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# Impact of childhood burns on academic performance: a matched population-based cohort study

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## ABSTRACT

**Objective** This study aimed to compare academic performance and high school completion of young people hospitalised for a burn compared with young people not hospitalised for an injury.

**Design** A retrospective population-based matched case-comparison cohort study.

**Participants** Young people aged ≤18 years hospitalised for a burn during 2005–2018 in New South Wales, Australia, with age, sex and residential postcode-matched peers not hospitalised for any injury during 1 July 2001 and 31 December 2018.

**Main outcome measures** Performance below the national minimum standard (NMS) on the National Assessment Plan for Literacy and Numeracy assessments and not completing high school.

**Results** Young females hospitalised for a burn had a 72% higher risk of poorer reading compared with their peers (adjusted relative risk (ARR) 1.72; 95% CI 1.33 to 2.23), while young males hospitalised with a burn showed no higher risk (ARR 1.14; 95% CI 0.91 to 1.43). Young males (ARR 1.05; 95% CI 0.81 to 1.35) and females (ARR 1.34; 95% CI 0.93 to 1.94) hospitalised with a burn had no higher risk of not reaching the NMS for numeracy compared with peers. Young people hospitalised with a burn had at least twice the risk of not completing year 10 (ARR 3.86; 95% CI 1.68 to 8.86), year 11 (ARR 2.45; 95% CI 1.89 to 3.18) and year 12 (ARR 2.09; 95% CI 1.63 to 2.67) compared with matched counterparts.

**Conclusions** Young females hospitalised with a burn displayed poorer academic performance for reading compared with matched peers, while males and females were more likely to leave school earlier. Identifying unmet learning support needs of young burn survivors should be investigated.

## INTRODUCTION

Burns are a major public health problem which are among the top five most common causes of non-fatal childhood injuries.<sup>1</sup> In Australia, burns resulted in 6000 (1%) of all injury hospitalisations in 2019–2020.<sup>2</sup> Consequences of burn injuries can extend beyond the acute healing phase<sup>3</sup> with lasting effects on health, including hypermetabolism and an increased risk of chronic disease leading to a reduced life span.<sup>4</sup> Additionally, burn injuries may result in worsened social and psychological outcomes such as anxiety, post-traumatic stress, depression and reduced quality of life.<sup>5</sup>

Educational attainment is a crucial and a modifiable determinant of health and social outcomes,<sup>6</sup>

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Burns in childhood are associated with worse academic performance compared with children hospitalised for other health conditions.

## WHAT THIS STUDY ADDS

⇒ Academic performance in reading is worse for young females hospitalised for a burn compared with matched peers.  
⇒ Young people hospitalised for a burn had a higher risk of not completing high school compared with peers.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Indicates a need to monitor academic progression in young people after a burn so where needed ongoing learning support requirements can be met.

which has previously been associated with adverse childhood experiences.<sup>7</sup> One previous Australian study found that childhood burn injuries were associated with worse academic performance compared with children hospitalised for other health conditions.<sup>8</sup> However, the previous study did not examine all school grades, nor did it consider whether there was a higher risk of young people who had been hospitalised for a burn not completing high school compared with their peers. As studies which investigate the longitudinal impact of burns on academic performance and school completion are scarce, this study aimed to compare academic performance and high school completion of young people hospitalised for a burn compared with matched peers not hospitalised for a burn or any other injury.

## METHOD

A retrospective population-level case-comparison matched cohort study of young people hospitalised following a burn aged ≤18 years in New South Wales (NSW), Australia, using linked birth, health, education and mortality data between 1 January 2005 and 31 December 2018.<sup>9</sup>

## Data sources

Emergency department (ED) and hospital admission data provided information on hospital service use. ED visits to public hospitals included data on arrival and departure times, and type of visit. Hospital admissions included admissions to public and private hospitals, demographics and diagnoses.

Mortality data were obtained from the NSW Registry of Births, Deaths and Marriages, and young people who died during the study period were excluded.

