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Will They Sink or Swim? New Zealand Youth Water Safety Knowledge and Skills

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This article examines the practical and theoretical knowledge of New Zealand youth, identifies gaps in the understanding of water safety by these same youth, and suggests ways of addressing the shortcomings. A questionnaire was completed by 2,202 youth in a nationwide survey, New Zealand Youth Water Safety Survey 2003. Self-reported swimming, rescue, and resuscitation skills and understanding of small-boat and surf safety were the competencies chosen to evaluate youth skills and knowledge. Many estimated that they could not swim more than 100 m (n = 1,192, 54%) or that they could not perform CPR (n = 939, 43%). When analyzed by gender, socioeconomic status, and ethnicity, the lack of water-safety knowledge among males, youth from low-socioeconomic-status schools, and Pacific Islands and Asian students was consistent and pronounced. The author discusses the implications of these shortcomings for youth drowning risk and recommends ways to address inequities in the provision of water-safety education in schools.

Keywords: survival swimming, lifesaving, first aid and CPR

In an island nation with easy access to water, opportunity for New Zealanders to engage recreationally in aquatic activity abounds. A 1999 survey of aquatic activity reported that 80% of New Zealanders over 18 years of age had participated in some form of aquatic activity in the previous month (Water Safety New Zealand [WSNZ], 1999). Preliminary findings on youth sport and recreational activities reiterated this popularity, with swimming reported to be the most popular out-of-school active leisure pursuit for both boys and girls (Sport and Recreation Council, 2002). Although participation in recreational aquatic activity is generally perceived as a positive indicator of a healthy New Zealand lifestyle it is not without risk.

Drowning as a consequence of aquatic recreation is a significant cause of unintentional death among young New Zealanders. From 1980 to 1994, 544 New Zealand youth and young adults age 15–24 years died in unintentional drowning incidents (Langley, Warner, Smith, & Wright, 2000). Young males age 15–19 years had one of the highest age-specific rates of drowning-related death (7.9 per 100,000 person years) from 1989 to 1998 (Injury Prevention Research Unit, 2003). In the decade from 1992 to 2001, approximately half the New Zealand youth drowning fatalities occurred during recreational activity (WSNZ: Drownbase). Surf-lifesaving rescue statistics illustrate the potential for even greater loss of young lives. From

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1995 to 2000, young people age 10–19 years composed the largest group of victims, with a total of 2,363 youngsters rescued from the surf (Surf Lifesaving New Zealand, 2000).

To reduce the risk of drowning associated with aquatic recreation, many resources have been allocated to water-safety education for children and youth (WSNZ, 1999, 2002a). There is consensus among the water-safety-education community that teaching water-safety knowledge and skills will shape positive water-safety attitudes and perceptions and lead to safe behavior in, on, and around water. Although investing in child and youth water-safety education appears sound, little is known about the knowledge and skills base that informs and supports this group's practice of water safety.

The protective role of factors such as swimming, rescue, and cardiopulmonary-resuscitation (CPR) ability in the prevention of youth drowning is not well understood, even though swimming and lifesaving skills have long been advocated by swimming organizations as a way of reducing drowning risk (e.g., WSNZ, 2003). Some organizations have reasoned that the recent reduction in drowning in developed countries is the consequence of targeted risk-reduction interventions such as water-safety-education programs in schools and in the community (New South Wales Water Safety Taskforce, 2001; Royal Society for the Prevention of Accidents, 2002), but there is little evidence to substantiate such claims. Given that young people tend to swim (and drown) in unsupervised environments (Smith & Brenner, 1995), however, it would appear reasonable to assume that the abilities to swim and perform a deep-water rescue and CPR might be important protective assets for young people.

Youth's theoretical understanding of water-safety principles is perhaps the area of water-safety knowledge that is least researched and understood. What little has been reported suggests that many young people might lack a sound understanding of water-safety principles. A longitudinal study of 162 high schools found that more than half the physical education teachers responsible for teaching aquatics education did not consider their Year 11 students adequately prepared (Moran, 1999). Teachers also believed that the situation had worsened in the 10 years from 1987 to 1996. Earlier New Zealand studies reported that the knowledge base that informed youth decision making about their safety in water was, at best, tentative, and many students were poorly informed about water safety (Dukes, 1985, 1987). More recent studies have noted a paucity of CPR teaching in New Zealand schools (Lafferty, Larsen, & Galletly, 2003) and the community (Larsen, Pearson, & Galletly, 2004). A lack of boat-safety knowledge was also evident in a national survey of Year 4 and Year 8 pupils throughout New Zealand (Crooks & Flockton, 1999). U.S. studies have also suggested that lack of knowledge and experience among youth was strongly associated with increased boating fatalities in Ohio (Molberg, Hopkins, Paulson, & Gunn, 1993) and that youth were not aware of the dangers of swimming in rivers or lakes (Bennett, Quan, & Williams, 2002) or of the dangers of mixing alcohol with aquatic activity (Orlowksi, 1987, 1989).

