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School absenteeism is an early indicator of suicidality in young people: a retrospective longitudinal matched case-control study using New Zealand integrated data infrastructure

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ABSTRACT

Objective: School absenteeism, associated with social isolation and loneliness, may signal hidden risks that increase the likelihood of suicidal ideation and behaviors. Few studies have explored longitudinal associations between school absenteeism and suicidality. This study sought to examine longitudinal associations between school absenteeism (a potential early marker) and suicidality to identify other risk and protective factors of students and schools for suicide prevention.
Study design: Retrospective longitudinal matched case-control study.
Methods: We used the New Zealand Integrated Data Infrastructure (IDI) database to integrate mental health outcomes with educational data. Based on clinical International Classification of Diseases (ICD) codes and descriptions, we identified 3042 cases from 562,455 students (school year 6–13) enrolled in the education system in 2018, who had a subsequent hospital admission due to suicidality (2019–2021). Cases were matched using a 1:4 ratio with 12,168 control students by sex, school year-level, and ethnicity.
Results: School absenteeism was significantly associated with subsequent suicidality (adjusted odds ratio (aOR: 2.21, 95% CI 2.02–2.41). Other significant factors included students' post-school activities and previous suicidality; the school's region (secondary/minor urban schools vs. main urban), decile (a socio-economic index), and availability of Māori language learning (level C/D & above vs. not available).
Conclusions: School absenteeism is an early indicator of suicidality. Combined with other identified student and school factors, a risk stratification strategy for suicide prevention may be established to provide timely early prevention strategies for schools and students at high risk.

Introduction

Suicide is the second most common cause of death in young people (Hawton & Harriss, 2007; Patton et al., 2009) and significantly associated with school absenteeism, self-harm, and suicidal behaviors (Epstein et al., 2020). School absenteeism increases social isolation and signals hidden risks that increase the risk of suicidal behaviors (Alvarez-Subiela et al., 2022; Cuesta et al., 2021; Richardson et al., 2024). Longitudinal studies have found that suicidal ideation and suicidal behaviors are closely associated in young people(Fergusson et al., 2003). Furthermore, being truant from school has a fourfold increased risk of attempted suicide by age 21.

School attendance problems (SAP), include truancy, school refusal, and school withdrawal (Epstein et al., 2020). Truancy is defined as absences with inexcusable reasons usually concealed from parents (Kearney et al., 2020; Sosu et al., 2021). School withdrawal is usually initiated by parents (Heyne et al., 2019). School refusal refers to emotional distress associated with school attendance without concealment from parents. Refusal is associated with mental health difficulties in young people such as depression, anxiety, social withdrawal, and disruptive behaviors, aggression, drug use, and defiance (Egger et al., 2003; Kearney et al., 2019). Noted adverse outcomes are unsatisfactory

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academic performance, unemployment, poverty, and impaired adult health (Lawrence et al., 2019; Tonge & Silverman, 2019). These factors may increase the risk of suicidality.

School attendance problems are one known factor within the school environment for adolescent suicidality. Under the Integrated Conceptual Model for suicide prevention(Cramer & Kapusta, 2017; Prades-Caballero et al., 2025), multilevel prevention strategies are advocated as more effective than sole individual-level interventions. In multilevel prevention, school environment, interpersonal relationships and individual vulnerability interact across-levels. The conceptual role of school can function as a risk-amplifying environment or critical buffer, depending on school climate and connectedness(Morcillo et al., 2025). Interpersonal relationships can be factorized into domains such as social isolation and connectiveness, family relationship and wellbeing, peer victimisation and bullying(Morcillo et al., 2025; Prades-Caballero et al., 2025). Individual risk factors may include mental illness, previous suicidality, emotion dysregulation and impulsivity, sleep disturbance, substance use, neurobiological and genetic vulnerability, and identity-based stress [e.g., race or sex minority status] (Prades-Caballero et al., 2025; Richardson et al., 2024). Adolescence suicidality is multifactorial and dynamic; school attendance is known to be affected by multilevel factors and considered to be an early marker for subsequent suicidality. However, less is known about longer-term associations between individual and school factors and suicidality.

Approximately 90% of youth with school refusal experience mental health condition and 50% meet diagnostic criteria for anxiety and depression (Ingul et al., 2019; Sibeoni et al., 2018). Early recognition of mental health problems is important, as intervention may improve quality of life for young people(Burns & Birrell, 2014). In Aotearoa New Zealand, indigenous Māori youth have high rates of hospitalization for intentional self-harm(Henare & Ehrhardt, 2004). Māori females are twice as likely to attempt suicide compared to Māori males and Māori students are absent from school more often that non-Māori(Educationcounts, 2024; McGregor & Webber, 2020; Webber, 2020).

Evidence from cross-sectional studies demonstrate school absenteeism is associated with adverse mental health outcomes (Epstein et al., 2020; John et al., 2021). Cross-sectional studies examine associations between school absenteeism and suicidality at a single time point. Longitudinal studies, on the other hand examine school absenteeism at multiple time points and provide information on temporal changes. A longitudinal design can improve the reproducibility and validity of data, and it is a recommended method to evaluate potential causal associations (Fergusson et al., 2003; Fergusson et al., 2015; Twisk, 2003). In the current literature, there are few longitudinal studies due to the expense, extended timeframes, and inherent challenges such as participant retention.

