

The Future of Automotive Safety: Safety and the Road User

Benjamin Heydecker

Professor of Transport Studies

Centre for Transport Studies
University College London

ben@transport.ucl.ac.uk

The current state:

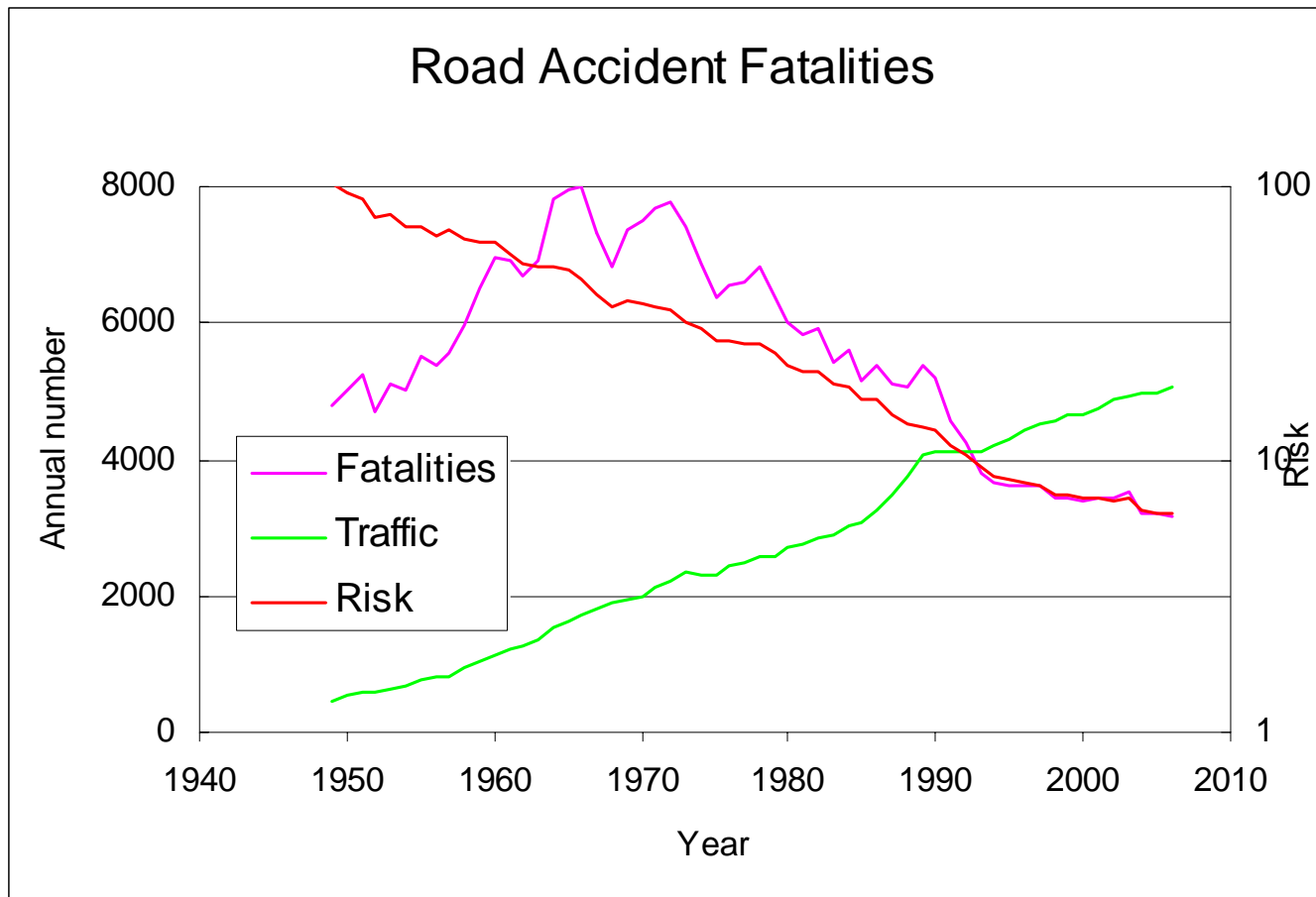
Road casualties and their valuation (Great Britain, 2005)