Without valid and comprehensive information on what constitutes the water-safety knowledge of young and old alike, drowning-prevention initiatives such as water-safety education in schools and the community might prove to be of little worth. Knowledge of the strengths and weaknesses of youth understanding of water-safety principles and practice might indicate where educational initiatives

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might best be targeted. It is therefore the purpose of this article to examine the practical and theoretical knowledge base of New Zealand youth, identify gaps in their understanding of water safety, and suggest ways to address any shortcomings.

Method

A multistage, stratified, random-sampling process was used to select a nationwide sample of 2,000+ high school students, about 4% of the target population of approximately 50,000 Year 11 students. A written questionnaire completed under the direction of survey administrators was designed to gather data on student aquatic recreational activities, water-safety knowledge, attitudes, and behaviors. The draft questions were tested in two pilot studies, modified, and subsequently presented to a group of national water-safety experts, who verified the content validity of the final questionnaire. Two further pilot studies were carried out 1 month apart to establish reliability of the survey instrument immediately before the commencement of the main survey. A national survey was conducted in 41 high schools during the second school term of 2003.

The questionnaire consisted of 25 questions and took approximately 45 min to complete. Self-reported swimming competency was assessed using seven response categories that ranged from *nonswimmer* to *can swim more than 400 m*. Abilities to perform a deep-water rescue and CPR were assessed using four response categories including *cannot perform* the skill, *poor* skill, *good* skill, and *excelle*nt skill. Theoretical understanding of water-safety principles was sought in responses to two illustrated, multiple-part questions that focused on small-boat and surf safety, topics chosen because of their popularity among youth. In the question on boat-safety knowledge, students were asked to list what essential safety equipment (e.g., life jackets, radio, bailer) would be required for a boating trip, what preevent safety preparation (e.g., check for sufficient life jackets on board) they would engage in, and what safety rules (e.g., no alcohol use, must wear life jacket) they would impose as skippers. In the question on safety in the surf, students were asked to identify surf hazards (e.g., large waves, rips, outgoing tide), list safety decisions they would make (e.g., swim between the flags, stay out if in doubt), and show where they would locate themselves (e.g., close to surf patrol, with other people) on the surf beach illustrated in the question.

Data from the completed questionnaires were entered into Microsoft Excel X for statistical analysis using SPSS version 12.0 in Windows. Frequency tables were generated for all questions, and, unless otherwise stated, percentages are expressed as the number of respondents to each survey question within groups. Data were analyzed using the sociodemographic variables of gender, socioeconomic status via the decile rating of the school attended, and ethnicity. For ease of interpretation, socioeconomic status is reported in three categories: low-decile, middecile, and high-decile school rating (a standard government evaluation based on a range of sociodemographic indicators such as average income per household) that correspond to low, middle, and high socioeconomic status. Ethnic groupings were broadly based on Statistics New Zealand's classification and included European, Maori, Pacific Islands (hereafter called Pasifika), Asian, and a category for those who self-identified as "other" ethnicities than those specified. Mann–Whitney

U tests (for two independent samples) and Kruskall–Wallis *H* tests (for multiple samples) were used to determine significant differences between groups. Detailed analysis of youth aquatic recreation and their water-safety knowledge, attitudes, and behaviors was published in a report titled *New Zealand Youth Water Safety Survey 2003* (Moran, 2003).

Results

Swimming Ability

Table 1 shows that more than one third (39%) of youth estimated that they could swim less than 50 m. More than half (54%) the respondents thought that they could swim 100 m or less, and almost one fifth (19%) thought that they could swim more than 400 m.

Results of a Mann–Whitney *U* test indicated significant difference between males' and females' estimates of swimming competency ($U = 521{,}525.5$; $p \leq .001$), with more females reporting lesser, and more males reporting greater, swimming proficiency. Table 1 shows that more females than males estimated they could swim less than 100 m (females 60%, males 49%). In contrast, more males thought that they could swim more than 100 m (males 37%, females 26%) and more males reported being able to swim more than 400 m (males 23%, females 14%).

