



RSA

# Serious injuries among motorcyclists in hospital and An Garda Síochána data

Period 2014-2023

Dr Stefanía Castelló, Research Department,  
Road Safety Authority, Ireland.  
[scastello@rsa.ie](mailto:scastello@rsa.ie)

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# Background



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- This report provides an overview of serious injuries among motorcyclists over 2014-2023.
- The EC has requested all EU Member States to report on serious injuries using hospital data, to complement police data on serious injuries. It is internationally acknowledged that police data alone will understate the number of serious injuries from road traffic collisions; therefore it is important that both sources of data are reported in Ireland to provide a holistic picture of the serious injury problem.
- This report is the third of a series of reports on serious injuries in Ireland over the same period.
- For the preparation of this report series, two sources of data were used:
  - **Hospital records** from the **Hospital In-Patient Enquiry (HIPE) database**, and
  - **Collision records** from the **Irish Road Traffic Collision database**, transferred from An Garda Síochána (AGS) to the RSA.
- The HIPE database is managed by the HSE and includes demographic and clinical information on casualties admitted to acute hospitals in Ireland.
- AGS information from 2020 onwards is provisional and subject to change. This means that AGS serious injury numbers presented here may change at a later date when new information becomes available.
- Details on the **methodology** that we use to report on serious injuries from hospital data can be found [here](#).



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# Definitions of injury

## Hospital data

- We follow a medical definition of a serious injury, based on an international validated injury severity scoring scale, the **Abbreviated Injury Scale (AIS)\***.
- The AIS scale allows to assign an injury severity score between 1 (minor) to 6 (critical) to each hospitalised casualty.
- A casualty may have one or more injuries recorded in their hospital chart. We first assign an AIS score to each injury, and then determine the maximum AIS score assigned to each casualty.
- **Seriously injured casualties are those with at least one injury with a maximum AIS score of 3 or more (MAIS3+).**
- Casualties with a maximum AIS score of 2 or less (**MAIS2-**) are defined as having injuries of minor-to-moderate severity.
- We add the number of casualties having MAIS3+ and MAIS2- scores to obtain the total number of **hospitalised casualties**.
- Please see [the methodology report](#) for more details on the definitions of injury.



# Definitions of injury

## An Garda Síochána data

- The definition of a serious injury followed by AGS is as follows:
  - A serious injury is an injury for which the person is **detained in hospital as an 'in-patient'**, or has any of the following injuries **whether or not detained in hospital**: fractures, concussions, internal injuries, crushing, severe cuts and lacerations, or severe general shock requiring medical treatment.
  - All hospitalised casualties fall into the AGS definition of a serious injury, as they are all 'in-patients'.

# Report Outline

- Trends
- **Characteristics of all hospitalised motorcyclists (2014-2023) and comparison with AGS serious injuries**
  - Demographics: age and gender
  - County
  - Collision type
  - Characteristics of injuries sustained, length of stay at hospital and discharge destination (hospital data only)
- **Characteristics of MAIS3+ motorcyclists in hospital records (2014-2023)**
  - Demographics: age and gender
  - Month, Day of week and Time of admission to hospital
  - County of residence
  - Collision type
  - Characteristics of injuries sustained, length of stay at hospital, and discharge destination

# All hospitalised and AGS serious injuries

2014-2023



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# Summary of results

## All hospitalised motorcyclists and AGS serious injuries – 2014-2023

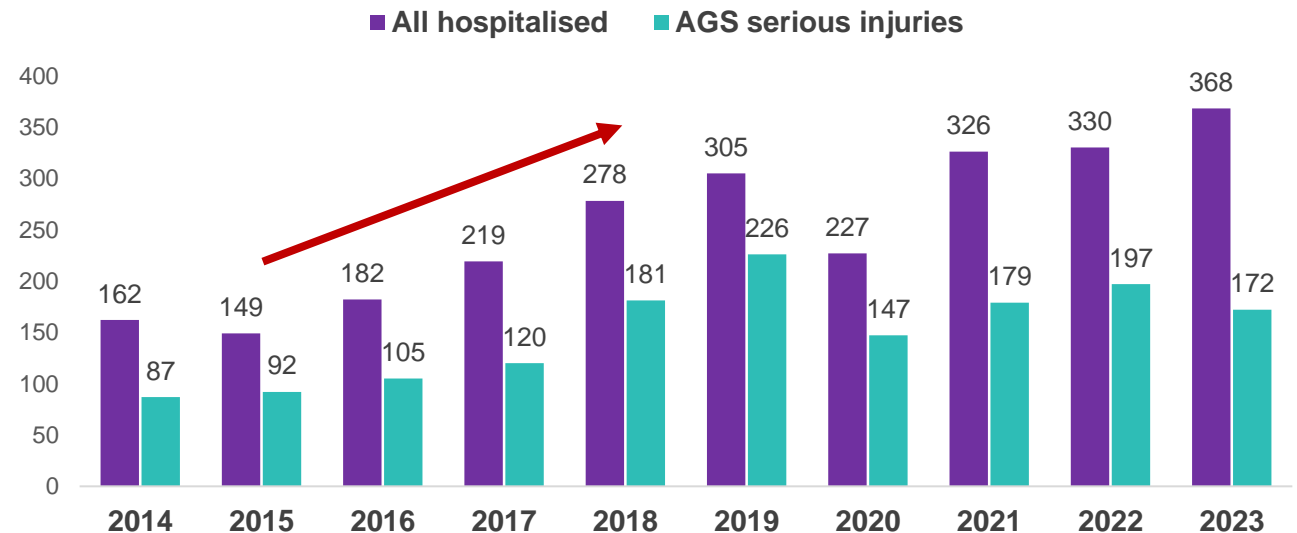
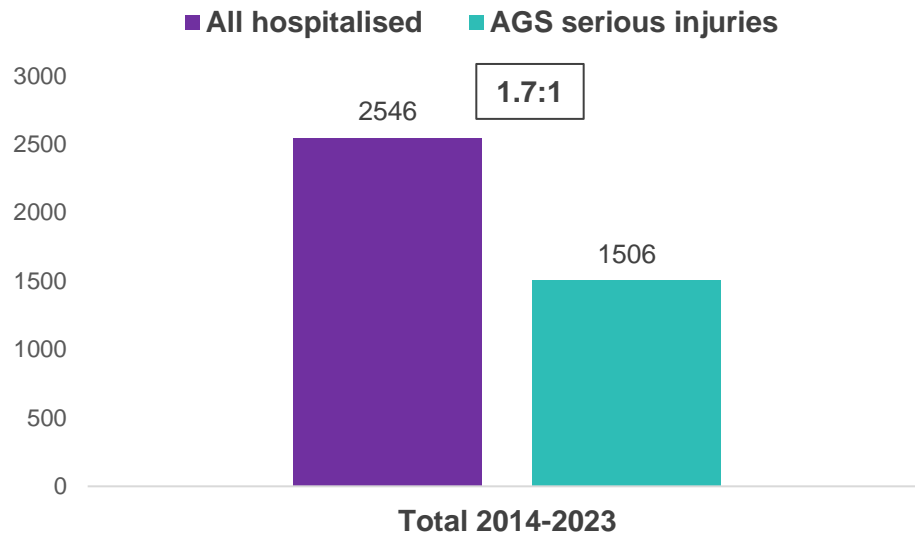
- Over 2014-2023, the total of hospitalised motorcyclists was 2,546, while the total of AGS recorded serious injuries was 1,506.
- This discrepancy between data sources is in line with international evidence showing that using police data alone understates the number of serious injuries from road traffic collisions in general.
- For instance, hospital data includes all motorcyclists admitted to hospital following a road traffic collision, and some of these collisions would not have been reported to AGS. Besides, the AGS definition of a serious injury is broad, is not based on a medical assessment, and will include injuries not requiring admission to hospital.
- Most hospitalised motorcyclists were males, aged 25-34 years, and residents in County Dublin. Seriously injured motorcyclists in AGS records had similar characteristics.
- The most frequent type of injury sustained by hospitalised motorcyclists was a fracture in the limbs.
- Almost 2 in 5 hospitalised motorcyclists spent 5 days or more in hospital as in-patients, and at discharge 14% were sent to another hospital for continued care.
- Single-vehicle collisions were the main mechanism of injury among hospitalised motorcyclists, whereas multi-vehicle collisions involving a car, truck, or van were the main collision type among motorcyclists recorded by AGS.