However, there has been an increased use of linked mental health and longitudinal school data to investigate the impact of school attendance on self-harm in young people (Epstein, 2021; John et al., 2021), using unique identifiers across different datasets (Clark et al., 2017). Combining statistical models with clinician knowledge can reduce Emergency Department admissions for suicidal behaviors (Simon et al., 2021; Tran et al., 2014). Using a longitudinal study to establish a risk stratification model provides systematic risk profiling to inform targeted population-based prevention, intervention, and contingency planning to reduce suicide risk (Mendez-Bustos et al., 2024; Reger et al., 2019; Simon et al., 2021).

In New Zealand, the Integrated Data Infrastructure (IDI) is a national research facility that holds de-identified microdata about people and households. Data comprises life events, health, education, income, social benefits, migration, and justice. These data are linked (based on unique ID) or integrated (based on probabilistic linkage) to form the IDI. The aims of the study were to: 1) Use IDI data to examine longitudinal associations between school absenteeism and suicidality; 2) Identify risk and protective factors for students presenting with suicidality; and 3) Generate a risk stratification profile for suicide prevention at an individual and school level.

Methods

Study population and study design

The population comprised New Zealand young people enrolled in school years 6–13 (age range 13–18). New Zealand schools are mainly state, private, or composite with Māori-language immersion (EduationCounts, 2024). The study cohort were 544,455 of 562,455 young people enrolled in schools (year level 6 and above) in 2018 with the global identifier of IDI. A nested matched case-control design with repeated measures of exposures were applied to control for confounding and attrition bias. In the 2018 cohort, between 2019 and 2021, there were 3042 cases with suicidal ideation, suicidal behaviors, or intentional self-harm presenting to Emergency Departments or mental health community services. The control group (without suicidality) was randomly selected from the same cohort, using a frequency matching approach based on the matched variables (school year, sex, ethnicity level 1-IDI registry) at a ratio of 1:4.

The exposure variable, school absenteeism, was derived from school attendance data and was a repeated measure for the cohort between 2015 and 2018. Under the multilevel suicide prevention strategy framework(Cramer & Kapusta, 2017; Prades-Caballero et al., 2025), school level and individual variables were included in the analysis.

Procedure and data integration

The study used school attendance data to define school absenteeism and utilized integrated Ministry of Health (MoH) and Ministry of Education (MoE) data.

Datasets used in integration included:

A. School attendance information (Education data- 2015-2018). Absenteeism was calculated based on available Term 2 data across the years. Chronic absence rates were defined as missing >30% of school days (measured in half-days). Moderate absence meant students missing 20%–30% of school days. A global definition was also calculated for comparison (Supplementary File 1).

B. Student enrolment information and demographics.

C. School information: affiliation (school type), decile, education philosophy, religious affiliation, school definition code, school region, school type, urban-rural, and education type. The decile system used descriptive information about the neighbourhoods (Census MeshBlocks) that children live in and considers five indicators to determine socio-economic status including: households with income in the lowest 20% nationally, employed parents in the lowest skill level occupational groups, household crowding, parents with no educational qualifications, and parents receiving income support benefit (Amos, 2021).

D. Student health outcomes: suicidality and self-harm (intentional self-harm: ISH) (Health data-2015-2021). admissions to public hospital Emergency Departments and mental health services for young people with a diagnosis of suicidality (including ideation, suicide attempts, and intentional self-harm) were extracted. These were based on clinical description and confirmed with discharge diagnosis information from clinical coding based on Systematized Nomenclature of Medicine (SNOMED) concepts. These map to specified ICD classifications and diagnosis description (ICD10 codes R45.81(WHO, 2019), X60–84, Y87.0, and ICD 9 E950-E958) (Sara & Wu, 2023). Codes were verified by two team members of the research team.

Data preparation included 1) extracting all IDI datasets of public hospital discharges and health diagnoses, psychiatric diagnosis, student education, enrolment, and school presentations; 2) performing intra-system linkage of datasets within the education or health system; 3) performing cross-system integration using the global ID via IDI's probabilistic linkage algorithm.

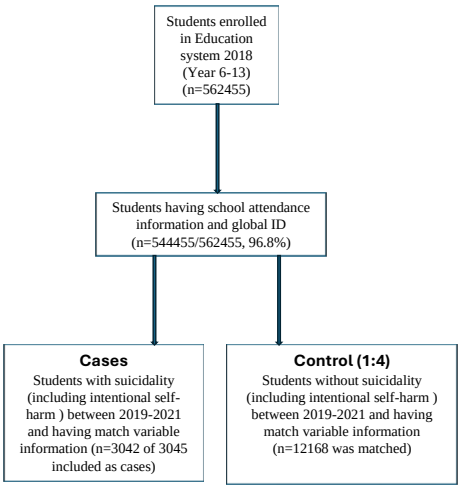

Fig. 1. Study flow chart for a matched case-control study.

Selection bias was controlled by cross-referencing case identification from two researchers and using matched controls. Information bias was controlled by data quality checking and editing. Confounding bias was mitigated using matched controls and multivariable models. Data quality and integration rate evaluations were assessed based on each individual's existing system ID. This included using multiple datasets for the same sets of variables to minimize the missing IDI system IDs. Missing IDs were controlled at 1.5% (Fig. 1).