Kruskall–Wallis *H* tests found significant differences in swimming competency when analyzed by socioeconomic status, $\chi^2(2) = 59.026$, $p = .01$, and ethnicity, $\chi^2(4) = 164.518$, $p \leq .001$. Students from low-decile schools estimated significantly less, and students from high-decile schools significantly more, swimming proficiency than other students. More students from low-decile schools than from mid- or high-decile schools were unable to swim 50 m (50% compared with 41% and 30%, respectively). European students reported the highest, and Pasifika and Asian students, the lowest, estimates of swimming proficiency. Fewer European students than Maori, Pasifika, or Asian students thought they were able to swim less than 100 m (47% compared with 56%, 73%, and 77%, respectively).

Table 1 Self-Estimated Swimming Competency by Gender

	Male (*n* = 1,171)			Female (*n* = 1,031)			Total		
Swimming ability	*n*	%	Cum %	*n*	%	Cum %	*n*	%	Cum %
Cannot swim	43	3.7	3.7	46	4.5	4.5	89	4.0	4.0
<25 m	90	7.7	11.4	110	10.7	15.1	200	9.1	13.1
26–50 m	274	23.4	34.8	287	27.8	43.0	561	25.5	38.6
51–100 m	169	14.4	49.2	173	16.8	59.7	342	15.5	54.1
101–200 m	161	13.7	62.9	143	13.9	73.6	304	13.8	67.9
201–400 m	163	13.9	76.9	125	12.1	85.7	288	13.1	81.0
>400 m	270	23.1	100.0	147	14.3	100	417	18.9	100.0

Note. Cum = cumulative.

Rescue Ability

Table 2 shows that more than one third of youth reported no rescue ability (35%), and a quarter estimated that they had poor rescue ability (25%). Although there was no significant difference ($p = .422$) in the number of males and females reporting no rescue ability, significantly more females ($U = 227{,}763.0$, $p \leq .001$) reported poor ability (females 29%, males 21%). More males reported good or excellent ability (males 44%, females 36%).

Significantly more students from low- than from mid- or high-decile schools, $\chi^2(2) = 33.684$, $p \leq .001$, estimated that they could not perform a rescue (42% compared with 33% and 31%, respectively). Significant differences were also found among ethnic groups, $\chi^2(4) = 92.010$, $p \leq .001$, with more European and Maori students confident of their rescue ability than Pasifika and Asian students (38% compared with 28% and 16%, respectively). More than one half (59%) of Asian students reported no rescue ability.

Resuscitation Ability

Table 3 shows that almost half the respondents estimated that they could not perform CPR (43%), almost a quarter (23%) reported poor skills, and one third (34%) reported good or excellent CPR skills.

Significantly more males ($U = 570{,}045.0$, $p \leq .001$), low-socioeconomic-status students, $\chi^2(2) = 8.497$, $p = .01$, and non-European students, $\chi^2(4) = 80.036$, $p \leq .001$, reported not being able to perform CPR.

Knowledge of Small-Boat Safety

Table 4 shows that a small proportion of students could not recall any essential boat-safety items (8%). Almost one fifth of students (19%) recalled only one or

Table 2 Self-Estimated Rescue Competency by Gender, Socioeconomic Status via Decile Rating of School Attended, and Ethnicity

	Rescue Ability							
	None		Poor		Good		Excellent	
	n	%	*n*	%	*n*	%	*n*	%
Male	403	34.4	249	21.3	442	37.7	77	6.6
Female	359	34.8	297	28.8	321	31.1	54	5.2
Low-decile (1–3)	266	42.1	122	19.4	208	33.0	35	5.6
Middecile (4–7)	208	32.7	178	27.9	213	33.4	38	6.0
High-decile (8–10)	288	30.9	246	26.4	341	36.5	58	6.2
European	383	28.6	359	26.8	512	38.2	85	6.3
Maori	140	34.5	86	21.2	155	38.2	25	6.2
Pasifika	99	48.5	41	20.1	55	27.0	9	4.4
Asian	121	58.7	44	21.4	32	15.5	9	4.4
Other	19	41.3	16	34.7	9	19.6	3	6.5
Total	762	34.6	546	24.8	763	34.7	131	5.9

Table 3 Self-Estimated Resuscitation (CPR) Competency by Gender, Socioeconomic Status via Decile Rating of School Attended, and Ethnicity

	CPR Skill							
	None		Poor		Good		Excellent	
	n	%	*n*	%	*n*	%	*n*	%
Male	530	45.3	261	22.3	297	25.4	83	7.1
Female	409	39.7	252	24.2	305	29.6	65	6.3
Low-decile (1–3)	300	47.6	130	20.6	155	24.6	45	7.1
Middecile (4–7)	262	41.1	152	23.9	182	28.6	41	6.4
High-decile (8–10)	377	40.3	231	24.8	265	28.4	62	6.6
European	487	36.4	342	25.5	409	30.5	102	7.5
Maori	183	45.1	84	20.7	113	27.8	26	6.4
Pasifika	120	58.8	42	20.6	36	17.6	6	2.9
Asian	130	63.1	36	17.5	30	14.6	10	4.9
Other	19	41.3	9	19.6	14	30.4	4	8.7
Total	939	42.6	513	23.3	602	27.3	148	6.7

