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Mortality after Motor Vehicle Accidents; A Forensic and Pathological Analysis from a Regional Collaboration.

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The Merseyside and Cheshire Major Trauma Network.
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Road traffic injuries are the eighth leading cause of death globally, and the leading cause of death for young people aged 15-29[1]. Major progress in road safety, including legal and technical advances has come from the understanding of risk factors and mechanisms in fatal incidents. While national and international mechanisms exist for recording events surrounding these deaths they are often based on the work of a single agency[2].

We have formed a collaborative approach to data collection between Merseyside major trauma collaboration, Merseyside police force, and the regional coroner's offices with the aim of identifying areas within the Haddon matrix for targeted local intervention.

Materials and Methods

We began by establishing a working partnership and data transfer agreements between Merseyside and Cheshire Major Trauma Network, Merseyside Police, the H.M. Coroners of Liverpool, Sefton, St Helens & Knowsley, and Cheshire.

Data were collected prospectively for 31 deaths from 1st January 2013 to 31st July 2014.

A surgeon from the trauma centre reviewed police data forms and formal forensic traffic investigation reports with members of the investigating police team.

Human, vehicle, and environmental factors were all recorded. An evaluation of which of the contributing factors of an incident were significant was recorded as standard (image 1).

Post mortem reports were reviewed by members of the medical team and details of significant injuries collected by anatomical region. There is an annual timetable for repeating this process in order to produce an ongoing but extensive database on local mechanisms of road traffic death.

Ethical approval was granted by the research and service evaluation service at the lead investigating hospital (Aintree Hospitals NHS Foundation Trust).

MG NSRF/D — **CONTRIBUTORY FACTORS** — Sept. 2004

1. Select up to six factors from the grid, relevant to the accident.
2. Factors may be shown in any order, but an indication must be given of whether each factor is **very likely (A)** or **possible (B)**.
3. Only include factors that you consider contributed to the accident, (i.e. do NOT include "Poor road surface" unless relevant).
4. More than one factor may, if appropriate, be related to the same road user.
5. The same factor may be related to more than one road user.
6. The participant should be identified by the relevant vehicle or casualty ref no. (e.g. 001, 002 etc.), preceded by "V" if the factor applies to a vehicle, driver/rider or the road environment (e.g. V002), or "C" if the factor relates to a pedestrian or passenger casualty (e.g. C001).
7. Enter U000 if the factor relates to an uninjured pedestrian.

Road Environment Contributed	101 Poor or defective road surface	102 Deposit on road (e.g. oil, mud, chippings)	103 Slippery road (due to weather)	104 Inadequate or masked signs or road markings	105 Defective traffic signals	106 Traffic calming (e.g. speed cushions, road humps, chicanes)	107 Temporary road layout (e.g. contraflow)	108 Road layout (e.g. bend, hill, narrow carriageway)	109 Animal or object in carriageway	
Vehicle Defects	201 Tyres illegal, defective or under-inflated	202 Defective lights or indicators	203 Defective brakes	204 Defective steering or suspension	205 Defective or missing mirrors	206 Overloaded or poorly loaded vehicle or trailer				
Injudicious Action	301 Disobeyed automatic traffic signal	302 Disobeyed 'Give Way' or 'Stop' sign or markings	303 Disobeyed double white lines	304 Disobeyed pedestrian crossing facility	305 Illegal turn or direction of travel	306 Exceeding speed limit	307 Travelling too fast for conditions	308 Following too close	309 Vehicle travelling along pavement	310 Cyclist entering road from pavement
Driver/ Rider Error or Reaction	401 Junction overshoot	402 Junction restart (moving off at junction)	403 Poor turn or manoeuvre	404 Failed to signal or misleading signal	405 Failed to look properly	406 Failed to judge other person's path or speed	407 Passing too close to cyclist, horse rider or pedestrian	408 Sudden braking	409 Swerved	410 Loss of control
Impairment or Distraction	501 Impaired by alcohol	502 Impaired by drugs (illicit or medicinal)	503 Fatigue	504 Uncorrected, defective eyesight	505 Illness or disability, mental or physical	506 Not displaying lights at night or in poor visibility	507 Cyclist wearing dark clothing at night	508 Driver using mobile phone	509 Distraction in vehicle	510 Distraction outside vehicle
Behaviour or Inexperience	601 Aggressive driving	602 Careless, reckless or in a hurry	603 Nervous, uncertain or panic	604 Driving too slow for conditions or slow vehicle (e.g. tractor)	605 Learner or inexperienced driver/rider	606 Inexperience of driving on the left	607 Unfamiliar with model of vehicle			
Vision Affected by	701 Stationary or parked vehicle(s)	702 Vegetation	703 Road layout (e.g. bend, winding road, hill crest)	704 Buildings, road signs, street furniture	705 Dazzling headlights	706 Dazzling sun	707 Rain, sleet, snow or fog	708 Spray from other vehicles	709 Visor or windscreen dirty or scratched	710 Vehicle blind spot
Pedestrian Only (Casualty or Uninjured)	801 Crossing road masked by stationary or parked vehicle	802 Failed to look properly	803 Failed to judge vehicle's path or speed	804 Wrong use of pedestrian crossing facility	805 Dangerous action in carriageway (e.g. playing)	806 Impaired by alcohol	807 Impaired by drugs (illicit or medicinal)	808 Careless, reckless or in a hurry	809 Pedestrian wearing dark clothing at night	810 Disability or illness, mental or physical
Special Codes	901 Stolen vehicle	902 Vehicle in course of crime	903 Emergency vehicle on a call	904 Vehicle door opened or closed negligently						*999 Other – Please specify below

