

Skateboarding Head Injuries

Analysis of Canadian Pediatric Data from 1993 thru 2017



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Origin of Study

- Forensic Engineering practice
 - Evaluate liability in collision-related civil lawsuits
 - Investigation of bicycle/motorcycle/skateboard-vehicle collisions
 - Required odds ratios and relative risk of head injury in non-helmeted skateboard collisions



*Courtesy:
FOX59*

Participation Rates

- 2010 Canadian Survey of organized sport (ages 15+ yrs) did not accurately indicate the level of skateboarding participation
- U.S. data (2010-2016) indicated approximately 2% of population participated in skateboarding



Courtesy:
drhowardgreen.com



BACKGROUND

Previous Studies

Author	Year	Country	Dataset	Years	hospitals	ages	n	male	any head injury	closed head injuries	laceration	concussion	TBI (concussion, TBI, and fractures)	location	helmet use	comment
Schieber et al.	1994	U.S.	National Electronic Injury Surveillance System	1992-1993	91	5 to 71	30,863		6.9%	3.1%						
Osberg et al.	1998	U.S.	National Pediatric Trauma Registry	1988-1996		5 to 19	254		50.8%							hospitalized
Kyle et al.	2002	U.S.	National Electronic Injury Surveillance System	1987-1988				86.8%			1.6%	8.1%				
Inoue et al.	2009	Australia	Queensland Injury Surveillance Unit	1999-2007		10 to 14	2323		14.0%					27% skatepark 18% roadway	4.0%	
Lustenberger et al.	2010	U.S.	National Trauma Databank	2002-2006			2270						36.3%			0.45 odds ratio for helmet use
Keays and Dumas	2014	Canada	Canadian Hospitals Injury Reporting and Prevention	2008-2010	16	≤18	4485	89.0%	13.8%	6.6%	3.6%			37% roads 25% skatepark 13% public spaces 11% residential	23.0%	
Sadeghian et al.	2017	U.S.	National Electronic Injury Surveillance System	2003-2012	100		854	91.0%	50.0%						27.0%	0.28 odds ratio helmet use 1.96 odds ratio head injury



STUDY

Data Acquisition

- Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP)
 - 16 hospitals across Canada - primarily pediatric
 - Recorded data: injury nature, body part, treatment level, accident location, activity type, nature of accident, safety equipment worn, descriptive text
 - CHIRPP paper form: 1993-2011
 - eCHIRPP digital form: 2012-2017
 - incidents occurring between January 1993 and November 2017
 - defined as skateboarding
 - “head” found in descriptive field

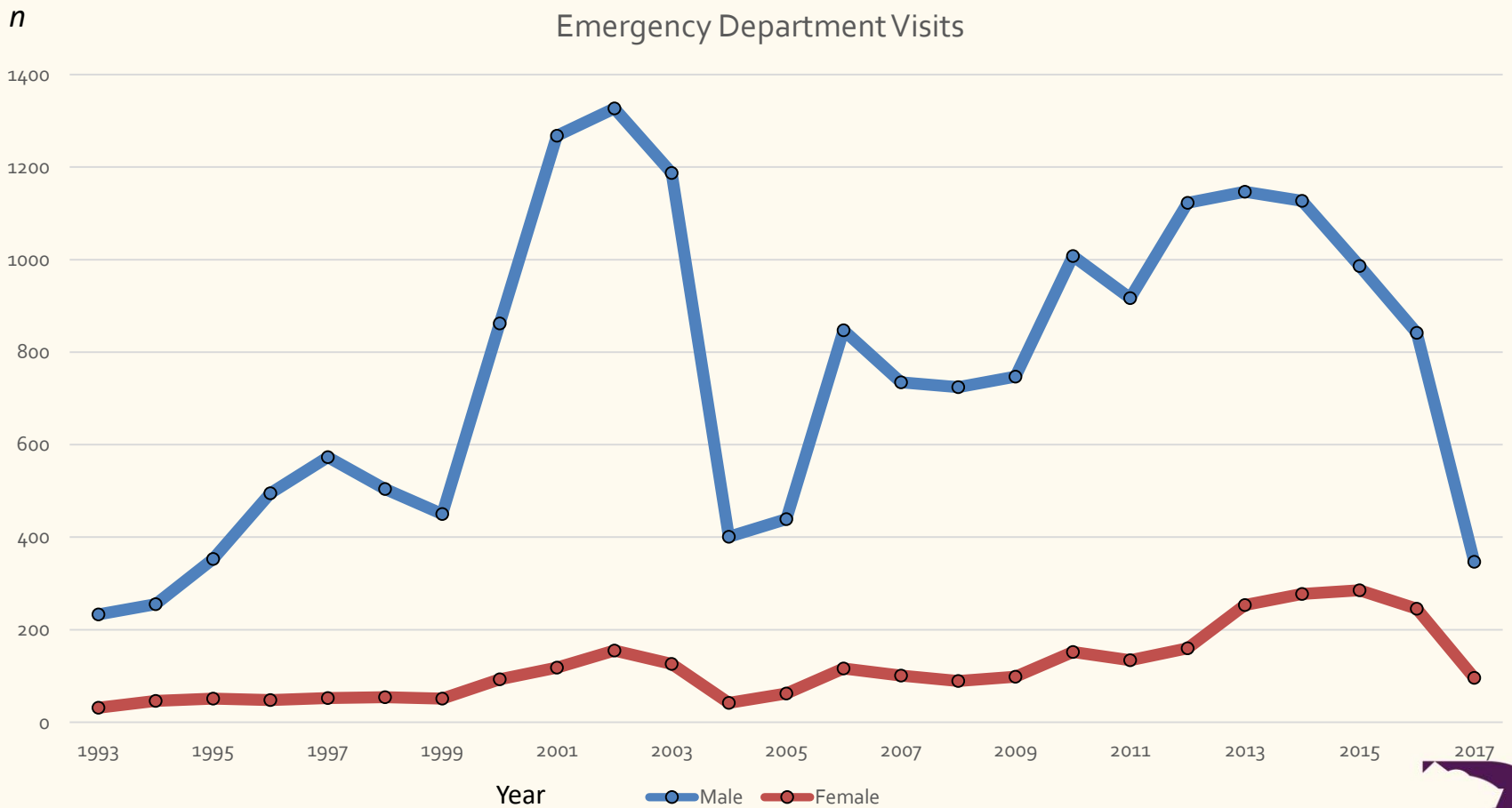


Data Categorization

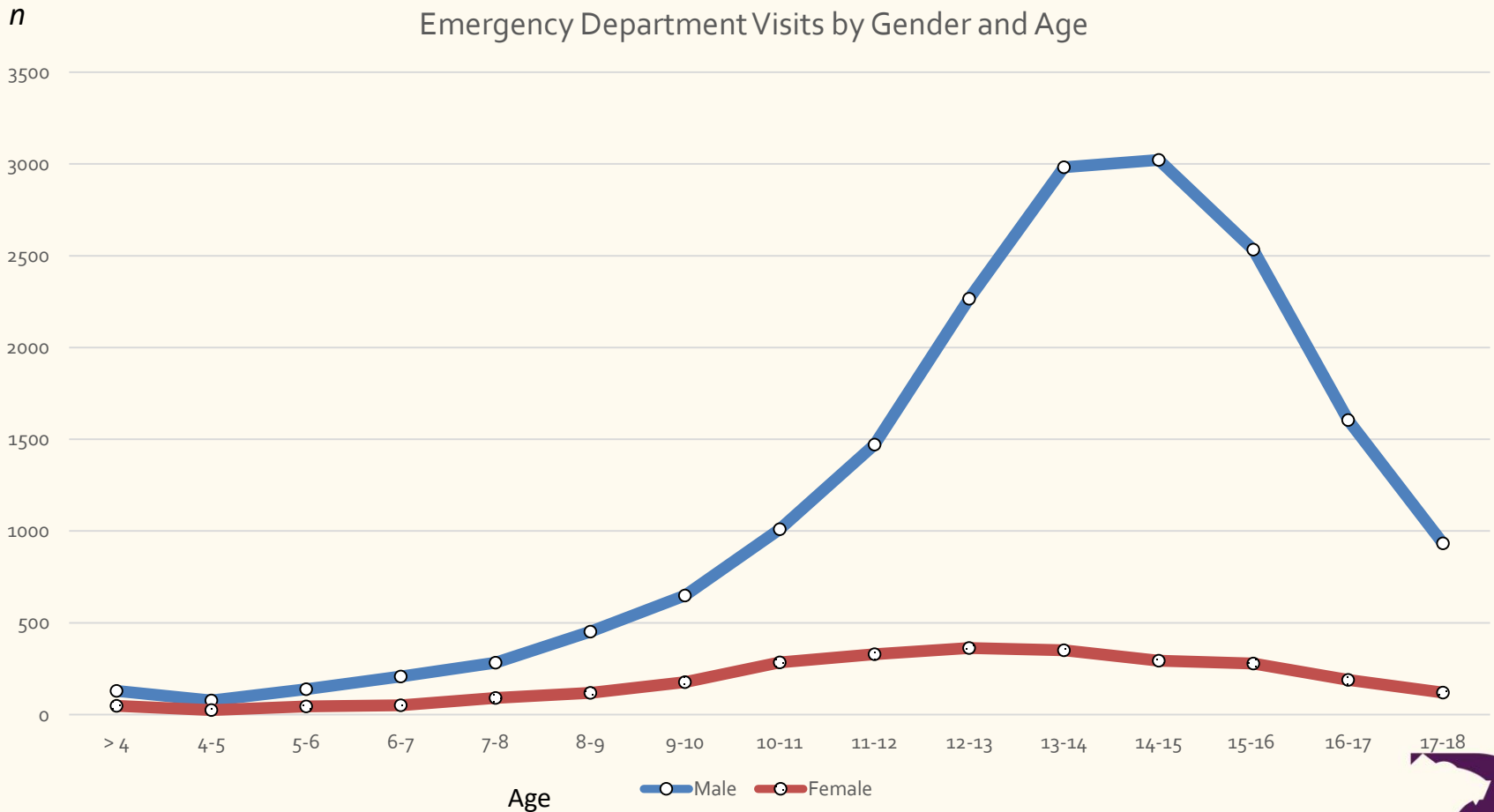
- Gender
- Age
- Year
- Head injury
 - Minor head injury
 - Concussion
 - Intracranial injury
 - Contusion
 - Hemorrhage
 - Hematoma
- Vehicle contact
- Location
 - home
 - skate parks
 - roadways
 - paths (paths, sidewalks, bus stops, etc)
 - public areas (schools, community centres, churches, parks)
 - commercial areas (fitness clubs, arenas, stadiums, commercial buildings)