# Trends



## All hospitalised and AGS serious injuries – 2014-2023

- Over 2014-2023, a total of 2,546 motorcyclists were admitted to hospital as in-patients with injuries from road traffic collisions. Over the same period, AGS statistics indicated that 1,506 motorcyclists were seriously injured.
- There was an increase in the number of motorcyclists in both hospital and AGS records up to 2019.
- In 2020, there was a decline in the number of motorcyclists who were hospitalised, and also in the number of serious injuries recorded by AGS.
- The highest number of admissions to hospital among motorcyclists was recorded in 2023 (368).



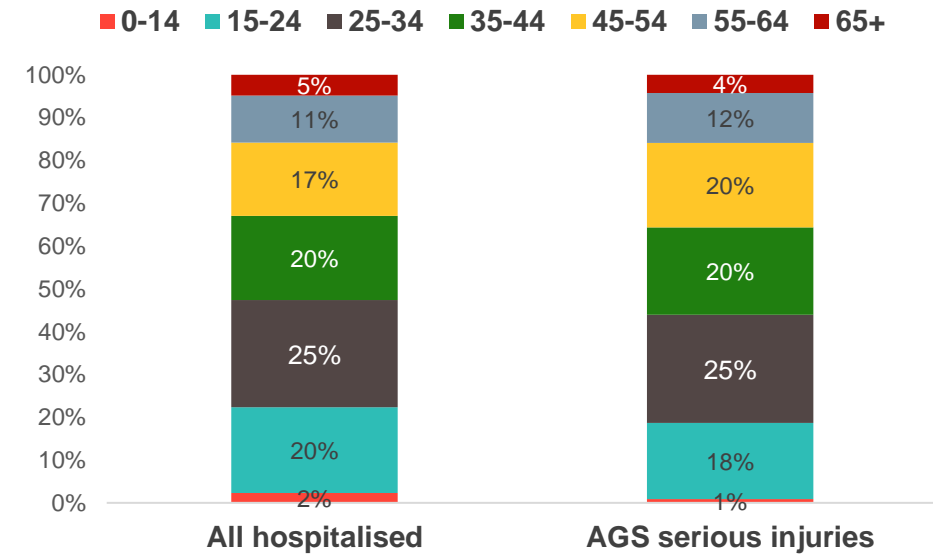
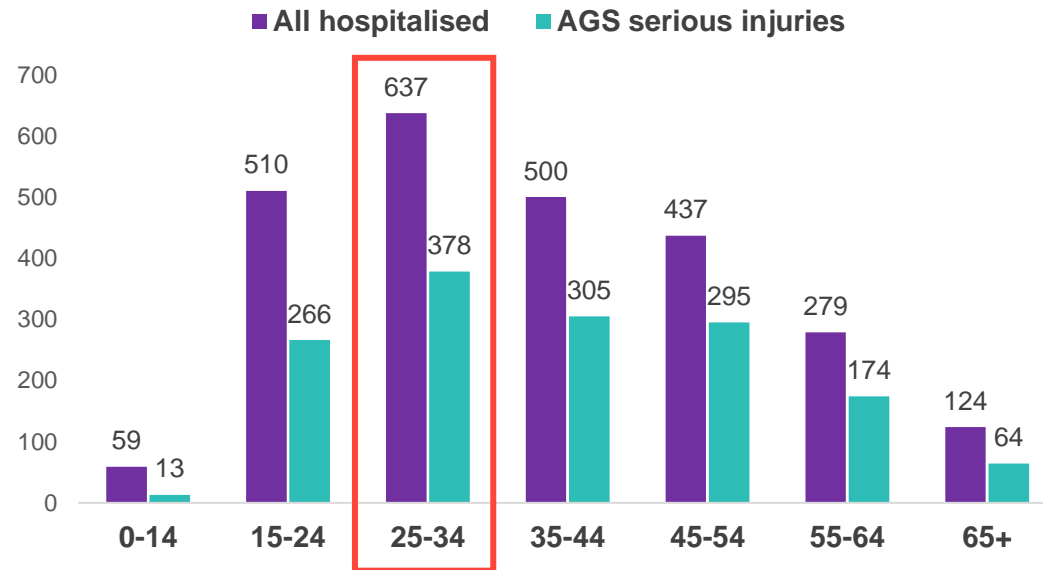
AGS data is current as of 31 March 2024. AGS data for 2020 onwards is provisional and subject to change.

# Age



## All hospitalised and AGS serious injuries – 2014-2023

- A quarter of hospitalised and AGS seriously injured motorcyclists were aged 25-34 years.



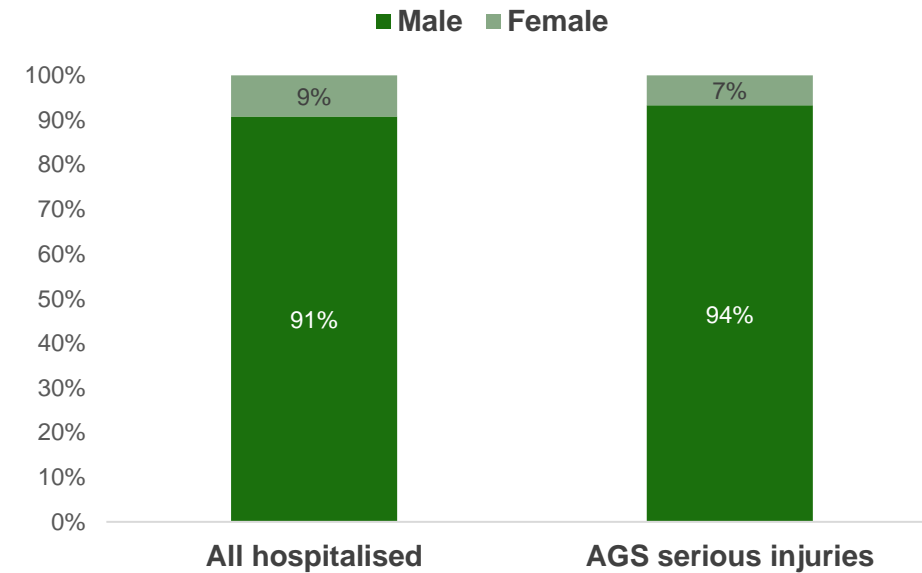
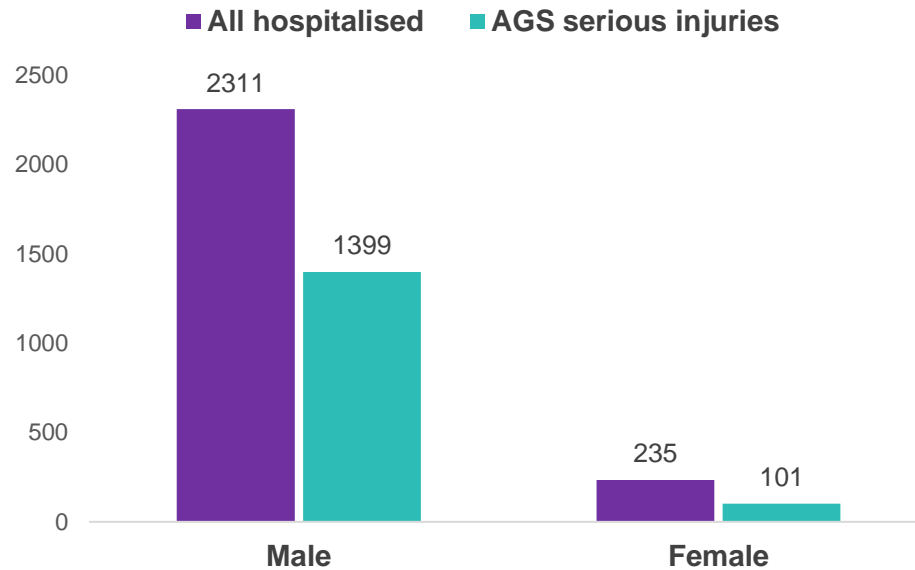
AGS data is current as of 31 March 2024. AGS data for 2020 onwards is provisional and subject to change.

