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Water skills for life: assessing population-level coverage of a school-based aquatic program in Aotearoa, New Zealand

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ABSTRACT

Introduction: In Aotearoa, New Zealand, Water Skills for Life (WSFL) is a national school-based water survival program. The program, which has been in operation in New Zealand schools since 2018, teaches children broad fundamental competencies for lifelong water safety. This study investigated program participation and coverage by schools, socioeconomic areas, and geographies. *Method:* Using WSFL data from July 2018 to July 2023, we examined program coverage (number and rate of children and schools participating) by regional council area, school year (1–8), school socioeconomic status (deciles 1–10), and year of program delivery. *Results:* A total of 256,511 children participated in the WSFL program from 2018 to 2023. Participation was highest in 2019 (30% of all public schools) and declined to 22% in 2022. Children in the lowest socioeconomic decile had the highest participation rate (17% of children on the school roll). Participation by region ranged from 2 to 25% of children on the school roll. Participation was highest at 18% of year 6 students. *Conclusions:* School-based aquatic programs can increase participation in areas with challenges accessing commercial programs. Providing school-based programs in low socioeconomic areas can reduce inequalities. The decline in program participation by schools in recent years is concerning and requires further research to understand the drivers. *Practical applications:* Continued investment and participation in population-level water survival programs that are available to all societal groups will increase water safety and reduce drowning rates. There is a need to ensure investment keeps pace with changing demographics including population growth.

1. Introduction

Drowning is a leading cause of mortality and morbidity among children globally (World Health Organization, 2014). As a highly preventable cause of injury-related harm, the World Health Organization (WHO) recommends the provision of basic swimming and water safety skills training for school-aged children as one of six selected interventions to address the global drowning burden (World Health Organization, 2017). Systems-level approaches, such as lesson provision through the school system, is one way to achieve population-level coverage (Lynch, 2012), addressing known barriers to access such as cost (Ananthapavan et al., 2024).

Globally there are few national population level water safety programs. In Scandinavian countries such as Norway, Finland, and Iceland, schools are the conduit to population-level coverage with instruction varying from a small number of lessons per year, through to weekly provision for all grades (Olstad et al., 2021). Other examples include Australia, where states and territories provide school-based swimming programs, but under the federated structure, coverage and content differs between jurisdictions (Peden et al., 2009). Several countries are moving towards population-wide provision of swimming and water safety via the education system, such as Vietnam, though this has not yet reached national coverage with adequate pool access and enough trained staff posing challenges to further expansion (Global Health Advocacy Incubator, 2024).

Varying approaches at sub-national level, including diversity of delivery models, target age-groups, course content, and data collection poses challenges for evaluation (Willcox-Pidgeon et al., 2021;

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Santibañez-Gutierrez et al., 2022; Costa et al., 2020) and as such, there is a dearth of literature evaluating such programs. This hampers program improvements and justification for further investment in, and expansion of, such initiatives, despite the potential benefits.

In Aotearoa, New Zealand (NZ) unintentional drowning claims the lives of 83 people on average per year (Water Safety New Zealand, 2024a), and as a nation, New Zealand records a higher all-age drowning rate relative to neighboring Australia (Peden et al., 2019). Drowning risk is generally lower among school-aged children, with this cohort representing 13% of New Zealand's population, but just 4% of the drowning fatalities in 2024 (Water Safety New Zealand, 2024a). A range of measures are in place to reduce drowning risk for children across NZ, a high-income country, including the provision of water safety skills through the Water Skills for Life (WSFL) program.

The WSFL program provides freely available resources for children ages 5–13 years to improve water safety skills and knowledge (Water Safety New Zealand, 2024b). The program, which is funded by the New Zealand Accident Compensation Corporation (ACC) and the New Zealand Lottery Grants Board, is delivered predominantly through schools alongside a small number of swim schools and other community partners. Those who deliver the program are chosen via funding applications submitted to WSNZ. This funding model prioritizes subsidies for participation by schools in lower socio-economic areas. The program has been running in NZ since 2016 and in schools since 2018.

