1

1   **Appendix 2: Supplementary results**
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Table S5. Number of matched controls to cases of concussion		
	N (47483)	**Percent (%)**
1	583	1
2	2253	5
3	44647	94

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Table S6. Number of individuals with 1, 2, or 3+ concussions		
	N (47483)	**Percent (%)**
1	42624	90
2	3887	8
3	972	2

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Table S7. Number of diagnoses by age at incident concussion				
Age-group, y	Control		Concussion	
ADHD	Diagnosis	Censored	Diagnosis	Censored
0 to 9	1506	19168	835	6128
10 to 19	2343	48225	1074	16280
20 to 29	225	20026	170	6720
30 to 39	139	14597	83	4899
40 to 49	76	12472	60	4147
50 to 59	45	8884	32	3014
60 to 69	25	5475	11	1866
70 to 79	12	3568	*	1255
80 to 89	8	2014	*	779
90+	*	221	*	127
Mood and anxiety disorders				
0 to 9	2463	18211	1376	5587
10 to 19	9316	41252	4613	12741
20 to 29	4540	15711	2879	4011
30 to 39	4121	10615	2595	2387
40 to 49	3645	8903	2150	2057
50 to 59	2486	6443	1419	1627
60 to 69	1456	4044	786	1091
70 to 79	1115	2465	550	708
80 to 89	606	1416	285	494
90+	53	169	26	101
Dementia				
0 to 9	24	20650	18	6945
10 to 19	132	50436	63	17291
20 to 29	83	20168	85	6805
30 to 39	107	14629	92	4890
40 to 49	166	12382	145	4062
50 to 59	251	8678	167	2879
60 to 69	427	5073	295	1582
70 to 79	791	2789	431	827
80 to 89	682	1340	362	417
90+	88	134	64	63

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Table S7. Number of diagnoses by age at incident concussion (continued)				
Parkinson's disease				
0 to 9	*	20673	*	6963
10 to 19	36	50532	28	17326
20 to 29	83	20168	54	6836
30 to 39	126	14610	104	4878
40 to 49	169	12379	110	4097
50 to 59	147	8782	84	2962
60 to 69	178	5322	98	1779
70 to 79	160	3420	92	1166
80 to 89	79	1943	30	749
90+	*	218	*	124
ADHD, attention-deficit hyperactivity disorder. ***** Denotes ≤5 cases.				

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Table S8. Hazard ratios for outcomes of interest with exposure to 3+ concussions compared to 1 concussion				
	Model a		**Model b**	
	HR (95% CI)	***p*-value**	**HR (95% CI)**	***p*-value**
ADHD	1.10 (0.63-1.94)	0.73	1.12 (0.64-1.97)	0.70
Mood and anxiety disorders	1.21 (1.00-1.45)	0.05	1.22 (1.01-1.47)	0.04
Dementia	1.94 (1.06-3.55)	0.03	1.95 (1.07-3.56)	0.03
Parkinson's disease	3.23 (1.61-6.48)	0.001	3.27 (1.63-6.59)	<.001
Model a, Cox proportional hazard ratio adjusted for age, sex, and geographic location via cluster analysis. **Model b**, model a plus adjustment for socioeconomic status and comorbidities.**HR**, hazard ratio. **95% CI**, 95% confidence interval. **ADHD**, attention-deficit hyperactivity disorder.				

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Table S9. Average time in years to follow-up diagnosis for attention-deficit hyperactivity disorder (ADHD)		
	Censored	**ADHD**
	Mean (95% CI)	**Mean (95% CI)**
Control	8.2 (8.1-8.2)	3.1 (3.0-3.2)
Concussion	9.5 (9.4-9.6)	3.6 (3.4-3.8)

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Table S10. Average time in years to follow-up diagnosis for mood and anxiety disorders (MADs)		
	Censored	**MADs**
	Mean (95% CI)	**Mean (95% CI)**
Control	7.2 (7.1-7.2)	4.7 (4.7-4.8)
Concussion	8.2 (8.1-8.3)	4.0 (4.0-4.1)

