The Impact of Visual Field Loss on Motor Vehicle Crashes and Crash Severity

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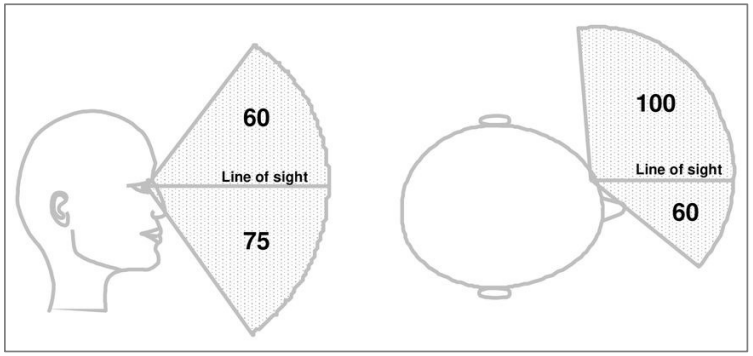
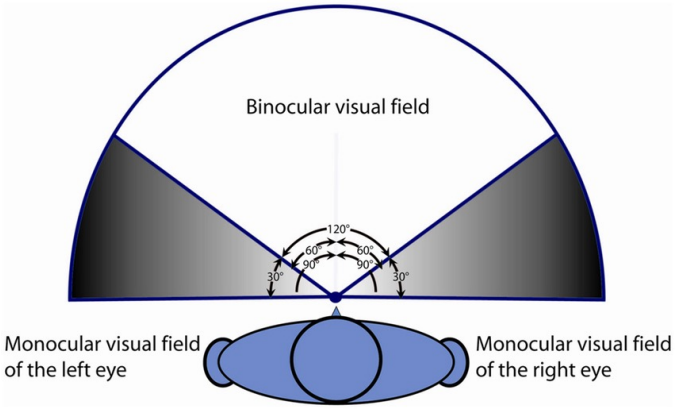
UWA Business School

Visual Field Loss

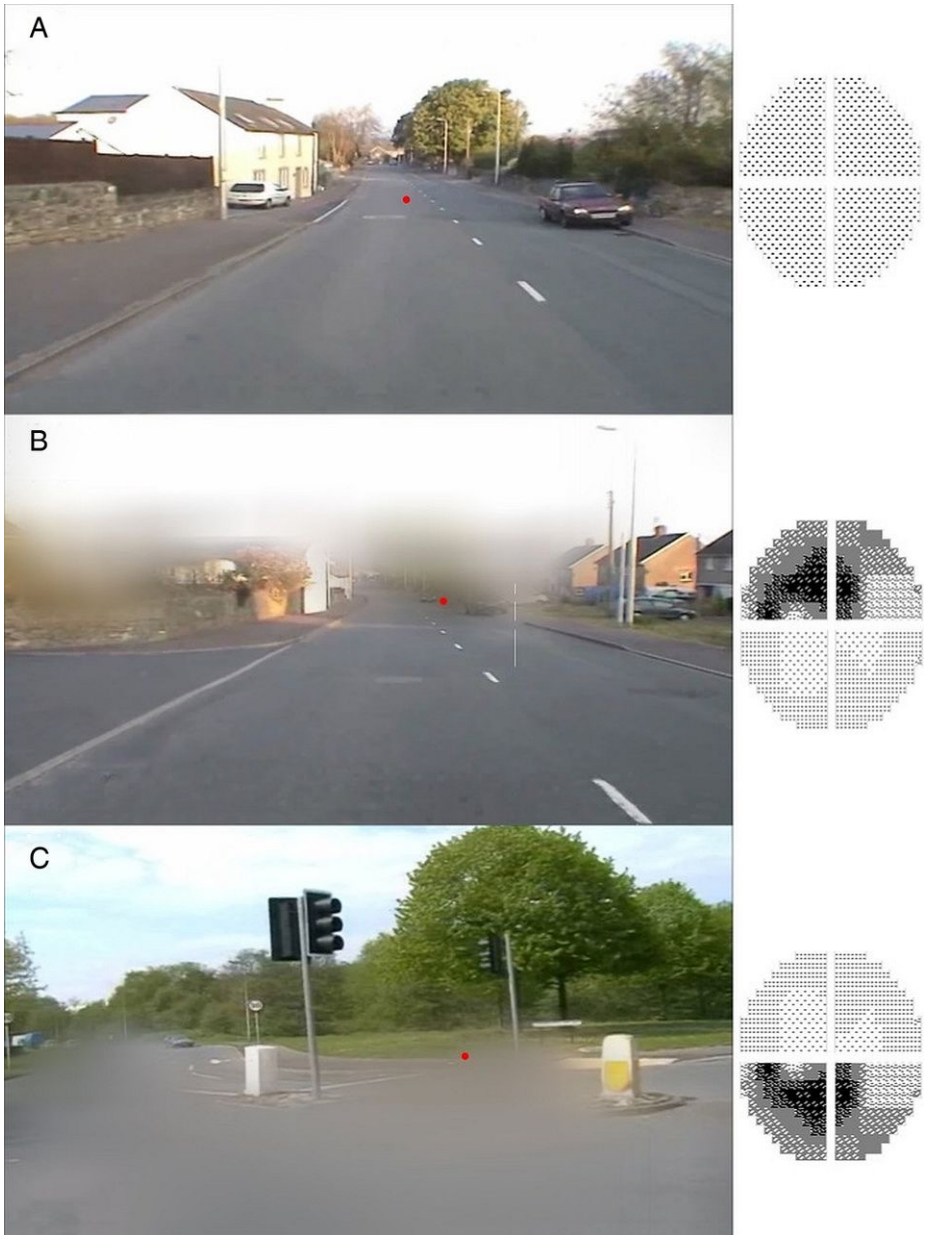
Research team: Lynn Meuleners, Siobhan Manners, Doina Olaru, Joanne Wood, Jonathon Ng, William Morgan, Nigel Morlet