Severity	Number	Valuation	Cost
Killed	3,201	£1.43 m	£4,572 m
Serious	28,954	£160 k	£4,647 m
Slight	238,862	£12 k	£2,955 m
All	271,017	£44.9 k	£12 bn

(Source: Department for Transport, 2007)

Progress:

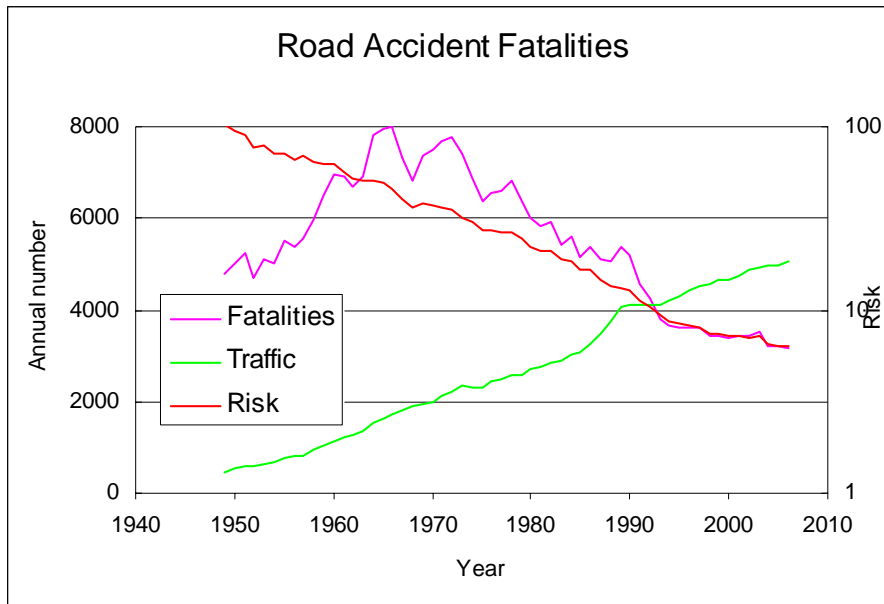
Development in road fatalities (Great Britain, up to 2006)



(Source: Department for Transport, 2007)

Analysis:

Development in road fatalities (Great Britain, up to 2006)



(Source: Department for Transport, 2007)

Accidents = Risk × Exposure

Exposure (Traffic veh-km) has increased

Fatalities have decreased

So Risk (per veh-km) has decreased

Accident Investigation and Safety Measures

Accident investigation

Analysis what has happened

To identify issues

To evaluate treatments

Safety measures:

Primary

To reduce frequency of occurrence of accidents

Secondary

To reduce consequences of accidents

Contributory factors to road crashes

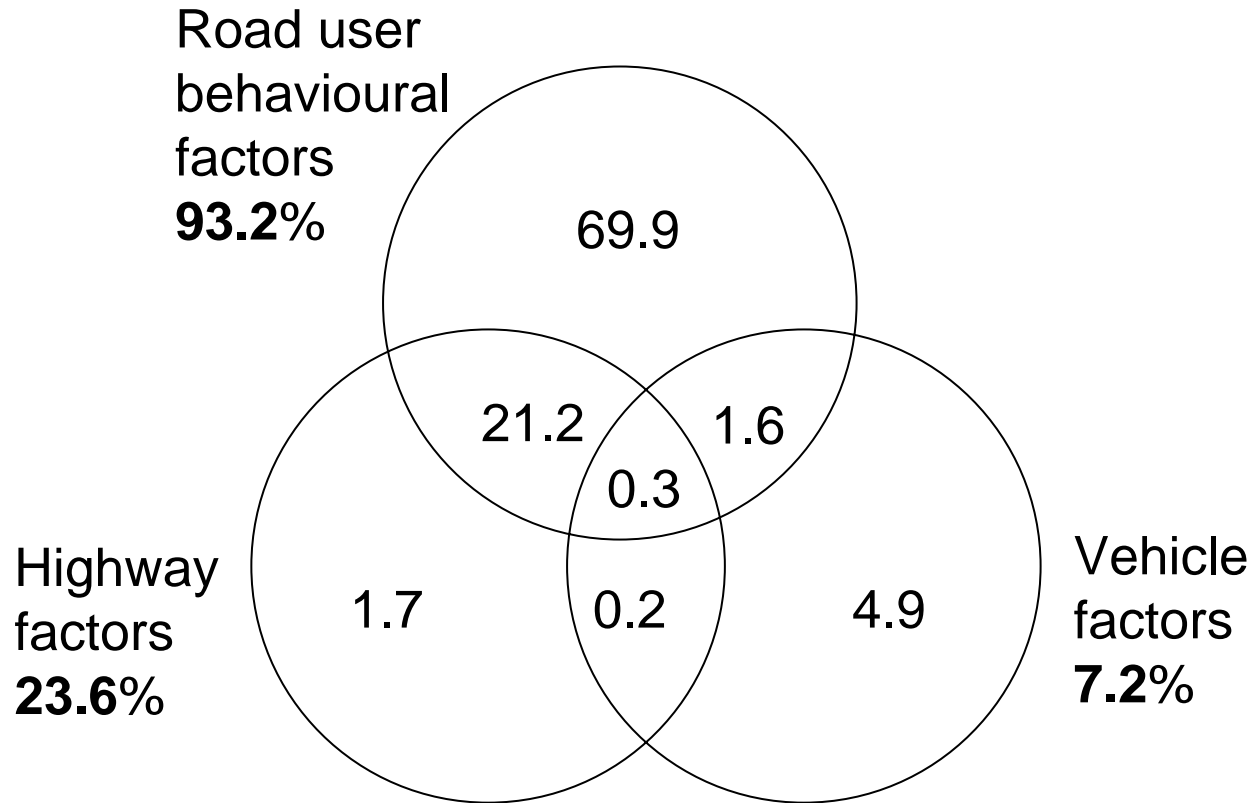
Factors, without which a crash would be less likely or less severe

Associated with:

- Road environment
- Road user
- Vehicle

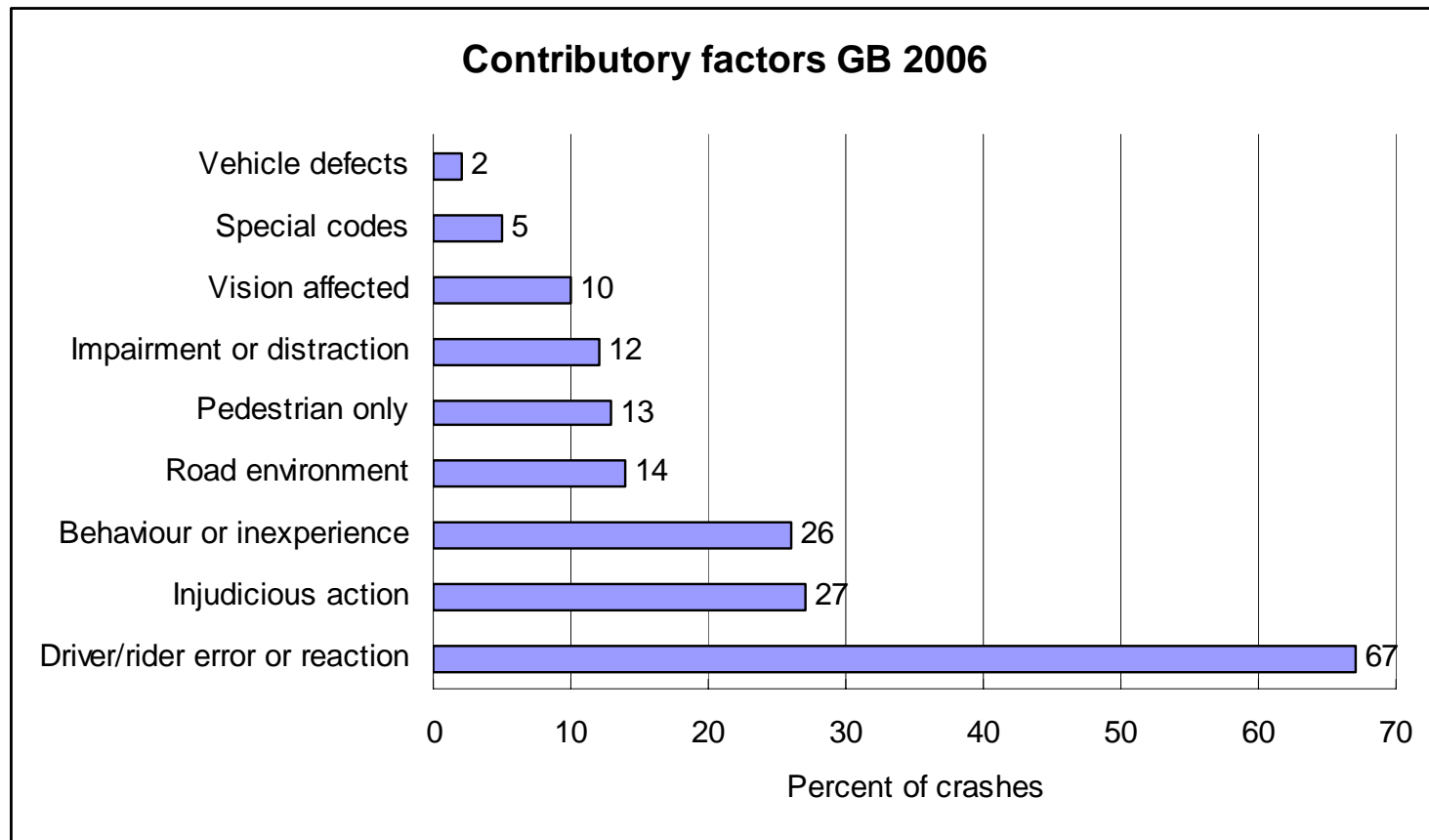
Contributory factors to road crashes

(Great Britain, 1995)



(Source: 'Fatal and non-fatal accidents' Transport Research Laboratory, 1995)

Contributory factors in Great Britain, 2006



(Source: Robinson and Singh in Department for Transport, 2007)

Safety strategy calls for joint work on 10 themes:

1. Safer road use for children
2. Safer drivers - training and testing
3. Safer drivers - drink, drugs and drowsiness
4. Safer infrastructure
5. Safer speeds
6. Safer vehicles
7. Safer motorcycling
8. Safer walking, cycling and horseriding
9. Better enforcement of traffic law
10. Promotion of safer road use

Main recommendations for improvement

Road Safety: the next steps (Department for Transport, 1987)

Economics

Engineering

Education, Training and Publicity

Enforcement and the Law

Research

Engineering safety measures

Vehicles

Roads

Interactions

Human response may not be neutral
engineering measures may not yield expected changes:

More

Less

Opposite sign

L Evans (2004)

Engineering safety measures - Vehicles

Primary measures – prevent crashes from occurring

Design features of vehicles

Maintenance and condition

Secondary measures – reduce chances of injury in a crash

Crashworthiness in design of vehicles

Euro NCAP

Occupant protection devices

Pedestrian protection

Engineering safety measures - Vehicles

Secondary safety of vehicles:

Improves with mass – collision dynamics

Abrupt change in speed: $\Delta V_1 = \left(\frac{M_2}{M_1 + M_2} \right) (V_1 - V_2)$

But is extra mass used for better design?

