

# Identifying the impact of injury or chronic illness on children's academic performance and hospital use

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# IDENTIFYING THE IMPACT OF INJURY OR CHRONIC ILLNESS ON CHILDREN'S ACADEMIC PERFORMANCE AND HOSPITAL USE

More than one million children in Australia experience a serious injury or have a long-term chronic health condition such as asthma, type 1 diabetes or epilepsy. Of these, more than 100,000 each year will spend time in hospital.

Associate Professor Rebecca Mitchell at the Australian Institute of Health Innovation (AIHI), Macquarie University, has led this body of research looking at the impact of injury or chronic illness on children's academic performance and hospital use.

A traumatic injury or chronic illness can adversely affect children's school performance and result in the need for longer term care, including hospital readmission. Learning and ability to concentrate can be disrupted, with many missing long periods of school entirely.

While education is critically important for children's mental, social and physical development, interrupted education can also have a cumulative effect. Some children do not complete high school or undertake tertiary studies, limiting their employment opportunities later in life.

Prompt recognition of children's need for learning support and early intervention after hospitalisation is critical. The following summary of research highlights those groups at risk.

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## TRANSFORMING HEALTHCARE THROUGH WORLD-CLASS RESEARCH

AIHI is a globally recognised research-intensive centre, with a steadfast commitment to improving healthcare services and health systems in Australia and beyond. We conduct research, evaluations, evidence-based advocacy, and consulting designed to strengthen the health system.

AIHI is led by Professor Jeffrey Braithwaite, an internationally recognised health services and systems researcher, alongside fellow Directors Professor Johanna Westbrook, a leading informatics and patient safety researcher, Professor Enrico Coiera, a renowned informatics and AI expert, and Professor Henry Cutler, a prominent health economist.



<b>\$53 million</b>	<b>179</b>	<b>\$109 million</b>
<b>Enterprise value of projects under AIHI management</b>	<b>Number of research projects involving AIHI</b>	<b>Enterprise value of grants involving AIHI and administered elsewhere</b>

## RESEARCH BACKGROUND

We compared academic performance and high school completion of young people admitted to hospital in New South Wales (NSW) with a serious injury or chronic illness to matched peers from the general population not admitted to hospital with these conditions during the study period (2005-2018).

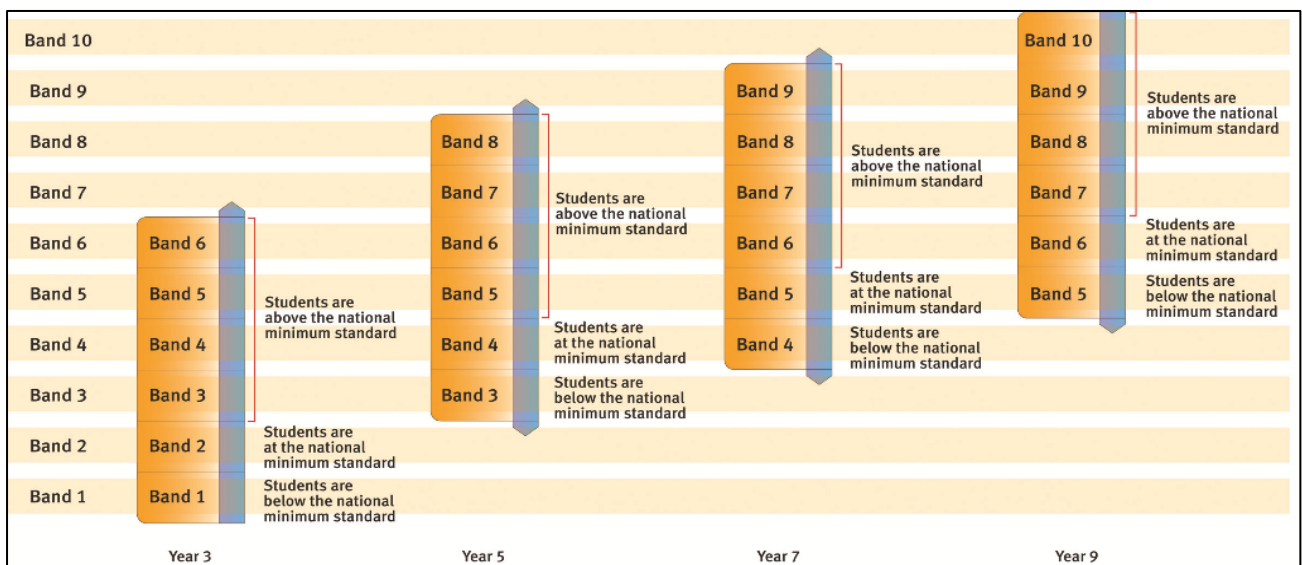
We linked health and education records across the NSW population for all young people aged  $\leq 18$  years who had been hospitalised after sustaining an injury or who were hospitalised with asthma, a mental health disorder, type 1 diabetes, or epilepsy.

