

Study	Year	Design	Sampling	% Male	Identification of TBI	Definition of TBI	Severity of TBI	Exclusion Criteria	Groupings	Age at injury	Substance Use Measures	Behavioural Measures	Age at Outcome	N Participants for Analysis	Results: Substance Use	Results: Behaviour	Statistical Method	Covariates	Results Adjusted for Covariates	Remarks
McKinlay	2009	Longitudinal	Birth cohort; all births in Christchurch in mid-1977	Not reported	Parental report; medical records	Diagnosis of concussion/suspected concussion or TBI based on medical assessment at GP surgery, A&E department or on hospital admission	Loss of consciousness for 20 mins; 48 hours hospitalisation of equal to or less than 2 days; no skull fracture; no history of deterioration after admission; Glasgow Coma Scale of 13-15	Non-specific head injury, more severe head injury	Inpatient mild TBI; Outpatient mild TBI; No TBI	Birth to 5 years	Rutgers Alcohol Problems Index; survey questions related to illicit substance use and alcohol abuse/dependence	Diagnostic Interview Schedule for Children; Self Report Early Delinquency scale; Revised Behaviour Problems Checklist	14 to 16 years	915	31.6% of inpatient and 12.3% of outpatient participants had substance abuse behaviour; Inpatient group had higher odds of substance abuse disorder vs. reference group, p<0.05; p values for outpatient not reported	36.8% of inpatient and 7.0% of outpatient had oppositional defiant disorder/ conduct disorder (ODD/CD) behaviour; Inpatient group had higher odds of ODD/CD oppositional defiant disorder/ conduct disorder vs. reference group, p<0.01; p values not reported for outpatient	Logistic Regression	Family adverse life events (ages 0-5); maternal punitiveness (age 3)	Higher odds of inpatient group having substance abuse, p<0.05, and oppositional defiant disorder/ conduct disorder, p<0.01	Attention deficit/hyperactivity disorder, mood and anxiety disorder criteria also explored
McKinlay	2014	Longitudinal	Birth cohort; all births in Christchurch in mid-1977	Not reported	Parental report; medical records	Diagnosis of concussion/suspected concussion or TBI based on medical assessment at GP surgery, A&E department or on hospital admission	Loss of consciousness for 20 mins; 48 hours hospitalisation; Post-traumatic amnesia of 2 hours; Glasgow Coma Scale score of 14-15	Non-specific injuries to the head; no diagnosis of concussion was given; abuse as suspected cause of injury	Inpatient mild TBI; Outpatient mild TBI; No TBI	Birth to 5 years	Alcohol and drug dependence: Composite International Diagnostic Interview	Criminal Behaviour: property offenses & violent offenses from Self-report Delinquency Inventory; self-report number of arrests	16 to 25 years	1055 for dependence analysis; 953 for criminal behaviour	Inpatient alcohol p<0.05; Inpatient drug p<0.05; p values for outpatient not reported	Inpatient arrests, property offenses, violent offenses all p<0.01; outpatient arrests p<0.05, property offenses p<0.01, violent offenses p<0.01, effects did not remain once alcohol and drug dependence were included as covariates	Negative binomial regression	Gender; socioeconomic status; early behaviour problems; parental substance abuse/dependence; pre-existing behaviour problems	Inpatient alcohol p<0.10; inpatient drug p<0.01; inpatient arrests, property offenses, violent offenses all p<0.01; outpatient violent offenses p<0.05	Injury at ages 6-15 years and ages 21 - 25 years were also explored in this study
Rosema	2014	Longitudinal	Admissions to a hospital in Melbourne, Australia	52.8	Hospital admission records	Medical records; Glasgow Coma Scale; length of coma; neurological signs; surgical interventions	Glasgow Coma Scale; presence of radiological and neurological abnormalities	Non-accidental, penetrating or previous TBI or pre-existing diagnosis of neurological or developmental disorder	TBI group; no TBI group	1 year to 7 years 11 months	None	Adult Self-Report	21.47 years (mean)	54	N/A	No difference between groups on overall externalising symptoms, p = 0.57, aggressive behaviour, p = 0.36, or rule breaking behaviour, p = 0.46	Independent t-test	None	N/A	Socioeconomic status was lower in the TBI group but not included in the analysis as this is common to childhood TBI