Academic performance and parental demographics were obtained from annual National Assessment Plan for Literacy and Numeracy (NAPLAN) assessments conducted in May during 2008 to 2018 for all schools.<sup>10</sup> NAPLAN assessments of numeracy and literacy were conducted on young people in primary school grades 3 (7–9 years of age) and 5 (9–11 years of age) and secondary school grades 7 (11–13 years of age) and 9 (13–15 years of age). Each assessment is scored out of 1000, represents the same achievement level over time<sup>11</sup> and is translated into proficiency bands that indicate performed above, at or below the national minimum standard (NMS). Inability to achieve the NMS indicates that a young person will have difficulty progressing in school without additional intervention.<sup>12</sup>

Information on a young person's attendance, absence, withdrawal (eg, objections to testing) or exemption due to disability was obtained (online supplemental table 1). Young people who were exempt due to severe disability or language difficulties were rated as scoring below NMS.<sup>13</sup>

A young person was identified as having a language background other than English (LBOTE) if either they or their parents or guardians spoke a language other than English at home.<sup>11</sup> Where there were multiple records of the parents' level of education, the highest level of education of either parent was identified. Information on high school completions at years 10 (15–16 years of age), 11 (16–17 years of age) and 12 (17–18 years of age) was obtained through the Record of School Achievement and the Higher School Certificate.

The Centre for Health Record Linkage (CHeReL) linked the health and education records using probabilistic record linkage and identified the population comparison group. Upper and lower probability cut-offs for a link were 0.75 and 0.25, respectively, and record groups with probabilities between the cut-offs were clerically reviewed.

### Case inclusion criteria

The burns cohort included young people with a year of birth  $\geq 1997$  who were aged  $\leq 18$  years at hospital admission with a principal diagnosis of a burn (International Classification of Diseases, 10th Revision, Australian Modification (ICD-10-AM): T20–T31) between 1 January 2005 and 31 December 2018. Cases were included if their hospitalised burn occurred before their NAPLAN assessment date (allocated to 15 May of each year) or school completion date (allocated to 19 December).

The ICD-10-AM external cause codes (ie, X00–X19) were used to describe the burn mechanism. The percentage of total body surface area (% TBSA) affected was derived using ICD-10-AM: T31 in up to 50 diagnosis classifications. Burns sustained to more than 10% TBSA were classified as a major burn.<sup>14</sup>

### Population comparison group criteria

The comparison cohort included young people who were not hospitalised for a burn or other injury between 1 July 2001 and 31 December 2018 (included a 3.5-year wash-out period). Members of the comparison group were randomly selected from NSW birth records and matched 1:1 on age, sex and residential postcode to their counterpart.

### Socioeconomic status and geographical location

Socioeconomic status was estimated using the Index of Relative Socioeconomic Disadvantage<sup>15</sup> and postcode of residence.

Socioeconomic status was categorised from most (ie, 1) to least disadvantaged (ie, 5). The Australian Statistical Geographical Standard classified residences as either urban (ie, major cities) or rural (ie, inner and outer regional, remote and very remote) based on distance to service centres.<sup>16</sup>

### Chronic health conditions

Chronic health conditions common for young people were identified.<sup>17–19</sup> A chronic health condition would reasonably be expected to last 12 months or result in the need for ongoing healthcare<sup>17</sup> and was identified using diagnosis classifications in the hospital admission records (online supplemental table 2) using a 3-year lookback period.

### Data organisation and analysis

Data analysis was conducted using SAS V.9.4 (SAS Institute).  $\chi^2$  tests of independence and Wilcoxon-Mann-Whitney tests were used to examine the characteristics of young people hospitalised after a burn and their matched peers. The number of ED visits, hospital admissions and hospital length of stay (LOS) in days during and after the index burn admission were identified for both the young person hospitalised after a burn and their counterpart. The calculation of hospital LOS was cumulative and included transfers between hospitals.