# Gender



## All hospitalised and AGS serious injuries – 2014-2023

- Over 90% of hospitalised and AGS seriously injured motorcyclists were males.



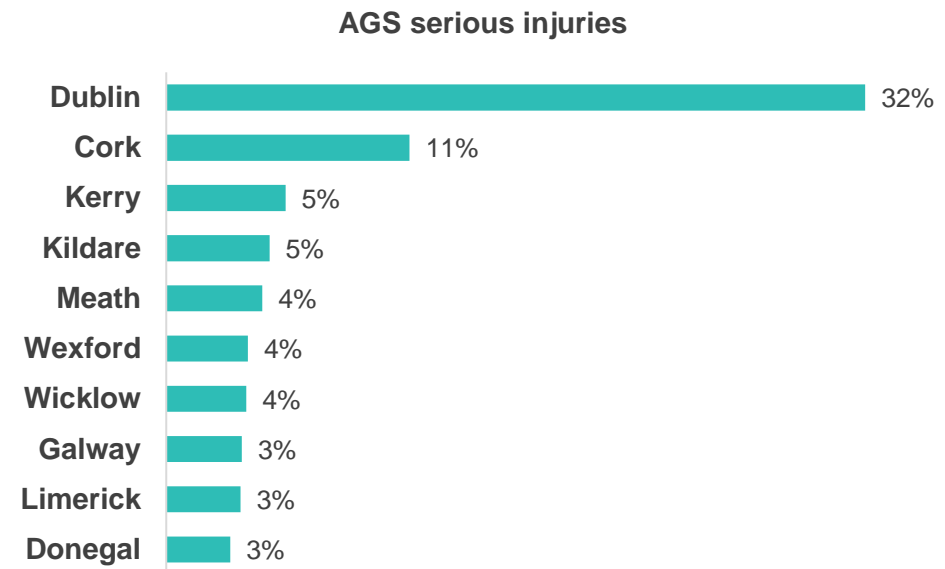
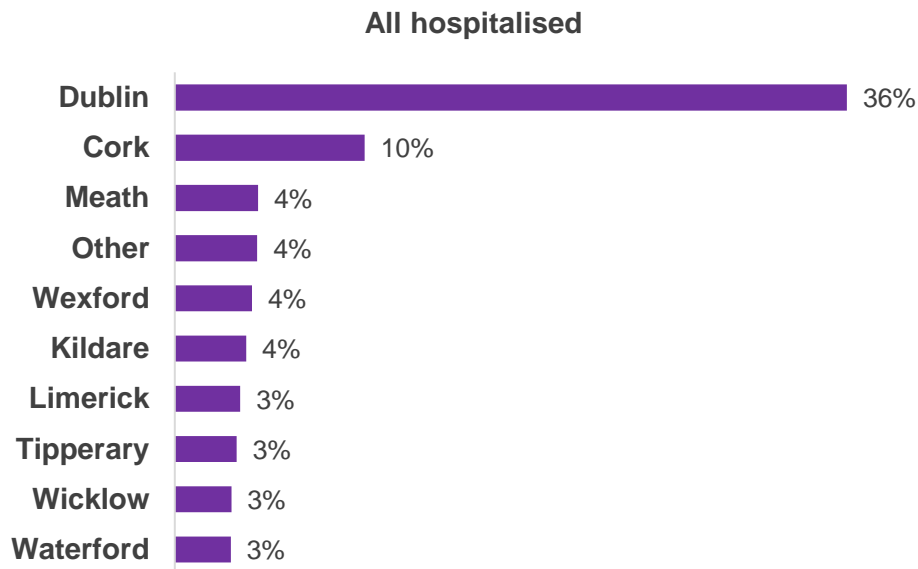
AGS data is current as of 31 March 2024. AGS data for 2020 onwards is provisional and subject to change.

# County



## All hospitalised and AGS serious injuries – 2014-2023

- Dublin was the county with the highest number of hospitalised motorcyclists (913) and AGS serious injuries (480), followed by County Cork.
- In hospital data, the county indicates the residence of the casualty, whereas in AGS records it refers to the location of the collision.
- The 'Other' category in hospital data indicates that a casualty was not resident in an Irish county.



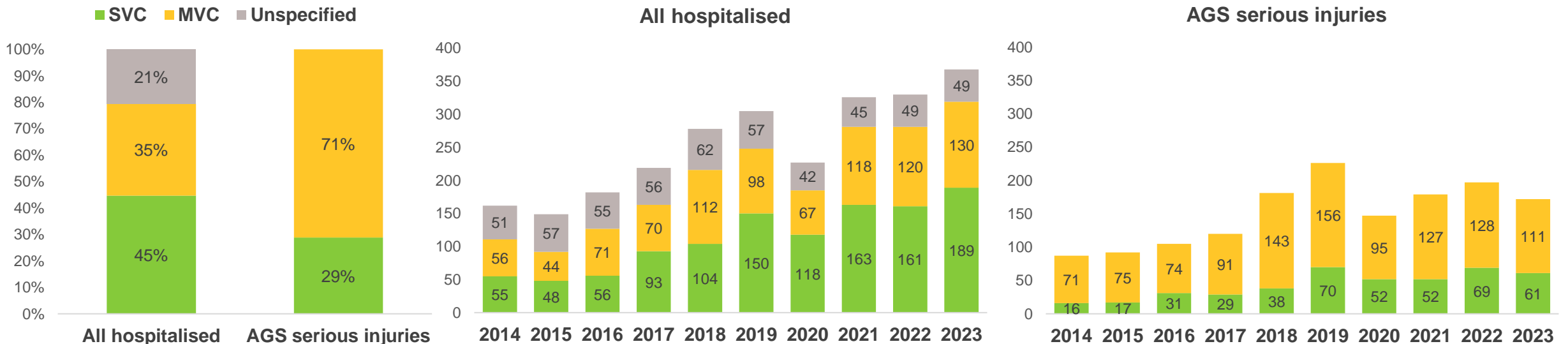
AGS data is current as of 31 March 2024. AGS data for 2020 onwards is provisional and subject to change.



# Collision type

## All hospitalised and AGS serious injuries – 2014-2023

- 45% (1137) of hospitalised motorcyclists were injured in single-vehicle collisions (SVCs), and 35% (886) in multi-vehicle collisions (MVCs).
- 71% (1071) of motorcyclists recorded as seriously injured in AGS records were involved in MVCs, and 29% (435) in SVCs.
- The number of SVCs in hospital data increased over the period, and was the highest in 2023 (189).
- Around 90% of motorcyclists involved in MVCs in both data sources were injured in a collision with a car, truck, or van.



