

AIHW submission to the Senate Community Affairs References Committee inquiry into concussions and repeated head trauma in contact sports

On 1 December 2022, the Senate referred the matter to the Senate Community Affairs References Committee for inquiry and report by 21 June 2023. This invited submission relates to item g. *the prevalence, monitoring and reporting of concussion and long-term impacts of concussion and repeated head trauma, including in First Nations communities.*

Who are we and what do we do?

The Australian Institute of Health and Welfare (AIHW) is a corporate Commonwealth entity under the *Public Governance, Performance and Accountability ACT 2013* (PGPA Act) and an independent statutory authority, established under the *Australian Institute of Health and Welfare Act 1987* (AIHW Act).

We create authoritative and accessible information and statistics that inform decisions and improve the health and welfare of all Australians. Our work provides governments, stakeholders and the broader community with valuable evidence and insights about key issues affecting the health and welfare of Australians.

Our functions are set out in section 5 of the AIHW Act. Our role is to:

- collect, produce, coordinate and assist in the collection and production of health- and welfare-related information and statistics
- conduct and promote research into Australians' health and their health services
- develop specialised standards and classifications for health, and health and welfare services
- publish reports on our work
- make recommendations to the Minister for Health on prevention and treatment of diseases and improvement and promotion of the health awareness of Australians
- provide researchers with access to health- and welfare-related information and statistics, subject to confidentiality provisions.

The AIHW is part of the Health and Aged Care Portfolio. We are governed by the AIHW Board. The board is accountable to the Parliament of Australia through the Minister for Health and Aged Care, the Hon Mark Butler MP.

Data on concussions and repeated head trauma in contact sports

The AIHW has access to more than 150 datasets containing health and welfare data that generally have a national scope. While data may exist in other data holdings that the AIHW does not regularly access such as sub-national or research entity based collections, the AIHW's concussion and head trauma data holdings related to specific sports activities are limited to concussions that require a hospital admission. These data are collected in the National Hospital Morbidity Database (NHMD). Data on repeated concussion or head trauma require a specific analysis using a linked dataset, such as the National Integrated Health Services Information Analysis Asset (NIHSI AA).

Sports injury hospitalisations in Australia, 2019–20

In the 2019–20 NHMD, there were 52,262 sports injuries that led to a hospital stay in Australia. Concussions were the most common (80%) subset of hospitalised sport intracranial injuries. There were 2,305 cases of hospitalisation for concussion caused by sports in 2019–20. Of these:

- 1,608 were male and 697 were female
- the most common age group being hospitalised for a sports related concussion was 15-24 years old
- 591¹ of the 2,305 cases, or 26% of all hospitalisations for concussion caused by sport, were related to contact sports which include Australian rules football, basketball, combative sports, and rugby (union, league and unspecified).

Participation data are also needed to calculate concussion rates for different sports. For example, while there appear to be large numbers of concussions related to football and cycling (Table A16), this may be a reflection of the large numbers of participants in these sports.

See **Appendix A** for the 2019–20 data tables including data by age group and sex, and sport. The 2020–21 data will be published by June 2023.

Health service use for patients with traumatic brain injury

A cohort (group) of 23,445 patients aged under 65 who were hospitalised with a traumatic brain injury (TBI) was analysed for service use over time using the NIHSI AA (version 0.5). The NIHSI AA is a linked dataset containing information on admitted patient care (hospitalisations), emergency department presentations, non-admitted patient care, deaths, prescription medications, Medicare services and residential aged care.

Following the injury, TBI patients typically arrived at an emergency department (93%) before being admitted to hospital. In hospital, TBI patients stayed an average of 6.8 days. Following hospitalisation, TBI patients received an increased number of Medicare services including diagnostic imaging, specialist services, and non-referred attendances such as general practitioner and allied health services. Most TBI patients in the cohort were male (70%) and were aged 15 to 24 (37%). Concussion was the most common TBI-related diagnosis (74%).

¹ Note that a portion of 'other' and 'other & unspecified football' could relate to contact sports but cannot be determined for this analysis by contact sport due to data quality issues.