Water safety skills are the main focus of the WSFL program, with an emphasis on survival skills and knowledge relevant to beaches, rivers and lakes. This focus is based on an analysis of New Zealand drowning data (from DrownBase™), which showed the majority of New Zealanders drowned while recreating in natural water environments (Water Safety New Zealand, 2024a). The program aims to ensure children are prepared for real-world situations they may face in the water, using a structured, age-appropriate curriculum (Water Safety New Zealand, 2024b). The program has seven skill sets (water survival, safety and awareness; safe entry and exit; submersion; personal buoyancy; orientation; safety of self and others; and propulsion) containing core skills, as well as a sequence of skills. Providers may choose which skill sets they want to teach, a decision generally made based on the depth and size of pool available. To support program delivery via schools, WSFL provides resources via an e-learning platform to support program implementation including lesson plans and assessment tools.

Given the lack of evaluation on population-level water survival programs, this study aims to assess coverage of the WSFL program in NZ. The goal is to better understand access to and participation in the program, while also highlighting who is missing out, to inform future WSFL program delivery.

2. Materials and methods

2.1. Setting

New Zealand is an island country with 15,000 km of coastline in the southwestern Pacific Ocean. At the 2023 census New Zealand had an estimated resident population of five million (Stats, 2023), of which 13% (647,910) were aged 5–14 years old. In July 2020 there were 4,371 schools for children in school years 1–8 in New Zealand (approximately ages 5–12 years (Ministry of Education, 2024); 1,943 primary schools, 117 intermediate schools, 113 secondary schools (years 7–15) and 178 composite schools (New Zealand Ministry of Education, 2023). Around 97% of children in year 1–8 attend public schools and 3% private schools.

2.2. Data set

We analyzed data from Water Safety New Zealand's WSFL database. The database was established as part of the roll out of the WSFL program to record program coverage, via children's participation, and achievement of skills. Each student is assigned a unique ID and data are entered by the program provider and schools. The database extract covered the period July 2018-July 2023.

A number of data consistency and data cleaning steps were conducted to derive the final analysis data set including 408,249 records of 256,511 children (Fig. 1). These included removing exact duplicate records, records with no achievements (i.e., empty records with no data entered), and records with large inconsistencies in dates of achievement and school year (i.e., difference in school years between records of the same child much larger than difference in dates of achievement or vice versa).

2.3. Data analysis

Outcomes of interest were program coverage, measured as number of children and schools participating in the program. Exposures of interest were Regional council area, school year of child, school socio-economic status (SES) decile, and year of program delivery. Schools are assigned a socio-economic score based on five census derived variables for the areas from which it draws it students (household income, occupation, household crowding, educational qualifications, and the income support levels of houses) (New Zealand Government Ministry of Education, 2025; New Zealand Government Ministry of Education, 2023). The 10% with highest proportion of low SES students are considered decile 1 schools, the next 10% of schools are considered decile 2 schools, etc.

We summarized the total number of records and number of children in the program by regional council, school socioeconomic status decile and school year of child stratified by year of program delivery and aggregated for the whole time period (2018–2023). Analysis of rates of participation by regional council and school socioeconomic status decile included all children in the WSFL datasets from school years 0–8 and analysis of rates by school year was restricted to years1-8, because NZ Ministry of Education school roll data is restricted to these years (New Zealand Government Ministry of Education, 2023).

Analysis of the number of children in the program was restricted to one record per child (most recent record) per year or for the whole time period. We summarized numbers of children participating and rates of participation by the exposure categories regional council area, school socioeconomic status decile and school year. Rates were calculated per number of children on school roll in July 2020 in school years 1–8 aggregated by the exposure categories. Analyses were conducted in Stata SE 17.0 and figures were created in R Version 4.3.1 running tidyverse 2.0.0 packages.

