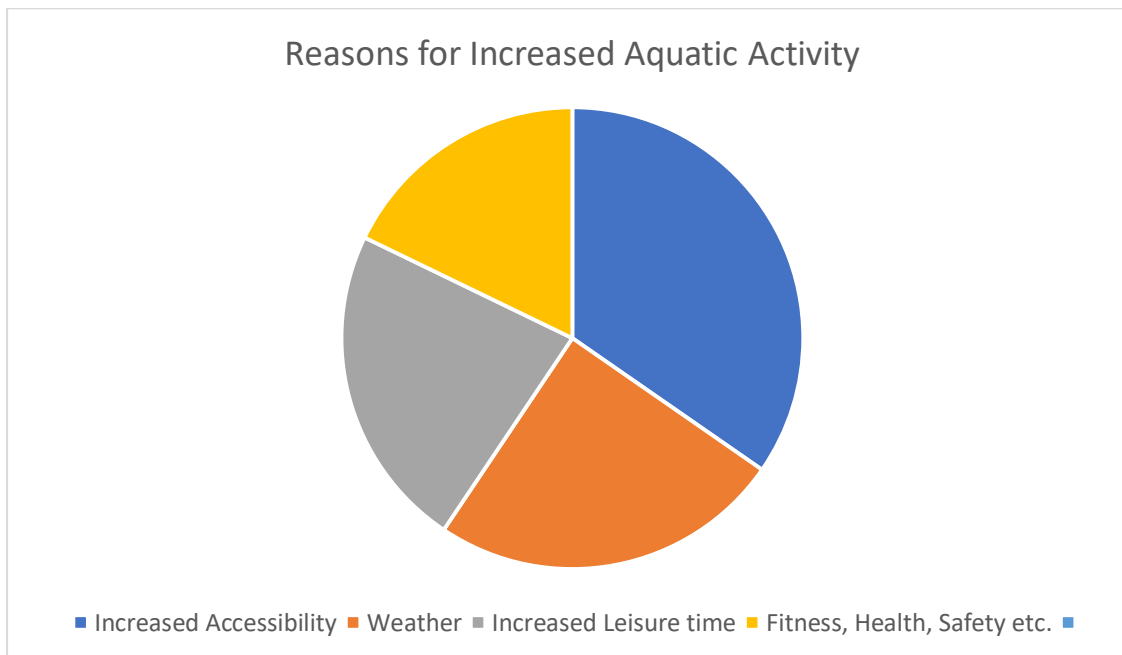


Figure 14 Reasons for increased aquatic activity.

Analysing aquatic participation by age showed several significant differences, shown in figure 15. Participants aged over 65 years (66%, n = 46) were significantly less likely to participate in and around water ( $\chi^2 (2) = 29.999, p \leq 0.001$ ) than younger age groups (20 – 44 years 90%, n = 137; 45 – 64 years 92%, n = 152). No significant differences were noted for swimming in open water, but there were variances for swimming in a pool ( $\chi^2 (2) = 8.466, p = 0.015$ ), boating ( $\chi^2 (2) = 6.743, p = 0.034$ ), and fishing ( $\chi^2 (2) = 6.805, p = 0.033$ ) where the likelihood of participating in these activities generally declined with advancing years.

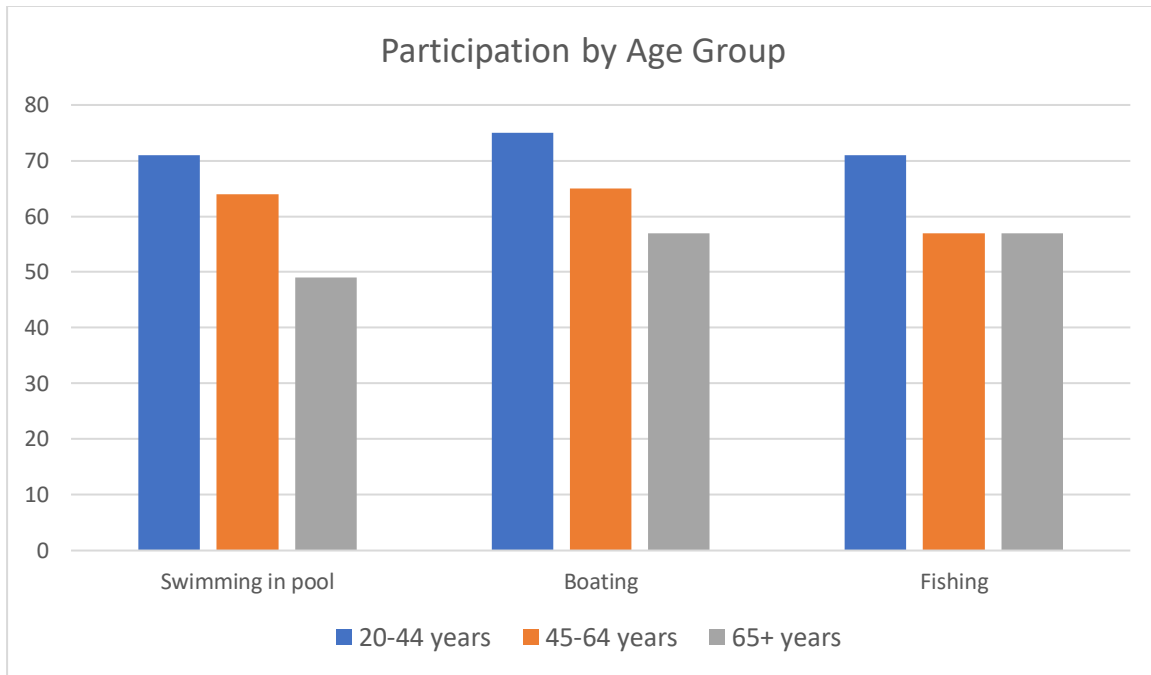


Figure 15 Aquatic participation by age.

Frequency of aquatic participation was also statistically different by age groups age ( $\chi^2 (2) = 24.923, p \leq 0.001$ ). Participants aged over 65 years (43%, n = 30) were less likely take part in activities weekly or daily compared with younger age groups (20 – 44 years 75%, n = 115; 45 – 64 years 72%, n = 119). Over half of the older age group (65+ years) participated in aquatic activities monthly or less in summer months (57%, n = 40). In addition, frequency of participation was more likely to have increased recently for the younger age groups (20 – 44 years 51%, n = 78; 45 – 64 years 48%, n = 80) compared with those aged over 65 years (29%, n = 20).

Significant differences were reported in aquatic participation ( $\chi^2 (2) = 6.774, p \leq 0.001$ ), frequency of participation ( $\chi^2 (2) = 13.757, p \leq 0.001$ ), and boating activities ( $\chi^2 (2) = 6.968, p = 0.031$ ) when analysed by employment status. Those employed (full or part-time) were more likely to participate (90%, n = 283) than those who were unemployed (73%, n = 17) or retired (65%, n = 35). Retired participants were more likely to participate less often (never or monthly) (54%, n = 29) than those who were employed (29%, n = 91) or unemployed (23%, n = 5), and less likely to go boating (50%, n = 20) than employed (69%, n = 205) or unemployed (77%, n = 17).

Analysis of aquatic participation by gender showed no significant differences in reporting of participation in aquatic activities or frequency of activities. Males, however, were more likely than females to recreate in boating (males 72%, n = 144, females 62%, n = 98 ( $\chi^2 (1) = 4.010, p = 0.045$ ); and fishing (males 71%, n = 141, females 53%, n = 83 ( $\chi^2 (1) = 12.168, p \leq 0.001$ )).

Analysis of aquatic participation by ethnicity also showed no significant differences in reporting of participation in aquatic activities or frequency of activities. Differences were shown in some of the activities with New Zealand European (swim open 76%, n = 208; boating 69%, n = 189), Pasifika (swim open 100%, n = 11; boating 73%, n = 8), and Maori (swim open 69%, n = 18; 77%, n = 20) more likely to swim in open water ( $\chi^2 (4) = 17.149, p = 0.002$ ) or go boating ( $\chi^2 (4) = 10.099, p = 0.039$ ) compared with Asian respondents (swim open 44%, n = 11; boating 40%, n = 10). Although not quite statistically different ( $\chi^2 (4) = 9.193, p = 0.056$ ) Asian groups also reported being less likely to swim in pools (48%, n = 12) than other ethnicities (NZ European 67%, n = 183; Pasifika 91%, n = 10; Maori 54%, n = 14).