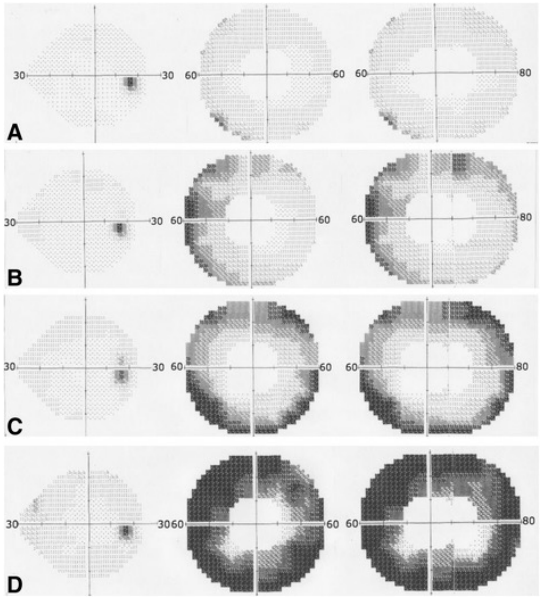




Visual field loss reduces hazard detection

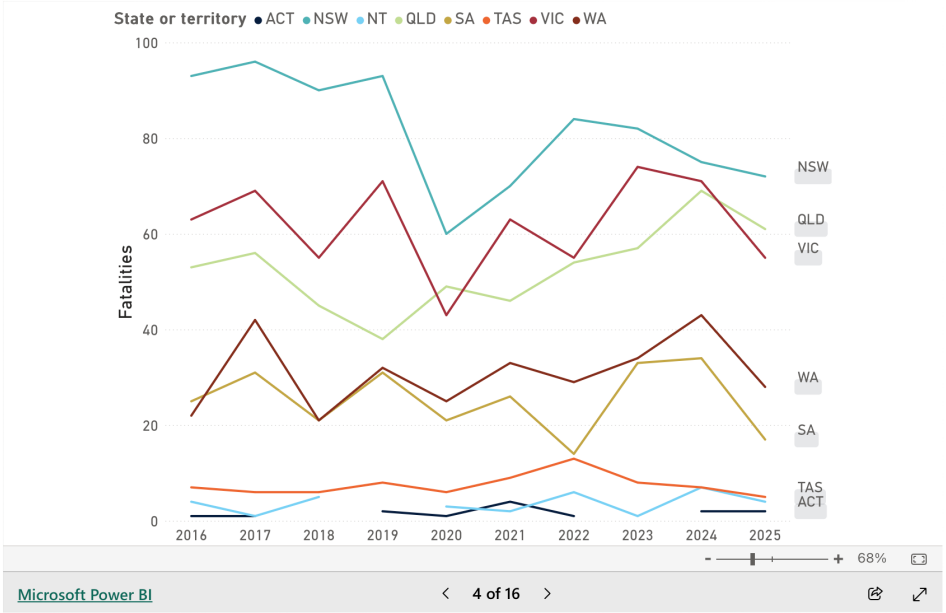
VFL





Visual Field Loss

Humphrey Field Analyser (HFA) machine



Source: Australian Road Deaths Database

https://datahub.roadsafety.gov.au/safe-systems/safe-road-use/road-safety-older-people#:~:text=States%20and%20territories,from%2022%20to%2043%20deaths).

Data

Epidemiology of Field of Vision Disorders (eFoVID) database

