Appendix

Update of Literature Search

A literature search was carried out to update that by McGinley and McMillan (2019). The purpose was to determine whether there was published evidence in women offenders with head injury on disability or consideration of comorbidities in analysis of violence as an outcome. The following databases were searched from 1 January 2019 to 20 February 2021; PsycINFO (EBSCO), CINAHL (EBSCO), EMBASE (OVID), Medline (OVID). Duplicates were removed prior to references being retrieved for review. Papers had to be published in English language. The text word search used by McGinley and McMillan (2019) was repeated:
((“Traumatic Brain Injury” OR TBI OR “Head Injur*”)) AND ((crim* OR inmate* OR prison* OR offend*))
No relevant studies were identified. Results were as follows:

HOST	Total	Titles Read	Abstracts Read	Papers Read	Disability	Head Injury and Violence or Comorbidity
OVID	140	140	28	14	0	0
EBSCO	117	117	36	17	0	0

McGinley A, McMillan TM. The Prevalence, Characteristics and Impact of Head Injury in Female Prisoners: A PRISMA Systematic Review. *Brain Inj* 2019: 33:1581-91

Analysis of Cognitive Test Scores

The cognitive test z-scores were adjusted for age, years of education, delayed word memory score and, where available, recent methadone use. This was done by fitting a linear model to the raw cognitive test scores, adjusting for the aforementioned covariates, extracting the residuals and standardising them to mean 0 and SD 1. For nine participants with methadone use missing, residuals were extracted from a model without that variable, and the full set of residuals restandardised. The overall cognitive impairment z-score was calculated as a mean of the positive symbol digit, AMIPB, COWAT animals and COWAT letters z-scores and the negative TRAILS part B z-score, resulting in a z-score for which lower values represent greater cognitive impairment. If an individual score was missing, then the overall score was calculated as the mean of the available scores (see table A4 and figure A3; p8-9).

Model Fit Statistics for Outcome Measures

Table A1: Hosmer-Lemeshow model fit statistics and corresponding p-values for logistic regression models fitted to the outcomes listed, indicating that all models were a good fit to the data

Model	Hosmer-Lemeshow statistic	p-value
GODS HI disability		
Current	4.25	0.83
Historical	2.14	0.97
GODS any cause disability		
Current	3.32	0.91
Historical	3.16	0.92
Violent offences		
Current	9.19	0.33
Historical	9.47	0.30
Property offences		
Current	6.34	0.61
Historical	1.17	0.99
Other offences		
Current	7.52	0.48
Historical	7.66	0.99

Central Nervous System Disorders and Adult Health

Table A2: History of central nervous system (CNS) disorder other than head injury

Variable	Statistic	All (N = 109)	S-HI (N = 85)	NoS-HI (N = 24)
CNS diagnosis: Adult	N (%)	34 (31%)	27 (32%)*	7 (29%)
Stroke or transient ischaemic attack	N (%)	6 (6%)	5 (6%)*	1 (4%)
Cerebral anoxia	N (%)	16 (15%)	13 (16%)§	3 (12%)
Epilepsy	N (%)	13 (12%)	9 (11%)§	4 (17%)
Dementia	N (%)	1 (1%)	0 (0%)§	1 (4%)
Multiple sclerosis	N (%)	1 (1%)	0 (0%)§	1 (4%)
Brain infection	N (%)	4 (4%)	4 (5%)§	0 (0%)
CNS diagnosis: Child	N (%)	23 (23%)	20 (26%)^	3 (12%)
ADHD	N (%)	8 (8%)	7 (9%)+	1 (4%)
Learning disability	N (%)	7 (7%)	6 (8%)~	1 (4%)
Developmental disability	N (%)	3 (3%)	2 (3%)+	1 (4%)
Epilepsy	N (%)	7 (6%)	5 (6%)*	2 (8%)
Cerebral anoxia	N (%)	1 (1%)	1 (1%)*	0 (0%)
Brain infection	N (%)	2 (2%)	2 (2%)*	0 (0%)
Toxic hazard				
Household exposure to lead	N (%)	6 (6%)	4 (5%)*	2 (8%)