Swimming in open water was the only aquatic participation activity shown to have statistical significance when analysed by New Zealand residency ( $\chi^2 (1) = 6.338, p = 0.012$ ). Those who had lived in New Zealand for ten years or more were more likely (75%, n = 242) to swim in open water than those who had resided in New Zealand for less than ten years (56%, n = 20).

Significant differences were reported in many aspects of aquatic participation under analysis by point of survey completion. Participants attending the Boat Show were more likely to participate in aquatic recreation (94%, n = 144;  $\chi^2 (2) = 13.759, p \leq 0.001$ ), participate in boating (82%, n = 125;  $\chi^2 (2) = 30.707, p \leq 0.001$ ), fishing (86%, n = 130;  $\chi^2 (2) = 58.851, p \leq 0.001$ ), participate daily or weekly (78%, n = 120;  $\chi^2 (2) = 13.321, p \leq 0.001$ ), and their participation to have increased recently (61%, n = 93) than Mitre 10 customers in Waikato (aquatic recreation 83%, n = 53; participate in boating 68%, n = 39; fishing 49%, n = 28; participate daily or weekly 58%, n = 37; recent increased participation 30%, n = 19) or Auckland (aquatic recreation 80%, n = 138; participate in boating 52%, n = 78; fishing 44%, n = 66; participate daily or weekly 62%, n = 107; recent increased participation 38%, n = 66). Boat Show respondents were also less likely to swim in open water (65%, n = 99;  $\chi^2 (2) = 8.879, p = 0.012$ ) than Mitre 10 customers (Waikato 77%, n = 44; Auckland 80%, n = 119).



### 2.4.3 Perceived Competence

#### Swimming

Most participants report they can swim (95%, n = 370), and two-thirds (65%, n = 252) perceive they were *good/very good* swimmers. Most estimate they can swim for more than five minutes non-stop (77%, n = 300). Most estimate they could swim this distance in deep, open water (64%, n = 249), one third *easily/very easily* (34%, n = 132).

#### Floating

Most participants report they can float without moving and without flotation aids (89%, n = 345), and two-thirds (64%, n = 247) thought they were *good/very good* floaters. Most estimate they can float for more than five minutes non-stop (85%, n = 290). Most estimate they could float this long in deep, open water (75%, n = 292), one half *easily/very easily* (48%, n = 188).

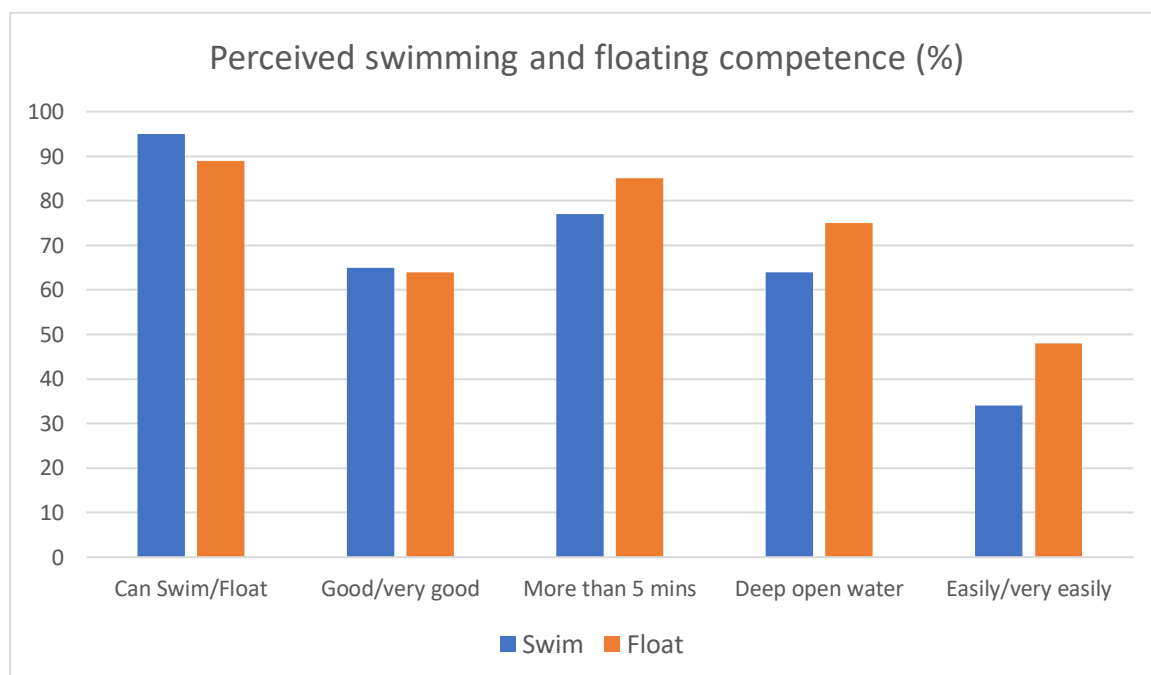


Figure 16 Perceived swimming and floating competence.

Few participants (12.6%, n = 49) reported they often swim for fitness, over half (58%, n = 224) had swum their estimated distance in a pool in the past year, although less than one third (30%, n = 115) reported swimming at least weekly in the open water in summer months. Only one fifth (22%, n = 85) estimated they could swim more than 200m non-stop in five minutes.

Analysis of perceived competence by age again showed significant differences throughout adulthood as shown in figure 17. While there was no difference reported in whether respondents could swim, the younger the age group the more likely ( $\chi^2 (2) = 12.989, p = 0.002$ ) to report they were *good/very good* swimmers; 20 – 44 years 74% (n = 111), 45 – 64 years 67% (n = 109), 65+ years 49% (n = 32). Respondents aged 65+ years were less likely (74%, n = 49) to perceive they could swim more than five minutes non-stop ( $\chi^2 (4) = 11.900, p = 0.018$ ) than the younger age groups (20 – 44 years 80%, n = 122; 45 – 64 years 80%, n = 129), and less likely to report they could swim ( $\chi^2 (4) = 11.900, p = 0.018$ ) or float ( $\chi^2 (4) = 10.422, p = 0.034$ ; swim 6%, n = 4; float 19%, n = 12) for one hour than the younger age groups (swim 20 – 44 years 26%, n = 39; 45 – 64 years 18%, n = 29; float 20 – 44 years 33%, n = 42; 45 – 64 years 39%, n = 59). Although not statistically different ( $\chi^2 (4) = 5.904, p =$

0.052), those aged 65+ years (51%, n = 36) were less likely to believe they could swim their estimated distance in deep open water than younger age groups (20 – 44 years 67%, n = 103; 45 – 64 years 66%, n = 110). There was no statistical differences for swimming for fitness although participants aged over 65 years (64%, n = 45) were more likely ( $\chi^2 (4) = 22.006, p \leq 0.001$ ) to report they seldom or never swam at beaches during the summer months than younger ages groups (20 – 44 years 33%, n = 50; 45 – 64 years 43%, n = 72) and more likely (71%, n = 50;  $\chi^2 (4) = 22.006, p \leq 0.001$ ) to report they last swam more than one year ago than the younger ages groups (20 – 44 years 32%, n = 49; 45 – 64 years 40%, n = 66).