Table 4 Small-Boat-Safety Knowledge Expressed in Terms of Safety Items, Safety Preparation, and On-Board Rules

	Safety Items				Safety Preparation			On-Board Rules		
Safety items identified	*n*	%	Cum %	Safety factors identified	*n*	%	Cum %	*n*	%	Cum %
0	185	8.4	8.4	0	385	17.5	17.5	521	23.7	23.7
1–2	411	18.7	27.1	1	521	23.7	41.1	696	31.6	55.3
3–4	774	35.1	62.2	2	808	36.7	77.8	692	31.4	86.7
5–6	591	26.8	89.1	3	398	18.1	95.9	248	11.3	98.0
≥7	220	10.0	99.0	≥4	87	4.0	99.7	42	1.9	99.8

Note. Cum = cumulative.

two boat-safety items. Some students identified no essential boat-safety preparation (18%) or identified only one preparatory safety task (24%). Almost one quarter of students listed no safety rules (24%), and one third (32%) listed only one safety rule that they would implement as skippers of the boat.

Significant differences in small-boat-safety knowledge were evident when component scores in each subquestion were summated and analyzed by gender ($U = 478{,}459.5$, $p \leq .001$). Fewer females than males recalled no essential boat-safety items, safety preparation, and on-board safety rules. No significant differences were found when boat-safety knowledge was analyzed by socioeconomic status ($p = .665$). Significant differences were found in boat-safety knowledge when analyzed by ethnic group, $\chi^2(4) = 182.310$, $p \leq .001$. European students were most likely, and Asian students least likely, to identify essential boat-safety items, identify necessary acts of safety preparation, and list on-board safety rules.

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Table 5 Surf-Safety Knowledge Expressed in Terms of Surf-Hazard Identification, Safety Decisions, and Safety of Location

	Surf-Hazard Identification			Safety Decisions				Safety of Location		
Safety factors	*n*	%	Cum %	*n*	%	Cum %	Risk	*n*	%	Cum %
0	417	18.9	18.9	649	29.5	29.5	Extreme	610	27.7	27.7
1	560	25.4	44.3	698	31.7	61.2	High	84	3.8	31.5
2	813	36.9	81.3	592	26.9	88.1	Moderate	209	9.5	41.0
3	328	14.9	96.2	228	10.4	98.4	Low	1,282	58.2	99.2
≥4	78	3.5	99.7	28	1.2	99.7				

Note. Cum = cumulative.

Knowledge of Surf Safety

Table 5 shows that one fifth (19%) of students could not identify any surf hazards and one quarter (25%) could only identify one. Almost one third (30%) made no safety decisions about their imaginary trip to the beach, and more than one quarter (28%) chose the most extreme risk options when asked where they would swim and locate themselves on the beach.

Significantly fewer females than males failed to identify any surf hazards (U = 536,332.0, $p \leq .001$), listed no safety decisions about their day's activity (U = 473,482.0, $p \leq .001$), or chose the extreme risk option (U = 503,613.0, $p \leq .001$). Significantly fewer students from high-decile schools than from low- or middecile schools failed to identify any surf hazards, $\chi^2(2) = 57.896$, $p \leq .001$, or failed to make safety decisions, $\chi^2(2) = 8.529$, $p = .014$. When analyzed by ethnic group, significant differences were found in surf-safety knowledge, $\chi^2(4) = 210.491$, $p \leq .001$. European students were least likely not to identify surf hazards, make no safety decisions, or fail to identify the safest location. In contrast to this, Table 5 shows that many Asian students were unable to identify any surf hazards (41%), make any appropriate surf-safety decisions (50%), or identify the safest location on the beach (50%).

Discussion

Youth water-safety knowledge was evaluated using self-reported swimming, rescue, and CPR competencies and the participants' theoretical understanding of boat and surf safety. Increased swimming proficiency, often regarded as the cornerstone of drowning prevention, has been assumed to be protective in a drowning situation, especially among youth and adult populations (Brenner, Saluja, & Smith, 2003). If so, results from this study suggest that the swimming proficiency of many New Zealand youth might do little to offset the dangers associated with their frequent aquatic activity. More than one third of students (39%) estimated that they could swim less than 50 m, a distance that has been used in previous studies to classify subjects as nonswimmers (Mael, 1995; Whipp, 2001). Given the emphasis that New

Zealand society places on the ability to swim and its presumed protective value in drowning prevention, it is concerning that more than one half (54%) of Year 11 students estimated that they could swim less than 100 m. Based on these findings, claims that an improvement in swimming ability is the prime reason for a recent decline in drowning incidence, as has been suggested in Australia (Ozanne-Smith & Wigglesworth, 2002; Ozanne-Smith, Wigglesworth, & Staines, 2003; Royal Life Saving Society Australia, 2002), are unlikely to be substantiated in the New Zealand context.