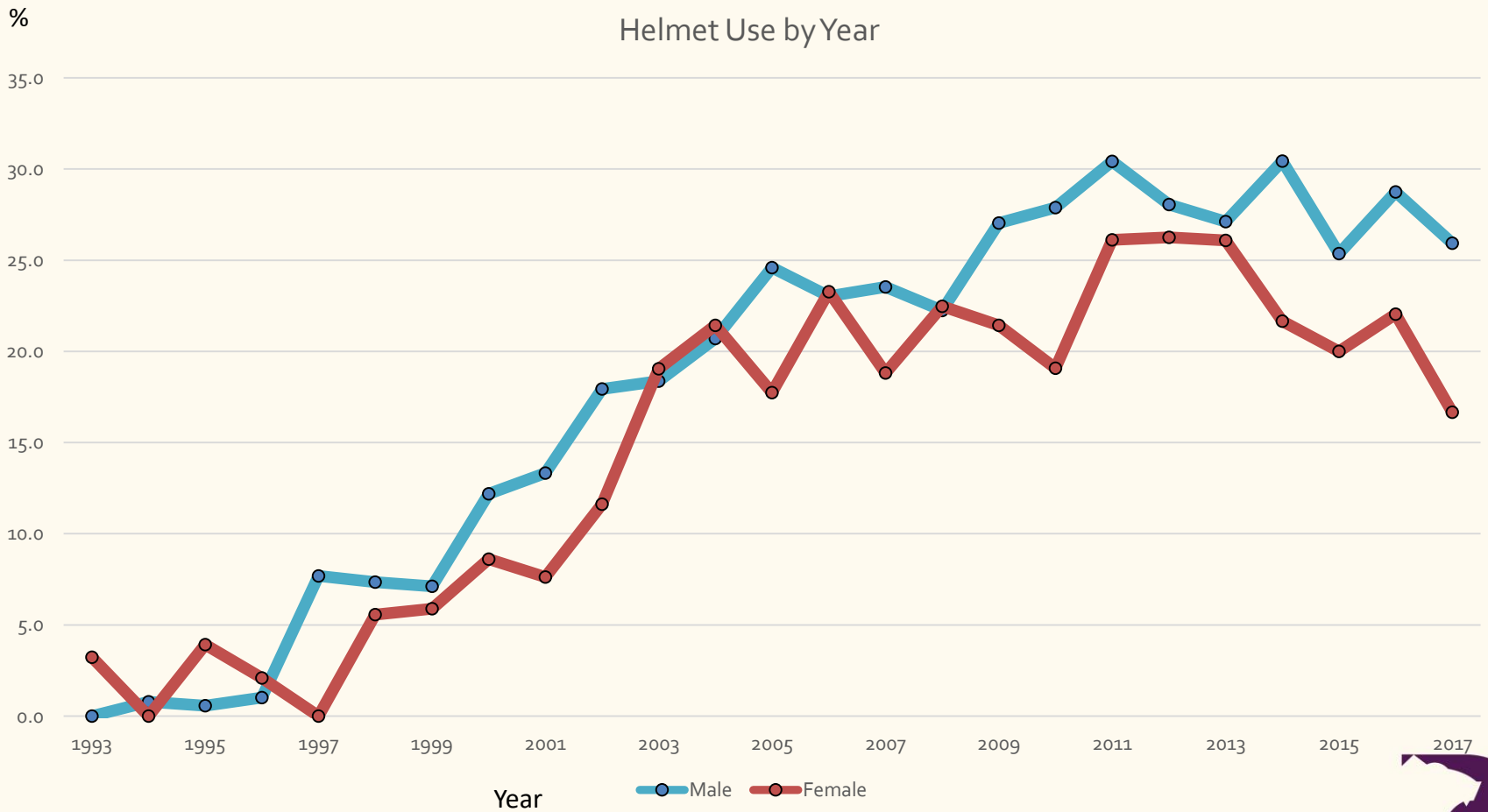
Hospital Visits by Year



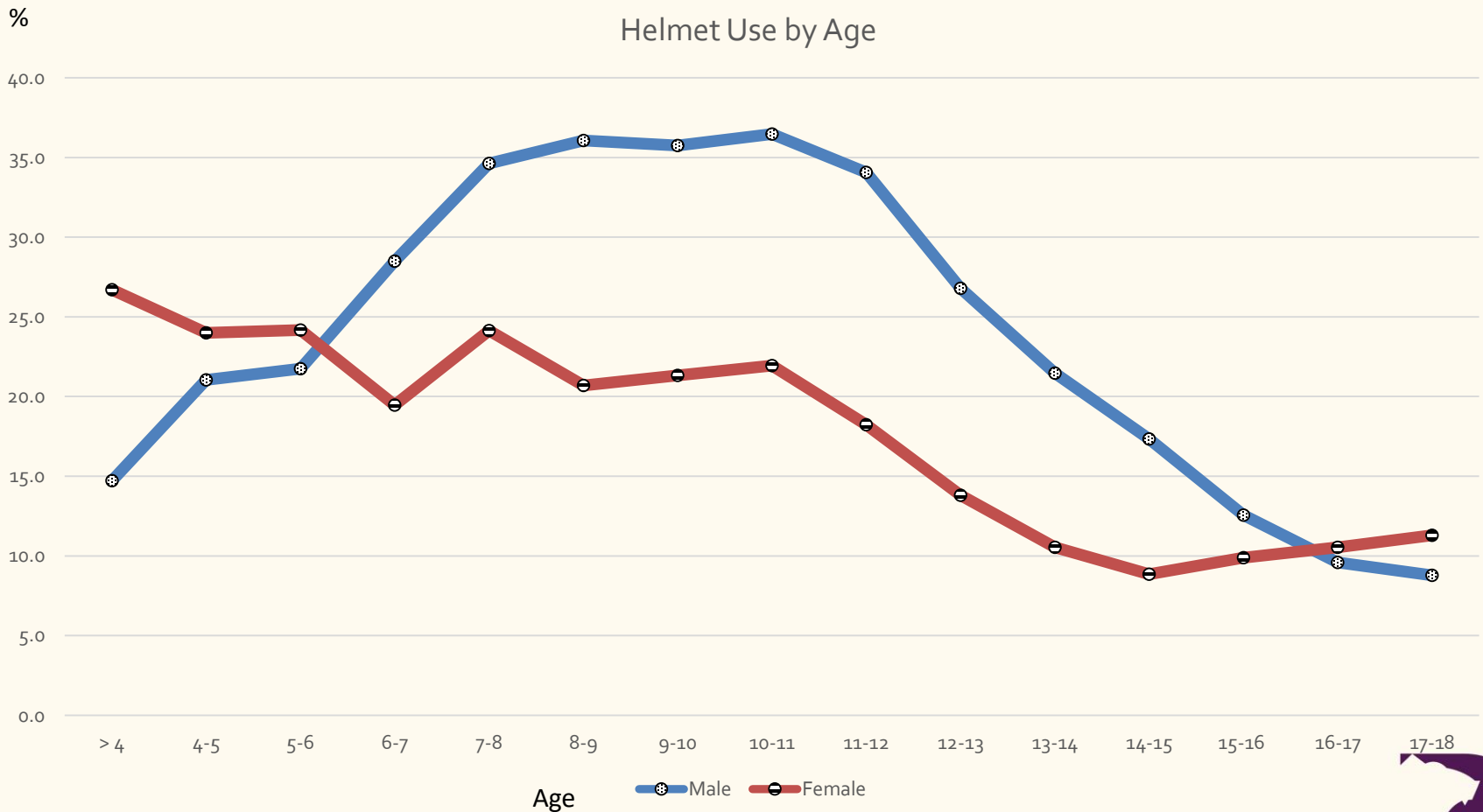
Hospital Visits by Age



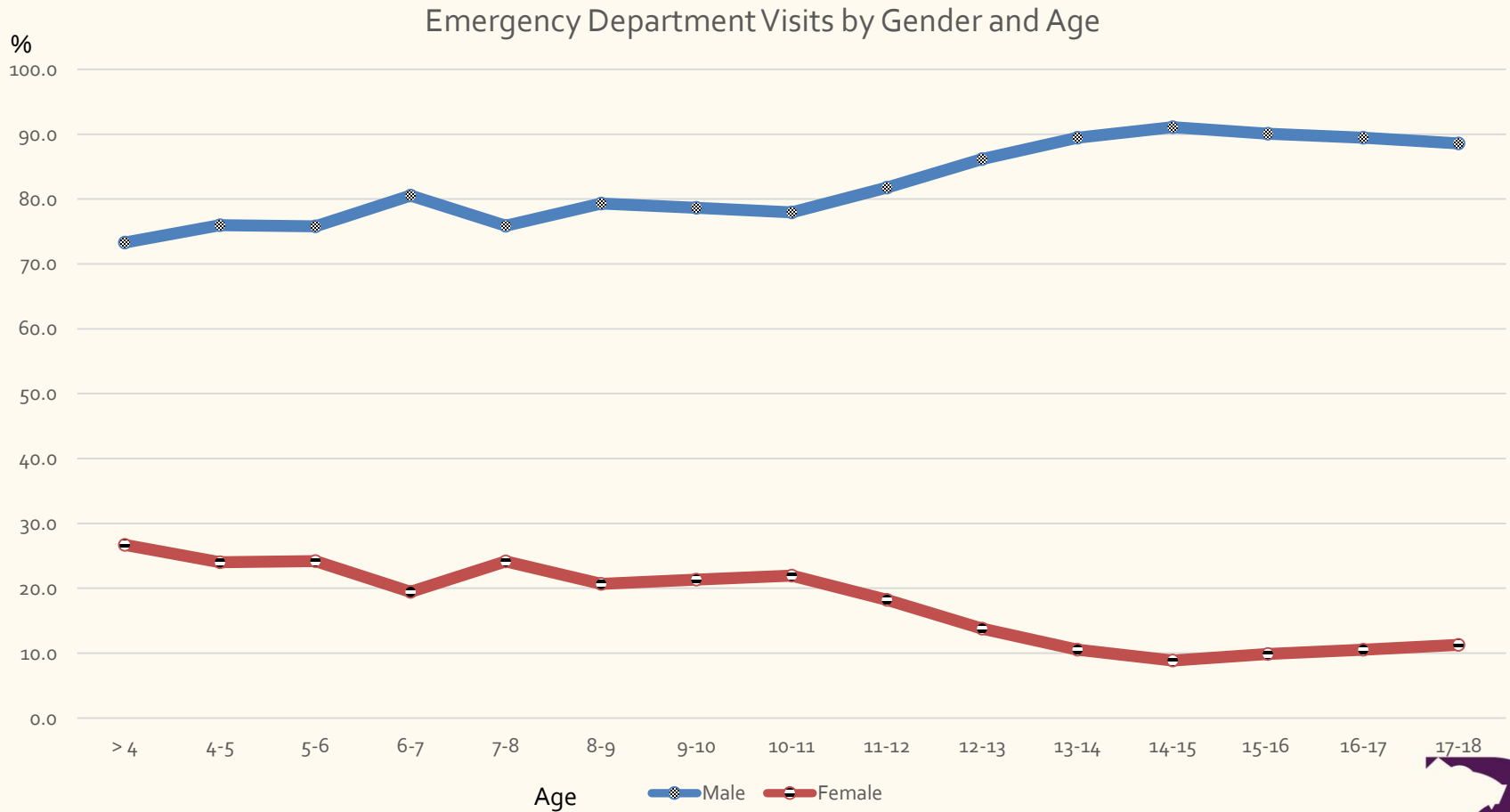
Helmet Use by Year



Helmet Use by Age



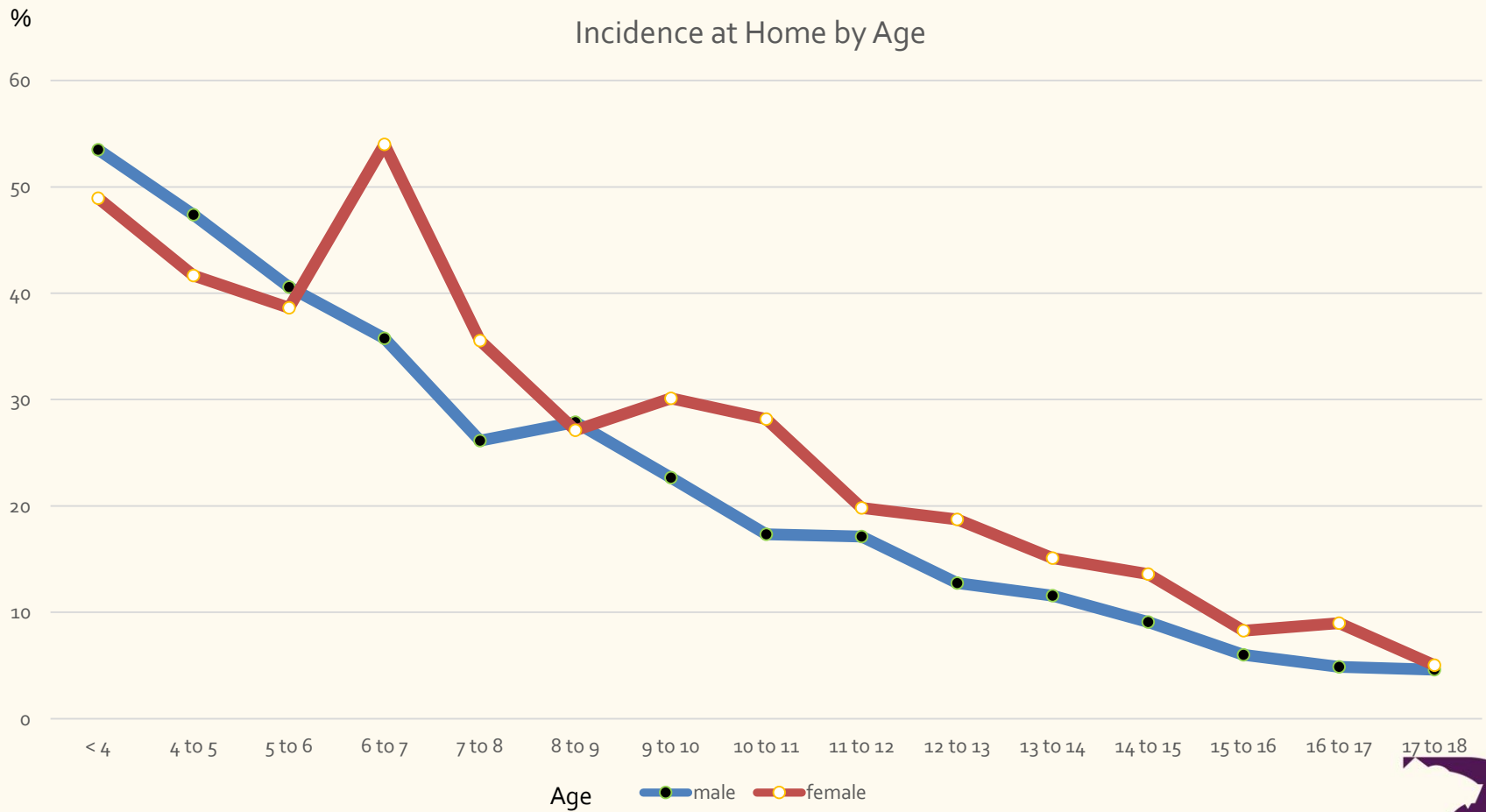
Distribution by Gender and Age



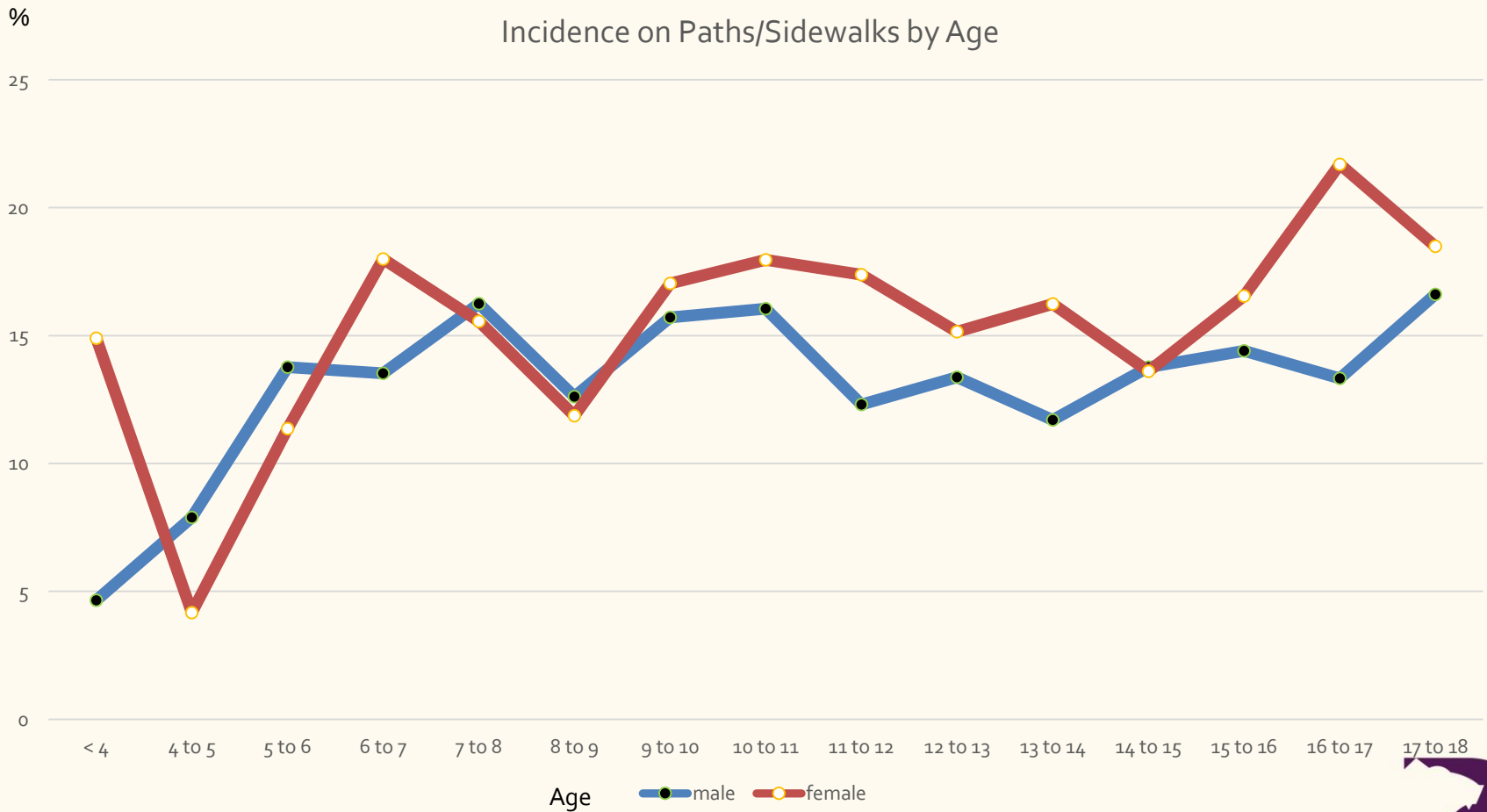


LOCATIONS OF INCIDENCE

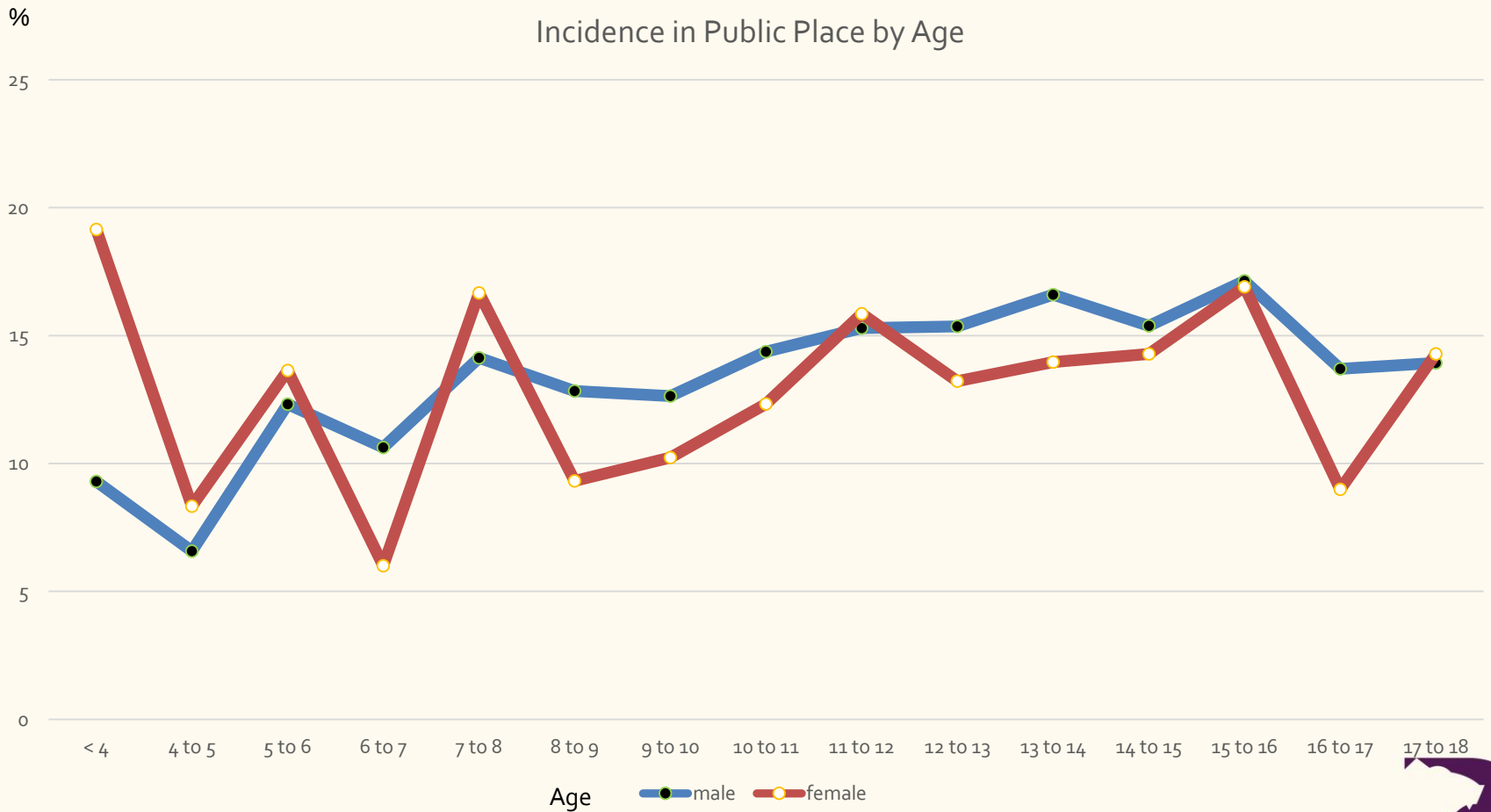
Home



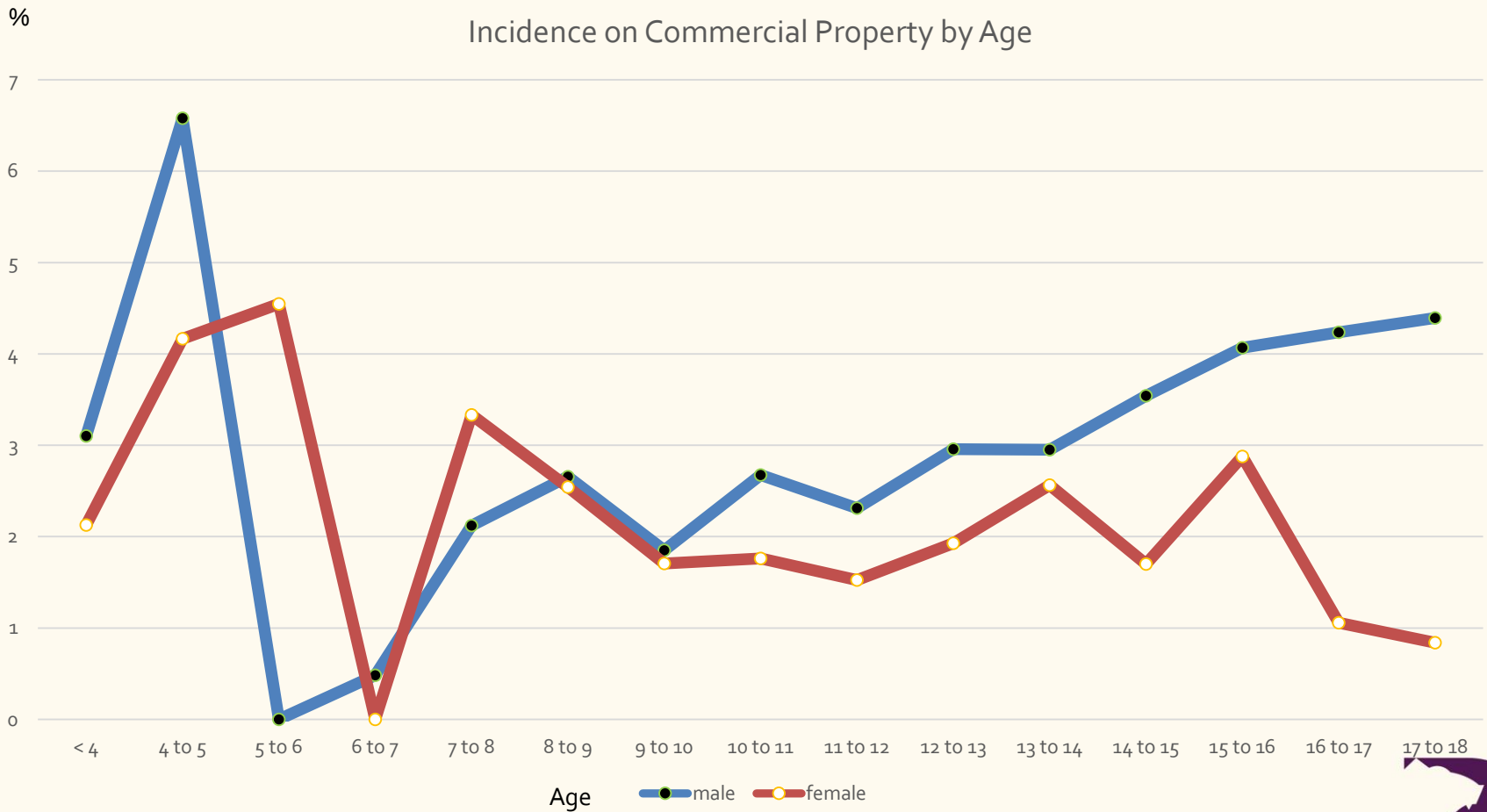
Paths/Sidewalks