Generalised linear mixed modelling (GLMM) was conducted of NAPLAN performance below the NMS (ie, binary variable – Y/N below NMS) for each assessment for young people and their matched peer who completed multiple school grades. For each assessment, PROC GLIMMIX<sup>20</sup> was used with a binary distribution, log link function, and Kenward and Roger approximation to df in the denominator.<sup>21</sup> To account for within-student correlation in the longitudinal data and repeated measurements, an autoregressive AR(1) covariance structure on the residuals was used. This allows for within-student correlation between assessments that decreases as the time between assessments increases. Adjusted relative risks (ARRs) and 95% CIs were generated. Variables were included in the model that had previously been associated with school performance<sup>5 8 22–25</sup> and forward selection was used to sequentially add covariates to the models, with significance assessed using p values ( $p < 0.05$ ). The final model included burn status, NAPLAN grade (ie, 3, 5, 7 or 9), sex, comorbidity status (Y/N), LBOTE, socioeconomic status of residential area, highest level of education for any parent/guardian (ie, bachelor or higher degree or other), log of hospital LOS and school sector (ie, government, Catholic, independent).

Factors associated with high school completion at either year 10, 11 or 12 for young people hospitalised after a burn compared with their matched peers were examined using generalised linear regression with binomial distribution and a log link function. ARR and 95% CIs were calculated. The selection of variables for inclusion in the models was informed by previous studies,<sup>5 8 22–25</sup> and forward selection was used to sequentially add covariates, with significance assessed at  $p < 0.05$ . The final models included burn status, sex, comorbidity status (Y/N), LBOTE, socioeconomic status of residential area, highest level of education for any parent/guardian and geographical location of residence.

### RESULTS

During 2005–2018, there were 2148 young people hospitalised after a burn for whom a matched comparison was identified and who completed the NAPLAN assessments in grade 3; 1661 in grade 5; 1077 in grade 7; and 476 in grade 9. There were 663 young people hospitalised after a burn with a matched peer

**Table 1** Demographic and hospital use characteristics of young people hospitalised after a burn and their matched comparison by grade

Characteristics	Grade 3*			Grade 5†			Grade 7‡			Grade 9§		
	Burn case (n=2148)		Comparison (n=2148)	Burn case (n=1661)		Comparison (n=1661)	Burn case (n=1077)		Comparison (n=1077)	Burn case (n=476)		Comparison (n=476)
	n	%	n	%	n	%	n	%	n	%	n	%
Sex												
Male	1197	55.7	1197	55.7	940	56.6	940	56.6	606	56.3	262	55.0
Female	951	44.3	951	44.3	721	43.4	721	43.4	471	43.7	214	45.0
Location of residence												
Urban	1546	72.0	1546	72.0	1176	70.8	1176	71.3	768	71.3	335	70.4
Rural	602	28.0	602	28.0	485	29.2	485	28.7	309	28.7	141	29.6
Not known	-	-	-	-	-	-	-	-	-	-	-	-
Socioeconomic status												
Most disadvantaged	625	29.1	625	29.1	480	28.9	480	27.9	300	27.9	136	28.6
2	561	26.1	561	26.1	426	25.7	426	24.2	261	24.2	105	22.1
3	444	20.7	444	20.7	344	20.7	344	21.6	233	21.6	98	20.6
4	197	9.2	197	9.2	148	8.9	148	9.1	98	9.1	58	12.2
Least disadvantaged	320	14.9	320	14.9	262	15.8	262	17.2	185	17.2	79	16.6
Not known	-	-	-	-	-	-	-	-	-	-	-	-
<b>LBOTE</b>												
Non-LBOTE	1502	69.9	1532	71.3	1171	70.5	1215	73.2	777	72.3	348	73.3
LBOTE	637	29.7	606	28.2	485	29.2	441	26.6	298	27.7	127	26.7
Not known	9	0.4	10	0.5	5	0.3	5	0.3	-	-	-	-
Chronic health condition												
0	2136	99.4	2121	98.7	1651	99.4	1633	98.3	1070	99.4	471	99.0
≥1	12	0.6	27	1.3	10	0.6	28	1.7	7	0.7	5	1.1
Parent highest level of education												
Year 11 or year 12 high school or equivalent	349	16.3	246	11.5	343	20.7	244	14.7	209	19.4	147	18.7
Certificate I-IV, trade, diploma or advanced diploma	1037	48.3	1038	48.3	801	48.2	820	49.3	544	50.5	242	50.8
Bachelor degree or higher	604	28.1	750	34.9	476	28.7	571	34.4	310	28.8	138	29.0
Not stated/not known	158	7.4	114	5.3	41	2.5	26	1.6	14	1.3	7	1.5
<b>Healthcare use</b>												
ED visits	5	0.2	3	0.1	6	0.4	3	0.2	6	0.6	2	0.4
Hospital admissions	3	0.1	1	0.0	3	0.2	1	0.0	2	0.2	0	0.0
Hospital length of stay (days)	4	0.2	1	0.0	4	0.3	1	0.0	4	0.4	0	0.0