	1st	2nd	3rd	4th	5th	6th
Factor in the accident						
Which participant? (e.g. V001, C001, U000)						
Very likely (A) or Possible (B)						

* If 999 Other, give brief details .....

(Note: Only use if another factor contributed to the accident **and include it in the text description of how the accident occurred**)

Image 1: STATs 19 tool for forensic traffic data collection

Results

The mean age of death was 53 years (Range 10-92 years). There was no significant trend found for the days of the week or hours of the day when fatal incidents occurred.

All deaths occurred either during daylight or in hours of darkness on roads with working street lighting. Road surface conditions were not a causative factor in any incident and no carriageway hazards or special road conditions applied to road deaths in this time period. The mean speed limit for roads on which fatal road incidents occurred was 45 miles per hour.

Drivers and pedestrians 'Failing to look properly' or 'failing to judge other persons path/speed' made up a significant number (30%) of all contributing factors to fatal incidents far outweighing the causation of alcohol impairment (6%) or excessive speed (8%) ($P<0.002$) .

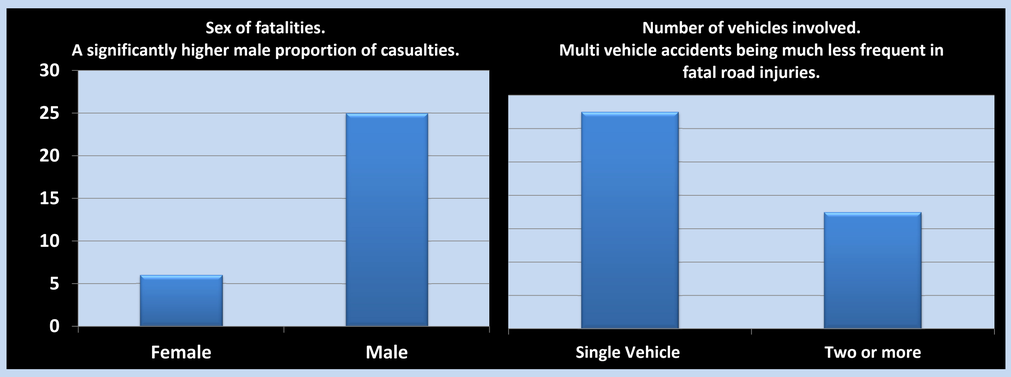
In 73% of road traffic deaths there were no other seriously injured casualties.

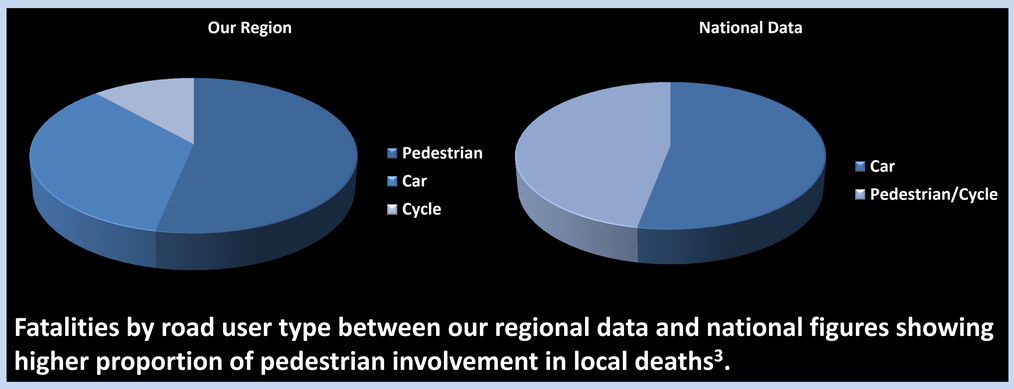
56% of pedestrian fatality incidents occurred from attempts at crossing the carriageway elsewhere. Of these deaths 44% of pedestrians killed were crossing from the drivers nearside and so should have been most visible to them.