2.4. Ethics approval

Ethical approval for the secondary use of already collected program data was granted by the University of New South Wales Human Research Ethics Committee (HC220033). When schools agree to participate in the WSFL program they provide consent for de-identified student data to be used for research purposes. Program schools obtain consent forms from participant's parents/caregivers.

3. Results

From 2018 to 2023, there were 408,249 records of the WSFL program for 256,511 children in school years 0–8 registered in the WSFL database (Fig. 1; Table S1; S2). The number of children participating in the program was highest in 2019 with 92,939 children and varied between 65,000 to 67,000 per year between 2020 and 2022 (Table S2). Overall, more than half (57.8%; n = 215,723) of all children participating in the program attended via schools in the Auckland (37.8%) and Canterbury (19.1%) regions (Table S2). Almost half (48.5%) of all children in the program attended schools in the four lowest socioeconomic deciles and almost three quarters (70.8%) were in school years 3 to 6 (Table S2).

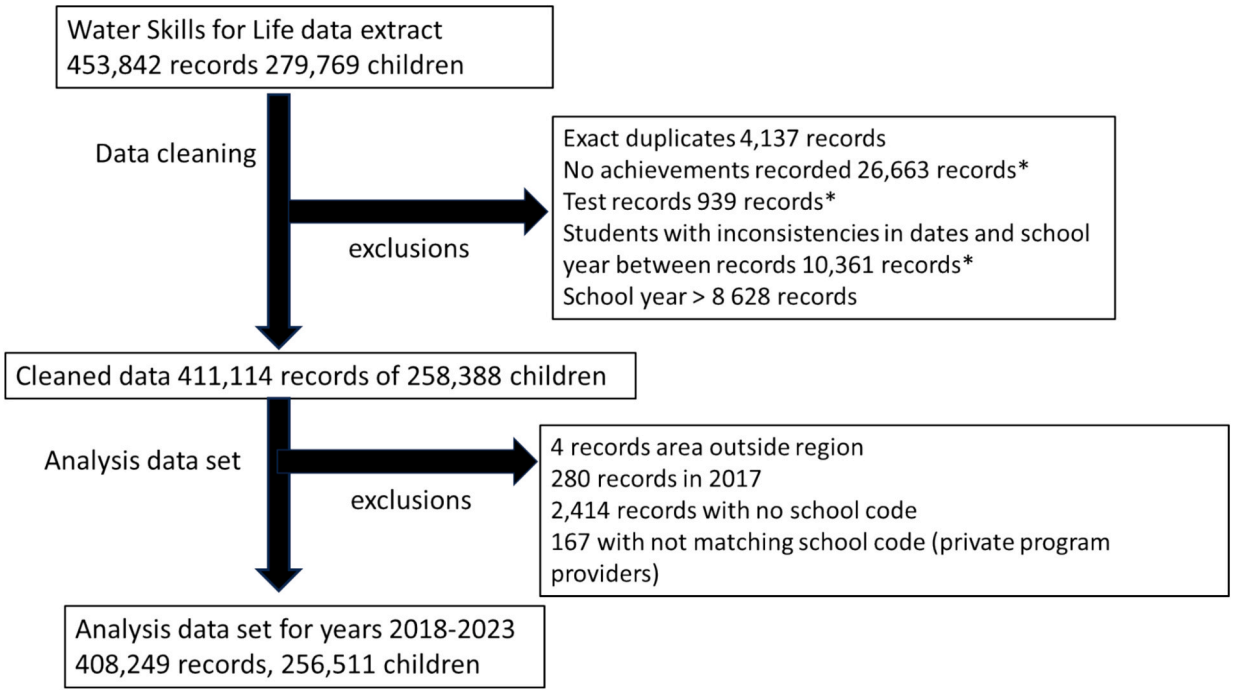

Fig. 1. Number of records and children in dataset after applying data cleaning inclusion and exclusion criteria, WSFL NZ 2018–2023.