Missing values n=1* ; n=2§ ; n=8^ ; n=9~ ; n=11+

Table A3: Adult health

Variable	Statistic	All (N = 109)	S-HI (N = 85)	NoS-HI (N = 24)	P-value
Any physical health condition	N (%)	72 (67%)	55 (66%)[§]	17 (71%)	0.863
Physical health condition type	N_{obs} (N_{miss})	105 (4)	81 (4)	24 (0)	
None	N (%)	36 (34%)	29 (36%)	7 (29%)	
Neurological	N (%)	7 (7%)	6 (7%)	1 (4%)	
Cardio	N (%)	2 (2%)	0 (0%)	2 (8%)	
Respiratory	N (%)	13 (12%)	12 (15%)	1 (4%)	
GIT	N (%)	2 (2%)	2 (2%)	0 (0%)	
Renal	N (%)	2 (2%)	1 (1%)	1 (4%)	0.051
Diabetes	N (%)	3 (3%)	1 (1%)	2 (8%)	
Hepatic	N (%)	3 (3%)	1 (1%)	2 (8%)	
Arthritis	N (%)	4 (4%)	4 (5%)	0 (0%)	
Orthopaedic	N (%)	3 (3%)	3 (4%)	0 (0%)	
Pain	N (%)	9 (9%)	6 (7%)	3 (12%)	
Other/multiple	N (%)	21 (20%)	16 (20%)	5 (21%)	
Any mental health condition	N (%)	98 (92%)	80 (96%)[§]	18 (75%)	0.004
Mental health problem	N_{obs} (N_{miss})	106 (3)	83 (2)	23 (1)	
None	N (%)	8 (8%)	3 (4%)	5 (22%)	
Depression	N (%)	9 (8%)	7 (8%)	2 (9%)	
Anxiety	N (%)	3 (3%)	3 (4%)	0 (0%)	
Dep+Anx	N (%)	49 (46%)	40 (48%)	9 (39%)	
PTSD (anx dep)	N (%)	8 (8%)	7 (8%)	1 (4%)	0.142
Psychosis plus other	N (%)	5 (5%)	4 (5%)	1 (4%)	
Learning disability plus other	N (%)	2 (2%)	1 (1%)	1 (4%)	
Personality disorder plus other	N (%)	17 (16%)	15 (18%)	2 (9%)	
Other	N (%)	1 (1%)	1 (1%)	0 (0%)	
Multiple other	N (%)	4 (4%)	2 (2%)	2 (9%)	
HADS* depression score	N_{obs} (N_{miss})	105 (4)	81 (4)	24 (0)	
	Median (IQR)	9 [6, 11]	10 [7, 12]	7 [4, 9]	0.008
	Range	(0, 20)	(0, 20)	(0, 14)	
Depression (HADS depression>10)	N (%)	37 (35%)	32 (40%)	5 (21%)	0.150
HADS anxiety score	N_{obs} (N_{miss})	105 (4)	81 (4)	24 (0)	
	Median (IQR)	13 [10, 16]	14 [10, 16]	11 [6, 13]	<0.001
	Range	(0, 21)	(5, 21)	(0, 18)	
Anxiety (HADS anxiety>10)	N (%)	73 (70%)	60 (74%)	13 (54%)	0.108
Current clinical depression or anxiety	N (%)	78 (74%)	64 (79%)	14 (58%)	0.077

Hospital Anxiety and Depression Scale*. Missing values n=2[§]

Figures A1-A2 Disability Outcome

Figure A1: Odds ratios for current (upper) and historical (lower) risk factors, for HI-attributed disability. Note that the horizontal axis on the lower plot has been truncated