Statistical analysis

Multilevel mixed-effect conditional logistic regressions (Fitzmaurice et al., 2012) were used to analyze suicidality (including intentional self-harm) and associations with exposure variables (absenteeism), student factors, and school factors using the SAS GLIMMIX (SAS Institute Inc, 2025) procedure. Nested case-control analysis is considered to save computing time and cost compared to Cox regression analysis of a large full cohort (Essebag et al., 2005). The mixed-effect model included repeated exposure (school absenteeism) over time (2015–2018) and accounted for intra-student correlations, strata for matching, and the other student and school factors. The random effect included strata and year (repeated exposure). Two-way interactions between absenteeism and year, absenteeism and other covariates were tested.

A priori subgroup analyses were conducted for known at-risk groups, specifically Māori, females and students with previous suicidality. Due to the large number of schools and small number of students at some schools (a weak intra-school correlation of 0.008), school was not included as a random effect in the repeated measure multilevel modelling. School factors were fitted as fixed factors.

For results comparison, the multilevel model including single exposure and outcomes association was assessed using a multilevel model (GLIMMIX) for each year (2015–2018), with strata and school as random effects (Supplementary).

Post-hoc subgroup analysis based on interaction tests were conducted for students with previous suicidality. Sensitivity analyses were conducted, excluding students with sick leave >25% and for different definitions of school absenteeism. Software SAS 9.4 was used in the analysis.

The research was registered in the Stats NZ microdata and IDI system with project number XXXXXX. The study has XX ETHICs approval with application number XXXXXXX. STROBE guidelines for observational study and CONSIDER guidelines for reporting of health research involving indigenous peoples were used for the study.

Results

There were 3045 cases and 12,168 matched controls from 1017 schools. Among these cases, because each case could have multiple hospital admissions, in total there were 4851 public hospital admissions with suicidality as a reason during 2019–2021 (Fig. 1). Of these, 273 students were admitted due to suicidal ideation, 2805 due to suicide attempts, and 78 due to intentional self-harm. The following results are based on 3042 cases with school attendance data.

Cases and matched controls had similar distributions for sex, school years, and ethnicity (Table 1). Most cases were New Zealand citizens (94.5%), 16.2% had post-school activities (education, training or employment), and 9.2% had hospital admissions related to suicidality in the previous three years. Matched controls had significant differences in characteristics of student type, post-school activities, New Zealand citizenship, and previous hospital admission related to suicidality and intentional self-harm.

Most cases were from secondary schools (80%), 77.1% urban and 19.8% suburban. In New Zealand, the school deprivation decile is an equality socioeconomic index. Decile 1 schools have the highest proportion of students from low socio-economic communities. Decile 10 schools have the highest proportion of students from high socio-economic communities. School decile was evenly distributed across levels 4–9 (10.1%–13.1%), with a smaller percentage in the two extreme deciles (1–2, and 10). Matched controls had significant differences in their school characteristics, such as region (urban area 74.1% and suburban 22.6%) and decile, with a smaller proportion in levels 2–6 (41.0%) and a similar proportion in 7–10 (47.4%). Māori language taught in schools, in terms of level and types of providers was also different in matched controls (Table 1 and 2).

The percentage of students presenting to school for at least a half-day was summarized using school attendance data. Median school presentation in 2015–2018 was 92.5%, 91.8%, 89.4%, and 87.8% in cases, and 94.3%, 93.9%, 93.5%, 91.8%, and 92.5% in controls, respectively. There were consistent differences in the proportion of school attendance and absenteeism due to sickness between cases and controls. Matched controls were 1.8–4.1% higher in the median school presentation proportion (Fig. 2). Cases had a chronic absence rate of 13.7% in 2015, which gradually increased to 35.9% in 2018. Similar trends were observed in the control group, albeit at a lower rate of 7.4% in 2015 to 22.8% in 2019. (See Fig. 2.)

Exposure analysis showed an odds ratio (OR) of 2.59 (95% Confidence Interval (CI): 2.39–2.81) with respect to suicidality between chronic absence versus normal school presence, with an adjusted OR of 2.21 (95% CI: 2.02–2.41). Moderate absence versus normal school presence had an OR of 1.79 (95% CI:1.75–1.84) and an adjusted OR of 1.68 (95% CI: 1.64–1.73) with respect to suicidality. Results for school absenteeism using the global definition were similar. The OR in suicidality for students with absenteeism, compared to normal presence was 2.05 (95% CI: 1.95–2.16), and the adjusted odds ratio (aOR) was 1.87 (95% CI: 1.77–1.97). Other definitions of school absenteeism using whole days were analysed and compared to those using half days (Supplementary). The ORs and adjusted ORs were in similar ranges. Due to a significant interaction between year and exposure, exposure analyses were conducted separately for each year. An increasing trend was observed in associations between absenteeism and suicidality (Supplementary). Analyses including other student factors revealed large heterogeneities in suicidality, attributed to students with post-school activities (F value:1711.2), previous suicidality (F value: 810.1), and school absenteeism (F value: 207.2). Post-school activities-after-school activities were beyond standard education in school, included 6.5% further education-related activities, and 4.4% employment-related activities in cases vs 0.8% and 0.1% in controls (Table 1). Students with previous suicidality had worse outcomes in suicidality with an aOR of 5.88 (95% CI: 5.21–6.67). (See Table 3.)