AGS data is current as of 31 March 2024. AGS data for 2020 onwards is provisional and subject to change.



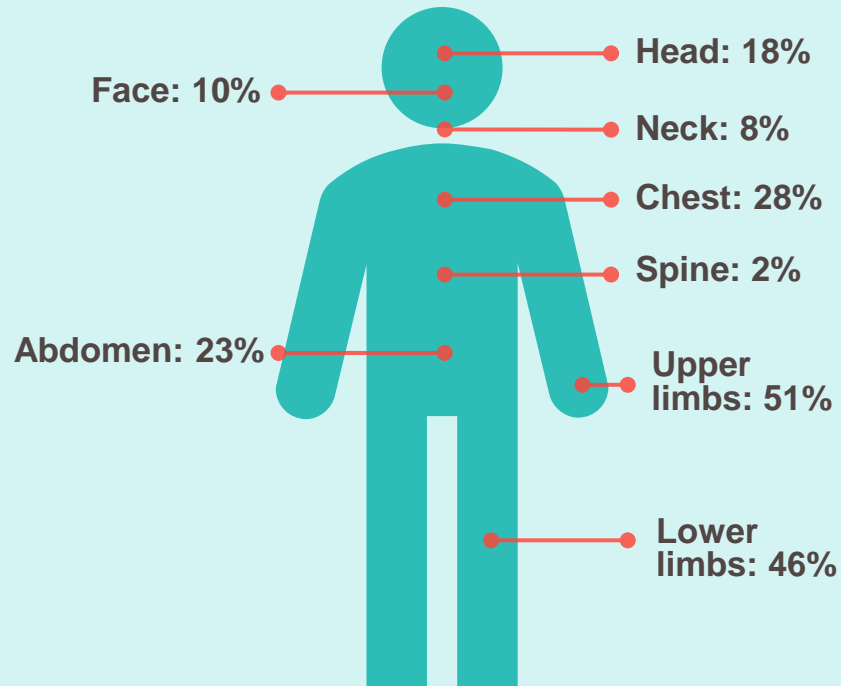
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# Injuries sustained\*

## All hospitalised – 2014-2023

Body part where at least one injury was sustained (% Yes)



- Hospitalised motorcyclists may have sustained one or more injuries (of any severity).
- 71% of hospitalised motorcyclists sustained 2 or more injuries in the same or in different body parts, with a mean number of injuries of 4.43, and a maximum of 23 injuries.
- 51% of all hospitalised motorcyclists sustained at least one upper limb injury\*\*. Of these, 85% sustained at least one fracture, and 15% at least one open wound.
- 46% of all hospitalised motorcyclists sustained at least one lower limb injury\*\*\*. Of these, 77% sustained at least one fracture, 33% at least one open wound.
- 28% of all hospitalised motorcyclists sustained at least one chest# injury. Of these, 87% sustained at least one fracture, and 50% at least one intra-thorax injury.
- 23% of all hospitalised motorcyclists sustained at least one abdomen## injury. Of these, 63% sustained at least one fracture, 23% at least one intra-abdominal injury, and 14% at least one injury in pelvic organs.
- 18% of all hospitalised motorcyclists sustained at least one head injury. Of these, 64% sustained at least one brain injury, and 26% at least one skull fracture.

\* Based on information from the ICD-10-AM injury codes recorded for each casualty in HIPE. Percentages represent the proportion of casualties with at least one injury or injury type in each body part.

\*\* The upper limb category include shoulder, upper arm, elbow, forearm, wrist, and hand injuries. \*\*\* The lower limb category includes hip, thigh, lower leg, knee, ankle and foot injuries.

# Examples of chest injuries include thorax, sternum, rib, heart, or lung injuries. ## Examples of abdomen injuries include lower back injuries; abdominal organs such as liver or stomach injuries; and pelvic organs such as kidney or bladder injuries.



# Length of stay at hospital

## All hospitalised – 2014-2023

- 38% of hospitalised motorcyclists stayed 5+ days at hospital as in-patients.
- The average number of days they spent at hospital as in-patients was of almost 8 days.

All hospitalised motorcyclists		
Number of days	All (2546)	%
1 day or less	736	29%
2 days	391	15%
3 to 4 days	440	17%
5 days or more	979	38%
Mean (SD)	7.44 (16.52)	
Stayed at ICU 1+ days (% yes)	13%	
Mean LOS at ICU (SD)	8.24 (9.86)	



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# Destination at discharge

## All hospitalised – 2014-2023

- At discharge from hospital, 83% of hospitalised motorcyclists were sent home and 14% were transferred to another hospital for continued care.

All hospitalised motorcyclists			
Destination	All (2546)	%	
Home	2109	83%	
Nursing home or other long-term accommodation	29	1%	
Transfer to hospital	363	14%	
Other	45	2%	

# Injury severity

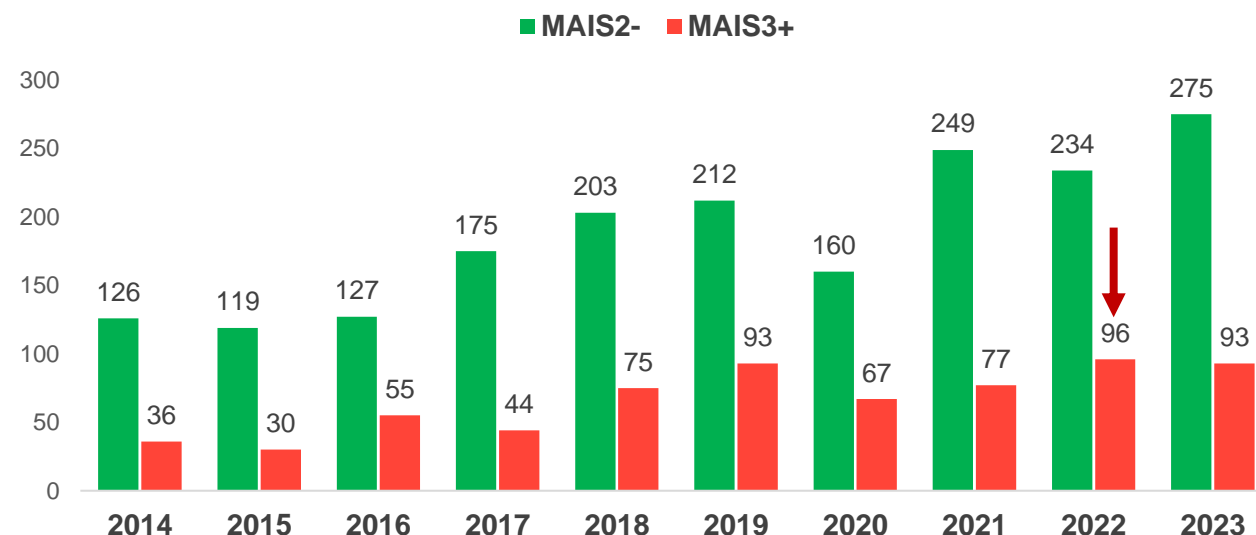
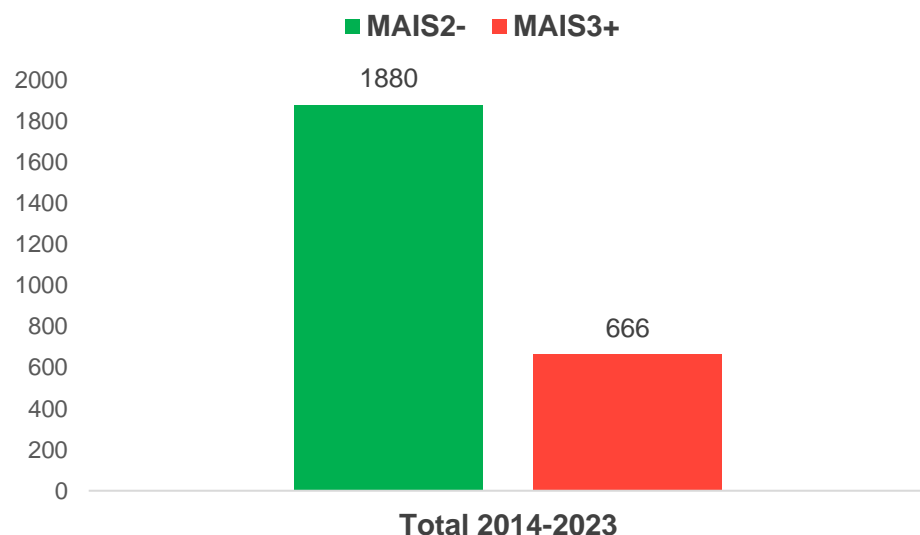
2014-2023 – Hospital data