Sport-specific data

- 2,708 (11.5%) of TBI injuries occurred in sports and athletics areas.
- New analysis is required to identify the contact sport concussions that are currently mixed within the football, team sport and other categories.
- Any new analysis should use the most recent NIHSI AA datasets and longer follow-up timeframes to examine repeated head trauma and outcomes.

See **Appendix B** for data tables including data by age group and sex.

Can further information be provided?

Data requests for specific analysis can be made to the AIHW. For example, subject to data privacy requirements, the AIHW may be able to provide information from the NHMD or NIHSI AA about hospitalisations for concussion and traumatic brain injuries for contact sports, or for specific demographic groups. Existing data sources from which analyses could be performed are at **Appendix C**. Please contact us to discuss your data requirements.

What is being done to improve sports injury data?

Participation in sport and active recreation have physical and mental health benefits. Sports injuries can decrease participation and health outcomes. Better data on the risks of sports injury within a sport can inform injury prevention programs and decrease injury risks to benefit individuals, sporting organisations, sport performance outcomes, and health systems.

Sports injury data is limited by a lack of sport activity data being collected outside of the admitted hospitalisation data in the NHMD. This limits monitoring of the types and numbers of injuries in sports to inform policy and prevention activities. This evidence gap has led the Australian Sports Commission to contract the AIHW to implement a National Sports Injury Data Strategy. This provides:

- \$2.8 million over 4 years from the 2022–23 Budget
- publishing a data strategy in early 2023
- developing data in partnership with stakeholders such as sporting organisations and insurers, which will include a framework to guide data collection, a data dictionary, and support to encourage better sports data collection including concussion data
- bringing together data sources into a national sports injury data asset
- developing new methods to analyse data
- publishing and communicating findings.

References

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ACCD 2019b. The Australian classification of health interventions (ACHI), 11th edn. Tabular list of interventions and alphabetic index of interventions. Adelaide: IHPA, Lane Publishing.

ACCD 2019c. The international statistical classification of diseases and related health problems, 10th revision, Australian modification (ICD-10-AM), 11th edn. Australian coding standards for ICD-10-AM and ACHI. Adelaide: IHPA, Lane Publishing.

AIHW 2022. Sports injury hospitalisations in Australia, 2019–20. Cat. no. INJCAT 225. Canberra: AIHW. <https://www.aihw.gov.au/reports/injury/sports-injury-hospitalisations-2019-20/contents/sports-injury-hospitalisations>

AIHW 2021. Health service use for patients with traumatic brain injury. Cat. no. INJCAT 218. Canberra: AIHW. <https://www.aihw.gov.au/reports/injury/treatment-pathways-brain-injury/contents/about>

WHO (World Health Organization) 2019. The international statistical classification of diseases and related health problems, 10th revision (ICD-10). Geneva:

WHO. <https://icd.who.int/browse10/2019/en#/>

Appendix A: Selected data tables from Sports injury hospitalisations in Australia, 2019–20

Table A15: Sports-related concussion hospitalisations, by life-stage age groups and sex, Australia, 2019–20

		Age group (years)						Total
		0–4	5–14	15–24	25–44	45–64	65+	
Count	Male	19	521	597	293	131	47	1,608
	Female	14	167	261	146	82	27	697
	Persons	33	688	858	439	213	74	2,305
Proportion	Male	1.1%	32.4%	37.1%	18.2%	8.1%	2.9%	100%
	Female	2.0%	23.9%	37.4%	20.9%	11.7%	3.8%	100%
	Persons	1.4%	29.8%	37.2%	19.0%	9.2%	3.2%	100%

Source: AIHW National Hospital Morbidity Database.