Across the study period, NZ-wide participation amounted to 256,511 students, 10% of students in year 1–8 on the school roll (Table 1). The Gisborne Region had the highest rate of program participation (24.7 per 100 children on school roll [95%CI: 24.2–25.3)), followed by Otago (22.5 per 100 children [95%CI: 22.2–22.7]) and Northland (21.0 per 100 [95%CI: 20.8–21.3]) (Fig. 2; Table 1; Fig. S1). Children in schools of the lowest socioeconomic decile had the highest rate of program exposure (17.0 per 100 children on school roll [95%CI: 16.9–17.2]) and those in the highest socioeconomic status decile had the lowest (5.6 per 100 children [95%CI: 5.6–5.7]). Children in school years 4–6 had highest rates of program participation ranging from 12.1 (95%CI: 12.0–12.2) per 100 children on school roll in year 4 to 18.3 (95%CI: 18.2–18.5) per 100 children on the school roll in year 6 (Table 1; Fig. S1).

The proportion of schools participating in the program varied by regional council, socioeconomic status decile of school area and year of program delivery (Tables S3, S4). Across New Zealand, the number of schools participating in the program was highest in 2019 (n = 599, 29.8%) and decreased until 2022 (n = 423, 21.8%). Schools in areas with the lowest socioeconomic status decile had the highest participation rate (36.7%) and those in the highest decile had the lowest rates (18.7%, Table S5). Northland and Gisborne regions had the highest proportion of schools participating (49.3% and 48.5%, respectively) and Waikato (5.2%) and Manawatu-Whanganui Region the lowest (3.5%) (Table S5, Fig. S2). These trends were mirrored in the average annual rate per 100 schools across the full study period 2018–2023, which is higher because different schools participated in different years. (Fig. 3; Table S5).

4. Discussion

Swimming and water safety education for school-aged children is one of several public health approaches to prevent child drowning (Crawford et al., 2024) and is a drowning prevention strategy strongly advocated for by WHO (World Health Organization, 2017). School-based programs can deliver whole of population coverage, yet despite some countries taking this approach to swimming and water safety education, evaluation of such programs is recommended yet limited (World Health Organization, 2017).

To address this research gap, we examined the coverage of, and participation in, the WSFL program in NZ. We found that nationally, 10% of students enrolled in school in years 1–8 across the study period participated in the program. Positively, we found higher proportions and rates of participation among schools with lower socio-economic status deciles, than those with the highest deciles. This is commensurate with the funding model for WSFL, which prioritizes subsidies for participation for schools in lower socio-economic areas due to cost-related challenges in access (Water Safety New Zealand, 2024c).

Nevertheless, this is an important finding given socio-economic status is found to impact drowning risk, with those of a lower socio-economic status recording higher drowning rates than those with a higher status, likely due to a range of factors including access to pools and lesson affordability (Water Safety New Zealand, 2024a; Royal Life Saving Society - Australia, 2024; Rahman et al., 2021; Cenderadewi et al., 2020). This is contrary to data from commercial swim schools in neighboring Australia, which show children from low socio-economic families are underrepresented (Willcox-Pidgeon et al., 2021; Mead et al., 2024). Provision of swimming and water safety education via the school system may address challenges parents face in enrolling their children in swimming lessons including cost and time (Windle et al.). Investment in such systems approaches (Franklin & Hasan, 2024) support population-level coverage and WSFL program implementation via schools is a lever that has been recommended to achieve multi-sectoral action on drowning prevention (Scarr et al., 2024) and have the potential to reduce inequalities in swimming and water safety abilities and potentially drowning in the long term.

However, despite the strengths of a population-level intervention, participation during the study period peaked at one in four students (24.7%) in the Gisborne region. Participation is high in regions of the North Island, where approximately three quarters of the NZ population live (North, 2025) and where fatal drownings are more concentrated (Water Safety New Zealand, 2024a). However, participation is lower in regions such as Manawatu-Whanganui and Wellington, despite significant population numbers (North, 2025). This finding indicates the need for further investment in the program to lift participation rates across the country. Pleasingly, in more recent years, newer initiatives such as

Table 1
Numbers* and rates of Water Skills for Life program participation by regional council area, school decile and school year 2018–2023, New Zealand.