When swimming ability was analyzed by gender, female youth were more likely to estimate little or no swimming competency. More females than males estimated that they could only swim 50 m or less (females 43%, males 35%). Other studies on drowning have found similar differences between males' and females' self-estimates of swimming ability. Gulliver and Begg (2005) reported similar proportions of 21-year-old Dunedin young adults not being able to swim 50 m (females 19%, males 10%). Overseas, a national telephone survey of 5,234 adults in the United States found that less than one fifth of men (16%) and almost one third of women (30%) could swim less than one length of a swimming pool (Gilchrist, Sacks, & Branche, 2000). This gender-based difference in self-estimated swimming ability is interesting given the much higher incidence of male drowning in New Zealand and worldwide. Howland, Hingson, Mangione, Bell, and Bak (1996) suggest that males probably overestimate their swimming ability and are more likely to place themselves at greater risk than females in aquatic settings. Although evidence of gender differences among New Zealand youth in self-reported swimming ability reported here tends to support such a notion, further study is required to determine whether male swimming proficiency is real or imagined, and thus likely to increase their risk of drowning.

Students from low-decile schools consistently reported poor swimming proficiency, the difference between them and students from high-decile schools being particularly noticeable. Almost twice as many students from low-decile schools than from high-decile schools thought that they could swim less than 50 m (50% compared with 29%), and twice as many students from high-decile schools claimed that they could swim more than 400 m (25% compared with 12%). The consequence of such disparity in swimming proficiency is that, even though students from low-decile schools participated in less aquatic activity than students from high-decile schools (Moran, 2003), they might be at greater risk of drowning because of a possible reduced protective benefit normally associated with increased swimming proficiency.

Further disparities were found when swimming proficiency was analyzed by ethnicity. Twice as many European and Maori students claimed that they could swim more than 100 m than Pasifika and Asian students (see Table 1). One third of Asian students (32%) and more than one quarter of Pasifika students (27%) thought that they could swim less than 25 m, giving them little protection in the event of either intentional or unintentional immersion in open water. The lack of swimming competency found among ethnic minorities in this study is consistent with findings in overseas studies that have associated high drowning incidence among ethnic minorities with poor swimming ability (Mael, 1995; Smith & Brenner, 1995).

Rescue and CPR skills were examined because such skills are believed to mediate drowning risk. Such a belief seems tenable, especially because many students

swim at unsupervised sites such as unpatrolled surf beaches and many students reported having been rescued by friends from a life-threatening situation (Moran, 2003). As was the case with swimming ability, however, reliance on the protective value of such knowledge and its presumed role in reducing drowning risk might be misplaced. More than one third of students (35%) had no rescue skills, and two thirds (67%) had either poor or no CPR skills. More males were confident that they could perform a deep-water rescue (males 44%, females 36%). In addition, more Asian and Pasifika students than European and Maori students reported no rescue ability (59% and 49% compared with 29% and 34%, respectively). Whether the differences in rescue ability between males and females and ethnic groups reported in this study are real or imagined is, like self-estimates of swimming proficiency, difficult to determine and requires further study.

A lack of rescue ability has also been reported among nearly a thousand 21-year-old Dunedin young adults, most of whom ($n = 486$, 52%) had not received any lifesaving training (Gulliver & Begg, 2005). Similar findings in overseas studies have prompted recommendations that all schoolchildren be taught basic water-rescue skills (Centers for Disease Control, 1986; Smith & Brenner, 1995). Nonetheless, teaching in-water rescue activities in schools might not reduce drowning risk given that potential rescuers became victims in 6% of New Zealand drowning incidents (WSNZ, 2002b). A more viable alternative might be teaching safety-awareness skills that reduce risk by preventing a crisis from occurring in the first instance rather than teaching crisis-management skills that might further endanger lives, as I have previously suggested (1996) in relation to surf survival.