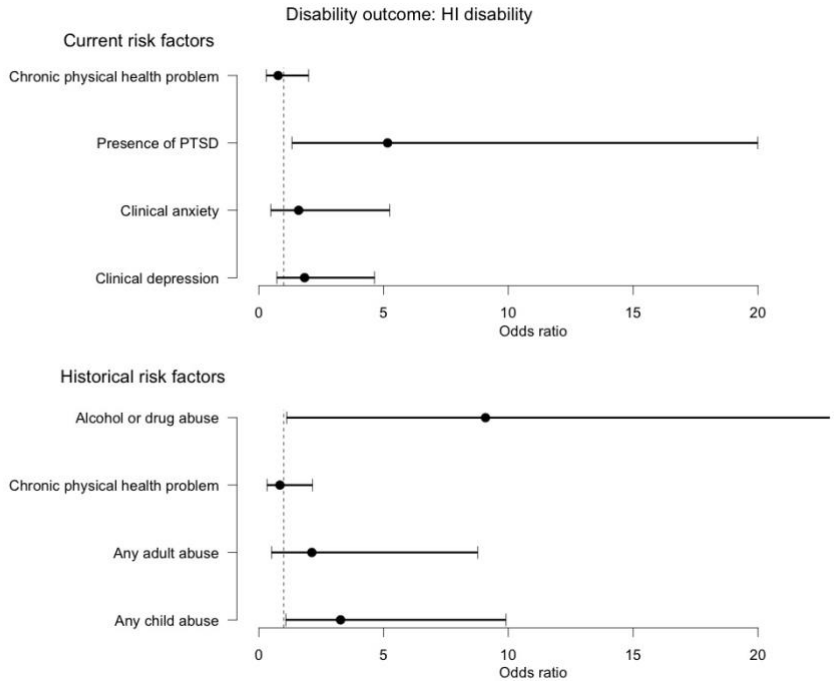
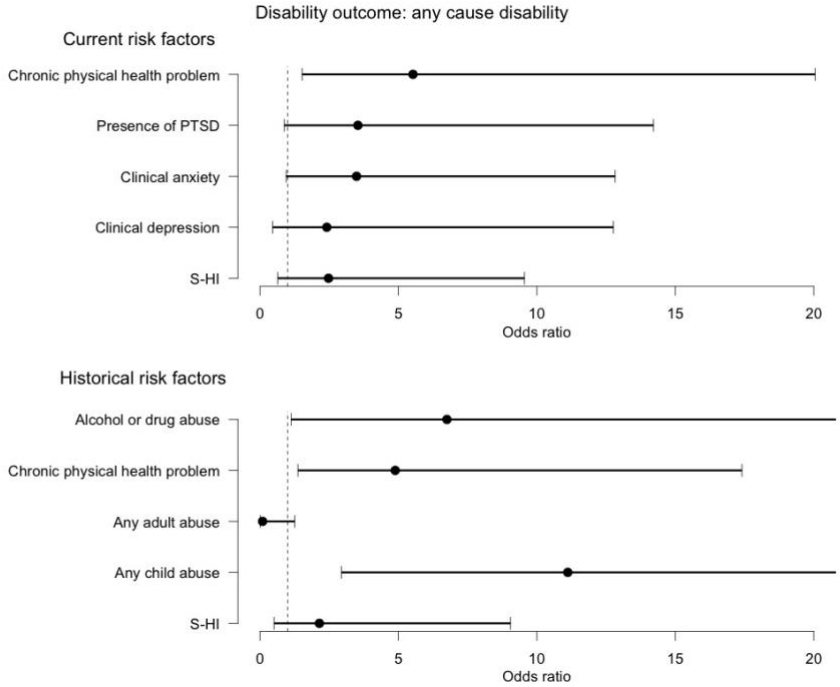


Figure A2 Odds ratios for current (upper) and historical (lower) risk factors, for disability of any cause. Note that the horizontal axis on the lower plot has been truncated



Cognitive Function

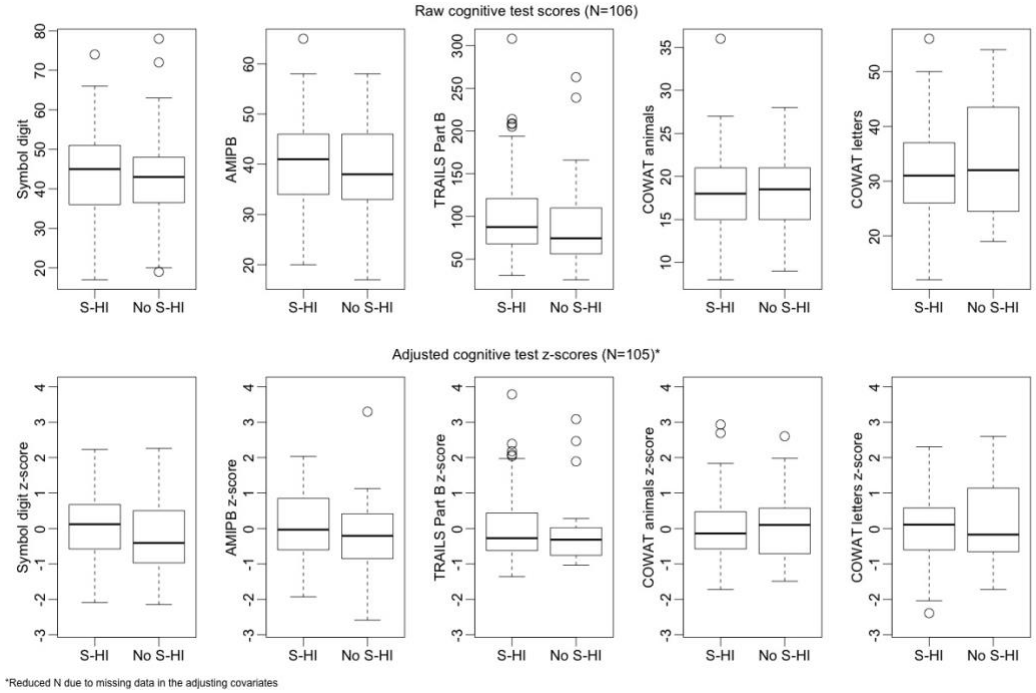
Table A4: Cognitive impairment. z-scores are adjusted for age, years of education, recent methadone and delayed word memory score