# Total and trend

## MAIS2- and MAIS3+ motorcyclists – 2014-2023

- We assigned an injury severity score to all hospitalised motorcyclists (2,546) using the AIS scale and determined the maximum score, to know the number of casualties who sustained clinically serious injuries (see [link](#) for more details).
- 74% of all hospitalised motorcyclists (1,880) sustained MAIS2- injuries (minor to moderate severity), and 26% (666) sustained MAIS3+ injuries (serious injuries).
- The number of MAIS2- and MAIS3+ motorcyclists increased since 2014, and declined in 2020 with respect to 2019. The number of MAIS3+ motorcyclists recorded in 2022 (96) was the highest of the period.



# Characteristics of MAIS3+ motorcyclists

2014-2023 – Hospital data



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# Summary of results

## MAIS3+ motorcyclists – 2014-2023

- 26% of all hospitalised motorcyclists over 2014-2023 sustained MAIS3+ injuries, these being the most clinically serious injuries with a higher probability of having long term consequences on the casualty's life.
- The number of MAIS3+ motorcyclists increased over the years, with the highest annual number recorded in 2022 (96).
- Most MAIS3+ motorcyclists were males, aged 15-34 years, and residents in County Dublin. They were more frequently admitted to hospital between June and August or on Sundays, and spent 14 days on average as in-patients.
- MAIS3+ motorcyclists sustained more frequently a single serious fracture in the lower limbs, or multiple serious injuries in the same or different body parts.
- 2 in 5 MAIS3+ motorcyclists were injured in multi-vehicle collisions where the other vehicle involved was a car, truck, or van.
- They were more frequently sent home at discharge from hospital, although almost a third was sent to another hospital for continued care.



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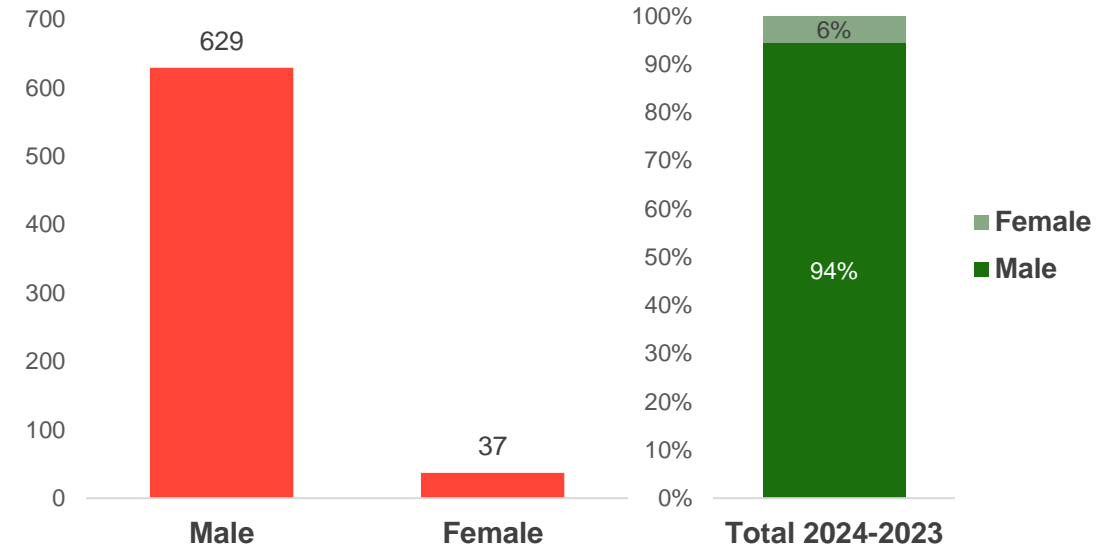
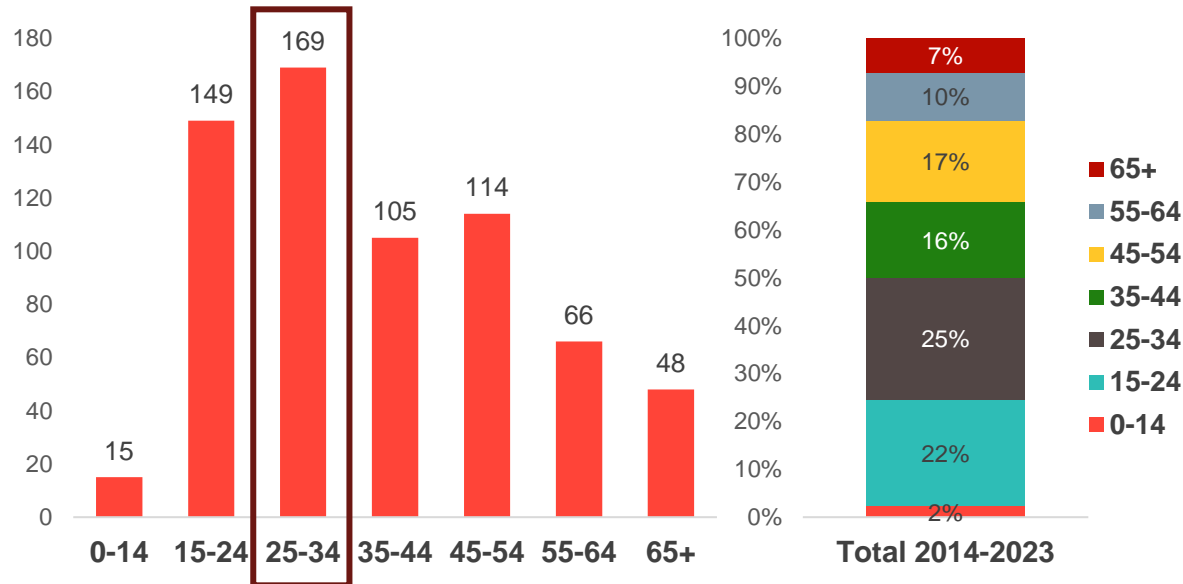


# Age and gender

## MAIS3+ motorcyclists – 2014-2023

- 25% of MAIS3+ motorcyclists were aged 25-34 years.

- 94% of MAIS3+ motorcyclists were males.