Table 1
Students' demographics, enrolment information and previous suicidality.

	Cases		Controls		Cochran-Mantel-Haenszel General association test
	$N = 3042$		$N = 12,168$		
	student counts	%	student counts	%	
Student characteristics					
Sex					
Female	2307	75.8%	9231	75.8%	N/A**
Male	735	24.2%	2940	24.2%	
Ethnicity					
New Zealand European and other European	1791	58.9%	7158	58.8%	N/A**
New Zealand Māori	903	29.7%	3612	29.7%	
Pacific Island People	174	5.7%	699	5.7%	
Asian/Middle Eastern/Latin American/African	156	5.1%	621	5.1%	
Other Ethnicity	12	0.4%	48	0.4%	
Not stated/do not know	6	0.2%	30	0.2%	
Current year level					
10	483	15.9%	1941	15.9%	N/A**
11	534	17.6%	2130	17.5%	
12	561	18.4%	2235	18.4%	
13	636	20.9%	2544	20.9%	
6	30	1.0%	120	1.0%	
7	111	3.6%	444	3.6%	
8	222	7.3%	888	7.3%	
9	468	15.4%	1866	15.3%	
Student type&					
Regular	2967	97.7%	11,949	98.2%	0.030
Not regular	69	2.3%	213	1.8%	
Citizenship					
Other citizenship	168	5.5%	921	7.6%	<0.0001
NZ	2877	94.5%	11,253	92.4%	
School Zoning status					
In zone	1050	34.5%	4650	38.2%	<0.0001
Not applicable	1659	54.5%	5910	48.5%	
Out of zone	333	10.9%	1614	13.3%	
Post school activities					
Have post-school activities	492	16.2%	123	1.0%	<0.0001
No postschool activities	2550	83.8%	12,048	99.0%	
Post school activities in more detail					
Further Education or Training	198	6.5%	102	0.8%	NA
Employment and further education/training/others	135	4.4%	12	0.1%	
Unknown	162	5.3%	6	0.0%	
NULL	2550	83.7%	12,051	99.0%	
Previous suicidality within 3 years					
No	2763	90.8%	11,874	97.5%	<0.0001
Yes	279	9.2%	300	2.5%	

& Irregular Students are those not funded by government, including External Student, Satellite Class Student and separately funded students.
** Results are not applicable for matching variables.

There was large heterogeneity in suicidality from school factors: school Māori language level of provision (F value: 23.7), school area (urban/secondary or minor urban/rural) (F value: 16.8), and decile (F value: 12.3). Students from schools providing Māori language learning at level C (learning Te Reo Māori as a subject for at least 3 h at level 4b) or above, i.e. level D/E/F/G/H (representing 12–100% of immersed learning content in Te Reo Māori) had reduced risk of suicidality compared to schools not offering Māori language learning (aOR:0.68 with 95% CI: 0.60–0.77; 0.60 with 95% CI: 0.49–0.73), regardless of other risk factors. Students in intermediate schools had reduced suicidality risk compared to secondary schools (aOR:0.29 (95% CI:0.62–0.87). Suburban schools had lower suicidality risk than main urban schools (aOR 0.79, 0.90 respectively). Students enrolled in schools of deciles between 2 and 6 had a higher risk of suicidality than students enrolled in schools of decile 10, with an aOR between 1.17 and 1.41. There were no significant differences between decile 7–9 and decile 10 (Fig. 3). Other significant factors were student type, zoning, New Zealand citizenship, and type of school provider (Table 3).

Previous suicidality, ethnicity, school type, and decile were significant moderators of the association between school absenteeism and subsequent suicidality ($p < 0.05$). Subgroup analyses demonstrated these moderating effects, reflected by the various adjusted OR in suicidality in these subgroups.

Among Māori (Table 4), school absenteeism remained a significant contributor to subsequent suicidality, with a slightly smaller aOR between chronic absenteeism and normal presence of 1.70 (95% CI: 1.48–1.95), and between moderate and normal presence of 1.33 (95% CI: 1.27–1.39). Other significant contributors in the heterogeneities of suicidality were the same as the results from all students, except for school decile. Notably, decile rating was not a significant risk factor for Māori students' suicidality. School provision of Māori language level A (Māori songs, greetings, and simple words) were associated with significant risk reduction in suicidality. This result was not significant for non-Māori students and when all students were included; non-Māori students had higher aORs in chronic and moderate absenteeism compared to Māori students (2.67 and 1.92).

Female students had slightly lower aOR than male students in chronic and moderate absenteeism, 2.38 and 1.63, respectively. Students with previous suicidality also had slightly lower adjusted OR for chronic and moderate absenteeism (aORs: 2.31, 1.91) than students without previous suicidality (Supplementary).

Discussion

In this study, the New Zealand's IDI was applied to examine longitudinal associations between school absenteeism and hospital admission

Table 2
School characteristics of students.