Rosema	2015	Longitudinal	Admissions to a hospital in Melbourne, Australia	65.33	Hospital admission records	Medical records; Glasgow Coma Scale; length of coma; neurological signs; surgical interventions	Glasgow Coma Scale; presence/absence of mass lesion or other specific injury on CT/MRI; presence/absence other neurological impairment	Non-accidental, penetrating or previous TBI or pre-existing diagnosis of neurological, developmental disorder or mental health problems	Mild TBI; moderate TBI; severe TBI; no TBI	1 year to 7 years 11 months	None	Adult Behaviour Checklist	17 to 23 years	104	N/A	No group differences on externalising symptoms p = 0.67	Linear mixed model	Socioeconomic status	Interaction with SES not supported, p =0.69	Trajectory of development of social skills and internalising problems at different time points was explored
Tonks	2011	Cross-sectional	Occupational therapy services in the United Kingdom	Not reported	Occupational therapy services for children with brain injuries	Glasgow Coma Scale when admitted to hospital	Glasgow Coma Scale	Premorbid learning disabilities or severe behaviour difficulties	TBI group; no TBI group	Injury occurred mean of 3.7 years prior to assessment	None	Strengths and Difficulties Questionnaire;	10 to 16 years	81	N/A	TBI group had more parent and teacher rated conduct problems, p<0.01, and peer problems, p<0.01	Analysis of Variance (ANOVA)	None	N/A	Executive function also assessed; effects of TBI in children age 8-10 (0-5 at time of injury) also explored
Winqvist	2007	Longitudinal	Birth cohort; all births in Northern Finland in 1966	60	Finnish Hospital Discharge Register	Skull fracture, cerebral contusion, concussion and intracranial injuries sustained as a result of trauma	International Classification of Diseases 8th revision	Not reported	Mild TBI; moderate-to-severe TBI; no TBI;	Birth to 14 years	Questionnaire: have you ever drunk alcohol? Have you ever been drunk?	None	14 years	176	Drinking to intoxication more common among TBI group than controls (34% vs 25%, p<0.01); mild TBI was associated with drinking to intoxication, p<0.001	N/A	Cox proportional hazards model; log-binomial regression	Father's occupation; family background; place of residence; family history of alcohol misuse; gender	Mild TBI associated with drinking to intoxication, p<0.002; farmer father and attending a special school lowered risk of drinking to intoxication, p<0.001; one-parent family, urban residence and parental alcohol misuse increased risk, p<0.001	Approx 10000 non-injured controls used

Study	Year	Design	Sampling	% Male	Identification of TBI	Definition of TBI	Severity of TBI	Exclusion Criteria	Groupings	Age at Injury	Substance Use Measures	Behavioural Measures	Age at Outcome	N Participants for Analysis	Results: Substance Use	Results: Behaviour	Description of Findings	Statistical Method	Covariates	Results Adjusted for Covariates	Remarks	Reason for Exclusion
Anderson	2012	Longitudinal	Admissions to a hospital in Melbourne, Australia	63	Hospital admission records	Admitted to hospital with TBI diagnosis, including period of altered consciousness	Glasgow Coma Scale; presence/absence of mass lesion or other specific injury on CT/MRI; presence/absence other neurological impairment	Penetrating or non-accidental TBI; pre-existing physical, neurological, psychiatric or developmental disorder	Mild; Moderate; Severe	2 years 0 months to 12 years 11 months	None	Behaviour Rating Inventory of Executive Function- Parent Version; Social Skills Rating Scale	10 years post injury	77	N/A	No severity differences in executive function $p = .55$, or social skills $p = .59$.	The group with severe TBI had the poorest parent reports of adaptive skills and the highest risk of impairment in that domain	MANOVA; Chi-square; 1 SD below the norm as impairment	Glasgow Coma Scale score; white matter volume; age at injury; Vineland Adaptive Behaviour Scale; socioeconomic status; family functioning; utilization of interventions	Pre-injury adaptive behaviour explained 23.3% of the variance in adaptive function at follow-up, $p = 0.01$	Neuroimaging and intellectual ability also explored	Measures not relevant