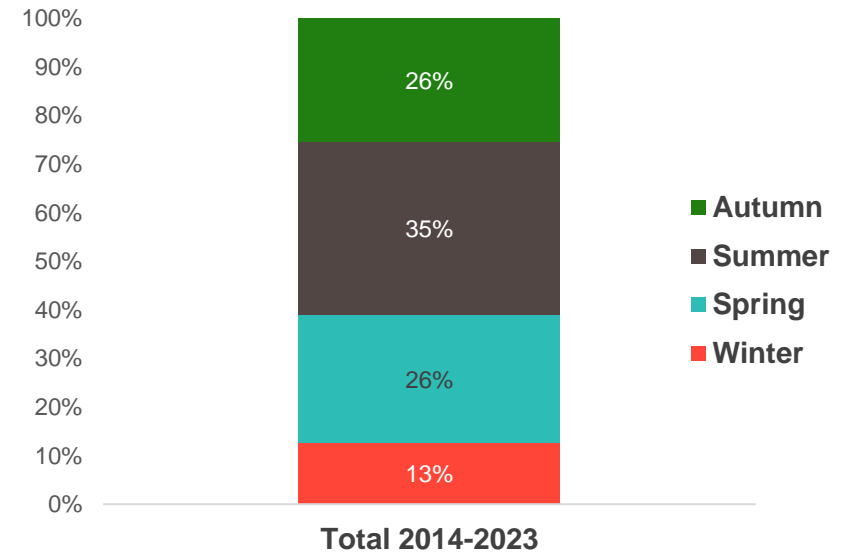
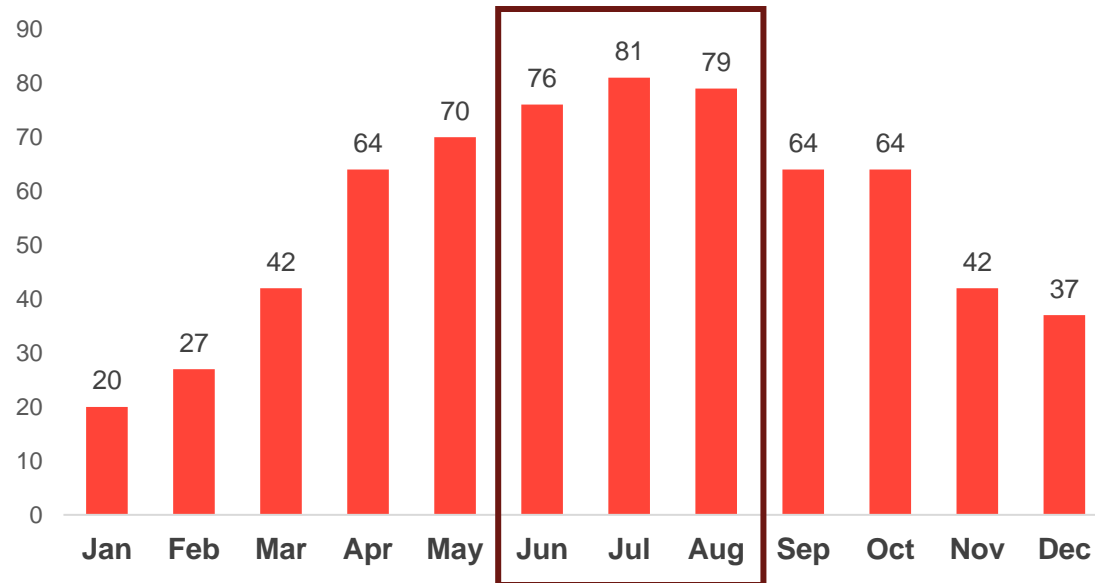




# Month of hospital admission

## MAIS3+ motorcyclists – 2014-2023

- The number of MAIS3+ motorcyclists admitted to hospital was the highest between June and August.
- Winter was the season with the lowest share of admissions to hospital (13%).





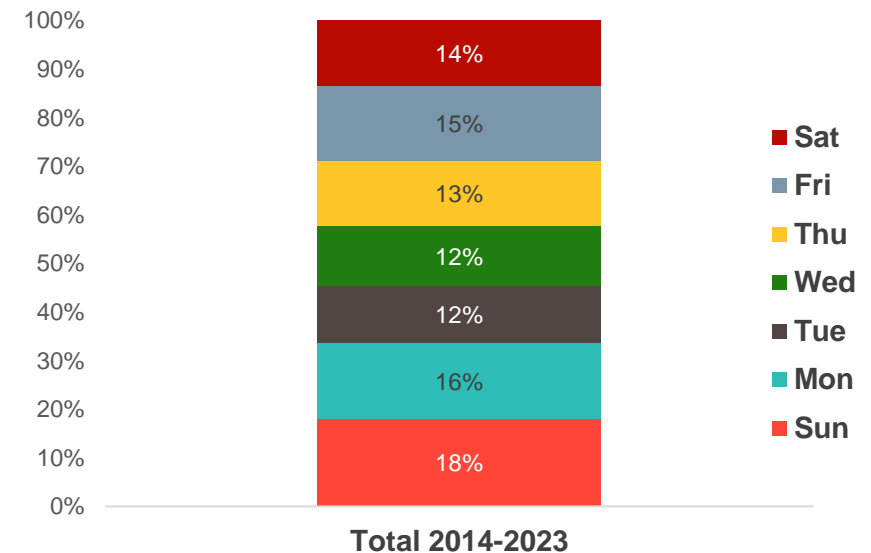
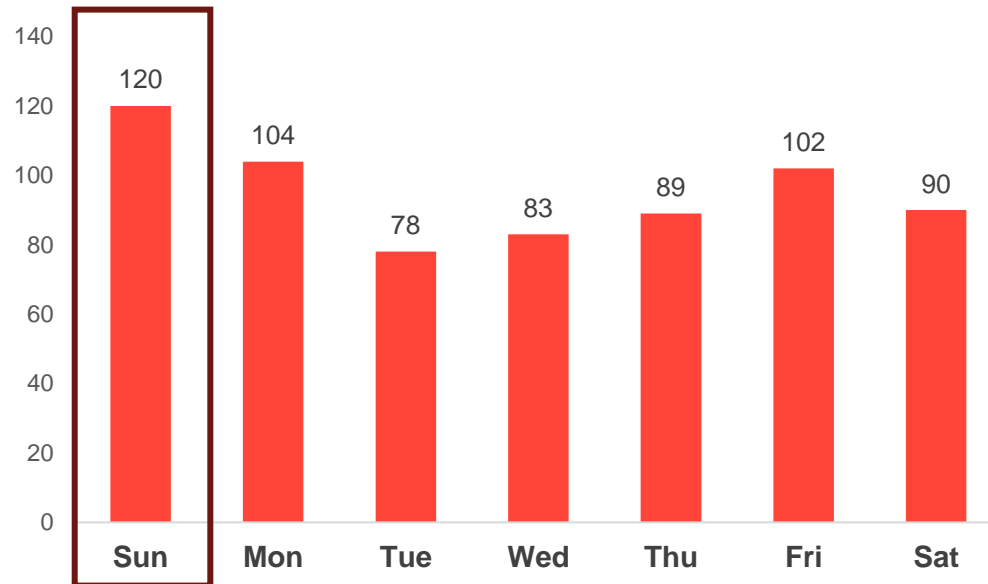
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# Day of hospital admission

## MAIS3+ motorcyclists – 2014-2023

- Sundays had the highest number and share of MAIS3+ admissions to hospital.