	Cases		Controls		Cochran-Mantel-Haenszel General association test
School Type (provider type)					
(restrict)/composite_1–15	168	5.5%	645	5.3%	<0.0001
Full Primary (Year 1–8)	114	3.7%	462	3.8%	
Contributing (Year 1–6)	45	1.5%	141	1.2%	
Intermediate (Year 7 & 8)	120	3.9%	543	4.5%	
Secondary (Year 7–15, including intermediate)	459	15.1%	2109	17.3%	
Secondary (Year 9–15)	1977	64.9%	8205	67.4%	
Special/correspondent school /teen Parent Unit (homebased)	162	5.3%	69	0.6%	
Māori language learning					
Taha Māori: Māori songs, greetings and simple words (MLL level 6)	318	10.5%	1275	10.5%	<0.0001
learning Te Reo Māori as a subject for at least 3 h (MLL level 5)	216	7.1%	771	6.3%	
learning Te Reo Māori as a subject for at least 3 h (MLL level 4b)	114	3.7%	657	5.4%	
"N","NULL"	2346	77.1%	9108	74.8%	
"D","E","F","G","H" (with learning content in Māori, 4a,3,2)	48	1.6%	360	3.0%	
School Deciles					
1	150	4.9%	648	5.3%	<0.0001
2	180	5.9%	759	6.2%	
3	267	8.8%	870	7.1%	
4	333	10.9%	1224	10.1%	
5	321	10.5%	1215	10.0%	
6	399	13.1%	1653	13.6%	
7	372	12.2%	1542	12.7%	
8	315	10.3%	1566	12.9%	
9	309	10.1%	1530	12.6%	
10	252	8.3%	1128	9.3%	
99	147	4.8%	39	0.3%	
Kura Kaupapa Māori School					
No	3036	99.7%	12,114	99.5%	0.061
Yes	9	0.3%	57	0.5%	
Education Philosophy					
Montessori/Rudolf Steiner	9	0.3%	33	0.3%	NA**
Mainstream	3036	99.7%	12,141	99.7%	
Religions					
NULL	2655	87.2%	10,473	86.0%	0.081
with religions	390	12.8%	1701	14.0%	
Region Area Type*					
Main Urban	2235	77.1%	8997	74.1%	<0.0001
Secondary Urban	234	8.1%	1047	8.6%	
Minor Urban	339	11.7%	1701	14.0%	
Rural	90	3.1%	393	3.2%	
N/A	144		N/A***	NA	

* Main urban - population of 30,000+; Secondary urban - population between 10,000 - 29,999; Minor urban - population between 1000 and 9999; Rural - population up to 999.
** Results are not applicable for education philosophy.
*** For keeping confidentiality, results were suppressed due to small number of school entities. Presented counts are rounded based on IDI RR3 rule (randomly rounded using base 3). These could result in some variables' total counts not the same as the actual total.

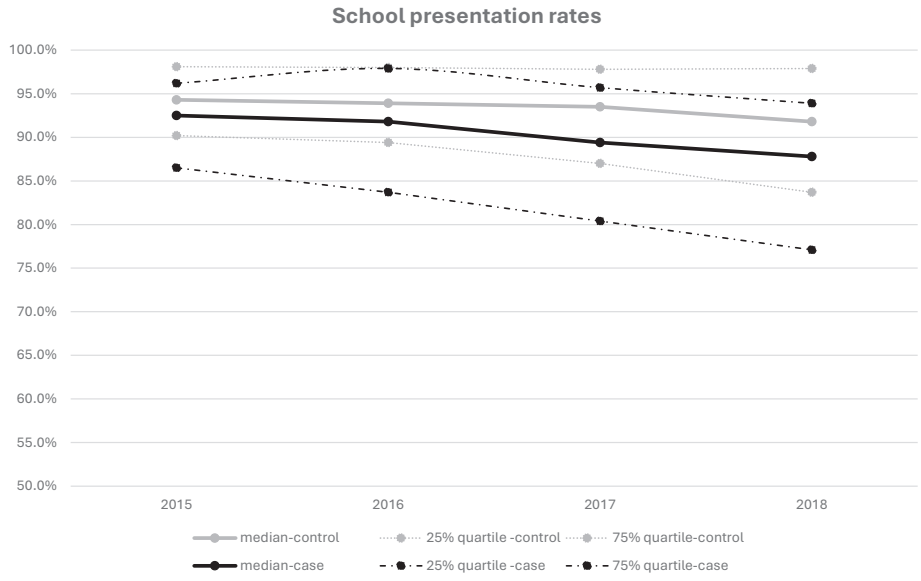

Fig. 2. The school presentation rates in cases and controls from 2015 to 2018.

Table 3
Suicidality and school absenteeism (exposure) with other student and school factors.[*, ***]

