



Casualty Severity Data

Road Safety **GB**
analysts network


Department
for Transport

agilysis 

Today's Webinar



- Host: Richard Owen – Agilysis
- Experts:
 - Will Cubbin – RSGB Research Director / Essex Safer Roads Partnership Manager
 - Bruce Walton – Technical Director Road Safety Analysis / Agilysis
- 45 minutes of presentations
- 15 minutes Q&A
- Please use Chat Function!



Road Safety **GB**
Conference

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The Studio - Birmingham

Hybrid Conference

Wednesday 1st March



roadsafety.network

Today's Webinar

- Topic: Casualty Severity Data
- Chosen by the Analysts Network 'Champions'
- <https://roadsafety.network/>



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The Analysts Network is managed by **Agilysis** on behalf of **Road Safety GB** with support and funding from the Department for Transport.

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Email*	
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Organisation name	Job title
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What would you like to learn more about* Select any areas of interest and we will be in touch shortly to provide more information	
<input type="checkbox"/> Analysts Network community membership	

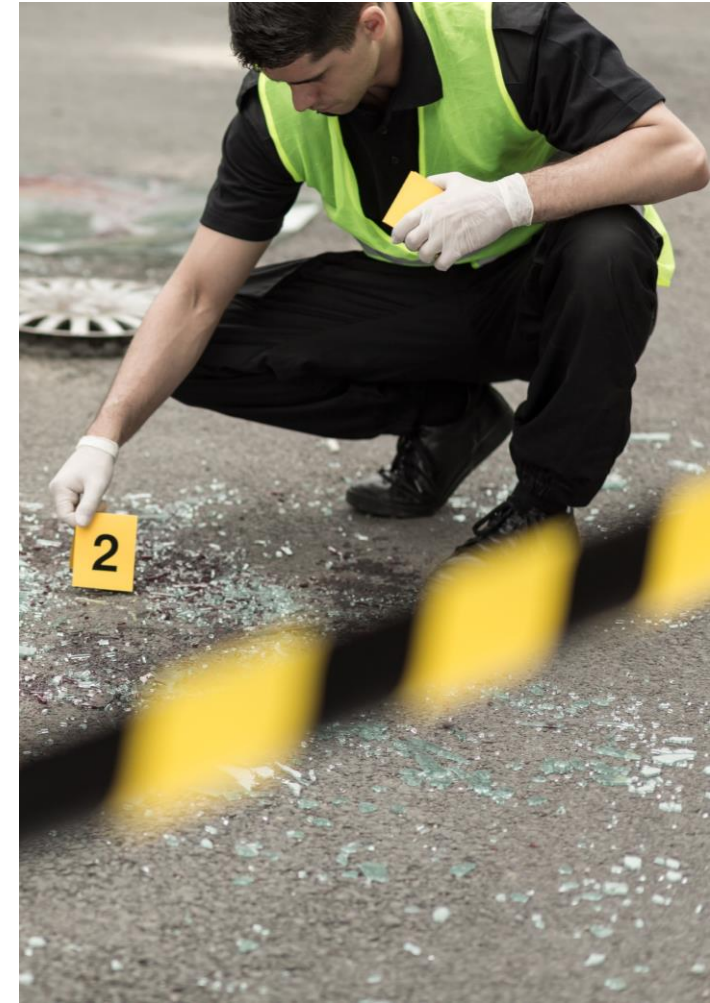
Old School Severity: What is a “Slight” injury?

'Slight' injuries include:

- Whiplash or neck pain
- Shallow cuts, lacerations or abrasions
- Sprains or strains not necessarily requiring treatment
- Bruising
- Slight shock requiring roadside attention