Engineering safety measures – Vehicle mass

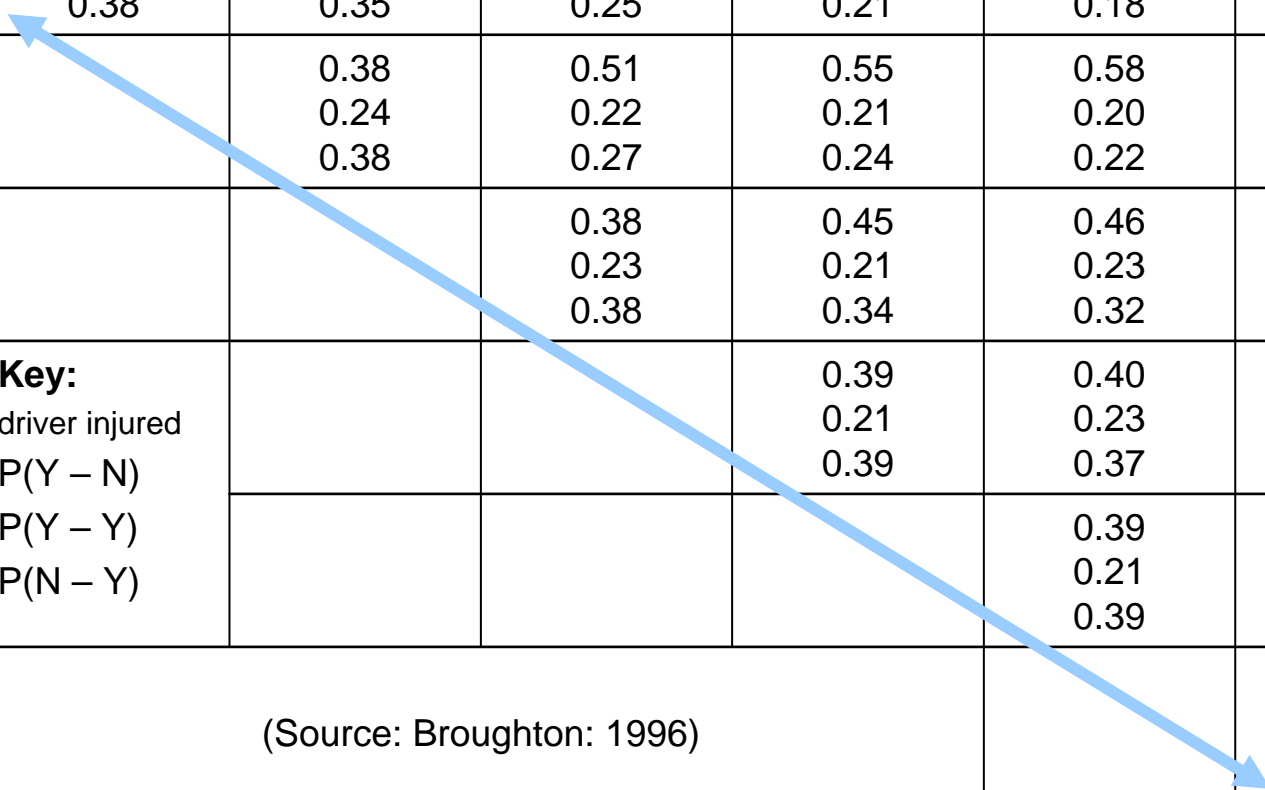
Mass of vehicle 1 (kg)	Mass of vehicle 2 (kg)					
	≤ 750	751 – 850	851 – 950	951 – 1050	1051 – 1200	> 1200
≤ 750	0.38 0.23 0.38	0.42 0.23 0.35	0.56 0.19 0.25	0.58 0.21 0.21	0.62 0.19 0.18	0.72 0.13 0.13
751 – 850		0.38 0.24 0.38	0.51 0.22 0.27	0.55 0.21 0.24	0.58 0.20 0.22	0.69 0.17 0.15
851 – 950			0.38 0.23 0.38	0.45 0.21 0.34	0.46 0.23 0.32	0.55 0.21 0.24
951 – 1050	Key: driver injured P(Y – N) P(Y – Y) P(N – Y)			0.39 0.21 0.39	0.40 0.23 0.37	0.51 0.20 0.29
1051 – 1200					0.39 0.21 0.39	0.50 0.19 0.30
≥ 1200	(Source: Broughton: 1996)					0.39 0.22 0.39