\*Grade 3  $\chi^2$  tests: LBOTE p=0.6; health conditions p<0.05; parent highest level of education p<0.0001; and Wilcoxon-Mann-Whitney tests: ED visits p<0.0001; hospital admissions p<0.0001; and hospital length of stay p<0.0001.  
 †Grade 5  $\chi^2$  tests: LBOTE p=0.2; health conditions p<0.01; parent highest level of education p<0.0001; and Wilcoxon-Mann-Whitney tests: ED visits p<0.0001; hospital admissions p<0.0001; and hospital length of stay p<0.0001.  
 ‡Grade 7  $\chi^2$  tests: LBOTE p=0.1; health conditions p>0.05; parent highest level of education p<0.01; and Wilcoxon-Mann-Whitney tests: ED visits p<0.0001; hospital admissions p<0.0001; and hospital length of stay p<0.0001.  
 §Grade 9  $\chi^2$  tests: LBOTE p=0.3; health conditions p=0.3; parent highest level of education p=0.3; and Wilcoxon-Mann-Whitney tests: ED visits p<0.0001; hospital admissions p<0.0001; and hospital length of stay p<0.0001.  
 ED, emergency department; LBOTE, Language background other than English.

**Table 2** School and NAPLAN assessment characteristics of young people hospitalised after a burn and their matched comparison by grade

Characteristics	Grade 3*		Grade 5†		Grade 7‡		Grade 9§									
	Burn case (n=2148)	Comparison (n=2148)	Burn case (n=1661)	Comparison (n=1661)	Burn case (n=1077)	Comparison (n=1077)	Burn case (n=476)	Comparison (n=476)								
	n	%	n	%	n	%	n	%								
School sector																
Government	1541	71.7	1469	68.4	1210	72.9	1131	68.1	689	64.0	631	58.6	303	63.7	286	60.1
Catholic	386	18.0	455	21.2	280	16.9	346	20.8	235	21.8	280	26.0	107	22.5	120	25.2
Independent	221	10.3	223	10.4	171	10.3	184	11.1	153	14.2	166	15.4	66	13.9	70	14.7
Home	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Remoteness area of school																
Major city	1489	69.3	1478	68.8	1133	68.2	1111	66.9	755	70.1	753	69.9	333	70.0	333	70.0
Inner regional	460	21.4	477	22.2	354	21.3	400	24.1	246	22.8	261	24.2	112	23.5	114	24.0
Outer regional/remote	199	9.3	192	8.9	174	10.5	150	9.0	76	7.1	63	5.9	31	6.5	29	6.1
Not known	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
NAPLAN assessment																
Numeracy (below NMS)	163	7.6	100	4.7	146	8.8	89	5.4	79	7.3	34	3.2	27	5.7	8	1.7
Reading (below NMS)	187	8.7	113	5.3	176	10.6	116	7.0	91	8.5	68	6.3	58	12.2	32	6.7

\*Grade 3  $\chi^2$  tests: School sector  $p < 0.05$ ; remoteness area of school  $p = 0.8$ ; all NAPLAN assessments  $p < 0.0001$ .