	Odds ratios	95% confidence interval (lower boundary)	95% confidence interval (upper boundary)	*P* value
	Student factors			
Absence based on NZ definition (using half-day measure)[*]				
Chronic	2.21	2.02	2.41	<0.0001
moderate	1.68	1.64	1.73	
Reference: Normal	1.00			
Ethnicity				
Māori	0.87	0.71	1.06	0.33
Pacific Island People	0.88	0.70	1.11	
Asian/Middle Eastern/Latin American/African	1.06	0.85	1.32	
Other Ethnicity	0.92	0.57	1.47	
Not stated/do not know	0.66	0.37	1.21	
Reference: European				
Gender				
Female vs Male	0.982	0.84	1.15	0.82
Post school activity				
Have postschool activities	13.36	11.82	15.11	<0.0001
Reference: Not having post-school activities				
Student Type				
Regular	1.01	0.80	1.28	0.94
Reference: NOT regular				
NZ CITIZEN				
No vs Yes	0.78	0.70	0.88	<0.0001
Zoning Status				
INZN (IN ZONE)	1.07	0.99	1.16	0.01
NAPP (NOT APPLICABLE)	1.13	1.04	1.23	
Reference: outside zone				
previous suicidality (within 3 years prior to 2018)	0.17	0.15	0.192	< 0.0001
No vs. Yes				
	School factors			
Māori Language Learning (provided by school)[**]				
A	1.06	0.96	1.18	<0.0001
B	1.28	1.15	1.42	
C	0.68	0.60	0.77	
D/E/F/G/H	0.60	0.49	0.73	
Reference: no Māori language learning				
School provider types[***]				
(restrict)/composite_1–15	0.87	0.761	0.994	<0.0001
Full Primary (Year 1–8)	0.91	0.764	1.088	
Contributing (Year 1–6)	1.18	0.925	1.507	
Intermediate (Year 7 & 8)	0.74	0.619	0.874	
Secondary (Year 7–15, including intermediate)	0.98	0.92	1.06	
special/correspondents /teen Parent	1.65	1.215	2.21	
Reference: Secondary (Year 9–15)				
School Area Type				
Secondary Urban	0.90	0.82	s0.99	<0.0001
Minor Urban	0.79	0.73	0.85	
Rural	0.91	0.78	1.06	
Not known	3.45	2.22	5.37	
Reference: main urban				
Decile				
1	0.97	0.83	1.13	<0.0001
2	1.23	1.07	1.42	
3	1.41	1.24	1.60	
4	1.29	1.15	1.44	
5	1.31	1.17	1.47	
6	1.17	1.05	1.30	
7	0.98	0.88	1.10	
8	1.01	0.90	1.13	
9	0.94	0.84	1.05	
99 (unknown)	2.48	1.68	3.68	
Reference: 10				

A: Taha Maori: Māori songs, greetings and simple words (MLL level 6);
B: learning Te Reo Māori as a subject for at least 3 h (MLL level 5);
C: learning Te Reo Māori as a subject for at least 3 h (MLL level 4b);
D/E/F/G/H: with learning content in Māori, 4a,3,2.

* Using the same half-days measure, regular attendance means attending more than 90% all school time, irregular absence means students attended school more than 80% and up to 90% of the term, moderate absence means students attended more than 70% and up to 80% and chronic absence means students attended 70% or less of the available school days.

** Māori language Learning level:

*** School provider types: composite school are those schools including both intermediate and high school (Year 7–15). Secondary (Year 7–15) included intermediate year 7–9. Special/correspondents/teen Parent are those students who were in home-based schooling.

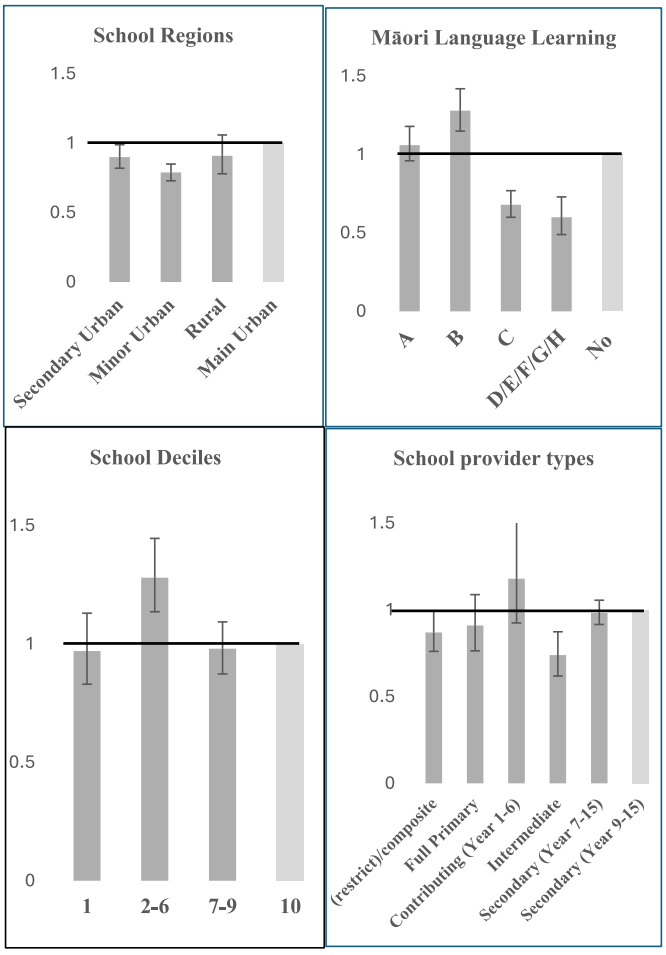

Fig. 3. Risk stratification visualization
Legend: Y axis represents the relative risk compared with the reference category (the last column) based on adjusted odds ratios (OR) and its confidence interval (error bar). The school provider types are (restrict)/composite_1–15, Full Primary (Year 1–8), Contributing (Year 1–6), Intermediate (Year 7 & 8), Secondary (Year 7–15), and Secondary (Year 9–15).