DeMateo	2014	Longitudinal	Admissions to a hospital in Ontario, United States of America	59	Hospital admission records	Acquired brain injury with a traumatic or non-traumatic cause, eg stroke, aneurysm, anoxia or infection, to have occurred at least 7 days after birth and not related to congenital neurodevelopmental disorder	Glasgow Coma Scale	Brain tumour; over 18 at the time of follow-up	TBI group; healthy controls from another study ($n=391$)	5 to 18 years	None	Strengths and Difficulties Questionnaire; Psychosocial Summary Score from the Child Health Questionnaire	5 years post injury	44	N/A	Psychosocial summary score was lower for TBI group at 5 years $p<0.001$.		Independent samples t-test; mixed effect models	Gender; age at injury; behavioural problems before injury as per school records	Psychosocial summary score shows a decline at the return to school timepoint, $p = 0.004$, which does not recover over time	Age range is too wide for inclusion	Age range at injury
Donders	2007	Cross-sectional	Rehabilitation facility, Michigan, United States of America	66.67	Chart review of participating rehabilitation facilities	Loss of consciousness; Rancho Los Amigos level VII-VIII	Glasgow Coma Scale	Prior learning disability; psychiatric history; impairment that precluded completion of the tasks	Early onset TBI; Late onset TBI	6 to 12 years	None	Dysexecutive Questionnaire;	17 to 21 years	45	N/A	No group difference for self-report, $p > 0.10$; difference for family or friend rated, $p < 0.003$	Early onset group described as having worse abilities to handle executive responsibilities in everyday life	ANOVA	None	N/A	Performance in cognitive tasks and community integration also explored	Dysexecutive Questionnaire does not measure relevant outcome
Green	2013	Longitudinal follow-up study	Admissions to a hospital in Melbourne, Australia	62.5	Hospital admission records	Admitted to hospital with TBI diagnosis, including period of altered consciousness	Glasgow Coma Scale; presence/absence of mass lesion or other specific injury on CT/MRI; presence/absence other neurological impairment	Penetrating or non-accidental TBI; previous TBI; pre-existing physical, neurological, psychiatric or developmental disorder	Parents of a child who had a TBI; parents of a non-injured child	Birth to 5 years	None	Sydney Psychosocial Reintegration Scale for Children (SPRS-C); Paediatric Quality of Life Inventory (PedsQL)	15 to 18 years (mean 15.5)	33 (17 TBI parents, 16 control parents)	N/A	No group difference in SPRS-C, $p = .087$; group differences in PedsQL, $p = 0.009$.	The non-injured group had higher quality of life scores than the TBI group, this was especially the case for severe TBI vs controls	Mann-Whitney tests	None	N/A	Check measures are okay	Measures assess problems child may have in life in general but not problematic behaviour
McKinlay	2002	Birth Cohort	All births in Christchurch in mid-1977	57	Parental report; medical records	Diagnosis of concussion/suspected concussion or TBI based on medical assessment at GP surgery, A&E department or on hospital admission	Loss of consciousness for 20 mins; hospitalisation of equal to or less than 2 days; no skull fracture on hospital admission	Non-specific head injury; more severe head injury	Inpatient mild; Outpatient mild; No injury	Birth to 10 years	None	Butter and Connors maternal report questionnaires	10 to 13 years	814 to 835 participants	N/A	Inpatient 0-10 all ratings of hyperactivity/inattention were higher than reference group, $p < 0.001$, and outpatient group, $p < 0.004$; inpatient 0-10 all ratings of conduct were higher in reference group, $p < 0.01$, and outpatient, $p < 0.02$ (not parent $p < 0.14$)	Inpatient group had higher ratings of both hyperactivity/inattention and conduct, the outpatient and no-injury groups had comparable ratings	ANOVA	Family life adverse effects; mothers age; birth weight; mother-child relationship; mothers education; parental separations; step parent changes; socioeconomic status; early conduct were higher than reference group, $p < 0.001$, and outpatient group, $p < 0.004$	Inpatient 0-10 all ratings of hyperactivity/inattention were higher than reference group, $p < 0.001$, and outpatient group, $p < 0.003$; inpatient 0-10 only teacher and combined ratings of conduct were higher than reference group, $p < 0.001$, and outpatient group, $p < 0.004$	Further analysis carried out on too young, similar outcomes are explored in the same cohort in McKinlay 2009	Age at outcome is too young, similar outcomes are explored in the same cohort in McKinlay 2009