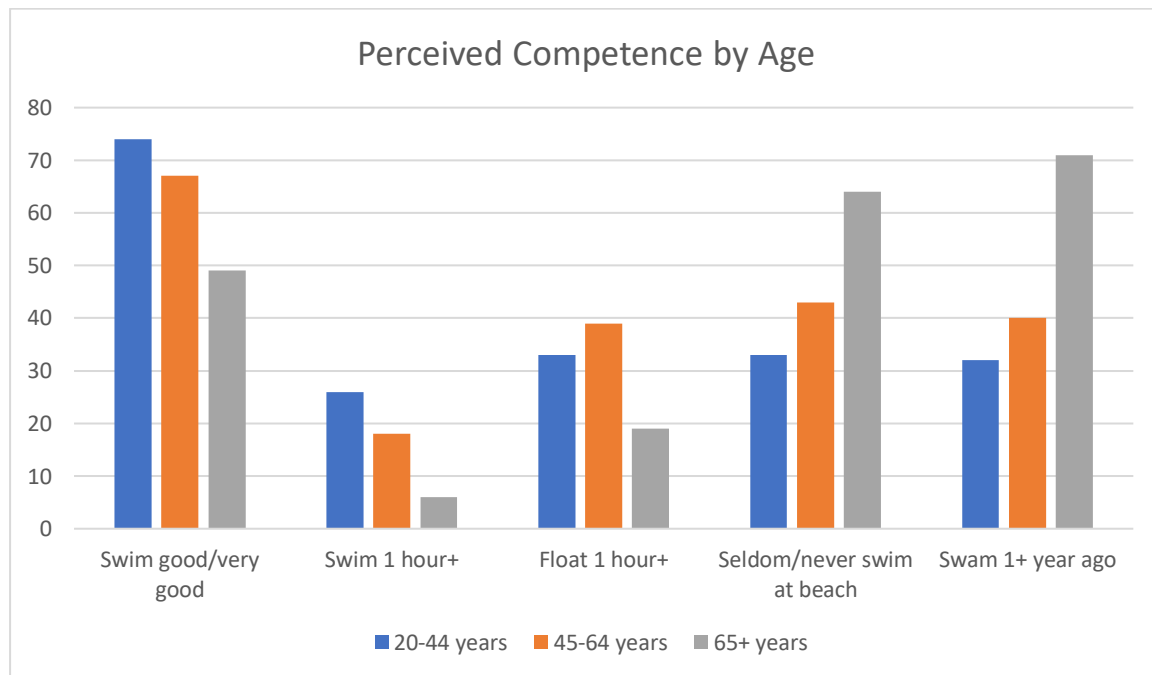


Figure 17 Perceived competence by age.

When analysed by employment status, significant differences were reported in whether or not respondents thought they could swim ( $\chi^2 (2) = 8.856, p = 0.012$ ), how well they could swim ( $\chi^2 (2) = 12.194, p = 0.002$ ), how long ago they swam ( $\chi^2 (2) = 12.789, p = 0.012$ ), and frequency of swimming in open water ( $\chi^2 (2) = 13.373, p = 0.010$ ). Retired respondents were less likely to perceive they could swim (87%, n = 47) or swim *good/very good* (45%, n = 23) than those who were employed (can swim 97%, n = 302; *good/very good* 70%, n = 213) or unemployed (can swim 96%, n = 21; *good/very good* 73%, n = 16). In addition, retired participants were more likely to swim less often (never or monthly) (65%, n = 35) than those who were employed (39%, n = 121) or unemployed (50%, n = 11), and more likely (63%, n = 34) to have swum more than a year ago than employed (39%, n = 122) or unemployed (41%, n = 9).

More males than females perceived they could swim faster (more than 200m in 5 minutes) ( $\chi^2 (4) = 16.599, p = 0.002$ ; males 27%, n = 58; females 15%, n = 27) and longer than one hour ( $\chi^2 (2) = 10.597, p = 0.005$ ; males 25%, n = 52; females 12%, n = 20). Although females were more likely to perceive they could float *good/very good* ( $\chi^2 (1) = 4.604, p = 0.032$ ; females 78%, n = 123; males 67%, n = 124), males were more likely than females to believe they could float in deep, open water ( $\chi^2 (1) = 4.604, p = 0.032$ ; males 79%, n = 169; females 70%, n = 123) and swim their estimated distance ( $\chi^2 (1) = 19.222, p \leq 0.001$ ; males 74%, n = 157; females 52%, n = 92) in deep, open water.

Analysis of perceived competency by ethnicity also showed significant differences in swimming (how well  $\chi^2 (1) = 15.851, p = 0.003$ ; how long  $\chi^2 (8) = 16.314, p = 0.038$ ) and floating competency (can float  $\chi^2 (4) = 21.240, p \leq 0.001$ ; float open water  $\chi^2 (4) = 11.551, p = 0.021$ ), and frequency ( $\chi^2 (8) = 16.445, p = 0.036$ ) and recency ( $\chi^2 (8) = 17.403, p = 0.026$ ). New Zealand European (70%,  $n = 203$ ), Maori (67%,  $n = 18$ ), and Pasifika (75%,  $n = 9$ ) ethnicities were more likely to believe they could swim good/very good when compared with Asian respondents (32%,  $n = 8$ ), and all (New Zealand European 21%,  $n = 61$ ; Maori 19%,  $n = 5$ ; Pasifika 17%,  $n = 2$ ) more likely to perceive they could swim for longer than one hour non-stop than Asian participants (4%,  $n = 1$ ). In addition, New Zealand European (91%,  $n = 272$ ), Maori (93%,  $n = 25$ ), and Pasifika (83%,  $n = 10$ ) ethnicities were more likely than Asian respondents (62%,  $n = 16$ ) to report they could float, and New Zealand European (78%,  $n = 234$ ) and Maori (82%,  $n = 22$ ) more likely than Pasifika (58%,  $n = 7$ ) or Asian (58%,  $n = 15$ ) to perceive they float in deep open water. Asian participants (69%,  $n = 18$ ) were more likely to report never or seldom swimming in open water than New Zealand European (40%,  $n = 120$ ), Maori (41%,  $n = 11$ ), or Pasifika (42%,  $n = 5$ ) ethnicities, and Pasifika (0%,  $n = 0$ ) less likely to report swimming in the last month when compared with New Zealand European (25%,  $n = 26$ ), Maori (26%,  $n = 7$ ), or Asian (23%,  $n = 6$ ) ethnicities.

Participants who had lived in New Zealand for ten years or more perceived themselves as being better swimmers and floaters than those who had been in New Zealand for less than ten years. Those with longer New Zealand residency were more likely to report they could swim (96%,  $n = 337$ ;  $\chi^2 (1) = 6.205, p = 0.013$ ) and float (90%,  $n = 315$ ;  $\chi^2 (1) = 3.984, p = 0.046$ ) than those newer to New Zealand (swim 87%,  $n = 33$ ; float 80%,  $n = 30$ ). They were also more likely to believe they could swim (66%,  $n = 231$ ;  $\chi^2 (1) = 5.063, p = 0.024$ ) and float (77%,  $n = 271$ ;  $\chi^2 (1) = 8.822, p = 0.003$ ) in open water compared with those who had lived in New Zealand for less than ten years (swim 47%,  $n = 18$ ; float 55%  $n = 21$ ). Those newer to New Zealand were more likely ( $\chi^2 (2) = 14.921, p \leq 0.001$ ) to report they could float for less than five minutes (40%,  $n = 12$ ) than those with longer residency (14%,  $n = 43$ ), although more likely ( $\chi^2 (2) = 8.208, p = 0.017$ ) to have swum in the last month (residency > 10years 37%,  $n = 14$ ; residency < 10years 23%,  $n = 81$ ).

Analysing perceived competence by point of survey completion showed Boat Show participants (29%,  $n = 45$ ) less likely ( $\chi^2 (4) = 34.258, p \leq 0.001$ ) to have swum more than one year ago than Mitre 10 customers (Auckland 54%,  $n = 93$ ; Waikato 42%,  $n = 27$ ), although less likely ( $\chi^2 (4) = 15.028, p = 0.005$ ) to swim for fitness (Boat Show 9%,  $n = 14$ ; Auckland 16%,  $n = 27$ ; Waikato 13%,  $n = 8$ ).

## 2.4.4 Risk Perceptions, Attitudes and Behaviours

### 2.4.4.1 Risk Perception

Participants rated being swept off isolated rocks while fishing (88%, n = 341) and being caught in a rip at a surf beach (69%, n = 270) as *high* or *extreme* risk, while reporting slight or no risk to engine failure in small boat 100m from shore (71%, n = 277) and rescuing a person in deep water at a swimming pool (63%, n = 244). Just over half (51%, n = 200) rated a *high* or *extreme* risk for falling into deep water from a riverbank (see figure 18).