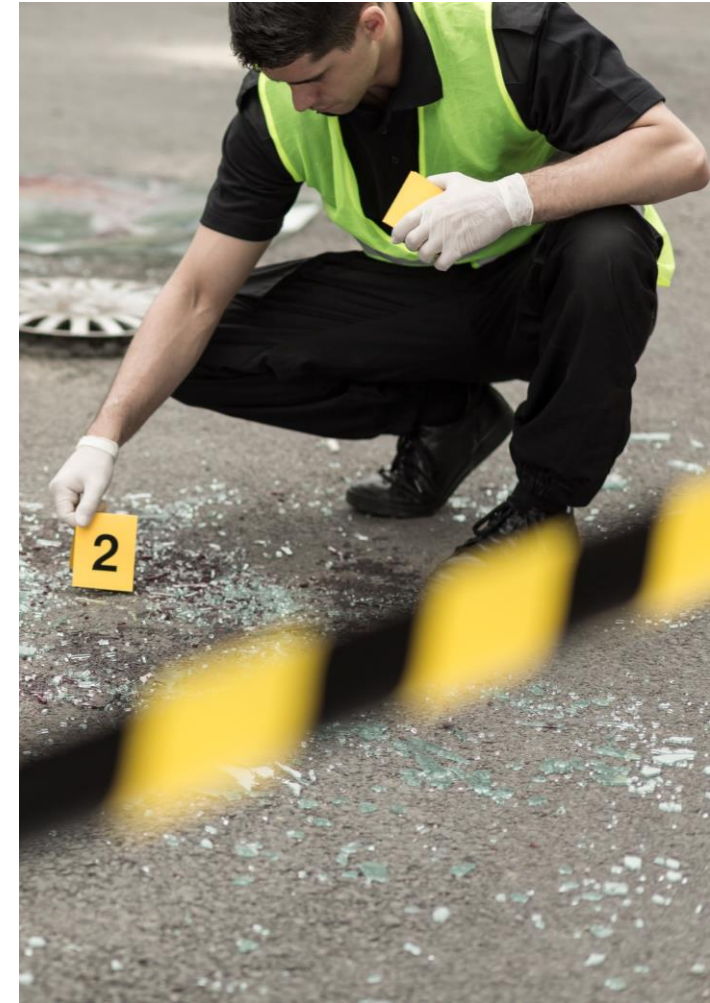
“Persons merely shaken [with] no other injury should not be included unless they receive *or appear to need* medical treatment”

STATS20 [my emphasis]



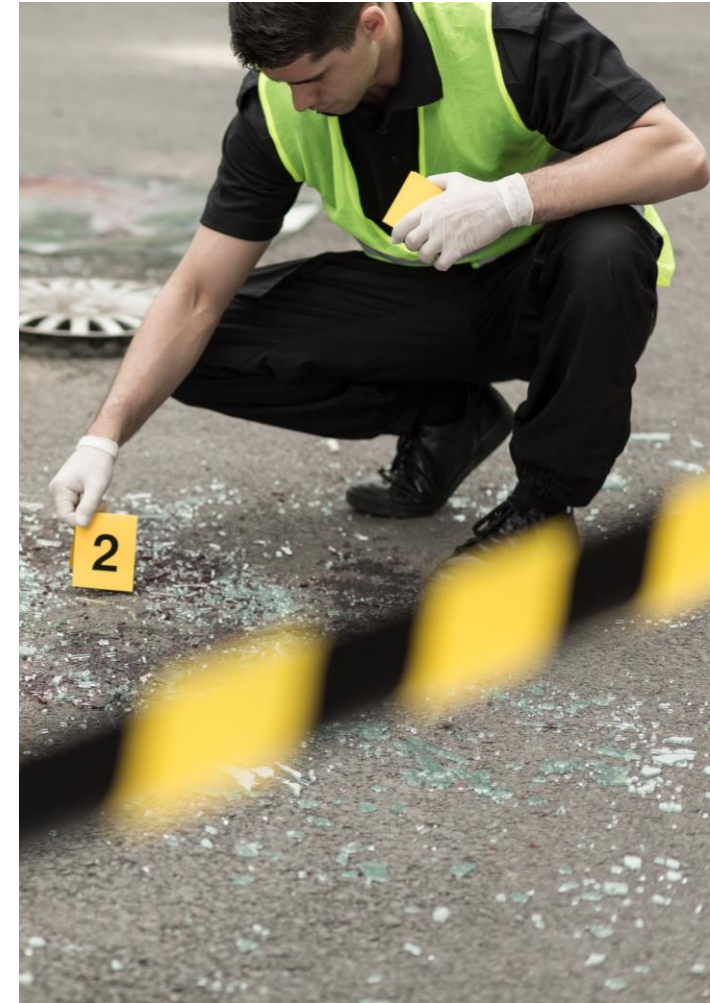
Old School Severity: what is a “KSI”

- “Killed or Seriously Injured”
 - Use this term only to refer to casualties
 - Collisions are better termed Fatal or Serious: “FSCs”
- Sample sizes for killed casualties are small
 - Life changing injuries should not be ignored
- Slight injury connotes less dangerous incidents
 - Incidents with slight casualties only are more likely to be under reported
 - “Only a sample”



Old School Severity: “Serious” is broad ...