†Grade 5  $\chi^2$  tests: School sector  $p < 0.01$ ; remoteness area of school  $p = 0.1$ ; all NAPLAN assessments  $p < 0.001$ .

‡Grade 7  $\chi^2$  tests: School sector  $p < 0.05$ ; remoteness area of school  $p = 0.4$ ; NAPLAN numeracy  $p < 0.0001$ ; NAPLAN reading  $p = 0.1$ .

§Grade 9  $\chi^2$  tests: School sector  $p = 0.5$ ; remoteness area of school  $p = 1.0$ ; all NAPLAN assessments  $p < 0.01$ .

NAPLAN, National Assessment Plan for Literacy and Numeracy; NMS, national minimum standard.

comparison who could have completed year 10; 629 in year 11; and 520 in year 12 of high school.

### Characteristics of young people

The young people hospitalised for a burn were of the same gender, age and lived in the same residential area to their matched peer. Across school grades 3 to 9, there was a higher proportion of males (55.0–56.6%) compared with females (43.4–45.0%), and a higher proportion of young people living in urban areas (70.4–72.0%) compared with rural areas (28.0–29.6%) hospitalised after a burn. Over two-thirds of young people ( $\geq 69.9\%$ ) were from an English-speaking background and almost all ( $\geq 98.1\%$ ) had no other chronic health conditions identified. Young people hospitalised after a burn had higher median ED visits, hospital admissions and hospital LOS than their matched peers in each grade (table 1).

Most young people attended government schools ( $\geq 58.6\%$ ) in major cities ( $\geq 66.9\%$ ): there was no significant difference in the geographical location of schools between those hospitalised for a burn and their matched peers across all grades. The proportion of young people hospitalised for burns that did not achieve the NMS for their numeracy and reading school assessments were higher across grades 3–9 compared with their matched peers, except for grade 7 for reading (table 2).

For young people across grades 3–9 who were hospitalised after a burn, the most common burn mechanisms were contact with hot drinks, food, fats and cooking oils (27.9%–31.9%), and contact with other hot fluids (17.9%–19.3%). Across all grades, almost all the burn cohort ( $\sim 95\%$ ) had  $< 10\%$  of their total body surface area affected by burns: the most common locations involved burns to the trunk (21.0%–22.6%) and wrist or hand (18.9%–24.0%) (table 3).

### Academic performance

There was no increased risk of not achieving the NMS for numeracy assessments among hospitalised young males (ARR 1.05; 95% CI 0.81 to 1.35) or females (ARR 1.34; 95% CI 0.93

to 1.94) when compared with matched peers. Where there was an increased risk of not achieving the NMS for reading among young females hospitalised for a burn (ARR 1.72; 95% CI 1.33 to 2.23) when compared with their matched peers, no such increase was observed among males (ARR 1.14; 95% CI 0.91 to 1.43) (figure 1; online supplemental table 4A–C).

### High school completion

All young persons hospitalised after a burn had nearly four times the risk of not completing year 10 (ARR 3.86; 95% CI 1.68 to 8.86) and over twice the risk of not completing year 11 (ARR 2.45; 95% CI 1.89 to 3.18) or year 12 (ARR 2.09; 95% CI 1.63 to 2.67), compared with matched peers (figure 2 and online supplemental table 5).

### DISCUSSION

This large retrospective population-level cohort study compared the academic performance and high school completion rates of young people hospitalised for a burn and young people not hospitalised for an injury and found an association between young females hospitalised with a burn injury and the risk of not achieving the NMS for reading. No association was identified between hospitalisation for a burn injury and the risk of not achieving the NMS on numeracy assessments compared with matched counterparts. Compared with matched peers, young persons hospitalised with a burn had a higher risk of not completing the last 3 years of high school.