VFL tests database + hospital morbidity - linked to population-based administrative datasets (e.g., crash and licensing data by the WA Data Linkage System

31,296 participants (394,047 data records)	4,307 (13.76%) were involved in 5,537 crashes	55.84% having binocular visual field loss (VFL)

512 with VFL were involved in multiple crashes!

VFL affects 10% of adults aged 55+

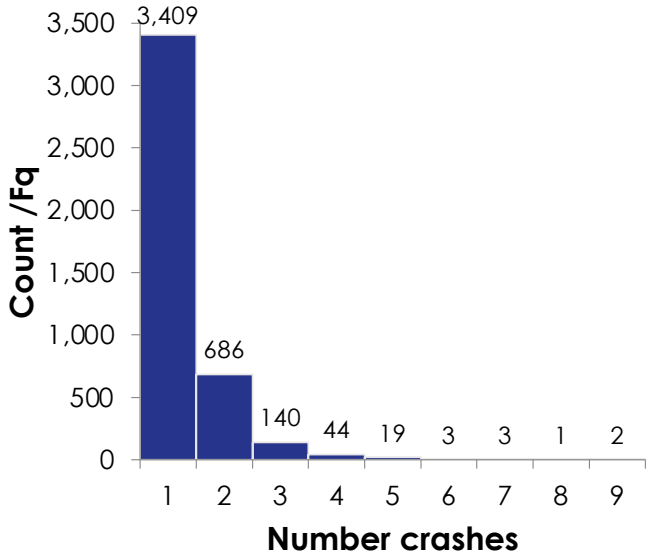
Descriptive Stats

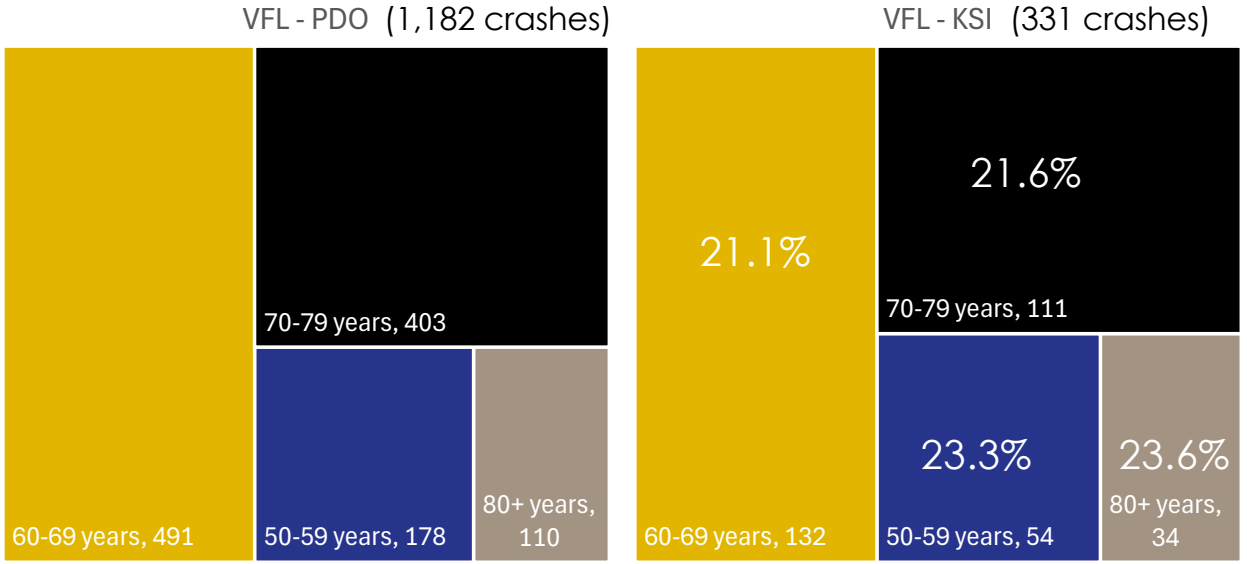
Drivers with VFL were predominantly:

- male (61.6%)
- aged 70+ (51.4%)

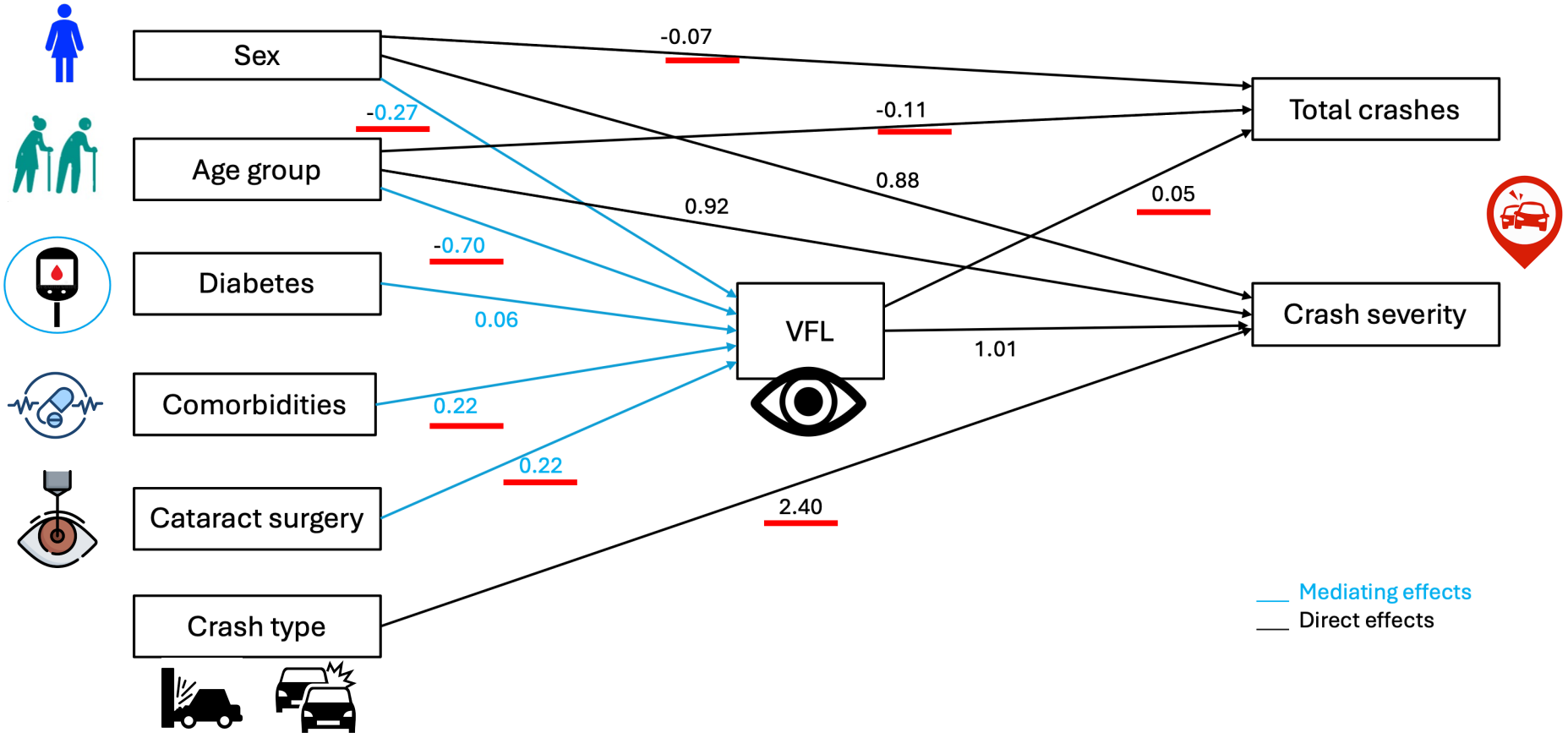
Nearly one-third had a comorbid health condition, 13.4% had diabetes, 15.2% had cataract surgery