Variable	Statistic	All (N = 109)	HI (N = 85)	No.HI (N = 24)
Word memory delayed score	N_{obs} (N_{miss})	106 (3)	82 (3)	24 (0)
	Mean (SD)	36.0 (4.2)	36.1 (4.0)	35.8 (5.0)
	Range	(18.0, 40.0)	(18.0, 40.0)	(18.0, 40.0)
Symbol digit score	N_{obs} (N_{miss})	106 (3)	82 (3)	24 (0)
	Mean (SD)	43.6 (11.8)	44.0 (10.9)	42.5 (14.6)
	Range	(17.0, 78.0)	(17.0, 74.0)	(19.0, 78.0)
Symbol digit adjusted z-score	N_{obs} (N_{miss})	105 (4)	81 (4)	24 (0)
	Mean (SD)	0.000 (1.000)	0.058 (0.909)	-0.195 (1.264)
	Range	(-2.147, 2.263)	(-2.089, 2.234)	(-2.147, 2.263)
AMIPB total score	N_{obs} (N_{miss})	104 (5)	81 (4)	23 (1)
	Mean (SD)	39.9 (9.7)	40.3 (9.5)	38.3 (10.7)
	Range	(17.0, 65.0)	(20.0, 65.0)	(17.0, 58.0)
AMIPB adjusted z-score	N_{obs} (N_{miss})	103 (6)	80 (5)	23 (1)
	Mean (SD)	0.000 (1.000)	0.053 (0.932)	-0.185 (1.213)
	Range	(-2.587, 3.296)	(-1.929, 2.036)	(-2.587, 3.296)
TRAILS part B score	N_{obs} (N_{miss})	101 (8)	79 (6)	22 (2)
	Mean (SD)	97.6 (52.9)	98.7 (50.9)	93.4 (60.9)
	Range	(26.0, 308.0)	(31.0, 308.0)	(26.0, 263.0)
TRAILS part B adjusted z-score	N_{obs} (N_{miss})	99 (10)	77 (8)	22 (2)

	Mean (SD)	0.000 (1.000)	0.015 (0.975)	-0.053 (1.106)
	Range	(-1.361, 3.785)	(-1.361, 3.785)	(-1.037, 3.085)
COWAT animals score	N_{obs} (N_{miss})	106 (3)	82 (3)	24 (0)
	Mean (SD)	18.1 (4.8)	17.9 (4.7)	18.9 (5.1)
	Range	(8.0, 36.0)	(8.0, 36.0)	(9.0, 28.0)
COWAT animals adjusted z-score	N_{obs} (N_{miss})	105 (4)	81 (4)	24 (0)
	Mean (SD)	0.000 (1.000)	-0.024 (0.992)	0.082 (1.043)
	Range	(-1.724, 2.933)	(-1.724, 2.933)	(-1.488, 2.603)
COWAT letters score	N_{obs} (N_{miss})	104 (5)	81 (4)	23 (1)
	Mean (SD)	32.0 (9.1)	31.6 (8.6)	33.5 (10.8)
	Range	(12.0, 56.0)	(12.0, 56.0)	(19.0, 54.0)
COWAT letters adjusted z-score	N_{obs} (N_{miss})	103 (6)	80 (5)	23 (1)
	Mean (SD)	0.000 (1.000)	-0.049 (0.928)	0.170 (1.227)
	Range	(-2.390, 2.603)	(-2.390, 2.301)	(-1.720, 2.603)
Overall cognitive impairment (adjusted z-score)*	N_{obs} (N_{miss})	105 (4)	81 (4)	24 (0)
	Mean (SD)	0.000 (1.000)	0.016 (0.890)	-0.054 (1.327)
	Range	(-2.764, 3.244)	(-2.661, 1.999)	(-2.764, 3.244)