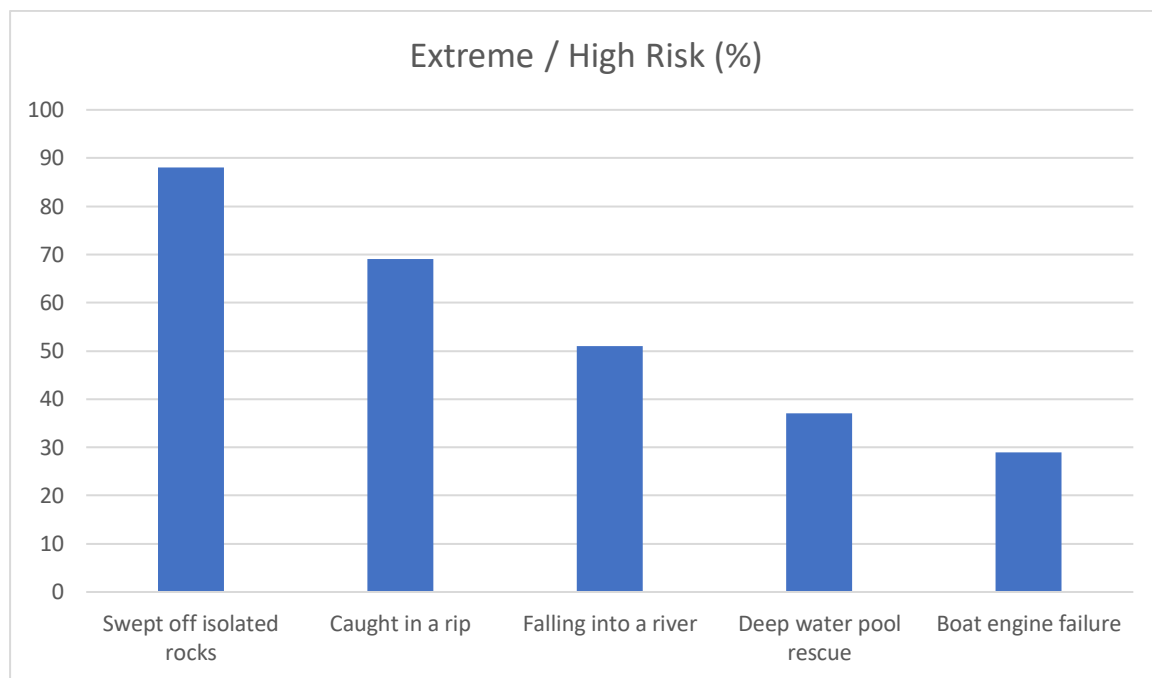


Figure 18 Perceived extreme/high risk (%).

### 2.4.4.2 Attitudes

Perceived risk of drowning and attitude responses are shown in figure 19, 'protective' attitudes in green and 'risky' attitudes in red. Almost two-thirds (61%, n = 239) reported feeling confident about their safety in open water. Two-thirds (68%, n = 265) believed their swimming confidence would keep them safe in open water, and that others were at greater risk in open water (65%, n = 253), and one half (54%, n = 206) thought their current swimming fitness would ensure their safety in open water, and that their swimming competence meant they could rescue someone in open water (50%). Safer attitudes toward preventing drowning were reported in two of the six attitudinal questions. Three-quarters (77%, n = 300) agreed the risk of drowning is always present in open water and almost all (88%, n = 343) agreed that irrespective of their level of swimming competence they would still need to wear a lifejacket in a boat.

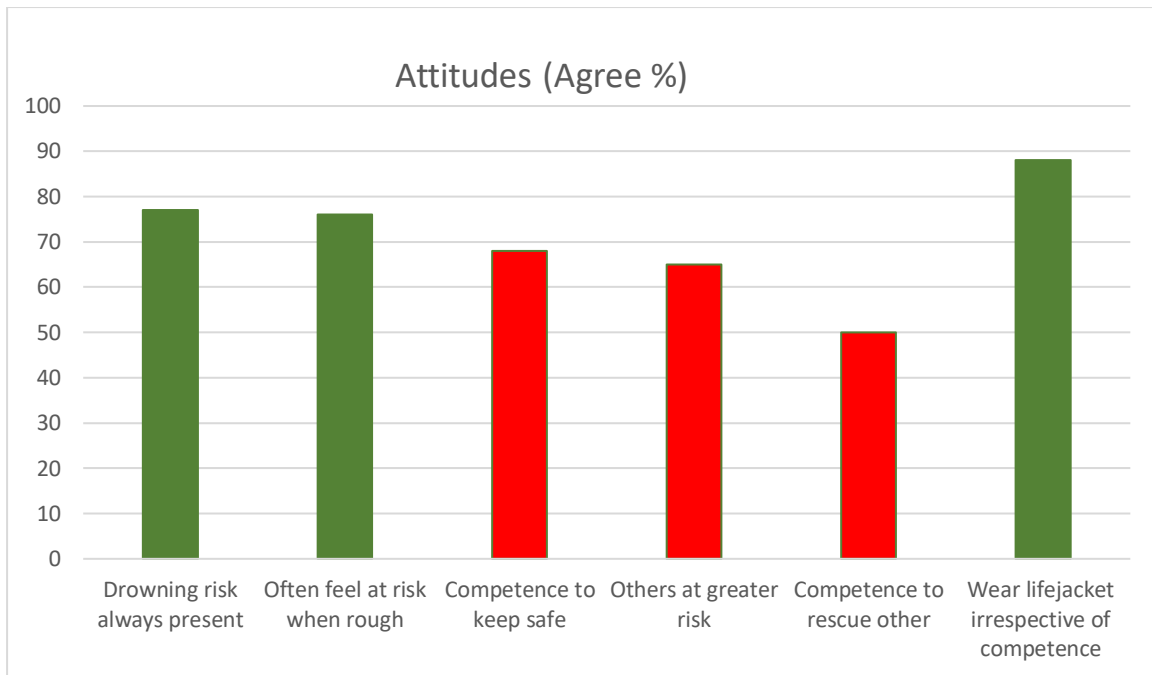


Figure 19 Attitudes by percentage.

#### 2.4.4.3 Behaviour

Over one half (58%, n = 226) reported *always* wearing a lifejacket when boating, fishing or paddling and over three-quarters (79%, n = 306) stated they *usually* or *always* wore a lifejacket, shown in figure 20.

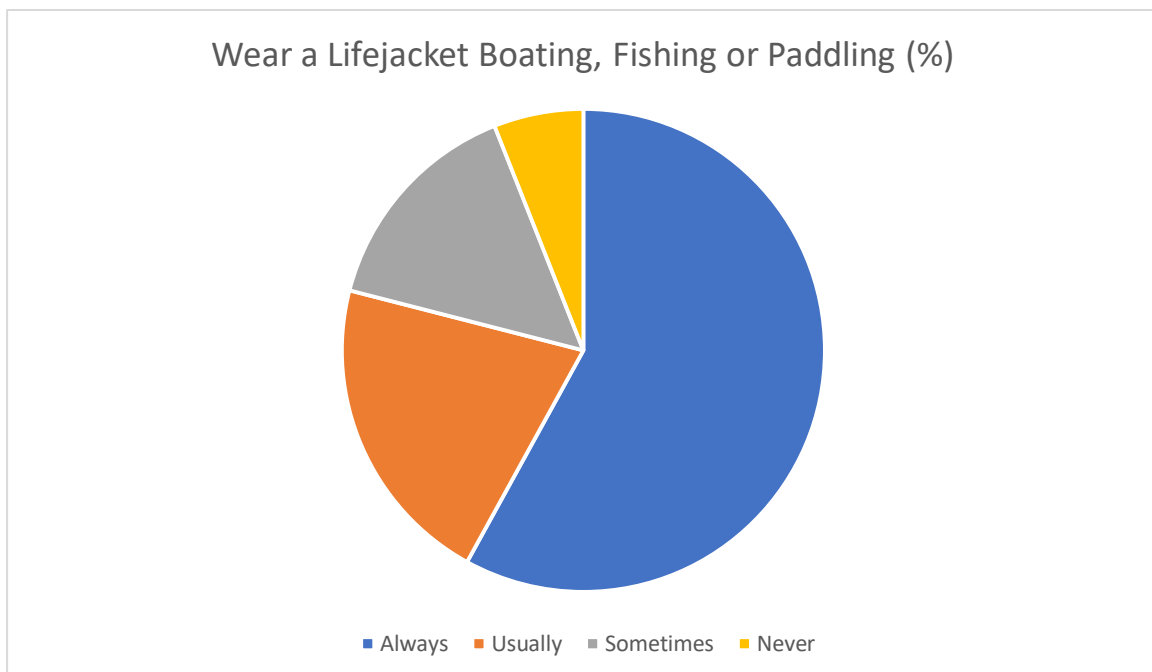


Figure 20 Lifejacket wearing behaviour.