due to suicidality among students in Years 6–13 (aged 13–18 years). Findings revealed a significant association between school absenteeism and hospital admission due to suicidality. We identified school and student risk and protective factors that may be considered for use in suicide prevention programs. School absenteeism is a known modifiable factor (Epstein et al., 2020). The current study demonstrates potential casual associations between school absenteeism and later risks for suicidality using a longitudinal method to examine nationwide integrated data. These findings were consistent with Fergusson, D.M. et al.'s cohort study (Fergusson et al., 2003) which found school truancy was associated with increased risk of suicide attempts (aOR 4.07, 95% CI: 2.45–6.74), and Epstein S. et al.'s (Epstein et al., 2020) meta-analysis demonstrated school absenteeism was associated with an increased risk of self-harm (pooled aOR 1.37, 95% CI:1.20–1.57). The student and school factors found in our study, further align with the multilevel suicidality prevention strategy (Morcillo et al., 2025; Prades-Caballero et al., 2025; Richardson et al., 2024). For example, at student level, apart from known risk factors being gender (female) and ethnicity (Māori), other significant factors included previous suicidality and post-school activities. At school level, significant factors included school's decile, urban location and Māori language teaching status.

Comparing our study to Krause et al. (2025) 's longitudinal study undertaken in Canada, there was a similar concurrent link evident between school absenteeism and mental health difficulties. The authors found at time point 1 (fall, 2022), students' school absenteeism predicted worse mental health at time point 2 (spring, 2023), where bidirectional effects between externalizing behaviors and absenteeism were evident. Rankine et al. (2025) also found a bidirectional relationship between school engagement and mental health. They concluded that both variables affected each other's future level and observed

Table 4
Subgroup analysis for Māori students – suicidality and school absenteeism with other student and school factors.*

	Odds ratios	95% confidence interval (lower boundary)	95% confidence interval (upper boundary)	P value
	Student factors			
Absence based on NZ definition (using half-day measure)*				
Chronic	1.70	1.48	1.95	<0.0001
moderate	1.33	1.27	1.39	
Reference: Normal				
Sex				
Female vs Male	1.02	0.74	1.40	0.91
Post school activity				
Have postschool activities	16.93	13.17	21.78	<0.0001
Reference: Not having post-school activities				
Zoning Status				
INZN (IN ZONE)	1.19	1.02	1.40	0.015
NAPP (NOT APPLICABLE)	1.26	1.08	1.46	
Reference: outside zone				
previous suicidality (within 3 years before 2018)	0.15	0.12	0.19	< 0.0001
No vs. Yes				
Māori Language Learning (provided by school) **				
A	0.71	0.58	0.86	< 0.0001
B&	na	na	na	
C	0.57	0.49	0.67	
D/E/F/G/H	0.59	0.48	0.74	
Reference: no Māori language learning				
	School factors			
School provider types				
(restrict)/composite_1–15	0.92	0.71	1.20	0.002
Full Primary (Year 1–8)	1.07	0.77	1.49	
Contributing (Year 1–6)	1.65	1.07	2.54	
Intermediate (Year 7 & 8)	1.32	0.97	1.80	
Secondary (Year 7–15)	1.21	1.05	1.38	
special/correspondents /teen Parent	2.07	1.26	3.40	
Reference is Secondary (Year 9–15)				
School Region/Area Type				
Secondary Urban	0.79	0.67	0.93	<0.0001
Minor Urban	0.65	0.56	0.75	
Rural	0.85	0.66	1.10	
Not known&	na	na	na	
Reference: main urban				
Decile				
1–2	1.06	0.88	1.29	0.14
3–4	1.11	0.93	1.34	
5–6	1.17	0.97	1.40	
7–8	0.98	0.81	1.19	
Reference: 9–10				

A: Taha Māori: Māori songs, greetings and simple words (MLL level 6);
B: learning Te Reo Māori as a subject for at least 3 h (MLL level 5);
C: learning Te Reo Māori as a subject for at least 3 h (MLL level 4b);
D/E/F/G/H: with learning content in Māori, 4a,3,2.
&na were those with results suppressed according to confidentiality protection rules due to <2 Ministry of Health (MoH) entities (Mental health providers) or Ministry of Education (MoE) entities (schools).
* Using the same half-days measure, regular attendance means attending more than 90% all school time, irregular absence means students attended school more than 80% and up to 90% of the term, moderate absence means students attended more than 70% and up to 80% and chronic absence means students attended 70% or less of the available school days.
** Māori language Learning level:

stronger impact in the later high school years. In Asia, Liu and Hung (2025) used the Taiwan Database of Children and Youth in Poverty data and reported mixed results, where the research group did not find a significant association between school absenteeism and later depression symptom (measured by Brief Symptom Rating Scale-BSRA), but a significant association between BSRA and later absenteeism.

Our study identified at-risk student groups based on school and student factors, which can be used in risk stratification for population-based prevention accordingly. Student risk factors identified from the current study include after-school activities (employment or further education/training), school absenteeism, and previous suicidality admission. Our results suggest that providing school-level Māori language learning for all students is associated with reduced suicidality. We also identified school-level risk factors, including socioeconomic status (decile) – an established risk factor for poor developmental outcomes (Biswas et al., 2020), and school region. Regional differences were found in schools located in the main urban (with a population > 30,000) compared to secondary and mini-urban with a sparse population (⟨10,000). The risk profile analysis of schools indicates that urban areas with a low socioeconomic index (decile <7) that do not provide Māori language learning in the curriculum have a higher risk of suicidality. In contrast, schools located in suburbs with high socioeconomic status and rich culture with provision of Māori language learning in the curriculum had a lowered risk of suicidality.