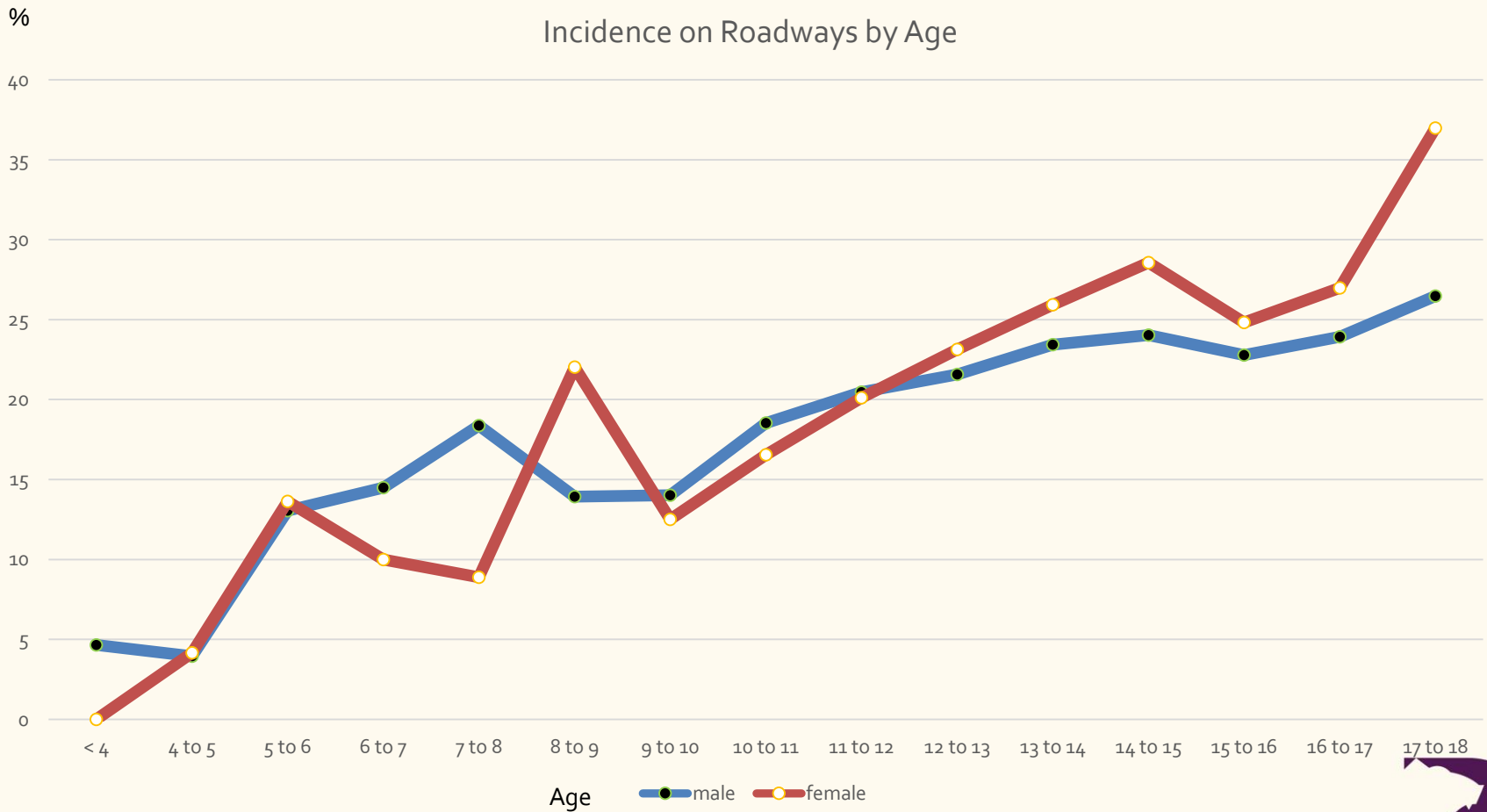
Public Places



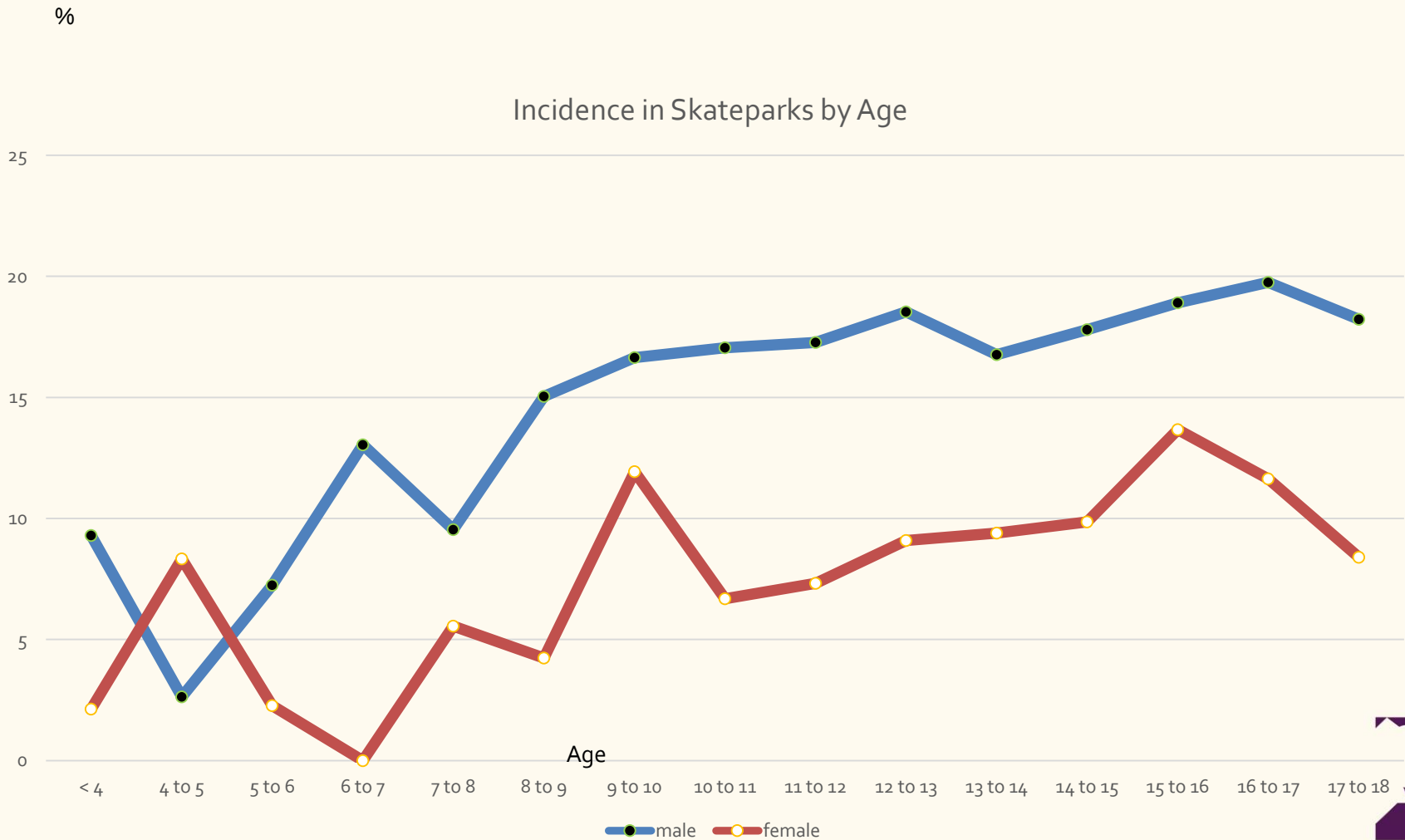
Commercial Property



Roadways

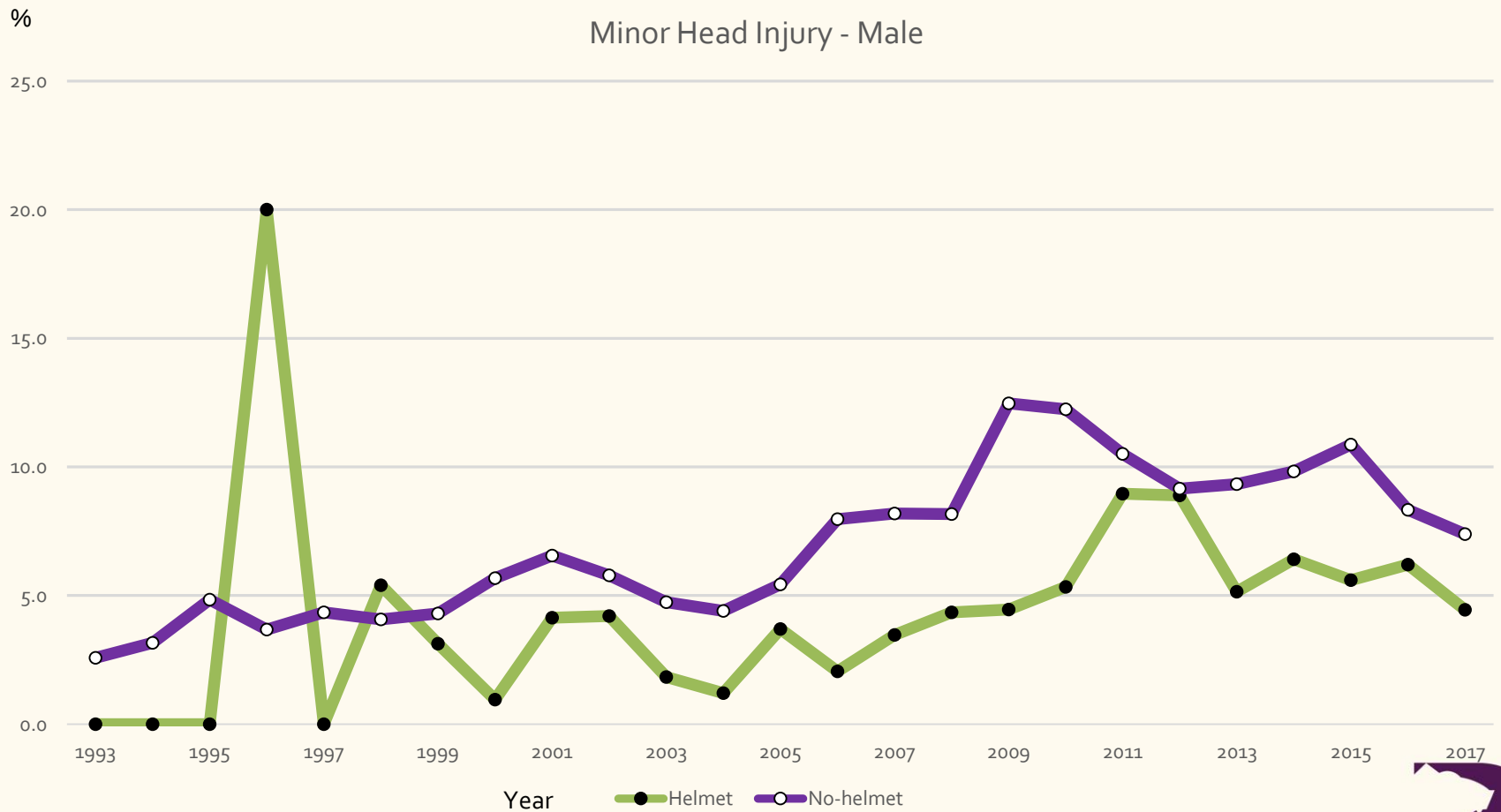


Skateparks

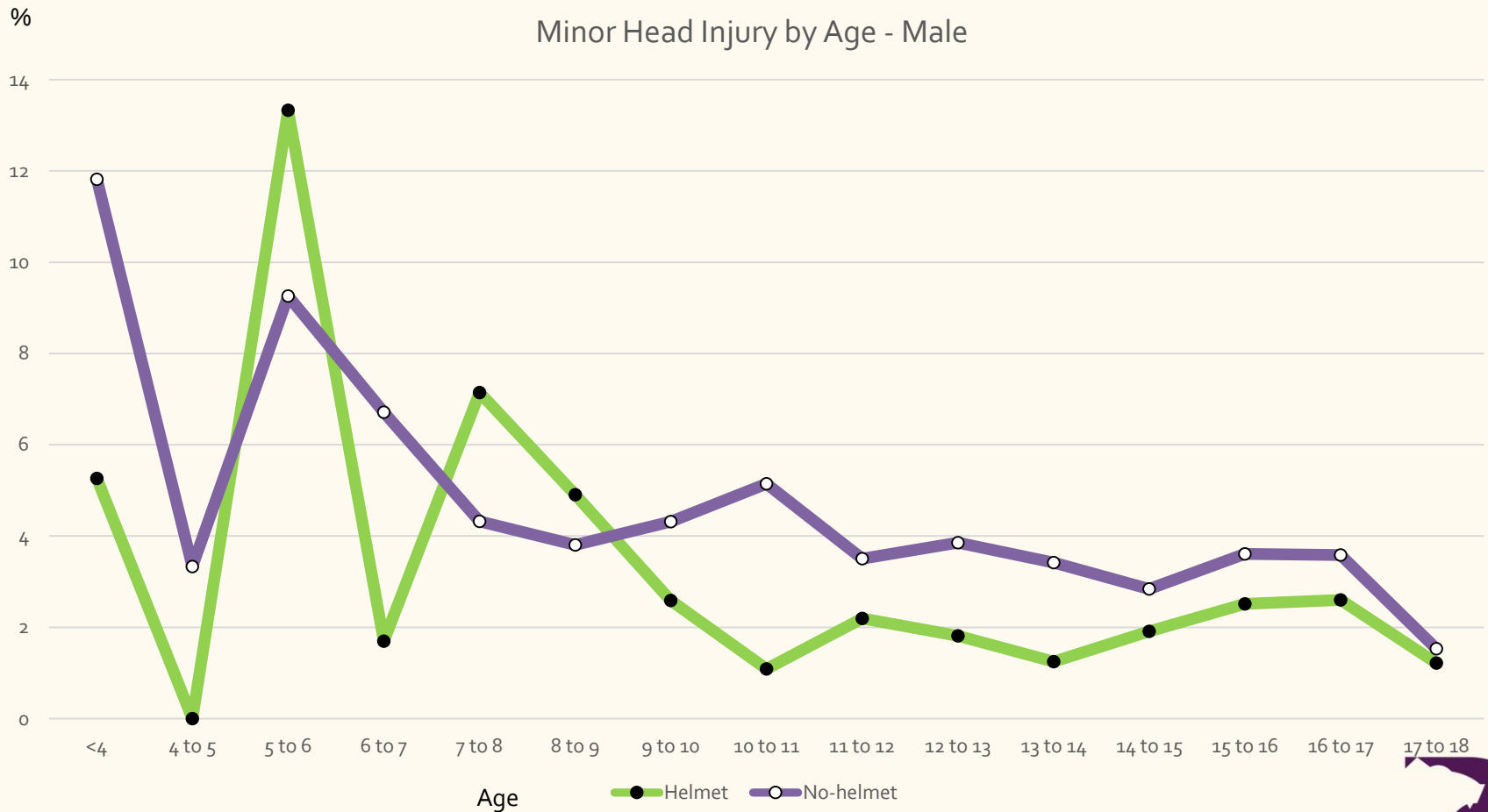


MINOR HEAD INJURIES

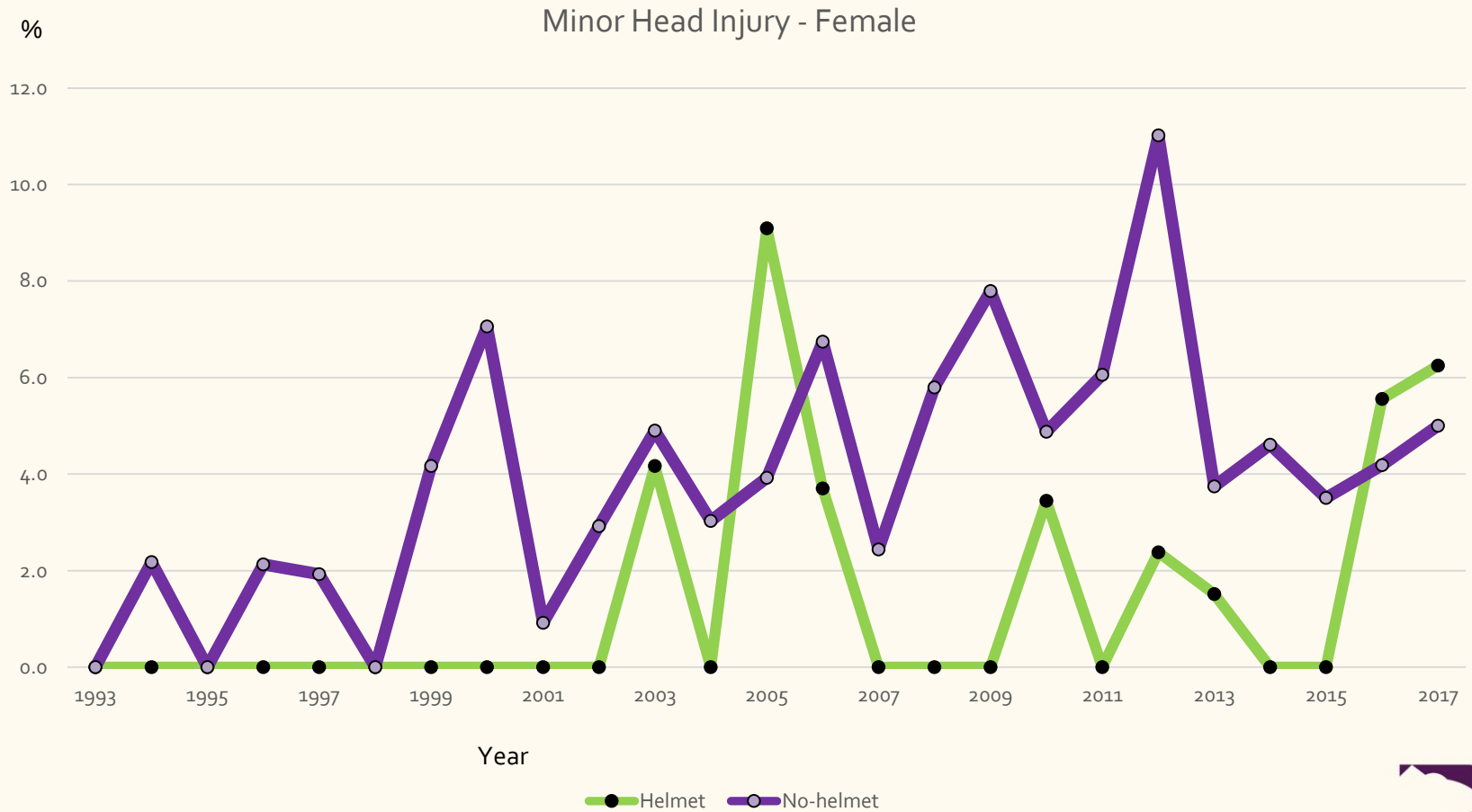
Male Minor Head Injury vs. Year



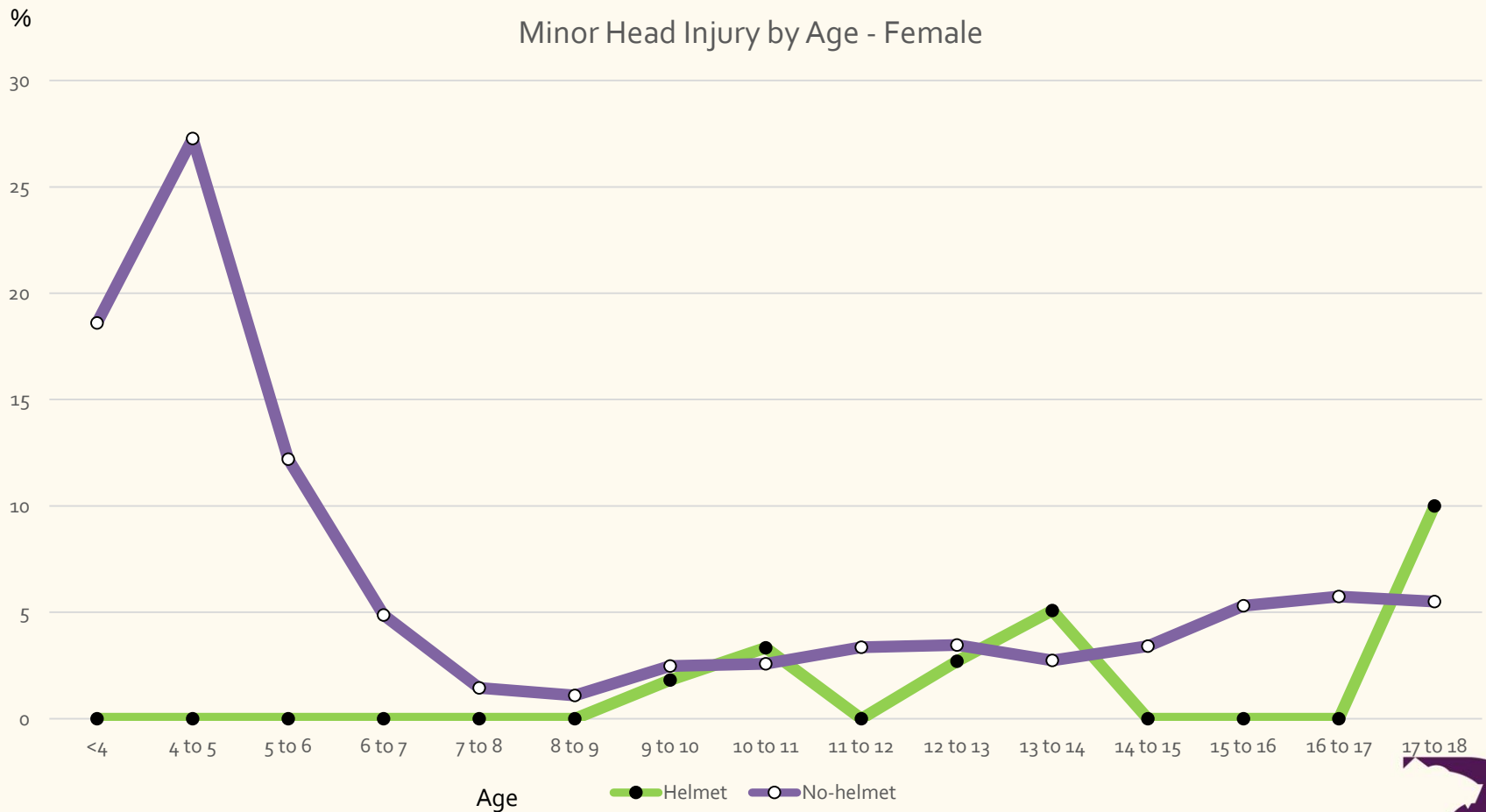
Male Minor Head Injury vs. Age



Female Minor Head Injury vs Year

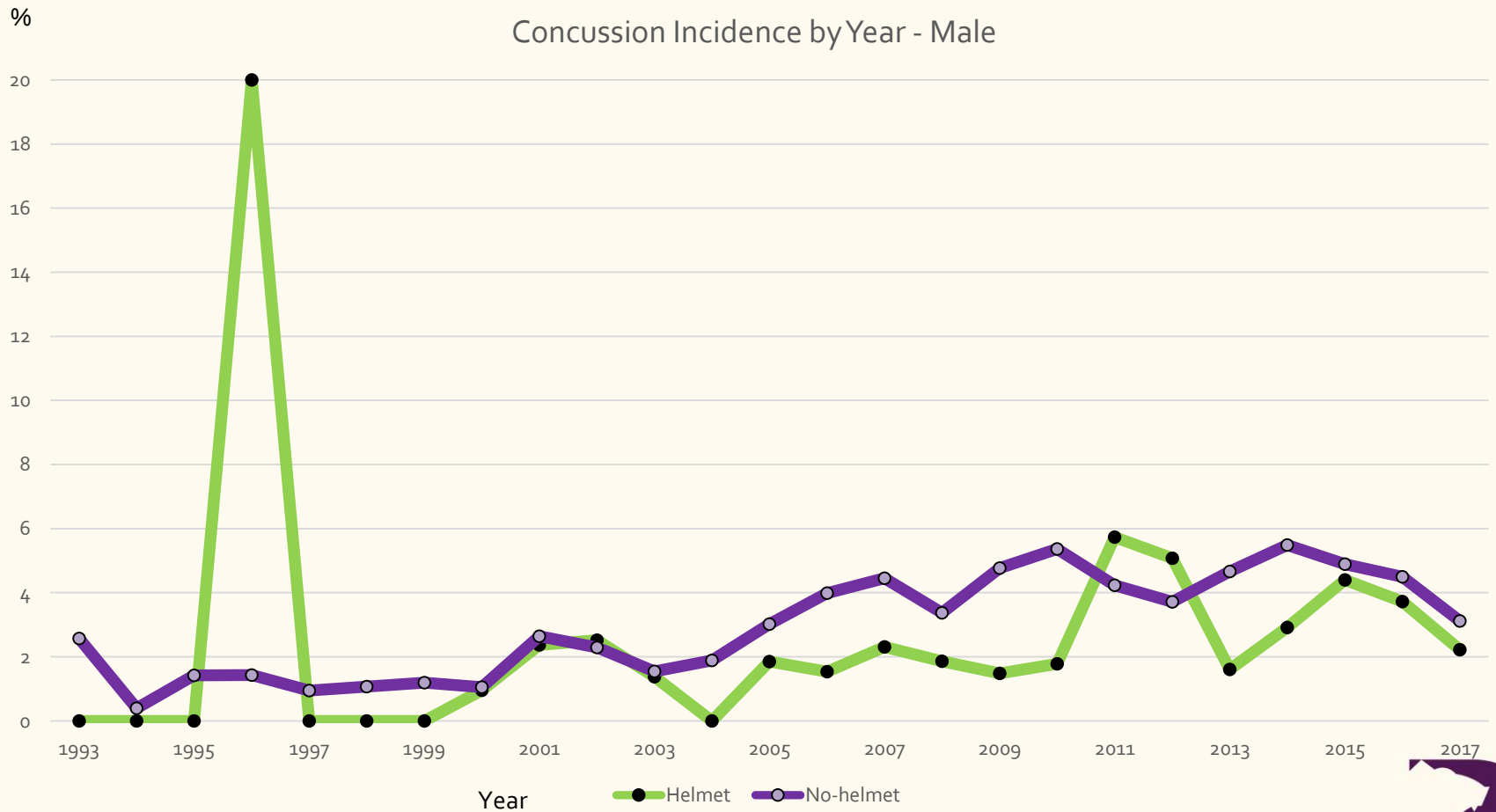