We randomly selected a young person of the same age and sex living in the same area who had not been hospitalised for an injury or those health conditions and, additionally, linked their health and education records too to form a comparison population.

We then compared the school performance on NAPLAN tests of young people who had been hospitalised with each health condition or injury to the performance of their matched peer to see if they achieved the national minimum standard (NMS) on their NAPLAN test. We also compared whether students who had been hospitalised with each health condition or injury completed high school compared to their matched peers.

Inability to achieve the NMS indicates that a child will have difficulty making progress in school without assistance.

As well as comparing academic performance, we also compared number of hospital admissions for the young people with an injury or with a chronic health condition compared to their matched peers.



Source: Australian Curriculum Assessment and Reporting Authority

# CHILDREN'S ACADEMIC PERFORMANCE - IDENTIFYING THE IMPACT OF INJURY OR CHRONIC ILLNESS

## Results

### Injury

Injured young people had a higher risk of not achieving the NMS compared to their matched peers for numeracy (Adjusted Relative Risk (ARR): 1.12; 95% confidence interval (CI) 1.06-1.17) and reading (ARR: 1.09; 95%CI 1.04-1.13). As injury severity increased from minor to serious, the risk of not achieving the NMS generally increased for injured young people compared to matched peers.

Injured young people had almost twice the risk of not completing high school at year 10 (ARR: 2.17; 95%CI 1.73-2.72), year 11 (ARR: 1.95; 95%CI 1.78-2.14) or year 12 (ARR: 1.93; 95%CI 1.78-2.08) compared to matched peers.

Mitchell RJ, Cameron CM, McMaugh A, Lystad RP, Badgery-Parker T, Ryder T. The impact of childhood injury and injury severity on school performance and high school completion in Australia: a matched population-based retrospective cohort study. *BMC Pediatrics*. 2021 Dec;21(1):1-4. <https://doi.org/10.1186/s12887-021-02891-x>

### Asthma

Young males hospitalised with asthma had a 13% and 15% higher risk of not achieving the NMS for numeracy (95%CI 1.04-1.22) and reading (95%CI 1.07-1.23), respectively, compared to matched peers.

Young males hospitalised with asthma had a 51% (95%CI 1.22-1.86) higher risk of not completing year 10, and around a 20% higher risk of not completing year 11 (ARR: 1.25; 95%CI 1.15-1.36) or year 12 (ARR: 1.27; 95%CI 1.17-1.39) compared to matched peers.

Young females hospitalised with asthma showed no difference in achieving numeracy or reading NMS, but did have a 21% higher risk of not completing year 11 (ARR:1.21; 95%CI 1.09-1.36) and a 33% higher risk of not completing year 12 (ARR: 1.33; 95%CI 1.19-1.49) compared to matched peers.

Mitchell RJ, McMaugh A, Homaira N, Lystad RP, Badgery-Parker T, Cameron CM. The impact of childhood asthma on academic performance: a matched population-based cohort study. *Clinical and Experimental Allergy*. 2022 Feb;52(2):286-296. <https://doi.org/10.1111/cea.14022>

### Mental disorders

Young males with a mental disorder had over a 1.7 times higher risk of not achieving the NMS for numeracy (ARR: 1.71; 95%CI 1.35-2.15) and reading (ARR: 1.99; 95%CI 1.80-2.20) compared to matched peers.