While not statistically significant, adults over 65 years were more likely (n = 47, 67%) to always wear a lifejacket compared with younger age groups (20 – 44 years n = 85, 56%; 45 – 64 years n = 94, 57%).

Significant differences were shown in attitudes when analysed by age groups. Those aged over 65 years were less likely ( $\chi^2 (2) = 6.252, p = 0.044$ ) to feel confident about their safety in open water than younger age groups (20 – 44 years 63%, n = 96; 45 – 64 years 66%, n = 109; 65+ years 49%, n = 34), and less likely to have confidence in their swimming fitness to keep safe ( $\chi^2 (2) = 7.866, p = 0.020$ ) (20 – 44 years 61%, n = 93; 45 – 64 years 51%, n = 84; 65+ years 41%, n = 29). Those age 20 – 44 years were more likely ( $\chi^2 (2) = 8.224, p = 0.016$ ) to believe their swimming competence means they don't need to wear a lifejacket in a boat (20 – 44 years 18%, n = 27; 45 – 64 years 8%, n = 13; 65+ years 9%, n = 9). Being swept off isolated rocks while fishing was the only risk that showed a difference by age ( $\chi^2 (2) = 6.474, p = 0.039$ ), those aged over 65 years (96%, n = 67) were most likely to perceive this as extreme or high risk when compared with the younger age groups (20 – 44 years 84%, n = 128; 45 – 64 years 88%, n = 146). All age groups were consistent in their perception that others were at greater risk, there were no statistical differences when analysed by age.

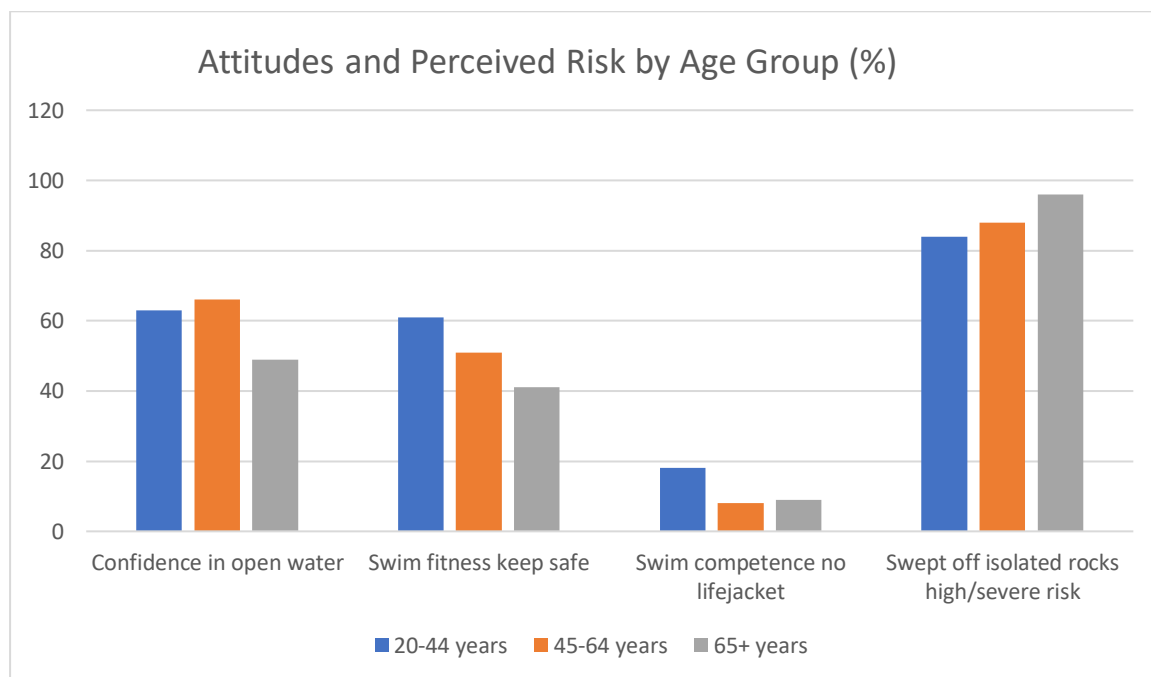


Figure 21 Attitudes and risk responses by age group (%).

Analysing attitudes by employment status showed those employed were more confident about their safety in open water ( $\chi^2 (2) = 6.070, p = 0.048$ ; 64%, n = 200), that their swimming competence would keep them safe ( $\chi^2 (2) = 8.050, p = 0.018$ ; 71%, n = 223), and that their current swim fitness would keep them safe ( $\chi^2 (2) = 6.252, p = 0.044$ ; 56%, n = 174) than those unemployed (safe open water 64%, n = 140; swim competence safe 55%, n = 12; swim fitness safe 59%, n = 13), or retired (safe in open water 46%, n = 25; swim competence safe 56%, n = 30; swim fitness safe 35%, n = 19). There were no significant differences regarding perceived risks or behaviour when analysed by employment status.

Unsurprisingly, males were also more confident than females about their safety in open water ( $\chi^2 (1) = 17.555, p \leq 0.001$ ; males 71%, n = 151; females 50%, n = 88), that their swimming competence means they don't need to wear a lifejacket in a boat ( $\chi^2 (1) = 4.618, p = 0.032$ ; males 15%, n = 32; females 8%, n = 14), and that they are more competent to rescue others ( $\chi^2 (1) = 20.682, p \leq 0.001$ ; males 60%, n = 128; females 37%, n = 65). Females were more likely than males to feel at risk in rough conditions ( $\chi^2 (1) = 4.120, p = 0.042$ ; females 81%, n = 142; males 72%, n = 153). Females were also more likely than males to perceive the risk as more severe for being caught in a rip ( $\chi^2 (1) =$

8.058,  $p = 0.005$ ; females 77%,  $n = 135$ ; males 63%,  $n = 135$ ) and engine failure in a dinghy ( $\chi^2 (1) = 10.338$ ,  $p \leq 0.001$ ; females 37%,  $n = 65$ ; males 22%,  $n = 47$ ).

Length of New Zealand residency had the largest effect on attitudes and risk perception. Participants who had lived in New Zealand for ten years or more were more confident about their safety in open water ( $\chi^2 (1) = 6.645$ ,  $p = 0.010$ ; 64%,  $n = 223$ ), that their swim fitness would keep them safe ( $\chi^2 (1) = 7.725$ ,  $p = 0.005$ ; 55%,  $n = 194$ ), and that they are more competent to rescue others ( $\chi^2 (1) = 7.196$ ,  $p = 0.007$ ; 52%,  $n = 182$ ) than those newer to New Zealand (safe in open water 42%,  $n = 16$ ; swim fitness keep safe 32%,  $n = 12$ ; swim competence rescue others 29%,  $n = 11$ ). Longer residents were less likely to feel at risk in rough conditions ( $\chi^2 (1) = 8.210$ ,  $p = 0.004$ ; 74%,  $n = 259$ ) than newer residents (95%,  $n = 36$ ) and more likely to think that others were at greater risk ( $\chi^2 (1) = 9.741$ ,  $p = 0.002$ ; 68%,  $n = 237$ ) than newer residents (42%,  $n = 16$ ); others at greater risk). Those living in New Zealand for less than ten years were also more likely to perceive the risk as more severe for being caught in a rip ( $\chi^2 (1) = 6.028$ ,  $p = 0.014$ ; 87%,  $n = 33$ ) and engine failure in a dinghy ( $\chi^2 (1) = 17.398$ ,  $p \leq 0.001$ ; 58%,  $n = 22$ ) than longer residents (rip 68%,  $n = 237$ ; engine failure 26%,  $n = 90$ ).

Asian ethnicities (35%,  $n = 9$ ) were significantly less likely to be confident about their rescue competence in open water when compared with other ethnicities ( $\chi^2 (1) = 9.920$ ,  $p = 0.004$ ); New Zealand European (50%,  $n = 150$ ), Maori (63%,  $n = 17$ ), and Pasifika (75%,  $n = 9$ ). Asian respondents (65%,  $n = 17$ ) were also more likely to perceive the risk of engine failure as more severe than other ethnicities ( $\chi^2 (4) = 20.715$ ,  $p \leq 0.001$ ); New Zealand European (25%,  $n = 74$ ), Maori (33%,  $n = 9$ ), and Pasifika (25%,  $n = 3$ ).