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Table S11. Average time in years to follow-up diagnosis for dementia		
	Censored	**MADs**
	Mean (95% CI)	**Mean (95% CI)**
Control	8.2 (8.1-8.2)	7.4 (7.2-7.6)
Concussion	9.5 (9.4-9.6)	6.9 (6.6-7.2)

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Table S12. Average time in years to follow-up diagnosis for Parkinson's disease		
	Censored	**MADs**
	Mean (95% CI)	**Mean (95% CI)**
Control	8.2 (8.1-8.2)	7.7 (7.4-8.1)
Concussion	9.5 (9.5-9.6)	8.0 (7.5-8.5)

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Table S13. Number of diagnoses of attention-deficit hyperactivity disorder by fiscal year		
	Control	**Concussion**
1990/91	*	*
1991/92	13	12
1992/93	29	15
1993/94	33	16
1994/95	42	27
1995/96	93	63
1996/97	87	52
1997/98	92	55
1998/99	109	57
1999/00	146	70
2000/01	128	66
2001/02	130	62
2002/03	170	102
2003/04	188	85
2004/05	192	105
2005/06	190	118
2006/07	212	93
2007/08	209	101
2008/09	207	102
2009/10	240	133
2010/11	292	145
2011/12	325	178
2012/13	409	177
2013/14	409	195
2014/15	430	237
* Denotes ≤5 cases.		

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Table S14. Number of diagnoses of mood and anxiety disorders by fiscal year		
	Control	**Concussion**
1990/91	84	94
1991/92	189	169
1992/93	264	215
1993/94	316	248
1994/95	425	313
1995/96	723	478
1996/97	683	439
1997/98	746	454
1998/99	926	545
1999/00	1046	603
2000/01	1192	697
2001/02	1259	687
2002/03	1365	746
2003/04	1417	776
2004/05	1445	795
2005/06	1517	782
2006/07	1582	846
2007/08	1628	847
2008/09	1704	917
2009/10	1888	981
2010/11	1923	995
2011/12	1927	1055
2012/13	1925	1055
2013/14	1935	1033
2014/15	1692	909

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Table S15. Number of diagnoses of dementia by fiscal year		
	Control	**Concussion**
1990/91	6	10
1991/92	23	16
1992/93	25	18
1993/94	44	34
1994/95	45	27
1995/96	72	34
1996/97	69	40
1997/98	58	40
1998/99	81	49
1999/00	76	57
2000/01	89	67
2001/02	119	65
2002/03	115	79
2003/04	122	88
2004/05	114	67
2005/06	131	83
2006/07	138	91
2007/08	140	71
2008/09	133	69
2009/10	156	102
2010/11	188	108
2011/12	165	85
2012/13	204	131
2013/14	212	140
2014/15	226	151

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Table S16. Number of diagnoses of Parkinson's disease by fiscal year		
	Control	**Concussion**
1990/91	*	*
1991/92	*	*
1992/93	*	*
1993/94	8	*
1994/95	14	*
1995/96	18	16
1996/97	17	10
1997/98	30	20
1998/99	27	10
1999/00	30	17
2000/01	41	15
2001/02	32	19
2002/03	29	25
2003/04	37	33
2004/05	56	26
2005/06	43	32
2006/07	65	33
2007/08	60	34
2008/09	65	32
2009/10	63	40
2010/11	64	49
2011/12	57	39
2012/13	78	42
2013/14	65	43
2014/15	79	56
* Denotes ≤5 cases.		