- An injury is ‘Serious’ by definition if the casualty:
 - Is detained in hospital as an in-patient immediately or later
 - Dies 30 days or more afterwards from injuries sustained
- 'Serious' injuries also include (but are not restricted to):
 - Any difficulty breathing
 - Internal injuries
 - Fracture
 - Burns (excluding friction burns)
 - Concussion
- Officer judgement is required
 - for instance “Deep cuts/lacerations” are “Serious”
 - Medical classifications cannot be applied by the police

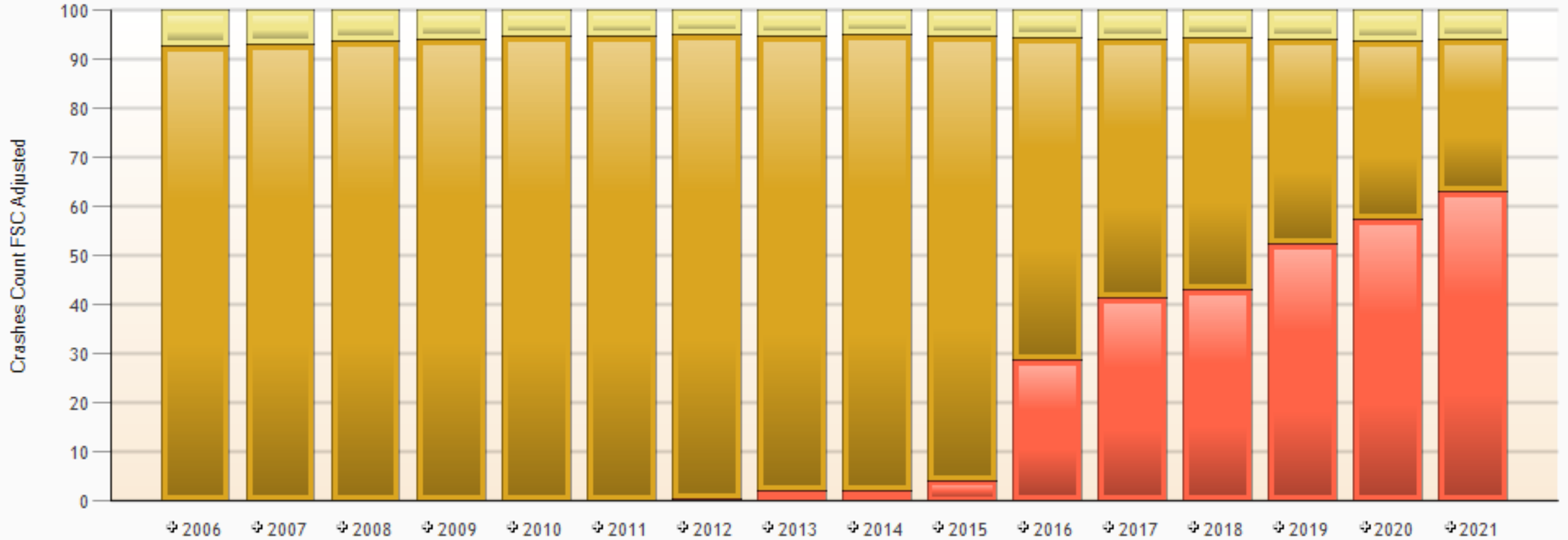




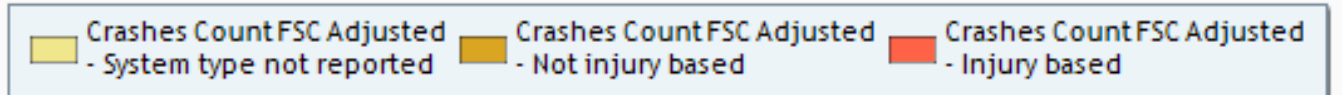
- **Officer records observed injuries**
 - They are not asked to make a judgement on severity
 - The system determines the severity
- **Advantages**
 - Better definition of wide range of casualties covered by “Serious”
 - More consistency over time and between forces
 - Insight into how injury risk varies by road user group
- **Disadvantages**
 - Risk of discontinuity in long term data series
 - Lack of consistency during implementation

A new approach: Injury Based Reporting

Crashes Count FSC Adjusted by Police Reporting System Is Injury Based by Crash Date



Source: MAST Online



Injury Based Reporting: since when, and how much?

Injury Based Reporting: Who's doing it?