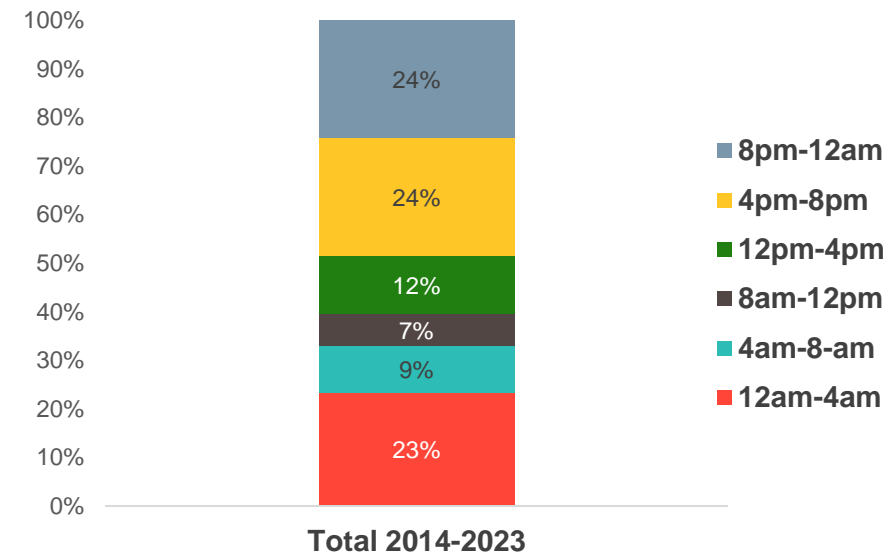
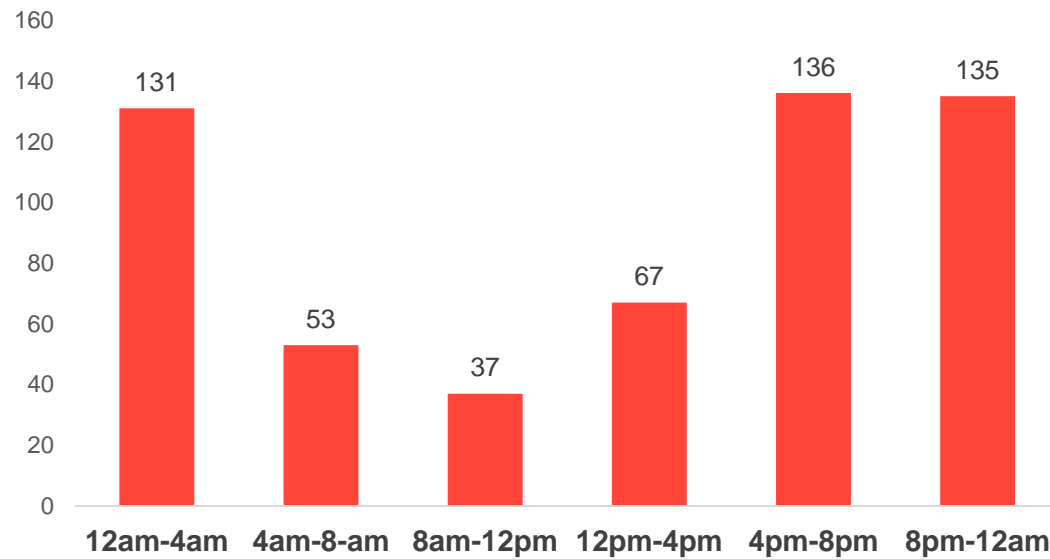


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# Time of hospital admission MAIS3+ motorcyclists – 2014-2023

- Overall, hospital admission of MAIS3+ motorcyclists was more frequent between 4pm-4am.





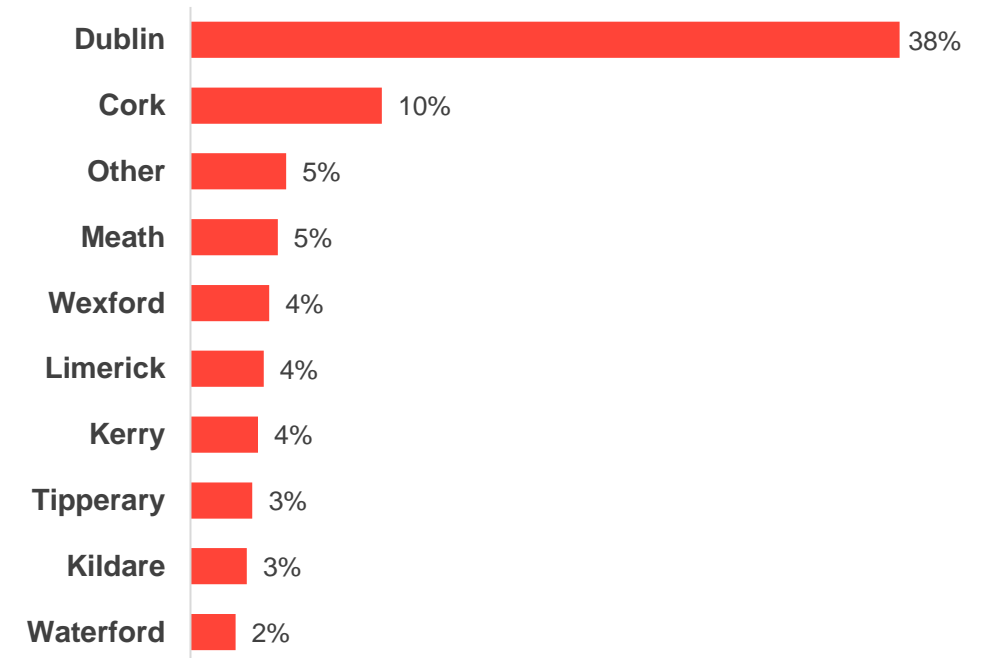
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# County of residence

## MAIS3+ motorcyclists – 2014-2023

- 38% of MAIS3+ motorcyclists (252) were County Dublin residents.
- 5% (34) were defined as not being residents in an Irish county ('Other').