Notes:

1. Proportion is of the total for each sex.
2. Proportions may not add to 100 due to rounding.

Table A16: Sports-related concussion hospitalisations, by sex and sport, Australia, 2019–20

	Male	Female	Total
Australian rules football	196	50	246
Basketball	69	21	90
Combative sports	33	9	42
Cricket	29	4	33
Cycling	354	87	441
Dancing	2	11	13
Equestrian activities	37	194	231
Hockey (all types)	11	11	22
Netball	1	24	25
Racquet sports	11	8	19
Recreational walking	9	14	23
Roller sports	137	30	167
Rugby (union, league and unspecified)	175	38	213
Running, athletics, track & field	11	12	23
Skiing, ice skating and snowboarding	28	17	45
Soccer	120	33	153
Surfing	17	6	23
Swimming and diving	13	8	21
Touch football	6	12	18
Wheeled motor sports	155	26	181
Other & unspecified football	80	16	96
Other	114	66	180
Total	1,608	697	2,305

Source: AIHW National Hospital Morbidity Database.

Note: Sports with 10 or fewer concussions grouped into 'other'.

Table A17: Sports-related concussion hospitalisations, by life-stage age groups and sport, Australia, 2019–20

Sport or activity	Life-stage age group						Total
	0–4	5–14	15–24	25–44	45–64	65+	
Australian rules football	1	72	136	34	2	1	246
Basketball	0	37	41	10	2	0	90
Combative sports	1	8	18	14	1	0	42
Cricket	0	11	10	10	2	0	33
Cycling	10	134	104	81	83	29	441
Dancing	0	4	3	3	2	1	13
Equestrian activities	1	51	76	63	38	2	231
Hockey (all types)	0	5	6	11	0	0	22
Netball	0	6	15	3	1	0	25
Racquet sports	0	3	1	2	5	8	19
Recreational walking	0	1	1	3	6	12	23
Roller sports	6	79	52	23	6	1	167
Rugby (union, league and unspecified)	1	50	133	28	1	0	213
Running, athletics, track & field	2	8	5	1	5	2	23
Skiing, ice skating and snowboarding	0	15	11	11	5	3	45
Soccer	1	48	65	32	7	0	153
Surfing	0	2	10	7	3	1	23
Swimming and diving	2	8	3	8	0	0	21
Touch football	0	6	5	7	0	0	18
Wheeled motor sports	1	52	69	42	16	1	181
Other & unspecified football	0	28	52	16	0	0	96
Other	7	60	42	30	28	13	180
Total	33	688	858	439	213	74	2,305

Source: AIHW National Hospital Morbidity Database.

Note: Sports with 10 or fewer concussions grouped into 'other'

Table A18: Proportion of sports-related intracranial injury hospitalisations that are concussions, by age group, Australia, 2019–20

Age group (years)	Proportion
0–4	84.6%
5–9	93.9%
10–14	91.0%
15–19	88.0%
20–24	85.5%
25–29	85.1%
30–34	76.2%
35–39	64.8%
40–44	74.2%
45–49	76.2%
50–54	64.6%
55–59	61.3%
60–64	55.7%
65+	37.0%
Total	80.3%

Source: AIHW National Hospital Morbidity Database.

Appendix B: Selected data tables from Health service use for patients with TBI

Table S3: Number of cohort patients by external cause, place of occurrence and activity, by sex, 2013–14 to 2014–15

	Male	Female	Persons
External cause of injury			
Falls	5,852	3,200	9,052
Transport	5,187	2,147	7,334
Assault	2,428	468	2,896
Contact with living things	1,112	249	1,361
Contact with objects	850	381	1,231
Intentional self-harm	135	97	232
Other external causes	812	506	1,318
Place of occurrence			
Home	2,323	1,686	4,009
Residential institution	n.p.	n.p.	158
School, college, university, day care, kindergarten	420	167	587
Health service area	893	614	1,507
Sports and athletics area	2,234	474	2,708
Street and highway	3,656	1,467	5,123
Trade and service area	778	295	1,073
Industrial and construction area	n.p.	n.p.	231
Farm	269	111	380
Other specified and unspecified place	5,459	2,189	7,648
Activity when injured			
Football (all codes)	1,638	129	1,767
Team sports (excluding football)	210	119	329
Motor sports	487	38	525
Equestrian sports	68	280	348
Other sports	1,174	378	1,552
<i>Sub-total – sports</i>	<i>3,577</i>	<i>944</i>	<i>4,521</i>
While working for income	900	234	1,134
While engaged in other types of work	331	158	489
<i>Sub-total – work</i>	<i>1,231</i>	<i>392</i>	<i>1,623</i>
Leisure activity	768	359	1,127
Essential activities (resting, sleeping, eating)	378	366	744
Other specified/unspecified	10,422	4,987	15,409
Total^(a)	16,376	7,048	23,445