- CRaSH has been adopted by a majority of forces
 - Trial in Surrey began in 2012
- Metropolitan Police do not use CRaSH
 - Bespoke COPA system uses injury-based reporting

Surrey Police	Nov 2012
Staffordshire Police	May 2015
Essex Police	Nov 2015
Gloucestershire Constabulary	Nov 2015
Warwickshire Police	Nov 2015
West Midlands Police	Nov 2015
Devon and Cornwall Constabulary	Dec 2015
West Mercia Police	Dec 2015
Cumbria Constabulary	Jan 2016
Humberside Police	Jan 2016
Kent Police	Jan 2016
South Yorkshire Police	Jan 2016
Norfolk Constabulary	Feb 2016
Suffolk Constabulary	Feb 2016
Durham Constabulary	Mar 2016
Bedfordshire Police	Apr 2016
Hertfordshire Constabulary	Apr 2016
Northumbria Police	Apr 2016
Cambridgeshire Constabulary	May 2016
Metropolitan Police	Sep 2016
Lancashire Constabulary	Dec 2018
Sussex Police	Apr 2019
Police Scotland	Jun 2019

Source: DfT RRCGB 2021

Injury Based Reporting: Who's not doing it?

- CRaSH has been adopted by a majority of forces
 - Trial in Surrey began in 2012
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 - Bespoke COPA system uses injury-based reporting

Avon and Somerset Constabulary

Cheshire Constabulary

Cleveland Police

Derbyshire Constabulary

Dorset Police

Dyfed-Powys Police

Greater Manchester Police

Gwent Police

Hampshire Constabulary

Leicestershire Constabulary

Lincolnshire Police

Merseyside Police

North Wales Police

North Yorkshire Police

Northamptonshire Police

Nottinghamshire Police

South Wales Police

Thames Valley Police

West Yorkshire Police

Wiltshire Police

What injuries count as “KSI”

Source: DfT RRCGB 2017

Injury in CRASH	Detailed severity	Severity classification
Deceased	Killed	Killed
Broken neck or back	Very Serious	Serious
Severe head injury, unconscious	Very Serious	Serious
Severe chest injury, any difficulty breathing	Very Serious	Serious
Internal injuries	Very Serious	Serious
Multiple severe injuries, unconscious	Very Serious	Serious
Loss of arm or leg (or part)	Moderately Serious	Serious
Fractured pelvis or upper leg	Moderately Serious	Serious
Other chest injury (not bruising)	Moderately Serious	Serious
Deep penetrating wound	Moderately Serious	Serious
Multiple severe injuries, conscious	Moderately Serious	Serious
Fractured lower leg / ankle / foot	Less Serious	Serious
Fractured arm / collarbone / hand	Less Serious	Serious
Deep cuts / lacerations	Less Serious	Serious
Other head injury	Less Serious	Serious

What injuries count as “Slight”?

Source: DfT RRCGB 2017

Injury in CRASH	Detailed severity	Severity classification
Whiplash or neck pain	Slight	Slight
Shallow cuts / lacerations / abrasions	Slight	Slight
Sprains and strains	Slight	Slight
Bruising	Slight	Slight
Shock	Slight	Slight

- Hospitalisation is not relevant to injury classification
- CRaSH was not always consistent with this
- In 2021, DfT removed injury based “serious” casualties which were based on this alone
 - Implemented retrospectively back to 2012

What is the basis for this?