The ability of bystanders to perform CPR has long been advocated as an important community skill and one that should be taught to youth to reduce death by drowning (Centers for Disease Control, 2002; European Resuscitation Council, 2000). In spite of widespread advocacy, however, this study found a lack of CPR knowledge among New Zealand youth, with only one quarter (27%) confident in their ability to perform CPR. Those with poor CPR skills included almost half of males (45%) and students from low-decile schools (48%) and more than half of Asian (63%) and Pasifika (59%) students. This lack of skill suggests that many students might be incapable of rendering assistance in a drowning emergency. It also suggests that those most likely to need the skill, young males who often swim unsupervised and in unregulated environments (Moran, 2003), are among the least prepared in the event of an emergency necessitating resuscitation. Such findings are consistent with another recent New Zealand study that reported that 45% of secondary school pupils in 173 schools were taught no CPR, 20% were taught once, and only 13% were taught CPR more than twice (Lafferty et al., 2003). Overseas studies report similarly low levels of CPR ability (in the United States, Liller, Kent, Arcari, & McDermott, 1993; in the United Kingdom, Lester, Donnelly, Weston, & Morgan, 1996).

It is generally assumed by many engaged in safety promotion that safety knowledge is likely to reduce injury risk by enhancing people's decision making when they are confronted with potential harm (Laflamme, Svanström, & Schelp, 1999). Responses to questions on boat and surf safety in this study, however, indicate that many youth did not have a good understanding of water-safety principles when at a surf beach or when boating. More than one quarter (27%) failed to recall more than two essential on-board safety items required for a fishing trip on a small boat. Furthermore, nearly 1 in 10 students (9%) failed to identify any boating-safety items,

including the need to carry life jackets on board. This suggests that some students were either ignorant of, or chose to ignore, one of the fundamental tenets of safe boating and one that is a legal requirement for all boaters in New Zealand. When asked what safety preparation they would initiate when organizing such a boat trip, almost 1 in 5 students (18%) reported no effective safety preparation before departure. These students failed to recall even the most rudimentary preparatory procedures such as checking that life jackets were available on board, checking the weather, checking other safety items, and informing others of their intentions. In addition, almost 1 in 4 students (24%) failed to recall any on-board safety rule, not even the need to regulate fundamentally unsafe boating practices such as alcohol consumption or not wearing life jackets.

The lack of surf-safety knowledge was equally disconcerting because most youth (75%) had swum at a patrolled surf beach in the preceding year (Moran, 2003). When presented with an aerial picture of one of New Zealand's most dangerous surf beaches, nearly one fifth (19%) failed to identify any surf hazards such as rip currents. This lack of awareness is especially alarming because the beach is popular with youth and was the focus of a national televised publicity campaign that highlighted the nature and location of dangerous rips. When asked what safety decisions they would make when organizing a trip with friends to that surf beach, almost one third of students (30%) made no effective safety decisions about their day's activities. These youth failed to recall even the most rudimentary and well-publicized advice to swim between the flags. Furthermore, when asked where they would position themselves on the beach and where they would enter the water, 1 in 4 students (28%) chose the least safe of four possible options. They indicated that they would enter the water well away from the clearly marked surf-patrol area and position themselves at an isolated part of the beach some distance from the lifeguard club that was also clearly identified in the picture. Given this evidence of poor decision making and limited understanding of the surf environment, many youth are likely to place themselves at greater risk of drowning at surf beaches, a likelihood that is reflected in surf-lifesaving rescue statistics (Surf Life Saving New Zealand, 2000).

As was the case with practical water-safety skills, knowledge of water-safety principles and practice varied considerably among youth. Gender-related differences in boat- and surf-safety knowledge indicated that females generally have a better understanding of water safety than males do. Lack of boat- and surf-safety knowledge was particularly evident among students of low socioeconomic status and among Asian and Pasifika youth. Similar findings have been reported in overseas studies of youth drowning (Bennett et al., 2002, 1998).

Concerns about a lack of youth water-safety knowledge are not new. A series of earlier New Zealand studies that examined the theoretical and practical knowledge of Year 5 and Year 10 students from Dunedin raised concerns about the "dismal" performance of most pupils (Dukes, 1985, 1987; Stenning & Dukes, 1987). Dukes (1987) concluded that the overall standard of performance was very poor and that "a high percentage of students were unable to look after themselves even in a simulation of the simplest common aquatic emergency" (p. 19). Results of the current study reiterate these claims and suggest that, in terms of their water-safety knowledge and skills, many students today are no better equipped than were their predecessors 2 decades ago.