Mitre 10 participants (Auckland 74%,  $n = 128$ ; Waikato 72%,  $n = 46$ ) were more likely to be confident about their swimming competence to keep them safe ( $\chi^2 (2) = 8.821$ ,  $p = 0.012$ ) than Boat Show respondents (0%,  $n = 91$ ), although more likely for the risk of drowning to always be present ( $\chi^2 (2) = 9.718$ ,  $p = 0.008$ ) (Boat Show (84%,  $n = 129$ ; Mitre 10 Auckland 66%,  $n = 42$ ; Mitre 10 Waikato 75%,  $n = 129$ ).



## 2.5 Discussion

Adult perceptions of their physical swimming and floating competencies, risks, personal assessment and aquatic participation was evaluated using self-reported swimming and floating competencies, attitudes and behaviours, and participation around aquatic activity. Protection Motivation Theory (Maddux & Rogers, 1983), used in previous drowning prevention studies (Moran, 2008b; Moran, Webber, & Stanley, 2018) has been used as a framework to help understand the responses to survey questions about attitudes, behaviours and perceptions. In this context the threat appraisal is measured by the severity (how severe the risk of drowning is) and vulnerability to the risk (e.g. others are at great risk of drowning than me, I often feel at risk when conditions are rough), and the ability to cope with the risk is defined by the response efficacy (e.g. wearing a lifejacket in a boat) and the self-efficacy (e.g. my current swim fitness or swimming competence will keep me safe in open water).

Most adults rated incidents of being swept off isolated rocks and being caught in a rip current as high or severe risk, but were less likely to perceive falling into a river fully clothed, boat engine failure or a deep-water pool rescue as a threat to drowning. Adults aged over 65 years were more likely to perceive the risk of falling off isolated rocks as being more severe than other age groups, possibly offering a protective factor in this instance.

Adults across the three age brackets responded with safe attitudes about drowning risks regarding the consistent acknowledgement of drowning in open water and often feeling at risk in rough conditions. In addition, very few adults thought their swimming competence was good enough not to wear a lifejacket on a boat. These safer attitudes are likely to offer protection to the drowning risk. It is a cause for concern that most adults also reported riskier attitudes such as having confidence in their own competence to keep themselves safe and even rescue others, and most thought that others were at greater risk. Older adults were significantly less likely than other age groups to report unsafe attitudes, and thus also reducing the risk of drowning.

Safe behaviours around lifejacket wearing when boating, fishing or paddling were reported by most adults, and more older adults reported always wearing a lifejacket. Safer behaviours such as lifejacket wearing have been shown to reduce drowning (Maritime NZ, 2016) and if these behaviours were transferred across other aquatic activities they are likely to offer protection from drowning.

Most adults reported a relatively high level of perceived swimming and floating competence being able to swim and float in deep, open water for more than five minutes each, despite only one-fifth estimating they could swim 200m in five minutes. As shown in previous studies, males reported higher confidence in their swimming and floating competence than females, and, in addition, this study also reports older adults as being more likely to perceive a lower swimming and floating competence than younger age groups. Reliance on perceived swimming and floating competence in the prevention of drowning is a concern when many adults may have never swum or floated for prolonged periods in deep, open water where most drownings occur, and may not be able to accurately assess competence. Greater confidence in practical water competencies may be protective if those skills can be realised and transferred to open water settings. In contrast, lower confidence of competence of older adults can offer protection if it results in safer response efficacy behaviours. However, around one fifth of older adult drownings occurred after an accidental immersion in the water where people may not have expected, or planned, to enter the water. Practise of floating, swimming and the other practical water competencies required in the prevention of drowning (Stallman et al., 2017; Langendorfer et al., 2018) and the in-water testing of

older adult water competencies is recommended to ensure an accurate assessment of personal competency both in the pool and open water settings.

Inherent in the risk of drowning is the extent of exposure to risk. Participants reported a relatively high level of aquatic activity in the previous year, around two thirds had swum in open water (67%), been boating (62%), swum in a pool (59%) or been fishing (57%). These participation percentages reported are higher than the Sport New Zealand (2015, 2018) and, apart from 'swimming', the *WSNZ 2018 Attitude and Behaviour Survey*, suggesting those who agreed to participate in this current study may have had increased interest in aquatic recreation or water safety. Apart from swimming in open water, where participation rates remained similar for all ages, participation in all other aquatic activities dropped off significantly in advancing age groups. Furthermore, participants aged over 65 years, and those who were retired, were significantly less likely to participate as frequently as younger participants, and those with other employment statuses, with many older adults reporting participation monthly or less in summer months. In addition, participants aged over 65 years more significantly more likely to have last swum more than one year ago, lessening their likelihood of accurately assessing their own practical water competencies. This lower frequency of participation and increased time between partaking in aquatic activities suggests a possible disparity between how older adults perceive their water competence, and their actual competence to cope with drowning risk. Accurate assessment of physical water competencies requires regular and current in-water practise of all practical water competencies, and this is recommended to cope with the inconsistencies and risks of aquatic recreation, especially in and around open water settings.

Lower perceived swimming and floating competence by older adults may well be due to increased frailty or pre-existing medical conditions, although very few participants in this study reported existing medical conditions that limited aquatic participation, and there were no differences to this by age group. However, pre-existing medical conditions were found to have contributed to one third of older Australian's drowning, and those with pre-existing medical conditions are more likely to be on medication and which, together with the condition, may impact upon fitness, competence, and survival in, especially, open water. Furthermore, medical conditions are a factor in one quarter of drowning among New Zealand older adults. It may be that participants are unaware of medical conditions that could increase drowning risk, and it is recommended that older adults have regular health checks before taking part in aquatic recreation. In addition, due to factors of falls and lack of supervision of older adult drowning in domestic settings such as baths, spas and pools (WSNZ, 2019c; Peden, et.al., 2019) it is recommended that the environments be improved to reduce the likelihood of a fall by the use of rails or non-slip bath mats, showering be considered instead of bathing especially where aids such as stools and chairs are used, and, where possible, have supervision or let family members know when bathing.

Due to the aging process, older adults may have reduced functional capacity and ability to cope with drowning, be more likely to experience cardiac arrest and hypothermia after drowning, more unlikely to survive the drowning process, and have increased likelihood of respiratory diseases after drowning, another motive to recommend regular aquatic activity to prepare for aquatic activity and assist in accurate personal assessment of physical water competencies.

While not tested in this study, poor adult water safety knowledge unlikely to offer much protection from drowning has been reported (Moran & Furner, 2017; Blank, Major, & Muller, 2017), and it is suggested further studies investigate water safety knowledge for all age groups.

Drowning among older adults is an increasing proportion of our total drowning toll. Older adults are likely to have protective factors such as safer attitudes and behaviours, and lower confidence of

personal competency, but be at higher risk due to the lack of frequency or recent practice and existing or unknown medical conditions. The knowledge gained from this research can assist effective decision making for the development of targeted water safety education interventions for older adults.

### 2.5.1 Recommendations

The following recommendations are made on the basis of the evidence provided in this report, both from the review of the literature and the responses from the 389 adults who participated in the study.

- Education on the necessity of regular and current in-water practice on all practical water competencies to prepare for aquatic recreation
- Regular medical checks to review physical capabilities and medications before participating in aquatic activities
- Improving domestic bathing environments with rails and non-slip bathmats, and the use of shower stools or chairs
- Use of supervision such as lifeguards at public pools and beaches, the 'buddy system' in home pool and spas, and, if practical, letting family members know when bathing
- Further research on perceived versus actual water competence for older adults
- Further studies on adult education on water safety knowledge including beach, boating, and other open water settings.

### 2.5.2 Limitations

Results from this study provide new understanding about why older adults in New Zealand are at greater risk of drowning and increasing in drowning statistics. However, the results should be treated with some caution in light of several methodological limitations. First, the data were obtained from a convenience sample of adult members of the public visiting chosen Mitre 10 stores in Auckland and Waikato, and the Auckland Boat Show, identified because of their likely high older adult inclusion. Consequently, the sample population varied from the national population demographics with more NZ Europeans taking part in the study. In addition, participants at the Boat Show are likely to have more interest and participation in aquatic recreation which may not be reflective in the general population. Third, although often used in water safety research, self-reporting of swimming competence may not accurately report actual competence and can result in measurement error (Robertson, 1992; Mickalide, 1997; Watson, Kendrick & Coupland, 2003). Finally, swimming and floating competencies were the only physical water competencies included in the study, and although risk perception and personal assessment of water competency was included, it is recommended further older adult studies consider the inclusion of other water competencies, both physical and cognitive (Stallman et al., 2017; Langendorfer et al., 2018).