	Category	Number	School roll	Rate (95% CI)
Regional Council	Auckland Region	96,265	881,715	10.9 (10.8–11.0)
	Bay of Plenty Region	15,794	184,725	8.6 (8.4–8.7)
	Canterbury Region	46,372	309,930	15.0 (14.8–15.1)
	Gisborne Region	7634	30,880	24.7 (24.2–25.3)
	Hawke's Bay Region	7707	98,780	7.8 (7.6–8.0)
	Manawatu-Whanganui Region	2943	132,860	2.2 (2.1–2.3)
	Marlborough Region	1394	22,870	6.1 (5.8–6.4)
	Nelson Region	1175	24,255	4.8 (4.6–5.1)
	Northland Region	22,238	105,680	21.0 (20.8–21.3)
	Otago Region	23,523	104,735	22.5 (22.2–22.7)
	Southland Region	7862	54,720	14.4 (14.1–14.7)
	Taranaki Region	3266	70,785	4.6 (4.5–4.8)
	Tasman Region	1508	27,110	5.6 (5.3–5.8)
	Waikato Region	8740	275,005	3.2 (3.1–3.2)
	Wellington Region	9416	253,115	3.7 (3.6–3.8)
	West Coast Region	516	15,005	3.4 (3.1–3.7)
Socioeconomic status decile	1 (lowest)	39,139	229,840	17.0 (16.9–17.2)
	2	27,696	207,000	13.4 (13.2–13.5)
	3	29,166	215,000	13.6 (13.4–13.7)
	4	29,034	223,325	13.0 (12.9–13.2)
	5	27,920	246,300	11.3 (11.2–11.5)
	6	18,139	194,820	9.3 (9.2–9.4)
	7	20,715	270,765	7.7 (7.5–7.8)
	8	19,636	278,495	7.1 (7.0–7.1)
	9	21,165	302,560	7.0 (6.9–7.1)
	10 (highest)	23,067	409,275	5.6 (5.6–5.7)
School Year	1	14,448	298,205	4.8 (4.8–4.9)
	2	15,929	312,370	5.1 (5.0–5.2)
	3	33,874	308,075	11.0 (10.9–11.1)
	4	37,924	313,565	12.1 (12.0–12.2)
	5	44,594	322,530	13.8 (13.7–14.0)
	6	58,856	321,505	18.3 (18.2–18.5)
	7	17,392	387,915	4.5 (4.4–4.6)
	8	16,577	332,175	5.0 (4.9–5.1)
Total	New Zealand	256,511	2,592,170	9.9 (9.9–9.9)

*One record per child for those with multiple records for the whole time period, missing or categories n/a not shown. Note half year of data available for 2023.

WSFL Beach and WSFL River-specific programs offering simulated open water scenarios have been rolled out in communities where population density and weather conditions combine, resulting in high aquatic participation (Omnipoll for Water Safety New Zealand, 2024). These include implementation at schools near four beach and two harbor drowning blackspots in Auckland and schools in the Waikato Region (Water Safety New Zealand, 2024a). Similarly, relatively higher coverage in regions with growing populations on the South Island bodes well for future years of program delivery (North, 2025). With continual improvements being made to the WSFL program, a commitment to ongoing evaluation will be vital to assess efficacy of these changes.