Conclusion

In summary, this study found that New Zealand youth water-safety skills and knowledge varied considerably by gender, socioeconomic status, and ethnicity. This makes generalizing at a population level about the impact of water-safety knowledge on the drowning risk associated with aquatic recreation problematic. Furthermore, the dependence on self-reporting to assess swimming, rescue, and CPR skills as health behaviors has some methodological limitations (Robertson, 1992). Notwithstanding these limitations, results from this study suggest that some individuals, notably males, those attending low-decile schools, and those of Pasifika and Asian ethnicity, might have less protective benefit than others from their water-safety skills and knowledge when participating in aquatic recreation. Although males claimed greater proficiency in swimming and rescue skills, females had better theoretical understanding of water-safety principles and practice than males, thereby having greater capacity to identify and avoid potential aquatic danger. The practical and theoretical knowledge base of students from low-decile schools and Asian and Pasifika students would appear to offer the least protection against drowning risk.

Based on this accumulated evidence, it is hard not to conclude that current efforts to educate youth about water safety are failing many young people, thereby adding to their risk of drowning. Consequently, I offer the following recommendations:

- To address the widespread lack of swimming proficiency among youth, greater emphasis is required on teaching basic swimming survival skills, especially among Pasifika and Asian students and those attending low-decile schools. Special assistance to low-decile schools via the provision of subsidies for swimming and water-safety lessons might address issues of inequitable educational opportunity.
- Mandatory instruction in CPR, available to all students before the end of compulsory schooling (16 years of age), might be a productive way to address the generally poor CPR skill levels. Furthermore, to ensure that such a critical lifesaving skill is taught properly, CPR training might best be taught by qualified personnel and fully funded to ensure equity of access.
- The provision of specialist surf- and boat-safety education is required if we are to address the very apparent lack of youth knowledge identified in this study. Such education, however, cannot be provided on a user-pays basis because that would disadvantage students attending the underresourced, low-decile schools. Funding subsidies to help external providers promote surf and boat safety is one way that such disparities might be addressed.
- Given that Asian students, who make up the bulk of new settlers in New Zealand, have limited water-safety skills and understanding, specific education programs in schools and the community offer great potential to reduce drowning risk in this group. Such programs might include school-based induction schemes for new arrivals, with an emphasis on water safety and aquatic recreation in New Zealand, water-safety information in a range of languages disseminated through migrant community groups and schools, and subsidized commercial swimming and water-safety lessons targeted at new arrivals and available through external providers.

Finally, by identifying shortcomings in the water-safety skills and knowledge base that many New Zealand youth bring to their frequent participation in aquatic recreation, this study has provided water-safety educators with a clear direction for future initiatives. Perhaps more important, it has provided educators and policy makers a clear, evidence-based stimulus for renewed investment in youth water-safety education. The water-safety education of future generations is too important in an aquatically oriented society such as New Zealand to be left to chance.

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References

Bennett, E., Quan, L., & Williams, K. (2002). A strength-based approach to adolescent drowning prevention. In *Book of abstracts of the World Congress on Drowning, Amsterdam, 26–28 June 2002*. Amsterdam: Stichting Foundation.

Bennett, E., Williams, K., Gomez, T., Murrey, M., Basford, R., & Bernthal, T. (1998). Ideas for drowning prevention: Coalition projects targeting adolescent drowning prevention. Retrieved August 19, 2002, from www.seattlechildrens.org/dp/Educators/Planning/DPprojects.htm

Brenner, R.A., Saluja, G., & Smith, G.S. (2003). Swimming lessons, swimming ability and the risk of drowning. *Injury Control and Safety Promotion, 10*(4), 211–215.

Centers for Disease Control and Prevention. (1986). North Carolina drownings, 1980–1984. *Mortality and Morbidity Weekly Reports, 35*(40), 635–638.

Centers for Disease Control and Prevention. (2002). *Water-related injuries in NCIPC injury fact book, 2001–2002*. Washington, DC: Author. Retrieved 25 August, 2002, from www.cdc.gov/ncipc/fact_book/30_waterRelated_Injuries.htm

Crooks, T., & Flockton, L. (1999). *Health and physical education assessment results, 1998*. National Education Monitoring Report No. 11. Educational Assessment Research Unit, University of Otago. Wellington, New Zealand: Ministry of Education.

Dukes, W. (1985). Dunedin water safety survey, 1984—Water test. *New Zealand Journal of Sports Medicine, 13*(4), 137–141.

Dukes, W. (1987). Dunedin water safety survey, 1984. Influence of age, sex and school on water test performance. *New Zealand Journal of Health, Physical Education and Recreation, 20*(1), 15–19.

European Resuscitation Council. (2000). Part 1: Introduction to the international guidelines 2000 for CPR and ECC. A consensus on science. *Resuscitation, 46*(1–3), 3–15.

Gilchrist, J., Sacks, J.J., & Branche, C.M. (2000). Self-reported swimming ability in U.S. adults, 1994. *Public Health Reports, 115,* 110–111.

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.

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,* 93–96.