Worse academic performance among young people hospitalised after sustaining a burn compared with young people hospitalised for other conditions has been demonstrated in a previous Australian study for grades 3, 5 and 7, although the authors did not disaggregate by sex.<sup>8</sup> There are several possible reasons for worsened academic performance among young people with burns, including reduced learning opportunities, school absenteeism caused by time spent undergoing rehabilitative programmes,<sup>26</sup> or psychosocial anxieties due to lower self-esteem and stigmatisation.<sup>5</sup> Additionally, poor sleep quality<sup>27</sup>

**Table 3** Characteristics of the burn injury sustained by young people hospitalised after a burn by grade

Characteristic	Burn cohort— Grade 3 (n=2148)		Burn cohort— Grade 5 (n=1661)		Burn cohort— Grade 7 (n=1077)		Burn cohort— Grade 9 (n=476)	
	n	%	n	%	n	%	n	%
<b>Burn mechanism</b>								
Exposure to either controlled or uncontrolled fire (X00–X03)	75	3.5	66	4.0	53	4.9	32	6.7
Exposure to ignition of highly flammable material or melting of clothing (X04–X06)	34	1.6	25	1.5	29	2.7	19	4.0
Exposure to other or unspecified smoke, fire and flames (X08–X09)	84	3.9	73	4.4	46	4.3	26	5.5
Contact with hot drinks, food, fats and cooking oils (X10)	686	31.9	530	31.9	325	30.2	133	27.9
Contact with hot tap water (X11)	166	7.7	131	7.9	79	7.3	24	5.0
Contact with other hot fluids (X12)	410	19.1	307	18.5	193	17.9	92	19.3
Contact with steam and hot vapours (X13)	10	0.5	7	0.4	3	0.3	1	0.2
Contact with hot air and gases (X14)	–	–	–	–	–	–	–	–
Contact with hot household appliances (X15)	196	9.1	137	8.3	73	6.8	27	5.7
Contact with hot heating appliances, radiators and pipes (X16)	83	3.9	61	3.7	40	3.7	15	3.2
Contact with hot engines, machinery and tools (X17)	80	3.7	66	4.0	46	4.3	25	5.3
Contact with other hot metals (X18)	14	0.7	13	0.8	8	0.7	5	1.1
Contact with other and unspecified heat and hot substances (X19)	310	14.4	245	14.8	182	16.9	77	16.2
<b>Total body surface area affected</b>								
Burn <10%	2037	94.8	1582	95.2	1021	94.8	450	94.5
Burn >10%	58	2.7	39	2.4	27	2.5	16	3.4
Unspecified	53	2.5	40	2.4	29	2.7	10	2.1
<b>Principal burn type</b>								
Head and neck (T20)	391	18.2	293	17.6	169	15.7	68	14.3
Trunk (T21)	459	21.4	356	21.4	243	22.6	100	21.0
Shoulder and upper limb, except wrist and hand (T22)	265	12.3	193	11.6	121	11.2	51	10.7
Wrist and hand (T23)	516	24.0	379	22.8	216	20.1	90	18.9
Hip and lower limb, except ankle and foot (T24)	266	12.4	244	14.7	192	17.8	112	23.5
Ankle and foot (T25)	195	9.1	156	9.4	107	9.9	44	9.2
Eye and adnexa (T26)	19	0.9	14	0.8	10	0.9	1	0.2
Respiratory tract (T27)	3	0.1	3	0.2	2	0.2	2	0.4
Other and unspecified internal organs (T28–T31)	34	1.6	23	1.4	17	1.7	8	1.6
	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
Time since index burn hospitalisation to NAPLAN assessment (months)	68.0	25.2	86.4	30.7	97.4	39.7	68.0	25.2

NAPLAN, National Assessment Plan for Literacy and Numeracy.