Source: NIHSI AA v0.5

Notes:

(a) The overall total includes 21 records where external cause, place of occurrence and activity when injured was not reported.

n.p. Not publishable because of small numbers, confidentiality or other concerns about the quality of the data.

Table S4: Number of cohort patients by external cause of injury, place of injury occurrence and activity when injured, by age group, 2013–14 to 2014–15

	0 to 14	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	Total
External cause of injury							
Falls	2,216	1,522	983	1,024	1,404	1,903	9,052
Transport	793	2,179	1,331	1,178	1,007	846	7,334
Assault	76	847	765	600	422	186	2,896
Contact with living things	357	651	205	66	39	43	1,361
Contact with objects	317	264	176	188	156	130	1,231
Intentional self-harm	n.p.	45	56	54	45	n.p.	232
Other external causes	n.p.	179	186	203	244	n.p.	1,318
Place of injury occurrence							
Street and highway	317	1,426	1,040	906	749	685	5,123
Home	929	395	417	553	704	1,011	4,009
Sports and athletics setting	705	1,239	414	175	103	72	2,708
Health service setting	122	199	215	242	325	404	1,507
Trade and service setting	71	246	207	182	174	193	1,073
Educational setting	473	88	n.p.	n.p.	10	n.p.	587
Farm	63	98	49	57	47	66	380
Industrial and construction setting	n.p.	44	52	49	39	n.p.	231
Residential institution	n.p.	n.p.	26	39	28	42	158
Other specified and unspecified place	1,240	n.p.	n.p.	n.p.	1,138	957	7,648
Activity when injured							
Football (all codes)	498	922	259	59	18	11	1,767
Team sports (excluding football)	112	129	47	20	n.p.	n.p.	329
Motor sports	110	213	80	62	45	15	525
Equestrian sports	65	93	54	53	50	33	348
Other sports	424	435	207	197	177	112	1,552
<i>Sub-total – sports</i>	<i>1,209</i>	<i>1,792</i>	<i>647</i>	<i>391</i>	<i>n.p.</i>	<i>n.p.</i>	<i>4,521</i>
Paid work	n.p.	207	219	224	247	n.p.	1,134
Non-paid work	50	42	35	73	112	177	489
<i>Sub-total – work</i>	<i>n.p.</i>	<i>249</i>	<i>254</i>	<i>297</i>	<i>359</i>	<i>n.p.</i>	<i>1,623</i>
Leisure activity	581	205	113	84	85	59	1,127
Essential activities (resting, sleeping, eating)	95	96	103	112	139	199	744
Other specified/unspecified	n.p.	3,345	2,585	2,429	n.p.	2,630	15,409
Total^(a)	3,925	5,687	3,702	3,313	3,317	3,480	23,445

Source: NIHSI AA v0.5

Notes:

(a) The overall total includes 21 records where external cause, place of occurrence and activity when injured was not reported.

n.p. not publishable because of small numbers, confidentiality or other concerns about the quality of the data.

Appendix C: Data collections of relevance to the inquiry

National Hospital Morbidity Database

The National Hospital Morbidity Database (NHMD) contains episode-level records for patients admitted to Australian hospitals. Hospitals included are all public and private acute and psychiatric hospitals, free standing day hospital facilities, and alcohol and drug treatment centres. Hospitals operated by the Australia Defence Force, corrections authorities and in Australia's offshore territories are not required to report information but are included if information is supplied.