94% involved in multi-vehicle crashes





Results - 1


Sex
Age group
Diabetes
Comorbidities
Cataract surgery
Crash type
VFL
Total crashes
Crash severity
-0.07
-0.27
-0.11
0.88
0.92
0.05
-0.70
0.06
0.22
0.22
1.01
2.40
Mediating effects
Direct effects

Results - 2

Predictor	Effect on mediator (VFL)		Direct effect on total crashes		Indirect effect on total crashes	
	logit	p-value	β	95% CI	β	95% CI
Binocular VFL (yes)			**0.05***	[0.01, 0.09]		
Sex (female)	**-0.27*****	<0.001	**-0.07*****	[-0.11, -0.03]	*-0.01**	[-0.03, -0.002]
Age (70+ years)	**0.70*****	<0.001	**-0.11*****	[-0.15, -0.07]	*0.03**	[0.02, 0.05]
Diabetes (yes)	0.06	NS	0.03 ??	[-0.04, 0.11]	0.01	[-0.004, 0.02]
Cataract surgery (yes)	**0.21***	0.027	-0.03 ??	[-0.09, 0.04]	*0.01**	[0.01, 0.04]
Comorbidity (yes)	**0.22***	0.012	0.01 ??	[-0.04, 0.07]	*0.01**	[0.001, 0.03]

Notes: Indirect effects estimated via nonparametric bootstrap (1,000 replications)
Percentile CIs shown * p<.05; *** p<.001

Results - 3

Predictor	Effect on mediator (VFL)		Direct effect on crash severity		Indirect effect on crash severity	
	logit	p-value	OR	95% CI	logit	95% CI
Binocular VFL (yes)			1.01	[0.88, 1.16]		
Sex (female)	-0.27	<0.001	0.88	[0.76, 1.01]	-0.001	[-0.01, 0.01]
Age (70+ years)	0.70	<0.001	0.92	[0.80, 1.06]	0.002	[-0.09, 0.02]
Crash type (multi-vehicle)	-	-	**2.40*** **	[1.85, 3.11]	-	-

Notes:
Indirect effects estimated via nonparametric bootstrap (1,000 replications), percentile CIs shown
Small indirect effects on crash severity - NS
*** p<.05; *** p<.001**

Findings

- VFL ↗ directly crash frequency by 5% but not crash severity
- 70+ (β=-0.11) had fewer crashes than those younger (higher VFL)
- Previous cataract surgery and comorbidities associated with higher VFL ↗
- Females (β= –0.07) had fewer crashes
- Indirect effects of VFL on crashes by previous cataract surgery (β=0.01), comorbidities (β=0.01), age 70+ years (β=0.03) and sex (β= –0.01)
- No significant mediation for crash severity.

Conclusions and recommendations

- Significant impact of visual pathways on driving outcomes
- Monitor closely older drivers with binocular VFL - more likely to be involved in more crashes.
- Recommend compensatory strategies (e.g., increased scanning of the road environment, more frequent glancing towards areas with VFL, increased head & shoulder movement) to reduce crashes for older drivers with VFL.

Thank you

Access to the WA Data Linkage System and expertise of ophthalmologists is greatly appreciated