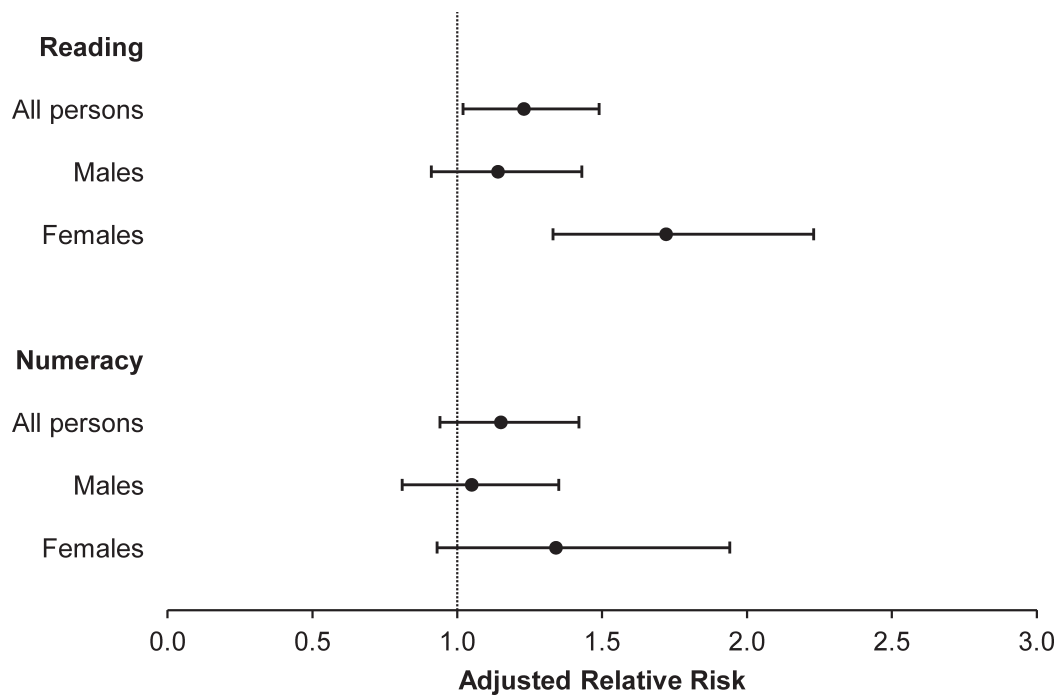
and chronic pain, which can be sustained well beyond the acute recovery phase following a burn,<sup>28</sup> may disrupt young people's ability to learn and engage with learning curricula.

Several plausible explanations exist for worse academic achievement among young females found in the current study. These include poorer health-related quality of life among young female burn patients compared with males,<sup>25</sup> which may have a direct, negative impact on schooling attendance and experience. Female paediatric burn survivors have also shown higher levels of help-seeking, mental health conditions, including anxiety, and externalising negative behaviours (eg, irritability, somatic complaints) compared with males.<sup>29–32</sup> Additionally, poorer body image perceptions<sup>33 34</sup> and worsened scarring outcomes (eg, increased physical pain)<sup>35</sup> among young female burn survivors may also hamper their motivation and/or ability to attend school and participate in activities. The deprivation of a normal school experience may result in poorer academic performance among young female burn survivors.<sup>24</sup>

To date, there has been a dearth of studies examining the association between burns and school completion among young people. The current results could, in part, be explained by factors associated with a school goers' intention to leave school early, including poor academic performance, lack of intrinsic

motivation and poor coping with stressful events.<sup>36</sup> It is possible that burn injuries could indirectly pose a greater risk for high school dropout among young people.<sup>29</sup> However, as school attendance in NSW is only compulsory until year 10, non-completion of high school in the final 3 years may be attributed to factors unrelated to a previous burn injury, such as completion of an apprenticeship, or employment.<sup>37</sup>

This study had several strengths. It was a large population-based study which linked health and educational outcomes over a 13-year period and was able to adjust for key factors that may affect academic performance, such as socioeconomic status, parental education and LBOTE. Limitations include only young people who had been hospitalised for a burn were studied, omitting young people treated solely at other healthcare settings (eg, primary care). Additionally, no information was collected on other potential mediating factors such as scar quality together with medium-term and longer-term complications following the initial burn injury (eg, chronic pain issues, utilisation of health services in the post-burn phase, familial adjustment and support). Factors related to burn injury causation were not considered and effects of principal type of burn were not disaggregated and examined separately due to low sample size or were not able to be disaggregated (eg, facial burns).