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Table S17. Hazard ratios for concussion-induced risk of outcomes of interest by age at incident concussion				
	Model a		**Model b**	
ADHD	**HR (95% CI)**	***p*-value**	**HR (95% CI)**	***p*-value**
0-9 years	1.48 (1.36-1.61)		1.46 (1.34-1.59)	
10-19 years	1.28 (1.19-1.37)	<.001	1.28 (1.19-1.37)	<.001
20-29 years	1.81 (1.48-2.22)		1.78 (1.45-2.19)	
30-39 years	1.56 (1.18-2.06)	0.002	1.56 (1.18-2.07)	0.002
40-49 years	2.11 (1.50-2.97)	<.001	2.08 (1.47-2.93)	<.001
50-59 years	1.92 (1.21-3.06)	0.006	1.93 (1.20-3.08)	0.006
60-69 years	1.03 (0.49-2.16)	0.94	1.02 (0.48-2.19)	0.95
70+ years	0.36 (0.10-1.28)	0.11	0.37 (0.10-1.31)	0.12
Mood and anxiety disorders				
0-9 years	1.39 (1.30-1.49)		1.38 (1.28-1.47)	
10-19 years	1.41 (1.36-1.46)		1.39 (1.34-1.44)	
20-29 years	1.96 (1.87-2.06)		1.91 (1.81-2.00)	
30-39 years	2.28 (2.16-2.40)	<.001	2.20 (2.09-2.32)	<.001
40-49 years	2.14 (2.03-2.27)		2.09 (1.98-2.21)	
50-59 years	1.98 (1.85-2.12)		1.96 (1.83-2.10)	
60-69 years	1.78 (1.62-1.95)		1.78 (1.62-1.96)	
70+ years	1.51 (1.38-1.65)		1.50 (1.37-1.64)	
Dementia				
0-9 years	1.88 (0.99-3.57)	0.05	1.70 (0.88-3.28)	0.12
10-19 years	1.16 (0.85-1.57)	0.35	1.14 (0.84-1.55)	0.41
20-29 years	2.44 (1.79-3.32)		2.32 (1.70-3.18)	
30-39 years	2.14 (1.60-2.86)		2.05 (1.53-2.76)	
40-49 years	2.22 (1.76-2.81)	<.001	2.14 (1.69-2.71)	<.001
50-59 years	1.73 (1.40-2.13)		1.65 (1.33-2.04)	
60-69 years	1.82 (1.54-2.15)		1.82 (1.54-2.16)	
70+ years	1.64 (1.49-1.81)		1.62 (1.47-1.79)	
Parkinson's disease				
0-9 years	N/A	N/A	N/A	N/A
10-19 years	1.63 (0.96-2.78)	0.07	1.59 (0.93-2.72)	0.09
20-29 years	1.44 (1.00-2.06)	0.05	1.36 (0.95-1.97)	0.10
30-39 years	2.17 (1.66-2.84)	<.001	2.03 (1.54-2.66)	<.001
40-49 years	1.74 (1.36-2.23)		1.67 (1.30-2.14)	
50-59 years	1.41 (1.07-1.87)	0.02	1.43 (1.07-1.90)	0.01
60-69 years	1.49 (1.15-1.95)	0.003	1.50 (1.15-1.96)	0.003
70+ years	1.46 (1.15-1.85)	0.002	1.44 (1.13-1.82)	0.003
Model a, Cox proportional hazard ratio adjusted for age, sex, and geographic location via cluster analysis. **Model b**, model a plus adjustment for socioeconomic status and comorbidities.**HR**, hazard ratio. **95% CI**, 95% confidence interval. **ADHD**, attention-deficit hyperactivity disorder.				

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Table S18. Hazard ratios for outcomes of interest with year of concussion diagnosis <1998 and ≥1998					
	Year of concussion diagnosis	**Model a**		**Model b**	
		HR (95% CI)	*p-value*	**HR (95% CI)**	*p-value*
ADHD	<1998	1.53 (1.37-1.70)	0.05	1.51 (1.35-1.68)	0.06
	≥1998	1.38 (1.30-1.46)		1.37 (1.29-1.45)	
Mood and anxiety disorders	<1998	1.61 (1.55-1.67)	<.001	1.59 (1.53-1.65)	<.001
	≥1998	1.83 (1.78-1.87)		1.80 (1.76-1.85)	
Dementia	<1998	1.61 (1.46-1.79)	0.02	1.59 (1.44-1.76)	0.03
	≥1998	1.91 (1.74-2.09)		1.87 (1.70-2.05)	
Parkinson's disease	<1998	1.45 (1.24-1.71)	0.06	1.44 (1.22-1.69)	0.07
	≥1998	1.76 (1.52-2.03)		1.71 (1.48-1.98)	
Model a, Cox proportional hazard ratio adjusted for age, sex, and geographic location via cluster analysis. **Model b**, model a plus adjustment for socioeconomic status and comorbidities. **HR**, hazard ratio. **95% CI**, 95% confidence interval. **ADHD**, attention-deficit hyperactivity disorder.					

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