Female Minor Head Injury vs. Age

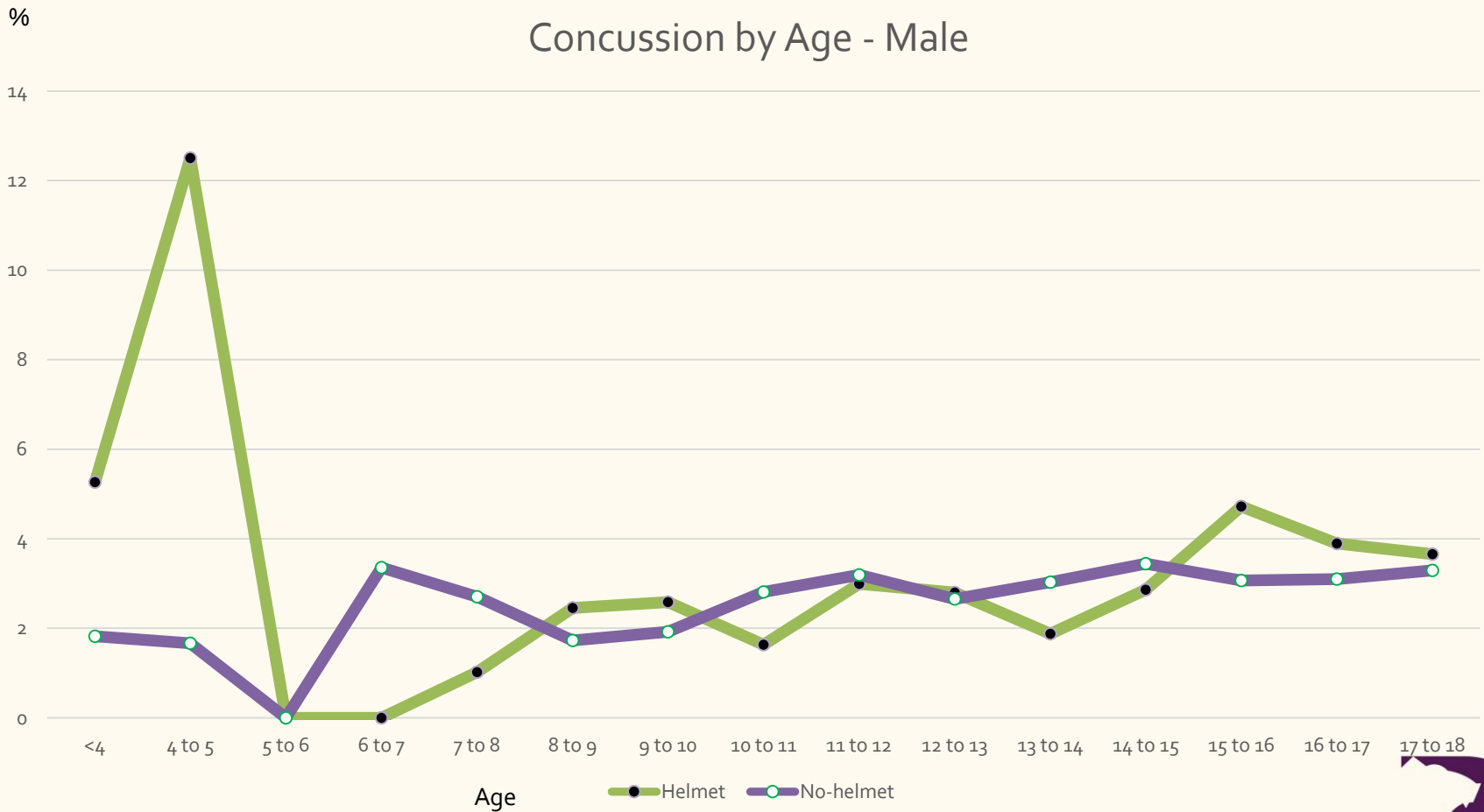


CONCUSSIONS

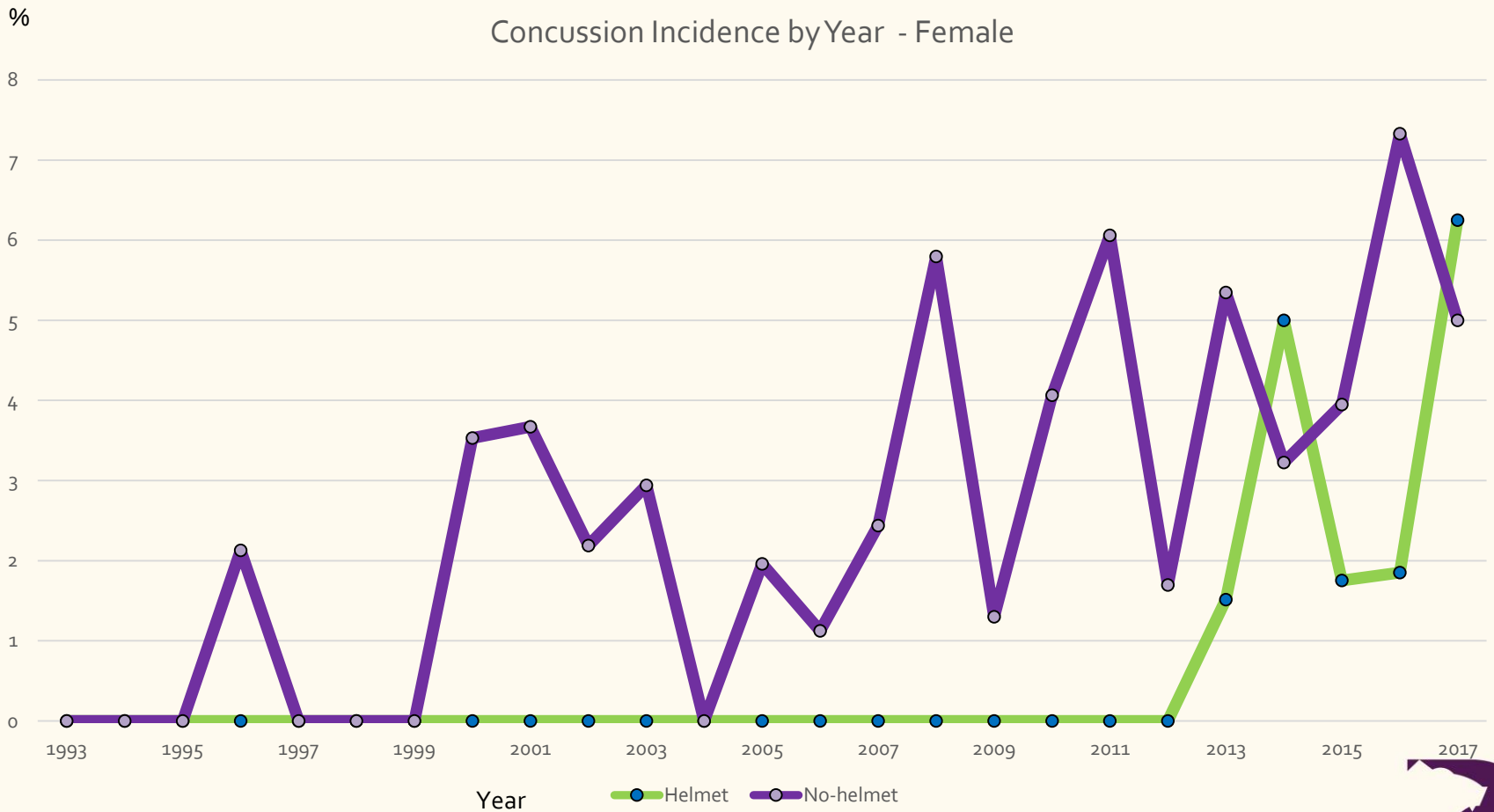
Male Concussions vs. Year



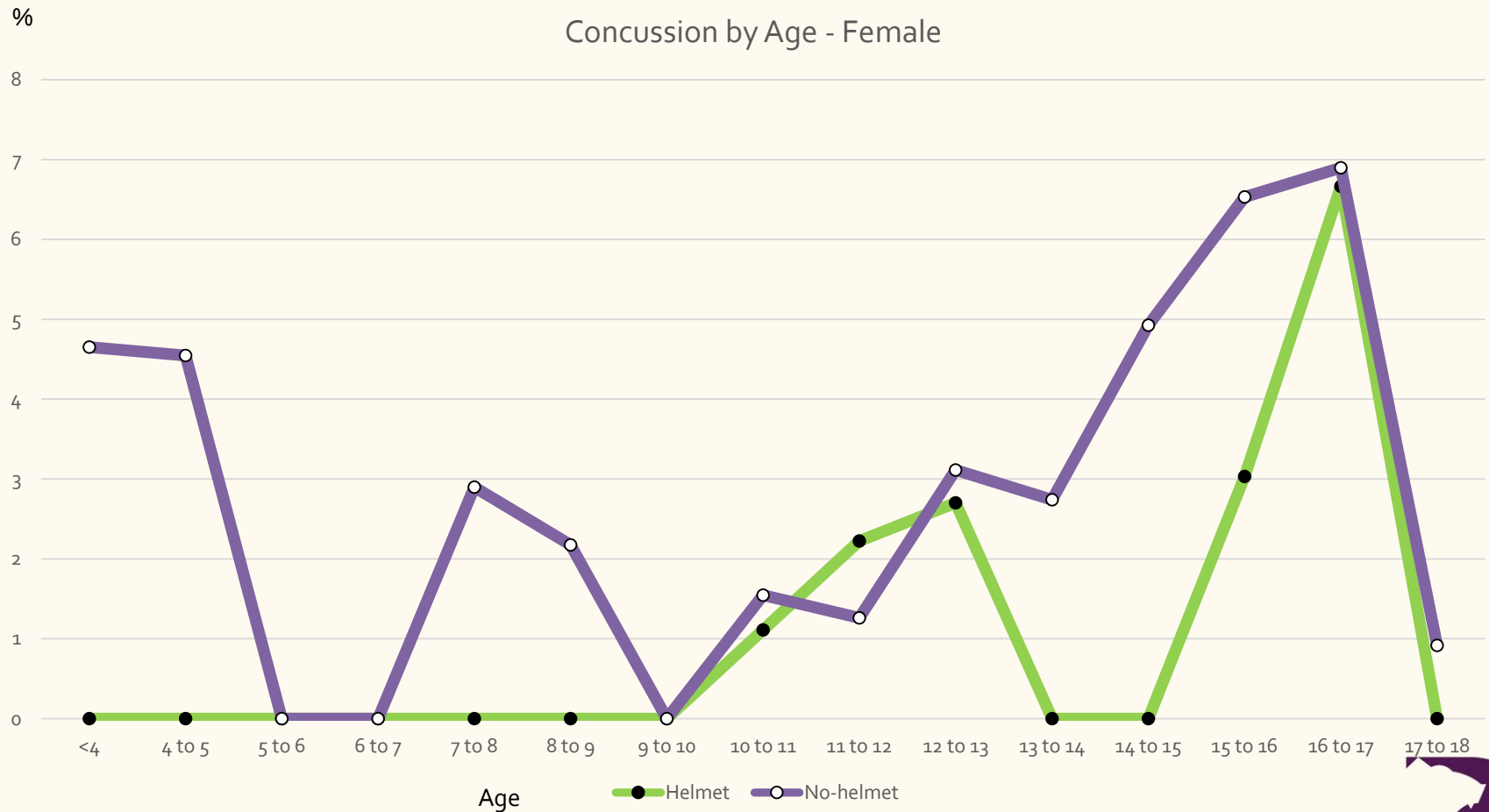
Male Concussion vs. Age



Female Concussions vs. Year

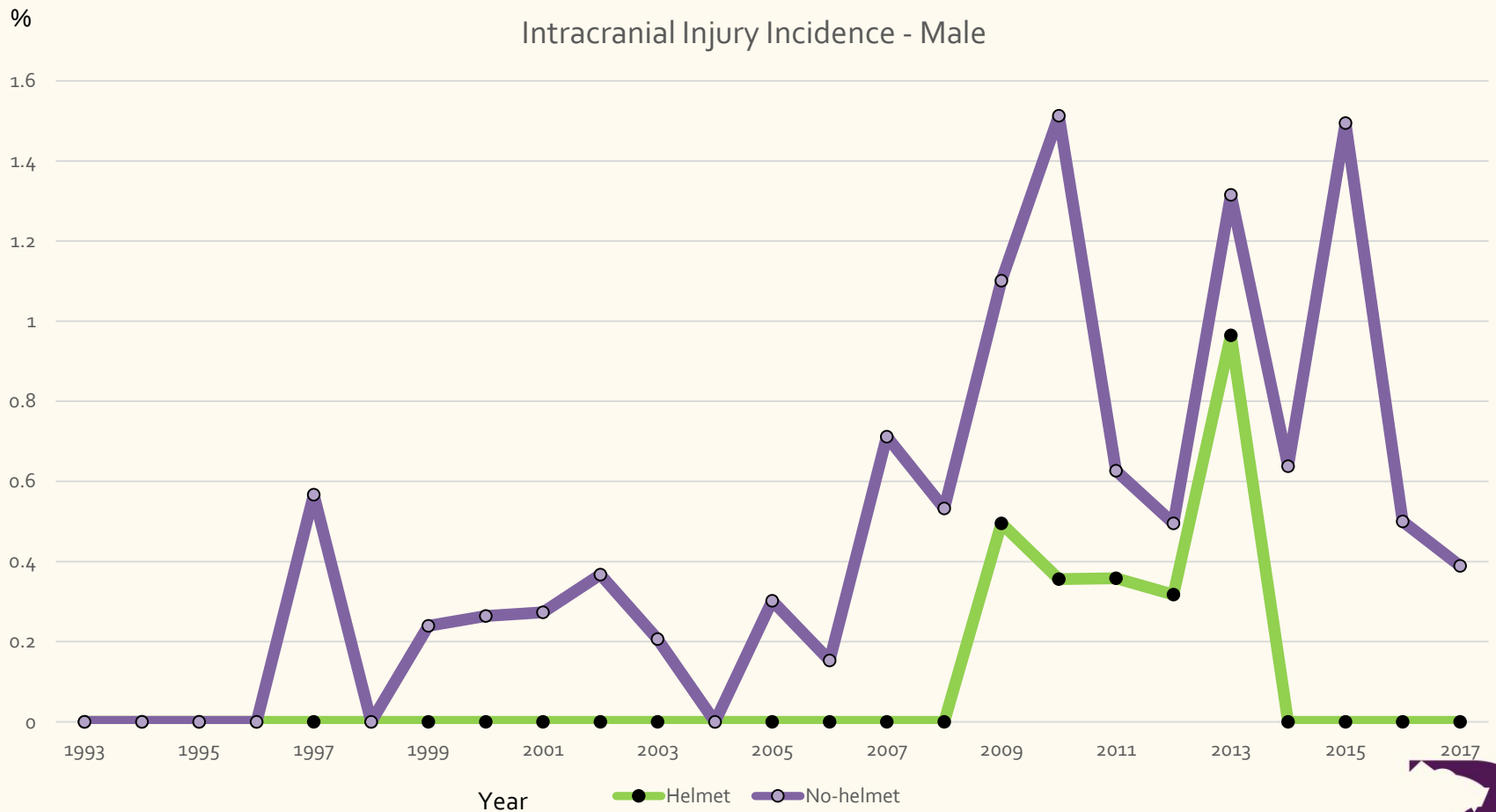


Female Concussion vs. Age

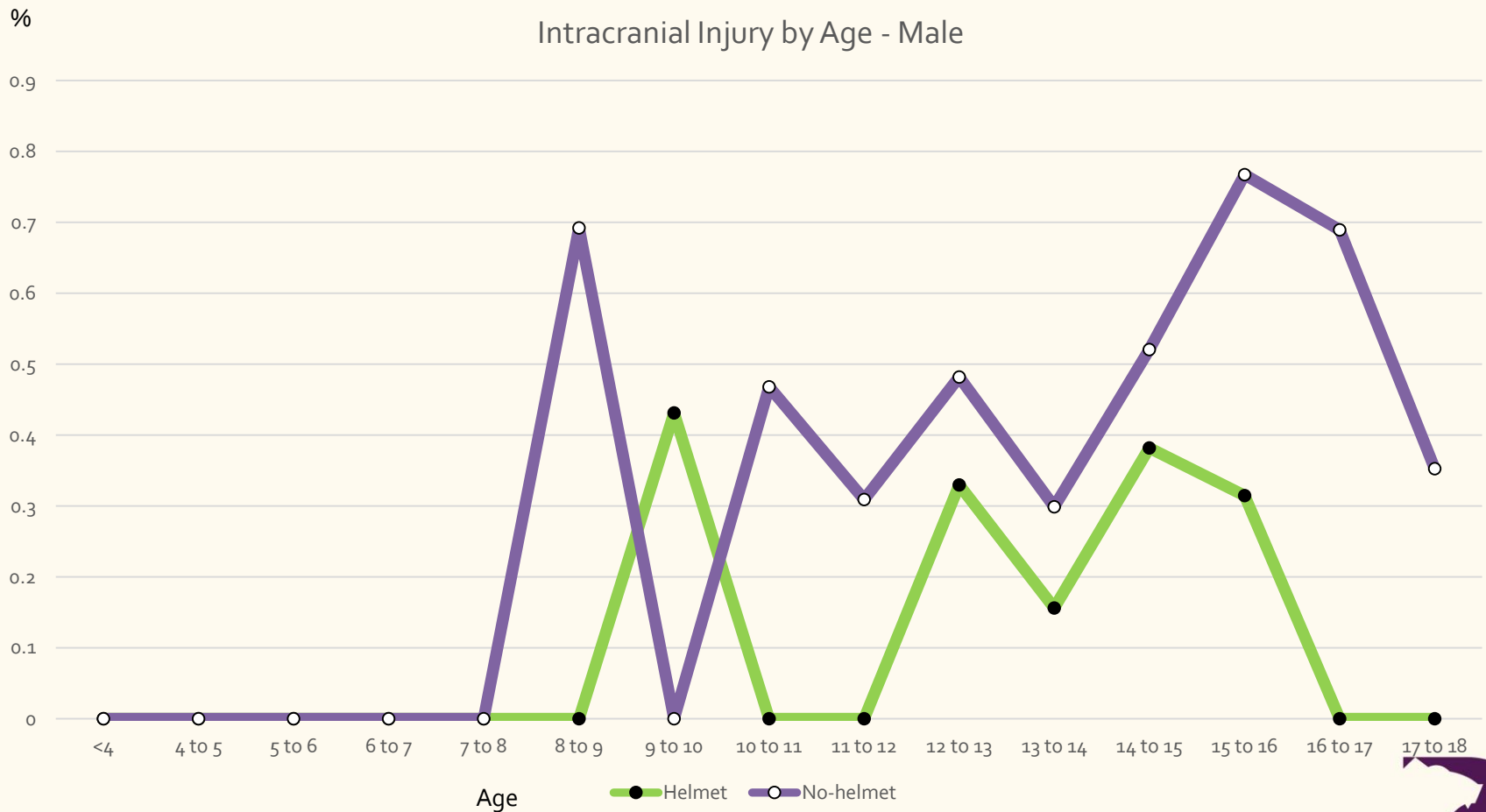


INTRACRANIAL HEAD INJURY

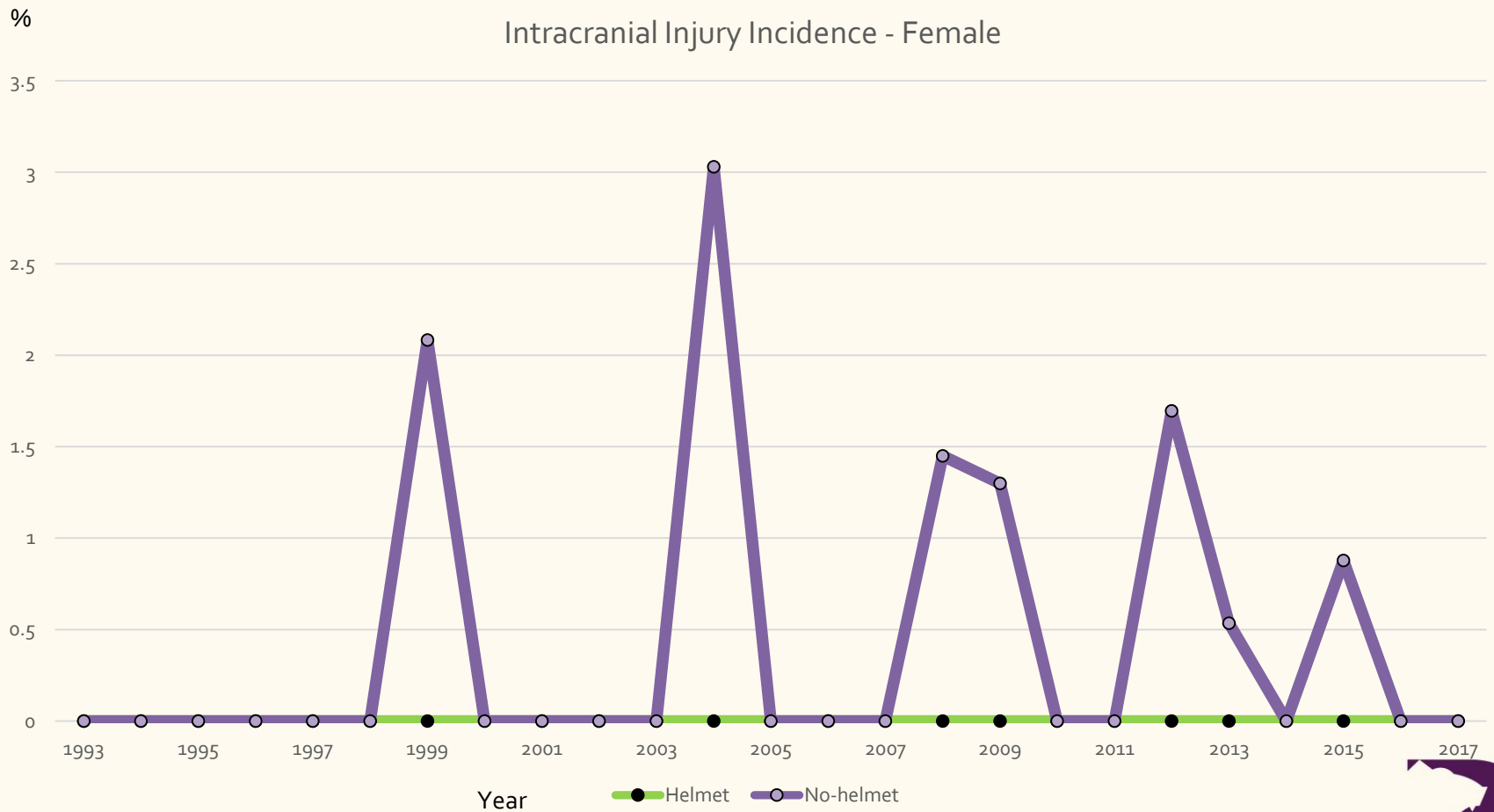
Male Intracranial Injury vs. Year