## 2.7 Study Conclusion

This research project measures perceptions of water competence and risk of older adults, and the aquatic recreation and activities they participate in, to inform the development of water safety education programmes for older adults. This study reinforces and expands on previous knowledge of safer water safety attitudes and behaviours among older adults when compared with adults of all ages.

New knowledge has been gained in the awareness of lower perceived swimming and floating competence, and further protective factors for older adults of their higher risk perception and their lower risk exposure due to lower frequency and levels of participation of aquatic recreation. In addition, the lower frequency and less recent aquatic participation, together with known and unknown medical conditions may put older adults at greater risk of drowning.



## References:

- Australian Institute of Health and Welfare (AIHW). (2018). Older People. Older Adults at a glance. Download this report from <https://www.aihw.gov.au/reports/older-people/older-australia-at-a-glance/contents/summary>
- Blank, S., Major, S., & Muller, T. (2017). Water Safety New Zealand Benchmark Survey February – March 2017. Water Safety New Zealand. MMRResearch™: Wellington.
- Brown, A., Edgar, K., Mellor, G., & Bain, P. (2013). *Coastal anglers audience profiling*. RNLI Research Project ID: 12-13a. RNLI Operations Research Unit: Poole. Downloadable at <file:///C:/Users/Admin/Downloads/angling-research-report.pdf>
- Brown, A., Edgar, K., Mellor, G., Crabbe, T., Bain, P., & Stolk, P. (2014). *Leisure divers audience profiling*. RNLI Research Project ID: 12-13c. RNLI Operations Research Unit: Poole. Downloadable at <file:///C:/Users/Admin/Downloads/14782-Diving-Research.pdf>
- Fisher, N. M., Limprasertkul, A., & Pendergast, D. R. (2018). Fat metabolism increases after exercise training in older men, but not women. *Healthy Aging Research*, 7(1), e6.
- Franklin, R. C., Scarr, J. P., & Pearn, J. H. (2010). Reducing drowning deaths: the continued challenge of immersion fatalities in Australia. *Medical Journal of Australia*, 192(3), 123-126.
- Griffiths, R., Dodd, J., & Karkaria, Y. (2018). *2018 Recreational Boating Participation Research*. Maritime New Zealand. Ipsos: Auckland. Downloadable from <https://www.maritimenz.govt.nz/recreational/safety-campaigns/documents/2018%20Recreational%20Boating%20Participation%20Research.pdf>
- Gulliver, P., & Begg, D. (2005). Usual water-related behaviour and 'near-drowning' incidents in young adults. *Australian and New Zealand Journal of Public Health*, 29(3), 238-243. doi:10.1111/j.1467-842X.2005.tb00761.x
- Haq, S., Stubington, P., Pannell, F., & Hindmarsh, J. (2013). *Canoeing and kayaking audience profiling*. RNLI Research Project ID: 12-13b. RNLI Operations Research Unit: Poole. Downloadable at <file:///C:/Users/Admin/Downloads/kayaking-canoeing.pdf>
- Howland, J., Hingson, R., Mangione, T. W., Bell, N., & Bak, S. (1996). Why are most drowning victims men? Sex differences in aquatic skills and behaviors. *American Journal of Public Health*, 86(1), 93-96.
- Hu, G., & Baker, S. P. (2010). Recent increases in fatal and non-fatal injury among people aged 65 years and over in the USA. *Injury Prevention*, 16(1), 26-30.
- IPSOS. (2018). *Datatile Database – Maritime New Zealand 2018*. Auckland: IPSOS.
- Kiwi Association of Sea Kayakers (KASK). (2018). KASK Incident Database, 2018. <https://kask.co.nz/>
- Koopman-Boyden, P. (2018). Older People. Te Ara – the Encyclopedia of New Zealand. <http://www.TeAra.govt.nz/en/older-people/print> Downloaded 15 October 2018.
- Langendorfer, S.J., Moran, K., & Stallman, R.K. (2018). Guiding Principles: Applying Water Competence to Drowning Prevention. *International Journal of Aquatic Research and Education* 11(2), Article 22. Published online 30<sup>th</sup> October. Available at: <https://scholarworks.bgsu.edu/ijare/vol11/iss2/22>

- Lee, D. H., Park, J. H., Choi, S. P., Oh, J. H., & Wee, J. H. (2019). Clinical characteristics of elderly drowning patients. *The American journal of emergency medicine*, 37(6), 1091-1095.
- Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of experimental social psychology*, 19(5), 469-479.
- Mahony, A., Peden, A., Franklin, R., Pearn, J., & Scarr, J. (2017). Fatal, unintentional drowning in older people. *Healthy Aging Research*, 6(1).
- Maritime New Zealand. (2016) New Zealand Safer Boating Forum Position on the use of Personal Floatation Devices on Recreational Vessels. New Zealand Safer Boating Forum. Maritime New Zealand: Wellington. Downloadable at <https://www.maritimenz.govt.nz/about/people-we-work-with/safer-boating-forum/documents/NZ-Safer-Boating-Forum-lifejacket-position-statement.pdf>
- McCool, J., Ameratunga, S., Moran, K., & Robinson, E. (2009). Taking a risk perception approach to improving beach swimming safety. *International Journal of Behavioral Medicine*, 16(4), 360-366.
- Mickalide, A. (1997). Threats to measurement validity in self-reported data can be overcome. *Injury Prevention*, 3(1), 67–69.
- Michalaki, A., Wright, M., & Pirapakaran, B. (2015). *Helping to prevent drowning at sea: understanding common factors in fatal incidents*. RNLI Research Project ID: 14:29. RNLI Operations Research Unit: Poole. Downloadable at [file:///C:/Users/Admin/Downloads/170146\\_freda\\_report\\_summary\\_lr.PDF](file:///C:/Users/Admin/Downloads/170146_freda_report_summary_lr.PDF)
- Ministry of Health. (2019). *Health of Older People – Our changing population*. Ministry of Health. Wellington, New Zealand. Downloadable from <https://www.health.govt.nz/our-work/life-stages/health-older-people>
- Mitzner, T. L., Beer, J. M., McBride, S. E., Rogers, W. A., & Fisk, A. D. (2009). *Older adults' needs for home health care and the potential for human factors interventions*. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 53, No. 11, pp. 718-722). Sage CA: Los Angeles, CA: SAGE Publications.
- Moran, K. (2003). *New Zealand Youth Water Safety Survey 2003. A report to Water Safety New Zealand*. Wellington: WSNZ.
- Moran, K. (2006). *Re-thinking drowning risk: The role of water safety knowledge, attitudes, and behaviours in youth aquatic recreation*. Unpublished doctoral thesis, Massey University, Palmerston North, New Zealand.
- Moran, K. (2008a). Will they sink or swim? New Zealand youth water safety knowledge and skills. *International Journal of Aquatic Research and Education*, 2(2), 114-127.
- Moran, K. (2008b). Rock-based fishers' perceptions and practice of water safety. *International Journal of Aquatic Research and Education*, 2(2), 127-138.
- Moran, K., Stallman, R.K. Kjendlie, P-L., Dahl, D., Blitvich, J.D., Petrass, L., ... Shimongata, S. (2012). Can you swim? Real and perceived water competency among young adults. *International Journal of Aquatic Research and Education*, 6(2), 122-135.
- Moran Ph D, K., & Ferner, D. (2017). Water safety and aquatic recreation among international tourists in New Zealand. *International journal of aquatic research and education*, 10(1), 5.