Young females with a mental disorder had around a 1.5 times higher risk of not achieving the NMS for numeracy (ARR: 1.50; 95%CI 1.14-1.96) compared to matched peers.

Both young males and females with a mental disorder had around a three times higher risk of not completing high school compared to peers.

Young males with multiple mental disorders had up to a six-fold increased risk (ARR: 6.16; 95%CI 4.33-

8.75) and young females with multiple disorders had up to an eight-fold increased risk (ARR: 8.21; 95%CI 6.15-10.96) of not completing high school compared to peers.

Mitchell RJ, McMaugh A, Schniering C, Cameron CM, Lystad RP, Badgery-Parker T, Nielssen O. Mental disorders and their impact on school performance and high school completion by gender in Australia: A matched population-based cohort study. *Australian & New Zealand Journal of Psychiatry*. 2021 Dec 7:00048674211061684. Doi:10.1177/00048674211061684

## Epilepsy

Young people hospitalised with epilepsy have a three times higher risk of not achieving the NMS for numeracy (ARR: 3.40; 95%CI 2.76–4.18) and reading (ARR: 3.15; 95%CI 2.60–3.82) compared to matched peers.

Young people hospitalised with epilepsy had a 78% higher risk of not completing year 10 (ARR: 1.78; 95%CI 1.14–2.79), 18% higher risk of not completing year 11 (ARR: 1.18; 95%CI 0.97–1.45), and 38% higher risk of not completing year 12 (ARR: 1.38; 95%CI 1.14–1.67), compared to matched peers.

Lystad RP, McMaugh A, Herkes G, Badgery-Parker T, Cameron CM, Mitchell RJ. The impact of childhood epilepsy on academic performance: a population-based matched cohort study. *Seizure: European Journal of Epilepsy*. 2022 May 18. DOI: 10.1016/j.seizure.2022.05.014



## Type 1 diabetes

Young females and males hospitalised with type 1 diabetes (T1D) had no higher risk of not achieving the NMS compared to peers for numeracy (ARR: 1.19; 95%CI 0.77-1.84 and ARR: 0.74; 95%CI 0.46-1.19) or reading (ARR: 0.98; 95%CI 0.63-1.50 and ARR: 0.85; 95%CI 0.58-1.24), respectively.

Young T1D hospitalised females had a higher risk of not completing year 11 (ARR: 1.73; 95%CI 1.19-2.53) or 12 (ARR: 1.65; 95%CI 1.17-2.33) compared to peers, while hospitalised T1D males did not.

Mitchell RJ, McMaugh A, Woodhead H, Lystad RP, Zurynski Y, Badgery-Parker T, Cameron CM, Hng TM. The impact of type 1 diabetes mellitus in childhood on academic performance: a matched population-based cohort study. *Pediatric Diabetes*. 2022 May;23(3):411-420. <https://doi.org/10.1111/pedi.13317>

## Implications

It is essential that we identify students who have sustained an injury, or who have a chronic illness, and are likely to need learning support. Providing educational supports, such as online learning options, flexible programming or mobilising peer support to enable collaborative sharing of class notes and homework activities, can enable students to receive learning assistance. Monitoring their progress when they return to school will also help to identify ongoing learning support needs. There are also

ways to manage symptoms and enhance performance at school:

- Early recognition and support could improve school performance and educational outcomes for young people who were hospitalised for chronic health conditions or injury.
- Assessing learning needs and monitoring return-to-school progress may aid identification of any ongoing learning support requirements.

## **CHILDREN'S HOSPITAL ADMISSIONS - IDENTIFYING THE IMPACT OF INJURY OR CHRONIC ILLNESS**

Young people who sustain an injury or who have a chronic health condition are more likely to use hospital and health services than the general population. We sought to find out what their risk was of having ongoing hospital visits compared to their matched peers.

### **Results**

#### **Injury**

In our study, there were 201,372 young people hospitalised after sustaining an injury. Young males (ARR 2.89; 95%CI 2.81-2.97) and females (ARR 2.79; 95%CI 2.68-2.90) who were hospitalised after an injury had a two-fold higher risk of subsequent hospital admission than their matched peers.