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Accident involvement risk

Vehicle and Road combination (per billion vehicle-km)

Vehicle class	Road class				
	Motorway	A Roads		B Roads	
		Rural	Urban	Rural	Urban
Car	221	269	1510	576	1368
Bus	137	257	4313	2351	2880
Goods	324	425	2986	1621	4698
Motor cycle	980	2020	11350	3072	7633
Pedal cycle	-	2363	13322	1009	4487

(Source: Memon, 2007)

Engineering safety measures - Roads

Euro RAP

Primary measures

- Road safety engineering
- Rural single-carriageway roads
- Match road design to its function
- Maintenance and condition
- Provision for different kinds of road users

Secondary measures

- Safety fences
- Forgiving roadside

Education, Training and Publicity measures

Education:

- Pre-driver
- Use of safety equipment
- Diver behaviour

Training:

- Licensing
- Newly qualified drivers

Publicity:

- Drink and drugs
- Conversation
- Tiredness

Enforcement and the Law

Speed

- appropriate for the road environment

Drink and drugs

Measures to protect children

Long-distance work driving

Current road safety strategy and targets in Britain

Strategy and target for 2010

Speed policy review: launched on 1 March 2000

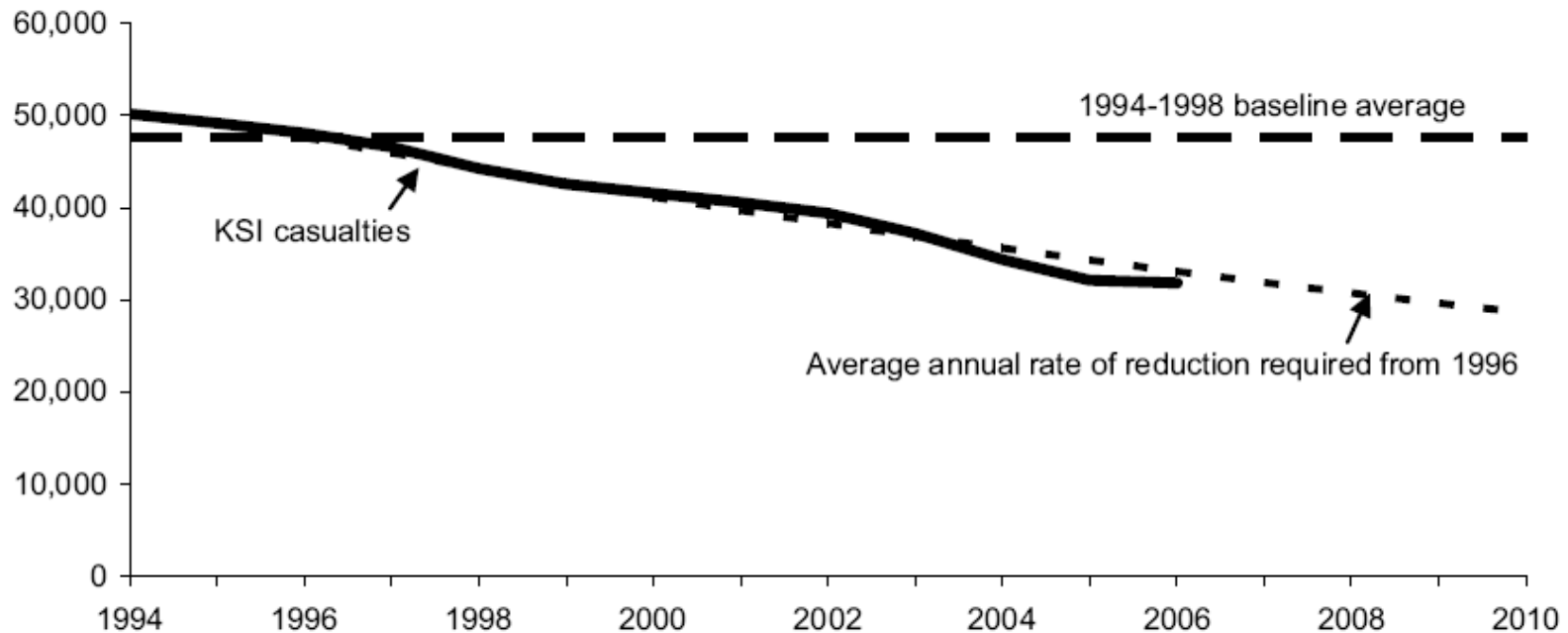
The target is to reduce by 2010:

- Annual number KSI by 40%;
- Annual number of child KSI by 50%; and
- Number slightly injured
per unit of vehicle-distance travelled by 10%;
compared with 1994 - 1998 average

Progress towards targets in Britain: 1

Casualties Killed or Seriously Injured

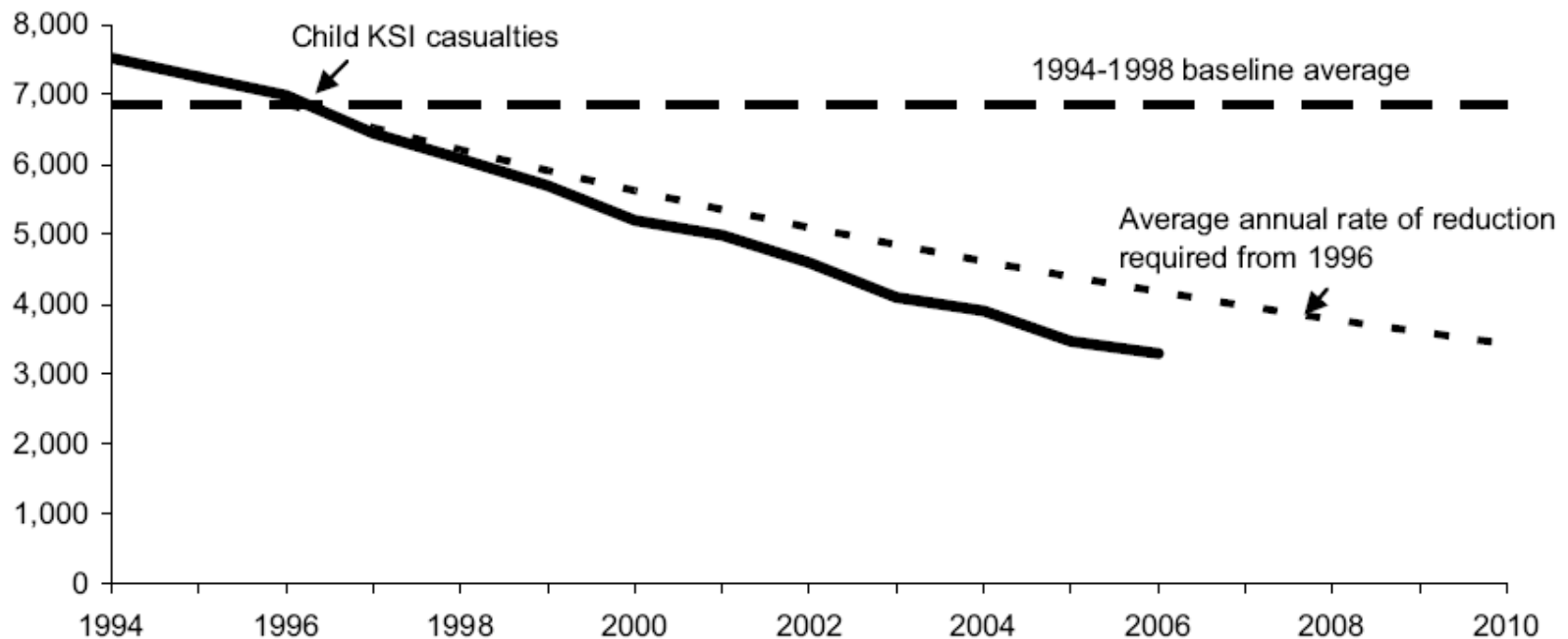
Chart 1a: Killed or seriously injured casualties: 1994-2006