Source: <https://www.aaam.org/abbreviated-injury-scale-ais/>



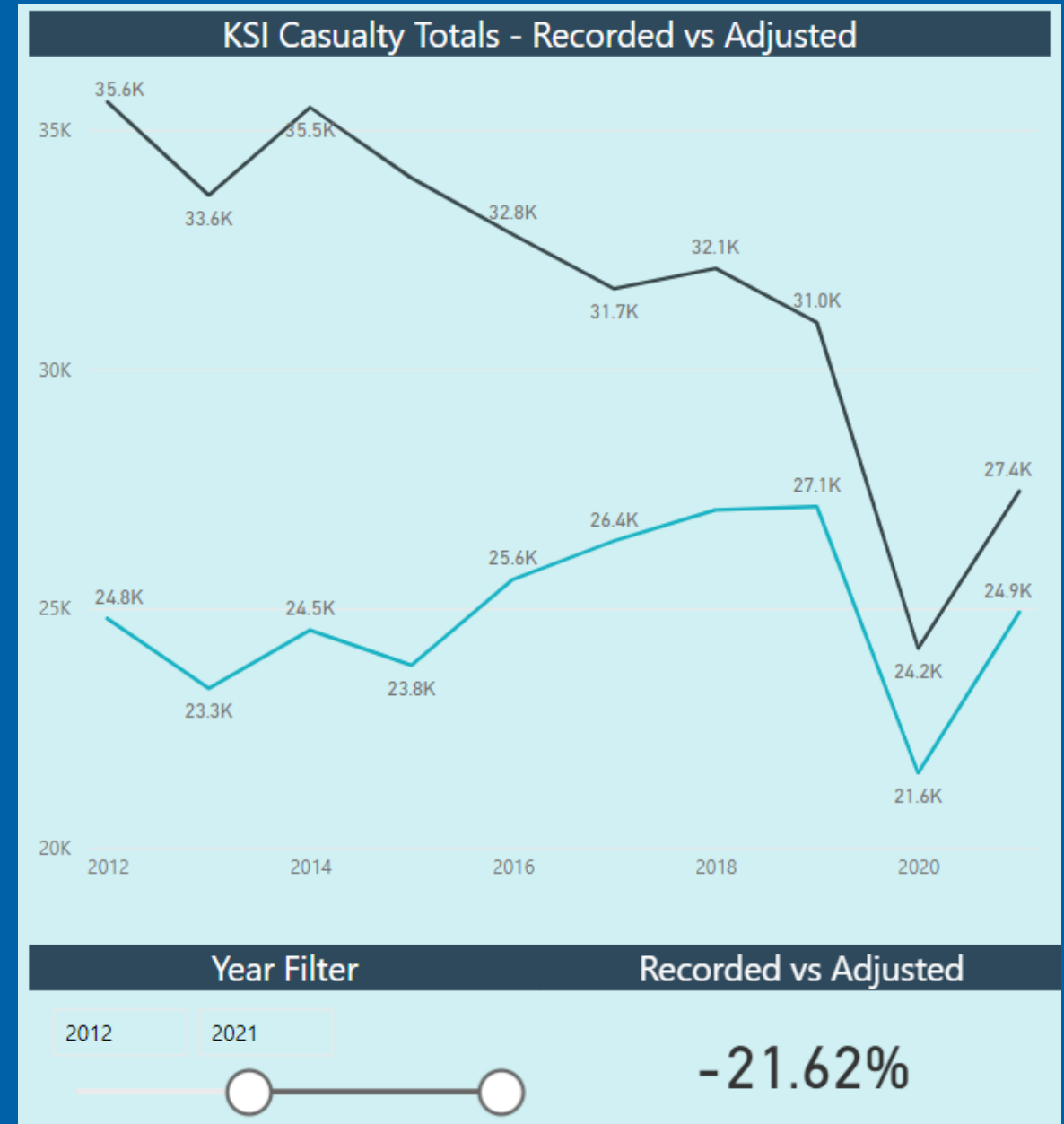
AIS-Code	Injury	Example
1	Minor	superficial laceration
2	Moderate	fractured sternum
3	Serious	open fracture of humerus
4	Severe	perforated trachea
5	Critical	ruptured liver with tissue loss
6	Maximum	total severance of aorta
9	Not further specified	

- AIS is an international standard used by medical professionals for many applications
- STATS19 is based on the Maximum injury according to this scale (MAIS)

Injury Based Reporting: What are the consequences?

- Since widespread adoption from 2016, a clear increasing trend in reported “serious” casualties
 - Light blue line - was a national statistic
- DfT and ONS agreed a statistical adjustment
 - Dark blue line - is now a national statistic
 - Adjustment at individual casualty record level
 - Probability that “Slight” injury would have been “Serious”
 - Reviewed annually
 - Publicly available

Source: MAST Online



A car occupied by four people leaves the road and hits a tree. One passenger breaks their arm. The driver and another passenger suffer bruises and whiplash. The other passenger is uninjured.



This is a serious injury collision in STATS19, with one vehicle and three casualties involved.