Only 6 full post mortem reports were available as the majority of cases did not undergo such examination and so only passing comment can me made at present.

Post mortem examination often revealed significant head injury. These injuries including decapitation, brain extrusion, and brainstem avulsions were likely instant causes of death.

Sternal fractures were relatively frequently observed & associated with multiple other injuries but not always coupled with major vessel disruption. Intra abdominal injury appeared relatively infrequently and was allied to massive levels of head and chest trauma.





Fatalities by road user type between our regional data and national figures showing higher proportion of pedestrian involvement in local deaths[3].

Conclusions

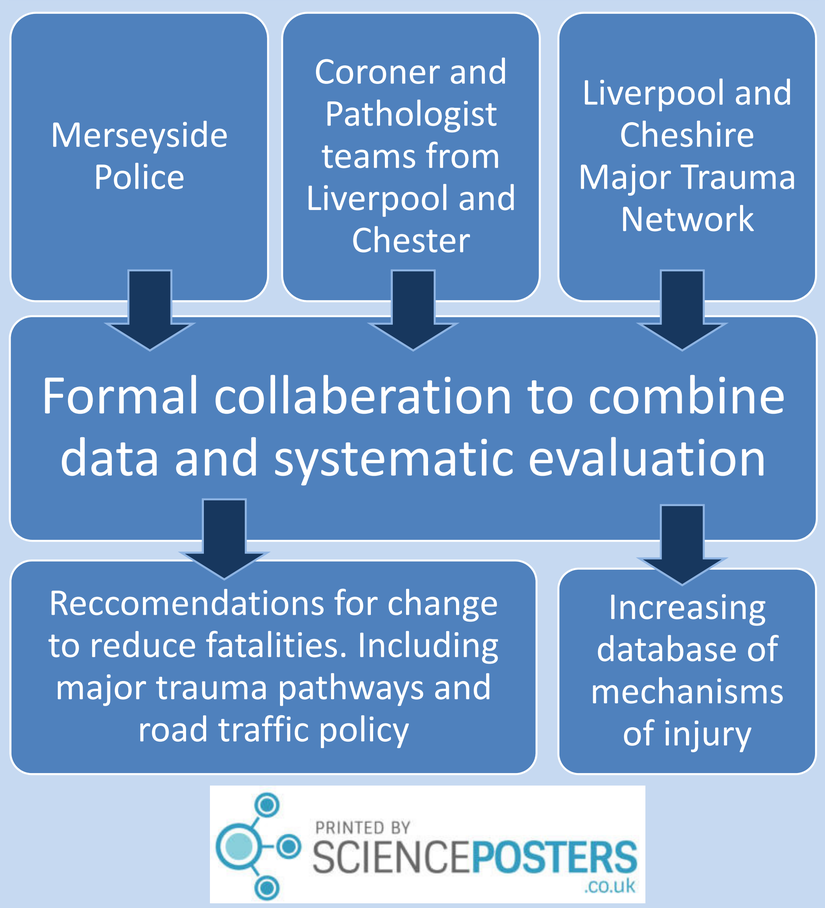
We have established a working multiagency partnership to create a detailed database of epidemiology and mechanisms of injury in fatal road traffic incidents.

Ongoing work aims to nurture collaboration and develop sustainable cooperation between the agencies involved and enable research that will reduce numbers of deaths. Particularly, this database will allow the search for trends in injuries contributing to early deaths that may guide the creation of pre hospital medical teams in this region.

Early results from this programme suggest health care professionals should be aware of the large proportion of deaths which occur in what appear to be benign road conditions as a consequence of driver or pedestrian lack of full situational awareness. Trauma networks should support other agencies in promoting the use of marked pedestrian crossings and supporting training to improve situational awareness, targeting the pre-event phase of a fatal accident.

Although we have not clearly identified any trends in potentially survivable causes of death, as the database grows and number of post mortem records expands we hope to comment further on physiology of fatal road traffic injuries further and target event and post event attributes of fatal accident.

The Construction of an Inter-Agency Collaboration



References
1) *Global status report on road safety 2013: supporting a decade of action*. World Health Organisation, Switzerland. 2013.
2) *Linking Police and Hospital data on Road Accidents in England: 1999 to 2009 results.* Department for Transport, UK. February 2012.
3) Number of fatalities resulting from road accidents in Great Britain, by road user group: 2000 to 2013. Making roads safer. Department for Transport, UK. September 2014.