Injury Prevention Research Unit. (2003). *Drowning-related deaths in New Zealand 1989–1998.* IPRU Fact Sheet 28. Dunedin, New Zealand: IPRU, University of Otago.

Lafferty, C., Larsen, P.D., & Galletly, D. (2003). Resuscitation teaching in New Zealand schools. *The New Zealand Medical Journal, 116*(1181), U582.

Laflamme, L., Svanström, L., & Schelp, L. (Eds.). (1999). *Safety promotion research*. Stockholm: Karolinska Institute.

Langley, J.D., Warner, M., Smith, G., & Wright, C. (2000). *Drowning related deaths in New Zealand 1980–1994*. Dunedin, New Zealand: University of Otago, Injury Prevention Research Unit.

Larsen, P., Pearson, J., & Galletly, D. (2004). Knowledge and attitudes towards cardiopulmonary resuscitation in the community. *The New Zealand Medical Journal, 117*(1193), U868.

Lester, C., Donnelly, P., Weston, C., & Morgan, M. (1996). Teaching schoolchildren cardiopulmonary resuscitation. *Resuscitation, 31,* 33–38.

Liller, K.D., Kent, E.B., Arcari, C., & McDermott, R.J. (1993). Risk factors for drowning and near-drowning among children in Hillsborough County, Florida. *Public Health Reports, 108*(3), 346–353.

Mael, F.R. (1995). Staying afloat: Within-group swimming proficiency for Whites and Blacks. *The Journal of Applied Psychology, 80*(4), 479–490.

Molberg, P.J., Hopkins, R.S., Paulson, J., & Gunn, R.A. (1993). Fatal incident risk factors in recreational boating in Ohio. *Public Health Reports, 108*(3), 340–346.

Moran, K. (1996). *Surf survival*. Wellington: Surf Life Saving New Zealand.

Moran, K. (1999). Aquatics education in New Zealand: A longitudinal study of curriculum practice. *Journal of Physical Education New Zealand, 31*(4), 2–6.

Moran, K. (2003). *New Zealand youth water safety survey*. Wellington: Water Safety New Zealand.

New South Wales Water Safety Taskforce. (2001). *NSW water safety framework 2001–2003.* Concord West, NSW: NSW Water Safety Taskforce.

Orlowski, J.P. (1987). Adolescent drownings: Swimming, boating, diving and scuba incidents. *Pediatric Annals, 17*(2), 125–132.

Orlowski, J.P. (1989). Drowning, near-drowning, and ice-water drowning. *Journal of the American Medical Association, 260*(3), 390–391.

Ozanne-Smith, J., & Wigglesworth, E. (2002). *Childhood drowning prevention*. Paper presented at the inaugural World Congress on Drowning, Amsterdam, June 26–28, 2002.

Ozanne-Smith, J., Wigglesworth, E., & Staines, C. (2003). *Drowning trends in Australia: The role of swimming instruction*. Paper presented at the 1st Asia-Pacific Injury Prevention Conference/6th National Injury Prevention and Control Conference, Perth, Australia, March 16–18, 2003.

Robertson, L.S. (1992). The validity of self-reported behavioral risk factors. *The Journal of Trauma, 32,* 58–59.

Royal Life Saving Society Australia. (2002). *The national drowning report 2001*. Drummoyne, Australia: Author.

Royal Society for the Prevention of Accidents. (2002). *Drowning statistics in the UK 2000*. Birmingham, UK: Author.

Smith, G.S., & Brenner, R. (1995). The changing risks of drowning for adolescents in the U.S. and effective control strategies. *Adolescent Medicine, 6*(2), 153–170.

Sport and Recreation Council. (2002). *SPARC fact 1997–2001.* Retrieved October 24, 2006, from www.sparc.org.nz

Stenning, R.B., & Dukes, W. (1987). Dunedin water safety survey, 1984—Test of water safety knowledge. *New Zealand Journal of Health, Physical Education and Recreation, 20*(1), 12–14.

Surf Life Saving New Zealand. (2000). Rescue statistics—Trend analysis of incidents type. Retrieved September 15, 2002, from https://www.slsnz.org.nz

Water Safety New Zealand. (1999). *Water safety—Profile*. Wellington: Water Safety New Zealand WSC.

Water Safety New Zealand. (2002a). Assessing student swimming and aquatic skills. A report prepared for the Ministry of Education and Water Safety New Zealand. Wellington: Author.

Water Safety New Zealand. (2002b). Drowning. Retrieved January 23, 2005, from www.watersafety.org.nz

Whipp, P. (2001). Teaching swimming: Issues beyond drowning. Retrieved January 20, 2004, from www.aare.edu.au/01pap/whi01680.htm