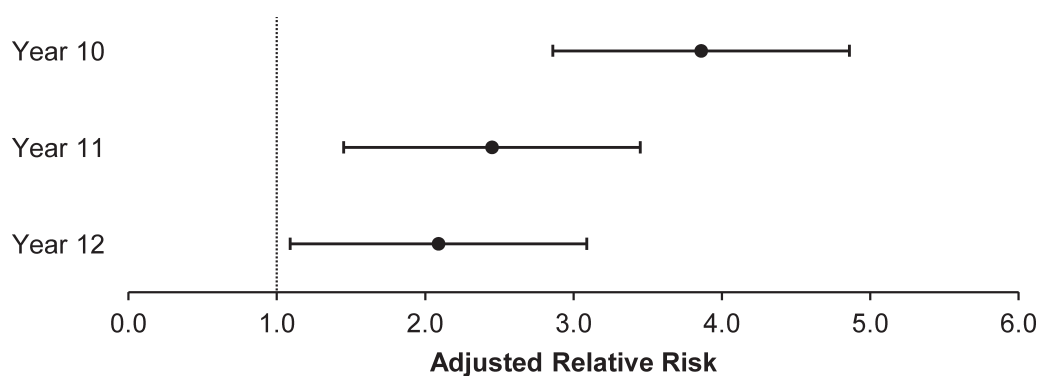
**Figure 1** Multilevel model of characteristics associated with a below national minimum standard NAPLAN assessment for young people hospitalised after a burn compared with a matched comparison by assessment. (1) All persons: Numeracy adjusted for burn status, school sector, sex, language background other than English, socioeconomic status, NAPLAN grade, parental education and hospital length of stay; reading adjusted for burn status, school sector, sex, comorbidities, language background other than English, socioeconomic status, NAPLAN grade, parental education and hospital length of stay. (2) Males: Numeracy and reading adjusted for burn status, school sector, language background other than English, socioeconomic status, NAPLAN grade, parental education and hospital length of stay. (3) Females: Numeracy adjusted for burn status, school sector, NAPLAN grade, parental education and hospital length of stay; reading adjusted for burn status, school sector, comorbidities, NAPLAN grade, language background other than English, socioeconomic status and parental education. NAPLAN, National Assessment Plan for Literacy and Numeracy.

Only health conditions relevant to a hospital admission were examined: it is therefore probable that some comorbidities were not identified, despite the 3-year lookback period. Data on visits to private hospital EDs were not able to be accessed for this study but would likely represent a very small number of patients. A higher proportion of young people with a burn injury were absent for NAPLAN assessments compared with their matched counterparts and the current study was not able to account for school clustering. Additionally, no information was available regarding

supplementary educational services that a young person may have received (eg, tutoring).

## CONCLUSION

Burn injuries may affect the physical, psychological and social domains of the lives of young people. Consequently, burn injuries may have a detrimental impact on academic trajectories of some young people, ultimately leading to poorer health and social outcomes in later life. There is a



**Figure 2** Adjusted relative risk of not completing high school for young people hospitalised after a burn compared with a matched comparison by grade. (1) Year 10 all person adjusted relative risk for burn status and sex. (2) Year 11 all person and females adjusted relative risk for burn status, sex, language background other than English, socioeconomic status, parental education and residential geographical location. (3) Year 12 all person adjusted relative risk for burn status, sex, language background other than English, socioeconomic status and parental education.

need to assess and monitor influencers of academic progression in young people after a burn so that, where needed, ongoing learning support requirements can be met.

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