The risk profile analysis suggests female students have a higher risk of suicidality compared to males. Students with previous hospital admissions related to suicidality were also at higher risk. Māori were over-represented in cases (29.7% vs. 24.1%) in the schooling student rolls 2018 NZ Education Counts. Students with employment, or similar after-school education presented a higher risk. One plausible reason is that these students are less engaged at school and have higher stress levels or obligations to help families financially. Subgroup analyses of students with high-risk profiles (female, Māori, with previous suicidality) revealed that absenteeism remained a significant factor associated with students' later suicidality but the effect size (measuring the magnitude of impact) contributing from this exposure was relatively lower than the other students without these risk profiles (male, non-Māori, without previous suicidality).

Our findings suggest that providing Māori language teaching (an indicator of the school environment, incorporating Māori culture and values in the curriculum) can be considered a school-level protective factor for all students. Connection with language is an integral aspect of cultural identity. The interactions between language, culture and reduced school absenteeism require further consideration. An inclusive school environment may reduce the risk of suicidal behaviors. Suicide rates among Māori are higher in young people aged <25 years (Beautrais & Fergusson, 2006). Rates of hospitalization from attempted suicides are higher among Māori males aged 15 to 24 compared to non-Māori. Increased risk is associated with cultural alienation, intergenerational trauma, behavioural transfer, and identity confusion (Lawson-Te Aho & Liu, 2010;Williams et al., 2018). Indigenous youth with strong cultural identity are more likely to experience good mental health.

Strength, limitations and future research implications

The integration of national education and health system data to identify students' hospital and mental health service admissions due to suicidality is a strength of this study. The retrospective nature of using a nested case-control design provided a robust design to evaluate the exposure-outcome relationship, when multilevel factors were presented. Multi-level factors identified in the study also provided evidence under the global trends of using Integrated Conceptual Model for suicide prevention (Cramer & Kapusta, 2017; Prades-Caballero et al., 2025) and multilevel prevention strategies. Data integration enabled access to information for minority groups that can be challenging to access using other methods. For example, study results showed that Asian students had similar suicidality cases to Pacific students, and a large proportion of Asian students were admitted to Emergency Departments without mental health service records.

A further benefit of the longitudinal design was the ability to examine trends over time. This approach revealed a slightly upward trend of school absenteeism pre-COVID, consistent with global education literature (Hancock et al., 2018; Heyne et al., 2019; Melvin et al., 2019). Although the reasons for this trend are well worth future research, it is not within the scope of the current study.

One limitation of the study was the administrative database lacked data on wider family determinants. Further, this analysis may omit outcome data not submitted to hospital/mental health facilities. Notably, intentional self-harm (a small number compared to suicide attempts) is not classified separately as suicidal or non-suicidal. Future research to investigate factors associated with different school absenteeism (King & Bernstein, 2001) would be of value.

Conclusion

School absenteeism can be considered an early marker to be included in a multilevel suicide prevention strategy. We recommend further research to integrate social surveys and social development databases, and within school and educational settings to identify population-level interventional programs. Further suicide prevention policy and strategy should consider the role of the indigenous language in strengthening students' cultural identity and self-esteem, enriching schools' inclusive cultural environment, and enabling a sense of belonging.

Data sharing declaration

The data supporting this study's findings are not directly available. However, following a formal application to IDI (Integrated Data Infrastructure | Stats NZ), the original datasets could be retrieved.

Other reports related to the submission

A progression report has been submitted to Oakley Mental Health Foundation in June 2024 which has included some findings, but all were included in the current manuscript.

CRediT authorship contribution statement

Irene Suilan Zeng: Writing – original draft, Visualization, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Mandie Foster:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Nick Garrett:** Writing – review & editing, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Kelly Jones:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Dorothy Cosmos:** Writing – review & editing, Funding acquisition, Conceptualization. **Tania Ka'ai:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Lillian Ng:** Writing – review & editing, Validation, Methodology, Funding acquisition, Conceptualization.

Compliance with ethical standards

The study complies with international ethical standards in observational studies and has AUTEC ethical approval (application number:23-101).

Declaration of competing interest

All authors have no conflicts of interest to declare.

Given the role as Editor-in-Chief of this journal, Mandie Jane Foster, had no involvement in the peer-review of this article and has no access

to information regarding its peer-review. Full responsibility for the editorial process for this article was delegated to another journal editor.

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The research was registered in the Stats NZ microdata and IDI system with project number MAA-2022-23. The study has AUT ETHICs approval with application number 2023-101. The study group includes two experienced NZ Māori researchers (NG, TK) who have guided study design and cultural perspective. The study has also conducted consultations with the Māori stakeholders, including data gathering, data confidentiality, linkage, and sharing throughout the study. STROBE guidelines for observational studies and CONSIDER guidelines for reporting of health research involving indigenous peoples were used for the study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pedn.2026.03.026.

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