Ref	Vehicle type
V1	Car



Ref	Class	Related vehicle	Severity
C1	Passenger	V1	Serious
C2	Driver	V1	Slight
C3	Passenger	V1	Slight

Ref	Adjusted serious	Adjusted slight
C1	1	0
C2	0.096730702231448	0.903269297768552
C3	0.094694656909988	0.905305343090012
Total	1.22	1.78

Severity Adjustment: An example

Data Demonstration

Bruce

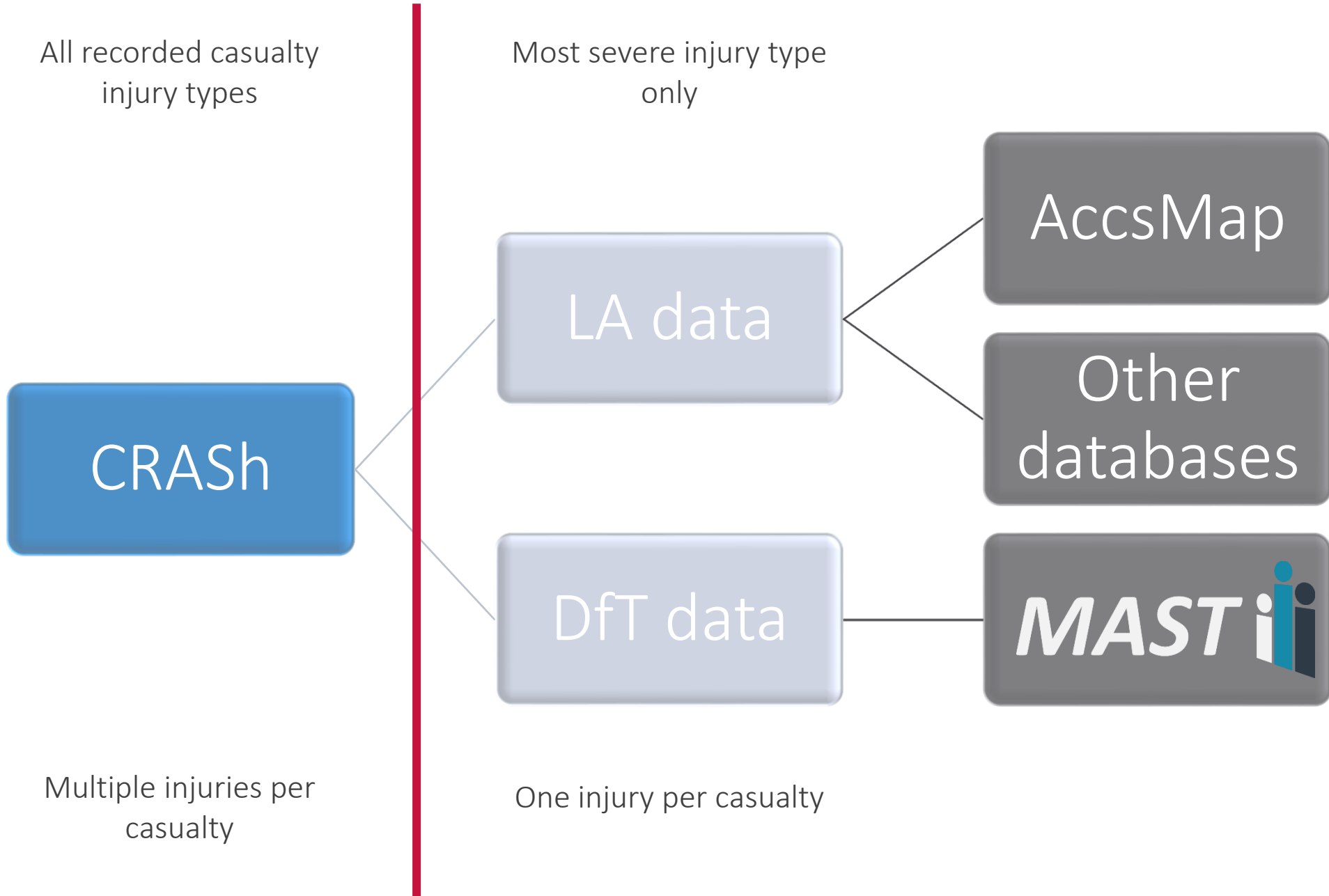