Progress towards targets in Britain: 2

Children Killed or Seriously Injured

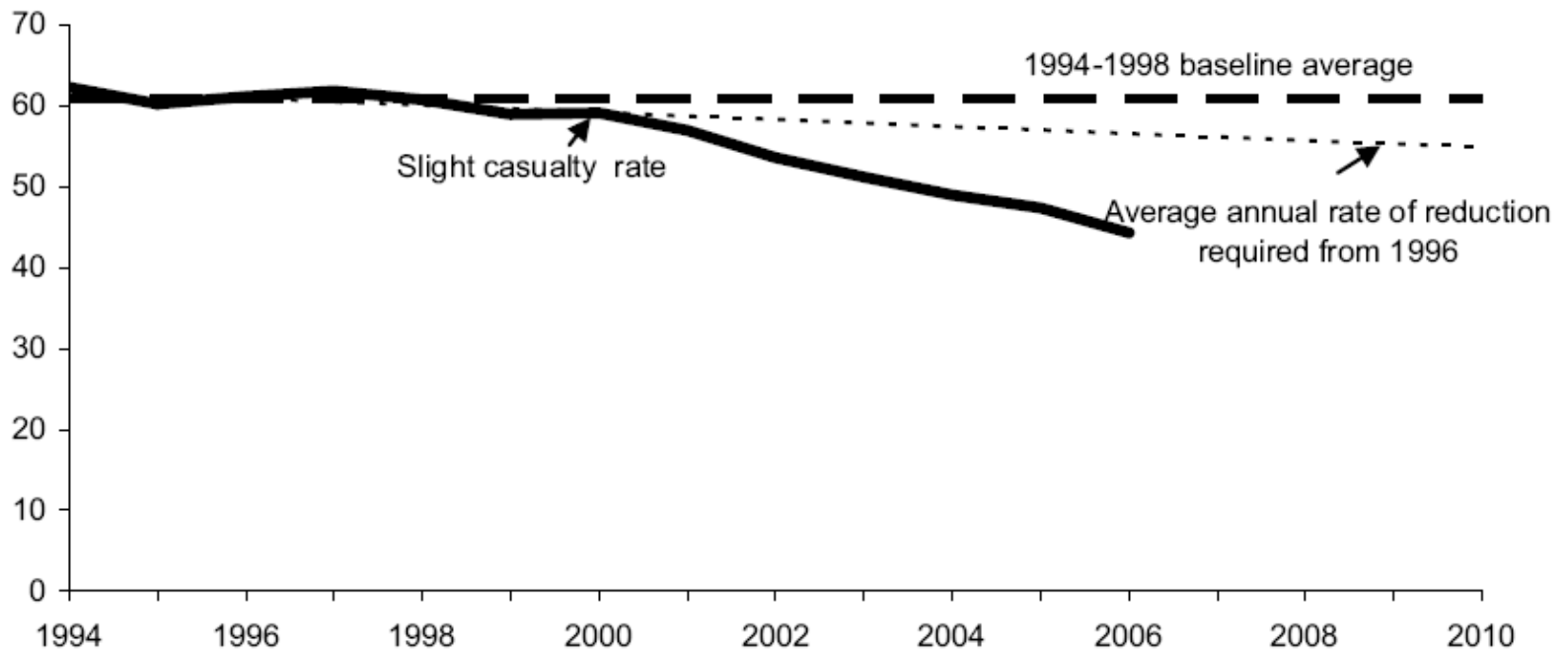
Chart 1b: Killed or seriously injured child casualties: 1994-2006



Progress towards targets in Britain: 3

Slightly injured casualties

Chart 1c: Rate of slightly injured casualties per 100 million vehicle kilometres:
1994-2006



Summary

Casualty **rates** are decreasing

Accident **risks** are decreasing

Safety improvements have been achieved through

- Engineering
- Education
- Enforcement

Targets help to focus attention

Further improvement will require:

Safer vehicles

Safer roads

Safer usage

Safer driving