Young males (ARR 3.38; 95%CI 2.81-4.05) and females (ARR 3.41; 95%CI 2.72-4.26) with serious injuries had around a three times higher risk of subsequent admissions compared to matched peers.

Young males with dislocations, sprains and strains (ARR 3.40; 95%CI 3.03-3.82), burns (ARR 3.37; 95%CI 2.99-3.80), and fractures (ARR 3.20; 95%CI 3.07-3.33), and young females with burns (ARR 3.84; 95%CI 3.40-4.33), dislocations, sprains and strains (ARR 3.54; 95%CI 2.96-4.23), and traumatic brain injury (ARR 3.39; 95%CI 3.01-3.82) had the highest risk of subsequent hospitalisation compared to matched peers.

Cameron CM, Lystad RP, McMaugh A, Mitchell RJ. Hospital service use following an injury hospitalisation for young males and females in a population-level matched retrospective cohort study. *Injury*. 2022 53 (8) 2783-89  
<https://doi.org/10.1016/j.injury.2022.06.021>

#### **Asthma, epilepsy and type 1 diabetes**

There were 65,055 young people hospitalised with asthma, 6,648 with epilepsy, and 2,209 with type 1 diabetes (T1D). Young people with epilepsy (ARR 10.95; 95%CI 9.98-12.02), T1D (ARR 8.64; 95%CI 7.72-9.67) or asthma (ARR 4.39; 95%CI 4.26-4.53) all had a higher risk of hospitalisation than matched peers.

Admission risk was highest for males (ARR 11.00; 95%CI 9.64-12.56) and females (ARR 10.83; 95%CI 9.54-12.29) with epilepsy compared to matched peers.

The highest admission risk by age group was for young people aged 10-14 years living with asthma (ARR 5.50; 95%CI 4.77-6.34), children aged  $\leq 4$  years living with epilepsy (ARR 12.68; 95%CI 11.35-14.17), and children aged 5-9 years living with T1D (ARR 9.12; 95%CI 7.69-10.81) compared to

matched peers.

Mitchell RJ, McMaugh A, Herkes G, Homaira N, Hng TM, A Cameron CM, Lystad RP. Hospital service use for young people with chronic health conditions: a population-based matched retrospective cohort study. *Journal of Paediatrics and Child Health* 2022 58 (8) 1439-46. <https://doi.org/10.1111/jpc.16028>

## Mental disorders

There were 27,801 young people hospitalised with a mental disorder. Emergency department visits, hospital admissions and ambulatory mental health service contacts were all higher for young males and females with a mental disorder than matched peers.

Ongoing hospitalisation risk was over 10-fold higher for young males with psychotic (ARR 13.69; 95%CI 8.95-20.94) and anxiety (ARR 11.44; 95%CI 8.70-15.04) disorders, and for both young males and females with cognitive and behavioural delays (ARR 10.79; 95%CI 9.30-12.53 and ARR 14.62; 95%CI 11.20-19.08, respectively), intellectual disability (ARR 10.47; 95%CI 8.04-13.64 and ARR 11.35; 95%CI 7.83-16.45, respectively), and mood disorders (ARR 10.23; 95%CI 8.17-12.80 and ARR 10.12; 95%CI 8.58-11.93, respectively) compared to matched peers.

Mitchell RJ, McMaugh A, Lystad RP, Cameron CM, Nielssen O. Health service use for young males and females with a mental disorder is higher than their peers in a population-level matched cohort. *BMC Health Services Research* 2022 22:1359 <https://doi.org/10.1186/s12913-022-08789-3>

## Implications

For hospitalised injury, patient management and care extends beyond the injury admission as many young people face high levels of contact with health services in the months and years following injury.

For each of the chronic health conditions, these results will guide health service planning and highlight opportunities for better management of the health conditions, such as further care integration between acute, primary and community health services for young people, to try to reduce the need for hospital admissions.

## CONTACT US



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*Images from Macquarie University and Pexels (Nilov and Thomas)*



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