Example Analysis in Essex

Will

Injury-type data



CRASH injury type data

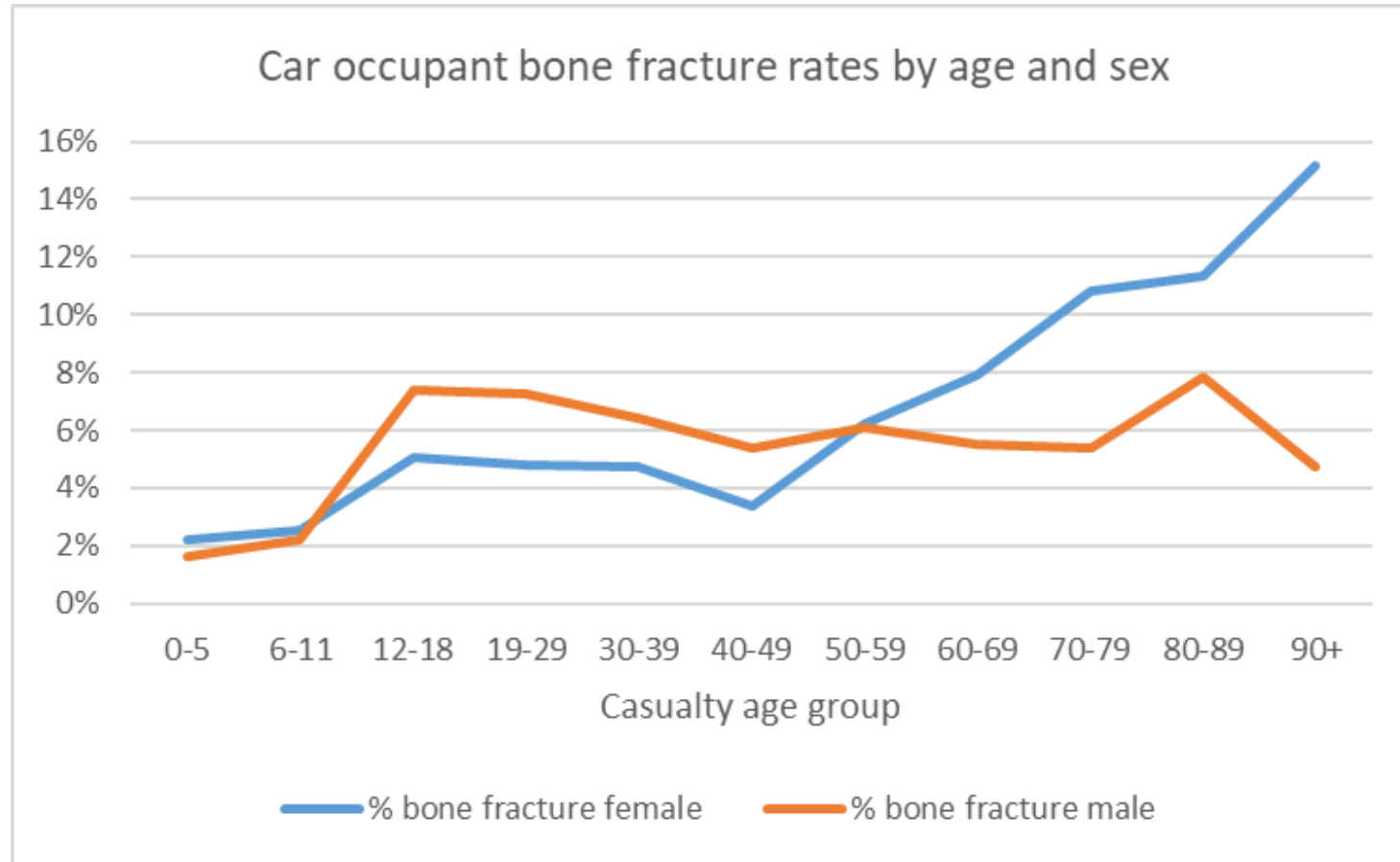


CRASH injury type data

- Effectively now a 4th table to STATS19 – much more analysis can be done
- Multiple injuries per casualty – new profiling characteristic?
- 20 point scale of severity (severity is life threatening, not life changing)