The data include demographic, administrative and length of stay data, as well as diagnoses of the patients, the procedures they underwent in hospital and external causes of injury and poisoning. Demographic data may also include whether patients identify as First Nations peoples or not.

Diagnosis, intervention and external cause information are coded according to the *International statistical classification of diseases and related health problems, 10th revision, Australian modification* (ICD-10-AM) (ACCD 2019a, 2019b, 2019c). This coding enables the identification of patients whose injury diagnosis includes concussion and head trauma. Additionally, if the injury was reported to have occurred whilst the patient was playing sport, then the particular sport will usually also be reported. This is known as the activity code.

The NHMD contains episode-level records for each hospital admission. In the NHMD, it is not possible to link different episodes for the same person. That is, if a person is admitted to hospital twice for a concussion, it is not possible to identify that the two admissions were for the same person.

National Mortality Database

The National Mortality Database (NMD) currently holds records for deaths in Australia from 1964 to 2020. The database comprises information about causes of death and other characteristics of the person, such as sex, age at death, area of usual residence and Indigenous status.

When a person is declared dead, information about their death is recorded on a death certificate by either a medical practitioner or a coroner. Registration of all deaths is compulsory in Australia and is the responsibility of the Registrar of Births, Deaths and Marriages of the relevant state or territory, under jurisdiction-specific legislation.

Causes of death are coded according to the *International statistical classification of diseases and related health problems 10th revision* (ICD-10) (WHO). This coding enables the identification of the underlying cause of death, as well as all the morbid conditions, diseases and injuries which contributed to the death. The ICD-10 does not include activity codes, therefore it is generally not possible to identify if a sport was related to the cause of death.

National Integrated Health Services Information Analysis Asset

The National Integrated Health Services Information Analysis Asset (NIHSI AA) is a linked dataset containing information on admitted patient care (hospitalisations), emergency

department presentations, non-admitted patient care, deaths, prescription medications, Medicare services and residential aged care.

The NIHSI AA allows analysis of service use and provision across specific parts of the health care system, and across time. The NIHSI AA includes hospitals data (admitted patient care, emergency department and non-admitted patient), Medicare Benefits Schedule (MBS), Pharmaceutical Benefits Scheme (PBS), Residential Aged Care and National Death Index. Private hospital coverage is limited. The NIHSI AA version 2.0 includes hospitals data from New South Wales, Victoria, Queensland, South Australia, Tasmania and the Australian Capital Territory and covers the time period 2010–11 to 2019–20.

Registry data

Clinical Quality Registries (CQRs) systematically monitor the quality (appropriateness and effectiveness) of health care, within specific clinical domains, by routinely collecting, analysing and reporting health-related information. Registry information is used to identify outcome benchmarks, significant outcome variance, and inform improvements in healthcare quality. The [Australia New Zealand Trauma Registry](#) (ATR) is a key component of the Australian Trauma Quality Improvement Program and collects in-hospital data from contributing sites on those most severely injured. The ATR now houses over 5 years of quality data for research purposes, and longer time frames may be needed to appreciate the long-term outcomes from concussion and other types of severe trauma.

State emergency department data from injury surveillance units

Concussion data are collected in emergency departments, but data are not routinely collected on whether a sport was involved. Some states (Victorian and Queensland Injury Surveillance Units) analyse emergency department records to identify sport activities, but this is limited by the amount of detail entered into the medical record and is likely an underestimate of concussions occurring during sport.

Other data sources

Concussion data are not currently collected from general practice or allied health in formats that support standardised reporting at state, territory or national levels.

Limitations

Outside hospitals, none of the national data holdings routinely used by the AIHW specifically to identify concussions associated with sport. This can be partially remedied through data linkage, where the AIHW can use information from hospitals data to track the health service use patterns and outcomes of people who have suffered traumatic brain injuries. This could link a person's record of having a sport-related concussion hospitalisation with their Medicare Benefits Scheme (MBS), Pharmaceutical Benefits Scheme (PBS) or subsequent hospital or rehabilitation admission data but would miss most concussions that are believed to not result in a hospital admission and go largely unidentified in national collections.