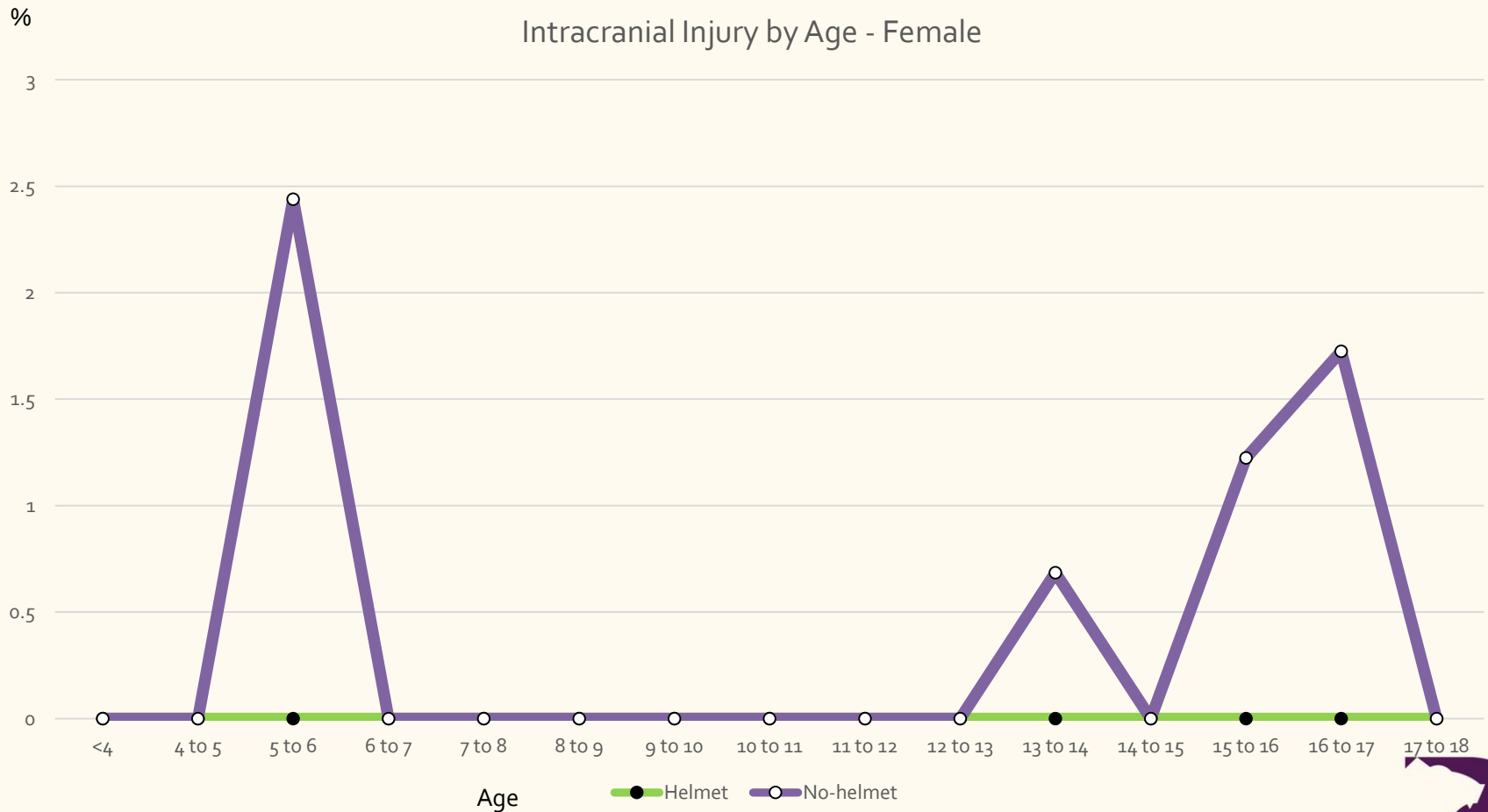
Male Intracranial Injury vs. Age



Female Intracranial Injury vs. Year



Female Intracranial Injury vs. Age



Vehicular/Intracranial

- Intracranial injuries are most likely due to vehicular involvement
- Typically non-helmeted
- Prior 2012 coding difference

Year	male		female	
	helmet	non-helmet	helmet	non-helmet
	intracranial	intracranial	intracranial	intracranial
CHIRPP	% vehicular			
1993				
1994				
1995				