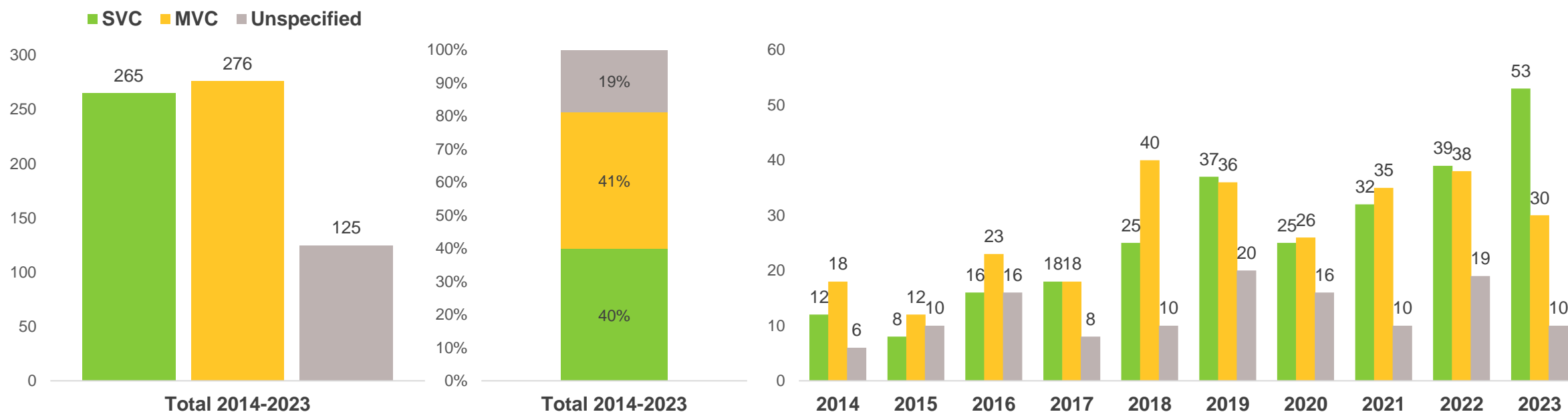




# Collision type

## MAIS3+ motorcyclists – 2014-2023

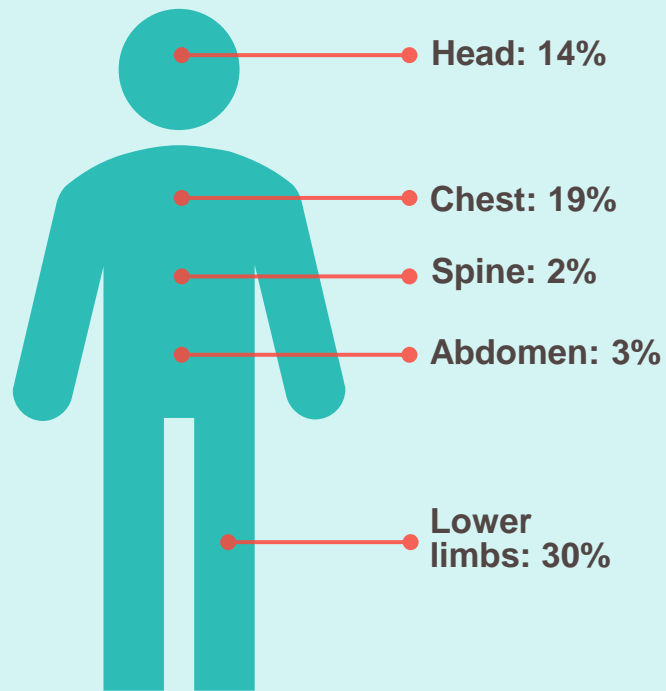
- 41% of MAIS3+ motorcyclists were injured in multi-vehicle collisions (MVCs, n= 276). Of all MAIS3+ motorcyclists in MVCs, 90% were injured in a collision with a car, truck, or van.
- There were 265 MAIS3+ motorcyclists (40%) injured in single-vehicle collisions (SVCs). The highest annual number of SVCs was recorded in 2023 (53).



# Injuries sustained\*

## MAIS3+ motorcyclists – 2014-2023

Share per body part for motorcyclists with a single serious injury:



- Casualties may have sustained a single serious injury, or multiple serious injuries in the same or different body parts.
- 69% of MAIS3+ motorcyclists sustained a **single serious injury** (percentages of single serious injuries per body part are displayed in the graph in the left).
  - 14% of MAIS3+ motorcyclists sustained a single serious head injury. 57% of these were serious brain injuries, and 43% were skull fractures.
  - 19% of MAIS3+ motorcyclists sustained a single serious chest<sup>#</sup> injury. 90% of these were serious injuries in internal chest organs.
  - 3% of MAIS3+ motorcyclists sustained a single serious abdomen<sup>##</sup> injury. 78% of these were serious injuries in pelvic organs.
  - 30% of MAIS3+ motorcyclists sustained a single serious lower limb<sup>\*\*</sup> injury. 99% of these were serious fractures.
- 31% of MAIS3+ motorcyclists sustained **multiple serious injuries** in the same or in different body parts.
  - The mean number of injuries among motorcyclists with multiple injuries was 2.36, with a maximum of 4 serious injuries.

\* Based on information from the ICD-10-AM injury codes recorded for each casualty in HIPE.

# Examples of chest injuries include thorax, sternum, rib, heart, or lung injuries. ## Examples of abdomen injuries include lower back and spine injuries; abdominal organs such as liver or stomach injuries; and pelvic organs such as kidney or bladder injuries. \*\* The lower limb category includes hip, thigh, lower leg, knee, ankle and foot injuries.



# Injuries sustained\*

## MAIS3+ motorcyclists – 2014-2023

MAIS3+ motorcyclists (n)		Collision type (%)				Age (%)			
Body part	All (666)	%	SVC (n= 265)	MVC (n= 276)	0-24 (n= 164)	25-34 (n= 169)	35-54 (n= 219)	55+ (n= 114)	
Single serious injury	Head	90	14%	15%	13%	13%	14%	15%	11%
	Chest#	125	19%	18%	18%	13%	15%	23%	23%
	Abdomen##	23	3%	4%	3%	*	5%	5%	*
	Spine	13	2%	~	*	*	4%	*	*
	Lower limbs**	202	30%	26%	33%	37%	25%	27%	34%
	Other	7	1%	*	*	*	*	*	*
<b>Multiple serious injuries</b>		206	31%	33%	31%	34%	36%	28%	25%

\* Denotes a cell with less than 5 cases. - indicates that further suppression was needed to avoid disclosure of a cell with less than 5 cases.

- Multiple serious injuries and serious lower limb injuries were the most frequent injury types in all ages and collision types. Serious chest injuries accounted for almost a quarter of MAIS3+ motorcyclists aged 35+ years.

\* Based on information from the ICD-10-AM injury codes recorded for each casualty in HIPE.

# Examples of chest injuries include thorax, sternum, thoracic spine, rib, heart, or lung injuries. ## Examples of abdomen injuries include lower back and spine injuries; abdominal organs such as liver or stomach injuries; and pelvic organs such as kidney or bladder injuries. \*\* The lower limb category includes hip, thigh, lower leg, knee, ankle and foot injuries.



# Length of stay at hospital

## MAIS3+ motorcyclists – 2014-2023

MAIS3+ motorcyclists (n)	Collision type (%)		Age (%)					
	All (666)	%	SVC (n= 265)	MVC (n= 276)	0-24 (n= 164)	25-34 (n= 169)	35-54 (n= 219)	55+ (n= 114)
Number of days								
1 day or less	70	11%	10%	9%	13%	13%	9%	~
2 days	48	7%	8%	6%	10%	7%	7%	*
3 to 4 days	110	17%	21%	14%	18%	17%	16%	14%
5 days or more	438	66%	61%	71%	59%	63%	68%	75%
Mean (SD)	14.22 (24.97)		11.27 (14.87)	16.31 (29.97)	10.68 (13.14)	15.45 (28.11)	13.03 (17.60)	19.77 (39.91)
Stayed at ICU 1+ days (% yes)	235	35%	31%	34%	34%	37%	35%	35%
Mean LOS at ICU (SD)	9.23 (10.83)		9.89 (12.73)	9.46 (10.08)	7.6 (8.46)	7.67 (8.52)	10.21 (12.75)	12.08 (12.41)

\* Indicates less than 5 cases in a cell. ~ Indicates that further suppression was needed to avoid disclosure of a cell with less than 5 cases.

- Most MAIS3+ motorcyclists were at hospital as in-patients for 5+ days.



# Destination at discharge

## MAIS3+ motorcyclists – 2014-2023

MAIS3+ motorcyclists (n)	Collision type (%)		Age (%)					
	Destination	All (666)	%	SVC (n= 265)	MVC (n= 276)	0-24 (n= 164)	25-34 (n= 169)	35-54 (n= 219)
Home	449	67%	71%	65%	73%	61%	71%	62%
Nursing home or other long-term accommodation	10	2%	2%	*	*	*	*	5%
Transfer to hospital	189	28%	25%	31%	24%	34%	26%	31%
Other	18	3%	~	4%	*	5%	*	*

\* Denotes a cell with less than 5 cases. – Indicates absence of cases in a cell. ~ Indicates that further suppression was needed to avoid disclosure of a cell with less than 5 cases.

- Most MAIS3+ motorcyclists were sent home at discharge, and almost a third were sent to another hospital for continued care.

# Serious injuries among motorcyclists in hospital and AGS records

2014-2023



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The findings presented in this report will inform evidence-based interventions to promote motorcyclists' safety and prevent serious injuries.

## Acknowledgements

- Members of the MAIS3+ project Board:
  - Dr Howard Johnson, National Health Intelligence Unit, Health Service Executive (HSE).
  - Dr Fionnuala Donohue, National Health Intelligence Unit, HSE.
  - Prof Noel McCarthy, Department of Public Health & Primary Care, Trinity College Dublin.
  - Ms Velma Burns, Research Manager, RSA.
  - Ms Sharon Heffernan, Statistician, RSA.
- RSA Research Department.



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