* For the overall cognitive impairment a lower score represents greater cognitive impairment

Figure A3 Box and whisker blots for cognitive scores



Figures A4-8 Risk Factors for Offending

Figure A4 Odds ratios (adjusted) for current (upper) and historical (lower) risk factors, for violent/non-violent offending

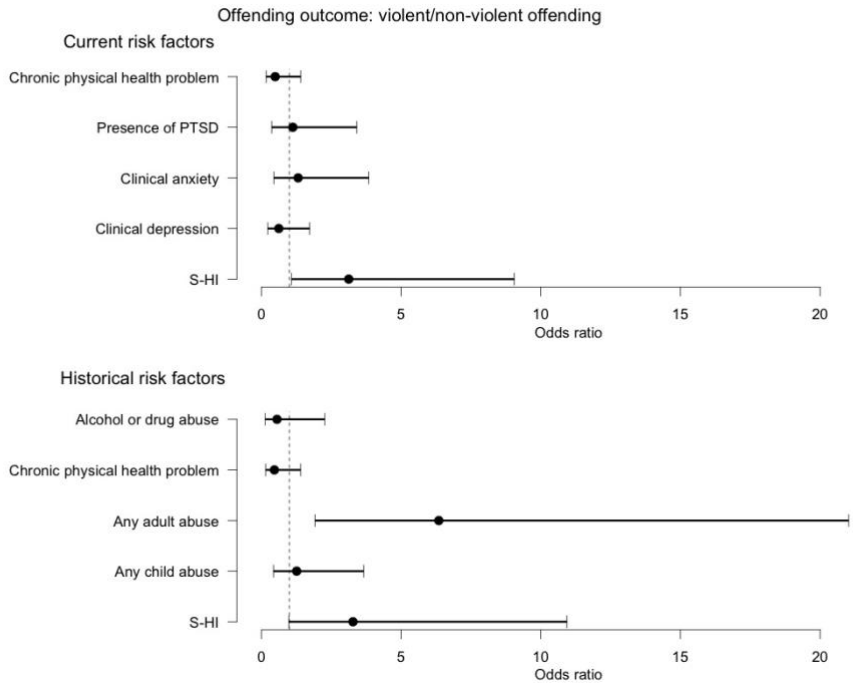


Figure A5: Rate ratios (adjusted) for current (upper) and historical (lower) risk factors, for total time in prison (months)