1996				
1997		33.3		
1998				
1999		0.0		0
2000		50.0		
2001		33.3		
2002		25.0		
2003		0.0		
2004				0
2005		0.0		
2006		0.0		
2007		25.0		
2008		33.3		0
2009	0	0.0		0
2010	0	9.1		
2011	100	100.0		
2012	100	50.0		100
2013	100	100.0		100
2014		100.0		
2015		90.9		100
2016		100.0		
2017		100.0		

Odds/Risk Ratio

Head Injury No-Helmet vs. Helmet - Odds/Risk		Odds Ratio	CI (low)	CI (high)	Risk Ratio	CI (low)	CI (high)
minor head injury	male	1.75	1.39	2.20	1.70	1.52	1.91
	female	2.44	1.27	4.70	2.32	1.67	3.22
concussion	male	1.20	0.97	1.49	1.17	1.06	1.31
	female	2.68	1.23	5.84	2.55	1.72	3.77
intracranial head injury	male	3.03	1.40	6.57	2.96	2.00	4.38
	female	N/A	N/A	N/A	N/A	N/A	N/A
any head injury	male	1.50	1.29	1.76	1.47	1.36	1.58
	female	2.66	1.62	4.38	2.94	2.29	3.77

**N/A because no helmeted intracranial head injuries



Skateboard strategies allow for an intentional community-based approach to support a diverse network of skateboarding opportunities that serve the whole community.

TORONTO PARKS, FORESTRY & RECREATION 2016



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What Now?

- Understanding the reasons for higher female risk
- Increased public health/safety campaigns for helmet use
- Legislation without public health/safety campaigns for bicycle helmet use is ineffective

Acknowledgments

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Arcon Forensic Engineers

Thank You