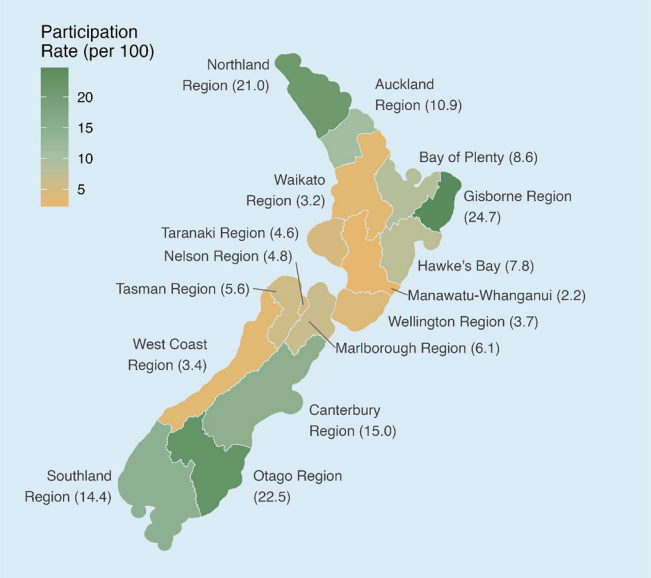

Fig. 2. Rates of Water Skills for Life program participation by regional council area 2018–2023, New Zealand. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Our analysis shows a decline in both school participation and child participation rates in the WSFL program since 2019. This decline post 2019 likely coincides with challenges the education sector and the aquatic industry faced during the COVID-19 pandemic (PwC, 2022; Mutch, 2021). This is concerning as several other countries have recorded increasing drowning rates associated with the pandemic (Houser and Vlodarchyk, 2021; Lawes et al., 2021). Longer-term analyses are needed to determine if school and child-based participation rates have returned to pre-pandemic levels post 2023. Regional differences are also worth exploring in greater detail to identify barriers and facilitators to participation at a sub-national level post the pandemic to consider if lessons from high participation regions can be applied to neighboring regions or nationally to redress the participation decline.

At a population level, New Zealand records consistently low rates of drowning among school-aged children, representing 13% of the population yet 4% of drowning fatalities in 2024 (Water Safety New Zealand, 2024a), underscoring the need to maintain focus on delivering high-quality, survival-focused education to all school-aged children. However, drowning statistics among adults (Water Safety New Zealand, 2024a) indicate it is important to embed swimming and water safety skills prior to adolescence as risk factors and exposures begin to change throughout adolescence and into adulthood (Water Safety New Zealand, 2024a; Royal Life Saving Society - Australia, 2012; Peden et al., 2024). Future research should examine skill attainment by school year to determine if declining participation rates in WSFL are due to adequate skill attainment and program completion or other reasons such as lack of interest or non-provision of the program to this age group by schools or differing participation by school type. This drop off is concerning given the WSFL program resources and curriculum cater for children up to 13 years of age (Water Safety New Zealand, 2024b) and indicates a need for further investment to widen focus from the priority funding for younger age groups (Water Safety New Zealand, 2024c).

4.1. *Strengths and limitations*

The population wide coverage of the WSFL program and large sample size with over 400,000 records for 256,511 children is one of the main strengths of this analysis. This enabled, to the best of our