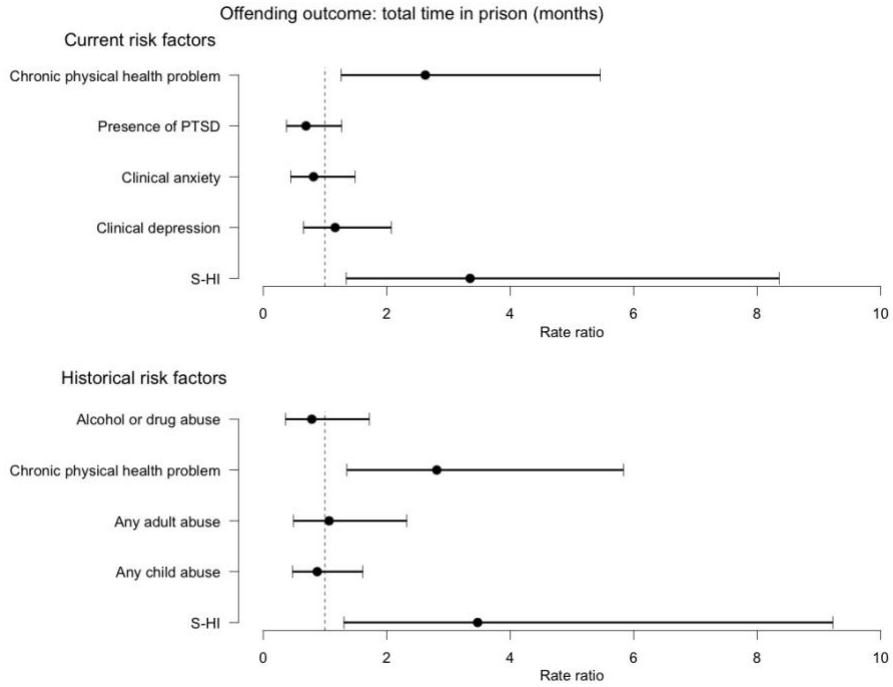


Figure A6: Rate ratios (adjusted) for current (upper) and historical (lower) risk factors for number of convictions

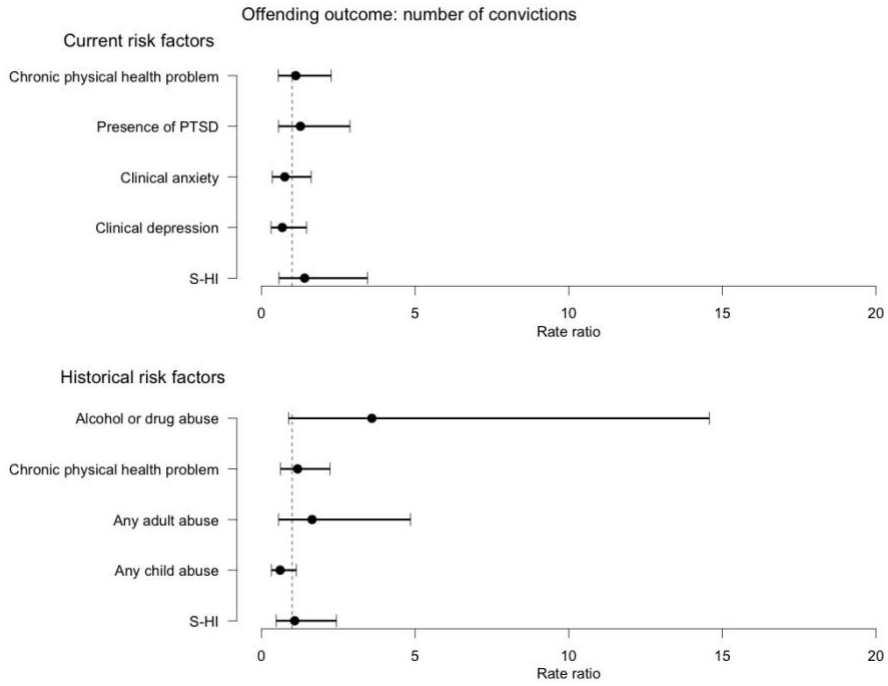


Figure A7: Rate ratios (adjusted) for current (upper) and historical (lower) risk factors for age at first arrest