Injury type	All	Car	Cycle	P2W	Pedestrian
Deceased	1.1%	0.8%	0.8%	1.9%	2.7%
Broken Neck Or Back	1.2%	1.2%	0.8%	1.9%	0.7%
Severe Head Injury, Unconscious	0.8%	0.5%	1.7%	0.9%	1.9%
Severe Chest Injury, Any Difficulty Breathing	0.4%	0.3%	0.3%	0.8%	0.8%
Internal Injuries	0.6%	0.5%	0.4%	1.3%	0.7%
Multiple Severe Injuries, Unconscious	0.6%	0.4%	0.2%	1.1%	1.1%
Loss Of Arm Or Leg (Or Part)	0.1%	0.0%	0.2%	0.3%	0.0%
Fractured Pelvis Or Upper Leg	1.8%	0.9%	2.8%	5.0%	3.9%
Other Chest Injury, Not Bruising	1.7%	1.8%	1.3%	2.6%	0.9%
Deep Penetrating Wound	0.2%	0.1%	0.2%	0.5%	0.5%
Multiple Severe Injuries, Conscious	1.0%	0.5%	1.2%	2.9%	1.8%
Fractured Lower Leg/Ankle/Foot	3.8%	1.3%	4.6%	12.1%	11.0%
Fractured Arm/Collarbone/Hand	6.2%	3.7%	13.2%	17.2%	5.8%
Deep Cuts/Lacerations	1.9%	1.1%	3.6%	3.9%	3.6%
Other Head Injury	3.8%	3.0%	6.3%	3.0%	7.3%
Whiplash Or Neck Pain	31.2%	40.6%	3.6%	5.8%	3.1%
Shallow Cuts/Lacerations/Abrasions	19.9%	15.6%	39.7%	21.6%	26.1%
Sprains And Strains	17.9%	17.4%	18.3%	19.5%	14.4%
Bruising	28.4%	23.8%	40.0%	28.4%	42.7%
Shock	5.9%	6.6%	4.1%	1.7%	5.3%

Car occupant bone fracture with age and sex



4 injury types:

Broken neck or back

Fractured pelvis or upper leg

Fractured lower leg/ankle/foot

Fractured arm/collarbone/hand

“The lifetime risk of fracture for a 60-year-old woman is approximately 44%, nearly double the risk of 25% for a man of the same age”

Cawthon, P.M., 2011. Gender differences in osteoporosis and fractures. *Clinical Orthopaedics and Related Research*®, 469(7), pp.1900-1905.

Bone fracture with age and sex

Differences in collision types? (road environment, manoeuvre, points of impact, CF (speed etc.))

Injury types not included (e.g. other chest injury could be broken rib)

Differences in vehicle safety features for different demographic groups

So what?

- Gives some validity to the data
- Are there more useful questions to ask of the data?



Cycle helmets



Cycle helmets

Injury type	% of all casualties		Helmet efficacy
	No helmet	Helmet worn	
Average road speed for collision location	33.0mph	38.1mph	
% on 30mph road	81%	61%	
% on 60 mph road	6%	19%	
Fractured Pelvis Or Upper Leg	3.2%	3.4%	have 'other' head injury
Other Chest Injury, Not Bruising	1.7%	1.0%	
Deep Penetrating Wound	0.0%	0.2%	
Multiple Severe Injuries, Conscious	1.0%	2.2%	
Fractured Lower Leg/Ankle/Foot	6.2%	4.9%	- Small increased rate of death
Fractured Arm/Collarbone/Hand	9.2%	18.3%	
Deep Cuts/Lacerations	4.0%	3.2%	
Other Head Injury	10.0%	6.3%	
Whiplash Or Neck Pain	4.2%	3.2%	
Shallow Cuts/Lacerations/Abrasions	37.6%	38.0%	
Sprains And Strains	14.7%	15.4%	
Bruising	37.6%	36.6%	
Shock	3.2%	3.7%	

$n_{(\text{no helmet})} = 402$

$n_{(\text{helmet})} = 410$

Cycle helmets

Differences in collision types?

Differences in demographics and other behaviours of helmet vs non-helmet wearers.

Wider policy implications:

- 87% of non-helmet wearers did *not* record a head injury (85% if we assume all fatals had a head injury).
- Life expectancy overall is higher for all cyclists, despite the risks.

Are there more useful questions to ask of the data?

“Cycle commuting was associated with a lower risk of CVD, cancer, and all cause mortality.”

Celis-Morales, C.A., Lyall, D.M., Welsh, P., Anderson, J., Steell, L., Guo, Y., Maldonado, R., Mackay, D.F., Pell, J.P., Sattar, N. and Gill, J.M., 2017. Association between active commuting and incident cardiovascular disease, cancer, and mortality: prospective cohort study. *bmj*, 357, p.j1456.

Next steps

Other areas scoped include car occupant casualties:

- Type of other vehicle involved
- Seatbelt status

How good is your other local data? (e.g. seatbelts, cycle helmets)

Much more can be done with this data!!



Discussion

- How does this help you?
- Who should be analysing this evidence?
- Does this help with public engagement?
- What research would you like to see
- What other data would be valuable
- Who else (not road safety professionals) would be interested?



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