Muscara	2009	Longitudinal study	Admissions to a hospital in Melbourne, Australia	63.88	Hospital admission records	Medical records; Glasgow Coma Scale; length of coma; neurological signs; surgical interventions	Glasgow Coma Scale; presence/absence of mass lesion or other specific injury on CT/MRI; scan findings	Previous TBI; pre-existing neurological or developmental disorder; abuse; learning or attentional disability	Mild; Moderate/Severe	8 to 12 years	None	Adaptive Behaviour Assessment System - Social Composite Score; Social Skills Rating System	16 to 22 years	36	N/A	Mild TBI were rated by parents as having a better performance than the moderate/severe TBI group in ABAS, $p < .05$; trend towards better parent ratings of social skills in mild TBI, $p = 0.07$	No difference between self and parent ratings on either scale	ANOVA	Vineland Adaptive Behaviour Scale; Behaviour Rating Inventory of Executive Function; Social Problem Solving Skills Inventory; socioeconomic status; family functioning questionnaire; injury severity	Pre-injury adaptive functioning and SES were predictive of ABAS parent report, 57% of variance, and SSRS parent report, 47% variance	Social reintegration also explored	Not case control
Rosema	2014	Longitudinal study	Admissions to a hospital in Melbourne, Australia	45.45	Hospital admission records	Medical records; Glasgow Coma Scale; length of coma; neurological signs; surgical interventions	Glasgow Coma Scale; presence/absence of mass lesion or other specific injury on CT/MRI; presence/absence other neurological impairment	Non-accidental, penetrating or previous TBI or pre-existing diagnosis of neurological, developmental disorder or mental health problems	Mild; Moderate; Severe	1 to 7 years	Achenbach Systems of Empirically Based Assessment	Adaptive Behaviour Assessment System - social subscale; Adult Self-Report; Adult Behaviour Checklist	mean 21.36 years	33	Excellent agreement found in participant and proxy ratings of alcohol and drug use, $p < 0.001$	All participant and proxy scores fell within normal range; fair agreement between participant and proxy ratings of externalising behaviour, $p < 0.01$	Participant and proxy have good agreement for measures of interest	Independent t-test; chi square; intraclass correlation coefficients; hierarchical regression analysis	Vineland Adaptive Behaviour Scale; socioeconomic status; family functioning questionnaire; injury severity	preinjury adaptive behaviour was predictive of rule breaking at a trend level, $p < 0.08$	Study explored participant and proxy agreement on many subscales	No really relevant in terms of research question; age range might be high at outcome
Timonen	2002	Birth Cohort	All births in Northern Finland in 1966	51	Finnish Hospital Discharge Register	Skull fracture, cerebral contusion, concussion and intracranial injuries sustained as a result of trauma	Not reported	Facial traumas	TBI group; no TBI group	Birth to 15 years	Finnish Hospital Discharge Register used to identify participants who were admitted to hospital meeting DSM-IV diagnoses or alcohol dependence or abuse; participants with at least 2 registered drink driving offences	Finnish Hospital Discharge Register used to identify participants admitted to hospital for a psychiatric disorder other than alcohol abuse/dependence; national register on crimes used to classify criminal offenders	16 to 31 years	5589 males; 5345 females	Adjusted OR 1.3 (CI 0.6 - 2.8) for males with TBI; only 2 females with TBI and heavy alcohol use	In males with TBI, risk of psychiatric disorder OR 2.1, risk of criminality OR 1.7, psychiatric disorder and criminality OR 4.3	Behaviour results for males were significant; there were only two female participants with TBI and outcome of interest	Odds ratios; ANOVA; logistic regression	Marital status of mother; social class of father; urban/rural home	In males psychiatric disorder OR 2.1, criminality OR 1.6 and both together OR 4.1	Concussion was most common type of TBI (93.8% in males, 100% in females); information on age also reported	The age ranges of both injury and outcome are too wide