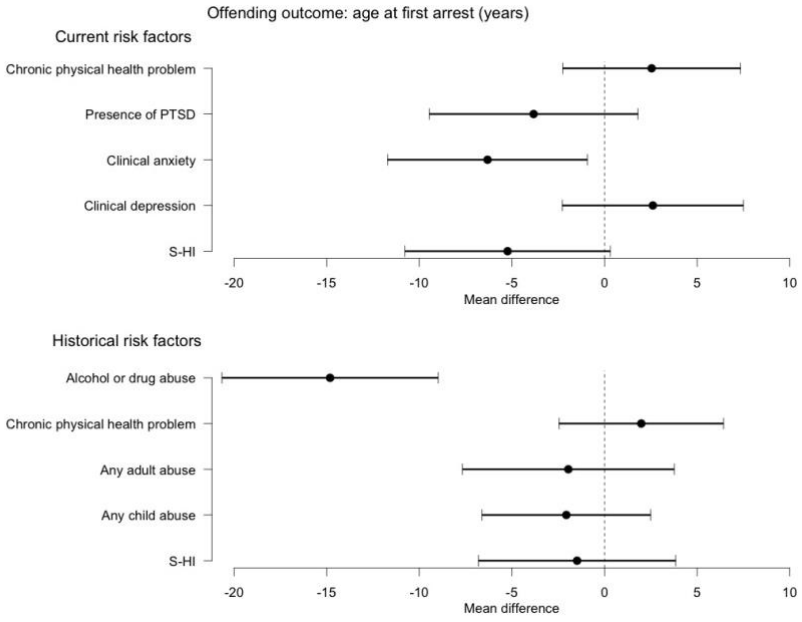
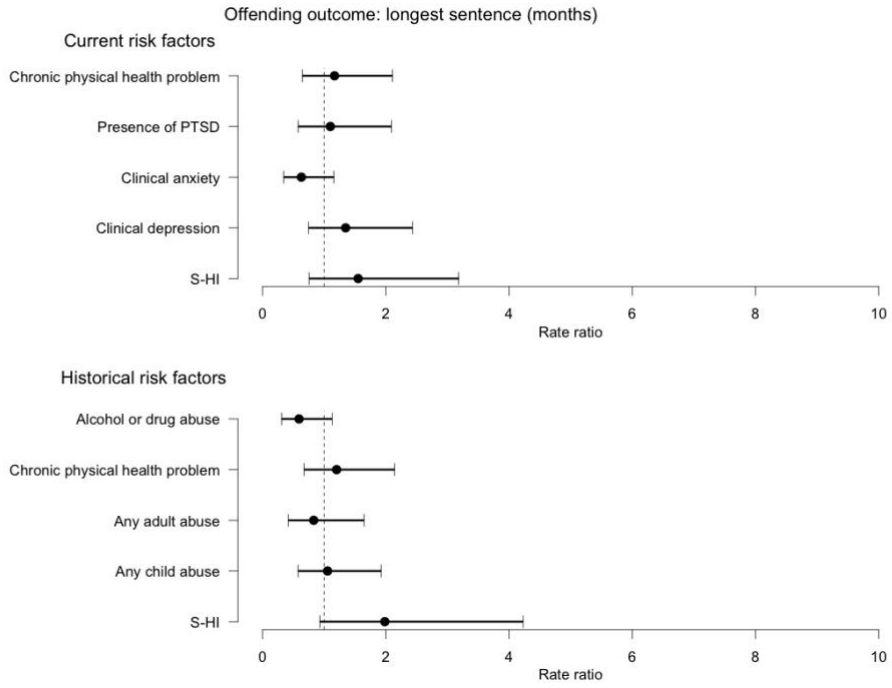


Figure A8: Rate ratios (adjusted) for current (upper) and historical (lower) risk factors for longest length of sentence



Comparison of Cognitive Test Scores with Test Norms

Published norms for the general population, stratified where available for age, education and gender, were used to create z-scores for each individual and from these mean deviation from the norms are presented in table A2.

Table A5: Comparison between cognitive test scores and test norms

Test	Stratification of Test Norm	Test Norm (Mean; SD)	WiP Mean Z-score	P value
Symbol Digit Modalities Test[1]	Age; education; gender	50.2; 11.4	-0.58	0.28
Auditory Verbal Learning Test[2]	Age	54.2; 7.9	-1.81	0.04
Trail Making Test B[3]	Age	58.4; 16.4	-2.39	<0.01
Verbal Fluency (letters)[4]	Age; education; gender	35.9; 9.6	-0.41	0.34

1. Kiely KM, Butterworth P, Watson N et al (2014). The Symbol Digit Modalities Test: Normative Data from a Large Nationally Representative Sample of Australians. *Archives of Clinical Neuropsychology*, 29; 767–775

2. Coughlan AK & Hollows SE. The Adult Memory and Information Processing Battery Test Manual. Psychology Department, University of Leeds, Leeds, UK 1985.

3. Tombaugh T. Trail Making Test A and B: Normative data stratified by age and education. Archives of *Clin Neuropsychol* 2004: 19:203-214.

4. Ruff R, Light R, Parker S et al. Benton Controlled Oral Word Association Test: reliability and updated norms. *Archiv Clin Neuropsychol* 1996: 11(4): 329-338.

Methods used to Reduce Error in Self-Report

Table A6

Variable	Tool	Method	Notes
Head Injury	OSU-TBI	Validated interview	Also informing participants about what constitutes a head injury prior to the start of the interview
Disability	Glasgow Outcome at Discharge Scale	Validated interview	Also utilising information separately from an informant (Personal Prison Officer)