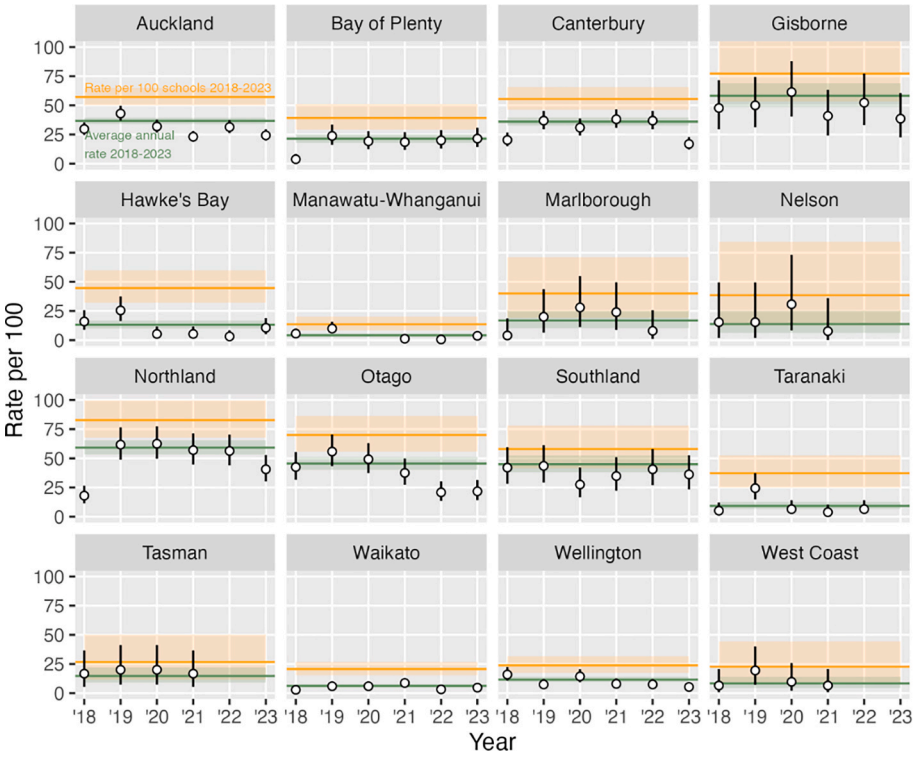

Fig. 3. Rates of Water Skills for Life program participation by regional council area average rate and annual average rate 2018–2023, New Zealand. Note The green horizontal line shows the average of the annual participation rate per 100 schools in each region; the orange horizontal line shows the average participation rate per 100 schools across the whole period 2018–2023. Shaded regions show the 95% confidence intervals.

knowledge, the first assessment of participation in water survival programs among children at a national level. Program participation data are typically entered by the program providers and although we applied a number of data consistency checks and exclusion criteria, we cannot rule out data entry errors. Similarly, despite only including one record per child for analysis during the data cleaning process, we cannot rule out that the same child may have multiple records if entered as a new record with a different ID by the provider. We encourage continued quantitative research to examine trends in program coverage and participation in more recent years, as well as consideration for qualitative research to examine barriers and facilitators to school participation in the WSFL program.

4.2. Practical applications

The provision of swimming and water safety education for children via the school system can provide population-level coverage of an important skill which can prevent drowning. It represents one aspect of a multi-faceted approach to drowning prevention which, in addition to education and skill development, includes policy and environmental supports.

This analysis of population level coverage of a swimming and water safety program in Aotearoa, NZ identified relatively high participation rates among low socioeconomic status schools, but far from total population coverage overall and declining participation rates for both children and schools in the most recent years with available data. Increased investment and encouraging participation in the WSFL program will be important as one strategy to reduce NZ's preventable loss of life and injury due to drowning over the coming years.

5. Conclusion

Swimming and water safety education is a recommended strategy to improve water safety and foster a lifetime of safe aquatic participation. Given higher drowning risk in low socio-economic areas, higher coverage of WSFL in schools in those areas is a very positive finding. However, increased investment can support more children to access this important education via the school system, which can alleviate challenges in accessing this education privately, such as cost and access.

CRediT authorship contribution statement

Amy E Peden: Writing – review & editing, Writing – original draft, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Felicity Fozard:** Writing – review & editing, Writing – original draft, Data curation, Conceptualization. **Gavin Walker:** Writing – review & editing, Data curation. **Esther Hone:** Writing – review & editing, Data curation. **Mark Hanly:** Writing – review & editing, Visualization, Methodology, Formal analysis. **Holger Möller:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization.

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Felicity Fozard (FF), Gavin Walker (GW) and Esther Hone (EH) are employed by Water Safety New Zealand. Water Safety New Zealand

provided funding support for the research. Analyses were conducted independent of the donor and authors FF, GW and EH. The other authors declare no conflict of interest.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jsr.2025.08.010.

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