- Moran, K., & Stanley, T. (2013). Readiness to Rescue: Bystander Perceptions of Their Capacity to Respond in a Drowning Emergency. *International Journal of Aquatic Research and Education*, 7(4), 290-300.
- Moran, K., Webber, J., & Stanley, T. (2018). Protection Motivation Theory (PMT), Risk of Drowning, and Water Safety Perceptions of Adult Caregivers/Parents. *The Open Sports Sciences Journal*, 11(1).
- New Zealand Search and Rescue (NZSAR). (2018). *Rescued Persons Research Study*. Auckland: Distill Research Agency. Downloadable from <https://nzsar.govt.nz/Portals/4/Documents/Rescued%20Person%20Research%20Report.pdf>
- Pearn, J. H., Peden, A. E., & Franklin, R. C. (2019). The influence of alcohol and drugs on drowning among victims of senior years. *Safety*, 5(1), 8.
- Peden, A. E., Franklin, R. C., & Clemens, T. (2019). Exploring the burden of fatal drowning and data characteristics in three high income countries: Australia, Canada and New Zealand. *BMC public health*, 19(1), 794.
- Peden, A. E., Franklin, R. C., Pearn, M. D., John, H., & Mahony, A. J. (2019). Unintentional Bathtub Drowning Deaths Among Those Aged 65 Years and Older in Australia. *International Journal of Aquatic Research and Education*, 11(3), 2.
- Peden, A. E., Franklin, R. C., & Queiroga, A. C. (2018). Epidemiology, risk factors and strategies for the prevention of global unintentional fatal drowning in people aged 50 years and older: a systematic review. *Injury prevention*, 24(3), 240-247.
- Pidgeon-Willcox, S., Kool, B., & Moran, K. (2018). Perceptions of the risk of drowning at surf beaches among New Zealand Youth. *Injury Control & Safety Promotion*. Published online 8<sup>th</sup> Feb 2018. Available at: <http://www.tandfonline.com/eprint/JeNxVUtBJMjknwRURN8j/full>
- Robertson, L.S. (1992). The validity of self-reported behavioral risk factors. *The Journal of Trauma*, 32, 58–59.
- Scoop Independent News. (2019). Older New Zealanders drown in growing numbers. Press Release: Water Safety New Zealand, 10 July 2019. Downloadable at <http://www.scoop.co.nz/stories/AK1907/S00226/older-new-zealanders-drown-in-growing-numbers.htm>
- Sport Australia. (2019). *AusPlay National data tables 30 April 2019*. Downloadable from <https://www.clearinghouseforsport.gov.au/research/smi/ausplay/results/national>
- Sport England. (2019). *Active Lives Adult Survey, May 17/18 Report*. Downloadable from <https://www.sportengland.org/media/13898/active-lives-adult-november-17-18-report.pdf>
- Sport New Zealand. (2015). *Sport and Active Recreation in the Lives of New Zealand Adults. 2013/14 Active New Zealand Survey Results*. Wellington: Sport New Zealand. Downloaded 24 April from <https://www.srknowledge.org.nz/wp-content/uploads/2015/03/Active-NZ-Survey-WEB-FINAL1.pdf>
- Sport New Zealand. (2018). *Active NZ – Main Report, 2017 Participation Report*. Wellington: Sport New Zealand ISBN: 978-0-947502-73-7 Published in 2018 by Sport New Zealand. Download this report at [sportnz.org.nz/ActiveNZ](http://sportnz.org.nz/ActiveNZ)

Stanley, T., & Moran, K. (2017). Parental perceptions of water competence and drowning risk for themselves and their children in an open water environment. *International journal of aquatic research and education*, 10(1), 4.

Stanley, T. & Moran, K. (2018). Self-estimates of swimming and rescue competence, and the perceptions of the risk of drowning among minority groups in New Zealand – lifesaving or life threatening? *Journal of Education and Human Development*, 7(1), 82-91. Published online March 2018. Available at: [http://jehdnet.com/journals/jehd/Vol\\_7\\_No\\_1\\_March\\_2018/10.pdf](http://jehdnet.com/journals/jehd/Vol_7_No_1_March_2018/10.pdf)

Stallman, R.K., Moran, K., Quan, L., & Langendorfer, S. (2017). From swimming skill to water competence: Towards a more inclusive drowning prevention future. *International Journal of Aquatic Research and Education*, 1-35. Published online 13<sup>th</sup> June 2017. Available at: <http://scholarworks.bgsu.edu/ijare/vol10/iss2/3>

Titchener, K., Haworth, N., & Lennon, A. (2011). Knowledge, attitudes and beliefs towards injury prevention: a population-based telephone survey. *International journal of injury control and safety promotion*, 18(3), 227-234.

Water Safety New Zealand. (2018a). *WSNZ 2018 Attitude and Behaviour Survey*. Water Safety New Zealand: Wellington.

Water Safety New Zealand. (2018b). Older adult drowning fatalities 1 Jan 2008 – 31 Dec 2017. Water Safety New Zealand Drownbase™: Wellington.

Water Safety New Zealand. (2019a). NZ Drowning Deaths 1 Jan 2014 – 31 Dec 2018. Water Safety New Zealand Drownbase™: Wellington.

Water Safety New Zealand. (2019b). MM Research WSNZ Self Perceptions Extra Analysis. Water Safety New Zealand: Wellington.

Water Safety New Zealand. (2019c). 2018 Drowning Report. Water Safety New Zealand: Wellington. Downloadable from <https://drowningreport.watersafety.org.nz/>

Watson, M., Kendrick, D., & Coupland, C. (2003). Validation of a home safety questionnaire used in a randomized control trial. *Injury Prevention*, 9, 180–183. PubMed doi:10.1136/ip.9.2.180

Wilson, D. (2018). *Ageing for Beginners. Getting older in today's world – what it means for you*. Auckland, New Zealand: Imagination Press Limited.

World Health Organisation. (2011) Global Health and Aging. National Institute on Aging. NIH Publication no. 11-7737. Downloadable from [https://www.who.int/ageing/publications/global\\_health.pdf](https://www.who.int/ageing/publications/global_health.pdf)



If **Yes**, how far can you swim non-stop in 5 minutes? (25 metres = 1 length of pool) \_\_\_\_\_

**12.** How long ago did you swim this distance in a pool?

Last month     Last 6 months     Last year     More than a year ago

**13.** Do you swim for fitness?

Never     Occasionally (about 1/month)     Often (1/ week)     Very often (more than 1/ week)

**14.** Do you think you could swim this distance in deep, open water?     Yes     No

If **Yes**,     Very Easily     Easily     With difficulty     With great difficulty

**15.** How often do you swim in open water (beach, lake or waterhole) during the summer months?

Daily     Weekly     About once a month     Less than once a month     Never

**16.** Can you float without moving and without flotation aids?     Yes     No

If **Yes**, how well would you say you can float?     Poor     Fair     Good     Very Good

If **Yes**, how long could you float?     Less than 1 minute     Less than 5 minutes  
 Less than 15 minutes     Less than 1 hour     More than 1 hour

**17.** Do you think you could float this long in deep, open water?     Yes     No

If **Yes**,     Very Easily     Easily     With difficulty     With great difficulty

**18. What do you think about the following statements?**

	<b>Agree</b>	<b>Disagree</b>
a) My swimming competence will keep me safe when swimming in open water	<input type="checkbox"/>	<input type="checkbox"/>
b) Others are at greater risk than me when swimming in open water	<input type="checkbox"/>	<input type="checkbox"/>
c) My current swimming fitness will ensure my safety in open water	<input type="checkbox"/>	<input type="checkbox"/>
d) My swimming competence means I don't need to wear a lifejacket in a boat	<input type="checkbox"/>	<input type="checkbox"/>
e) The risk of drowning is always in the back of my mind when swimming in open water	<input type="checkbox"/>	<input type="checkbox"/>
f) My swimming competence means that I am capable of rescuing others in open water	<input type="checkbox"/>	<input type="checkbox"/>
g) I often feel at risk swimming when conditions are rough	<input type="checkbox"/>	<input type="checkbox"/>

**19. Rate the risk to your life in the following situations:**

	<b>Extreme Risk</b>	<b>High Risk</b>	<b>Slight Risk</b>	<b>No Risk</b>
Engine failure in a dinghy 100 metres from the shore	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Caught in a rip current at a surf beach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assisting a person in trouble in deep water of a swimming pool	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fell into deep water fully clothed while walking along a river bank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Swept off isolated rocks by a wave while fishing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**20.** How confident do you feel about your safety in open water?

Very Anxious     Anxious     Confident     Very confident

**21.** Do you have any further comments? \_\_\_\_\_

**Thank you for your time. Please return the completed form to the researcher.**