

**Future role of passive and active safety
Trends in NCAP**

Guido Adriaenssens
IRCOBI Conference, Krakow, 14 September 2011

Content

- Role of NCAPs
- Euro NCAP
- Latin NCAP
- Global NCAP

Role of NCAPs

- **Comparative consumer programmes aimed at informing consumers about their buying choice**
- **Indirectly make safety issues commercially attractive to car manufacturers**
- **The NCAPs are becoming more professional in their communication strategies and the impact is growing**

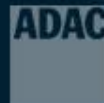
FOR SAFER CARS

EURO NCAP

www.euroncap.com



MINISTÈRE DES TRANSPORTS

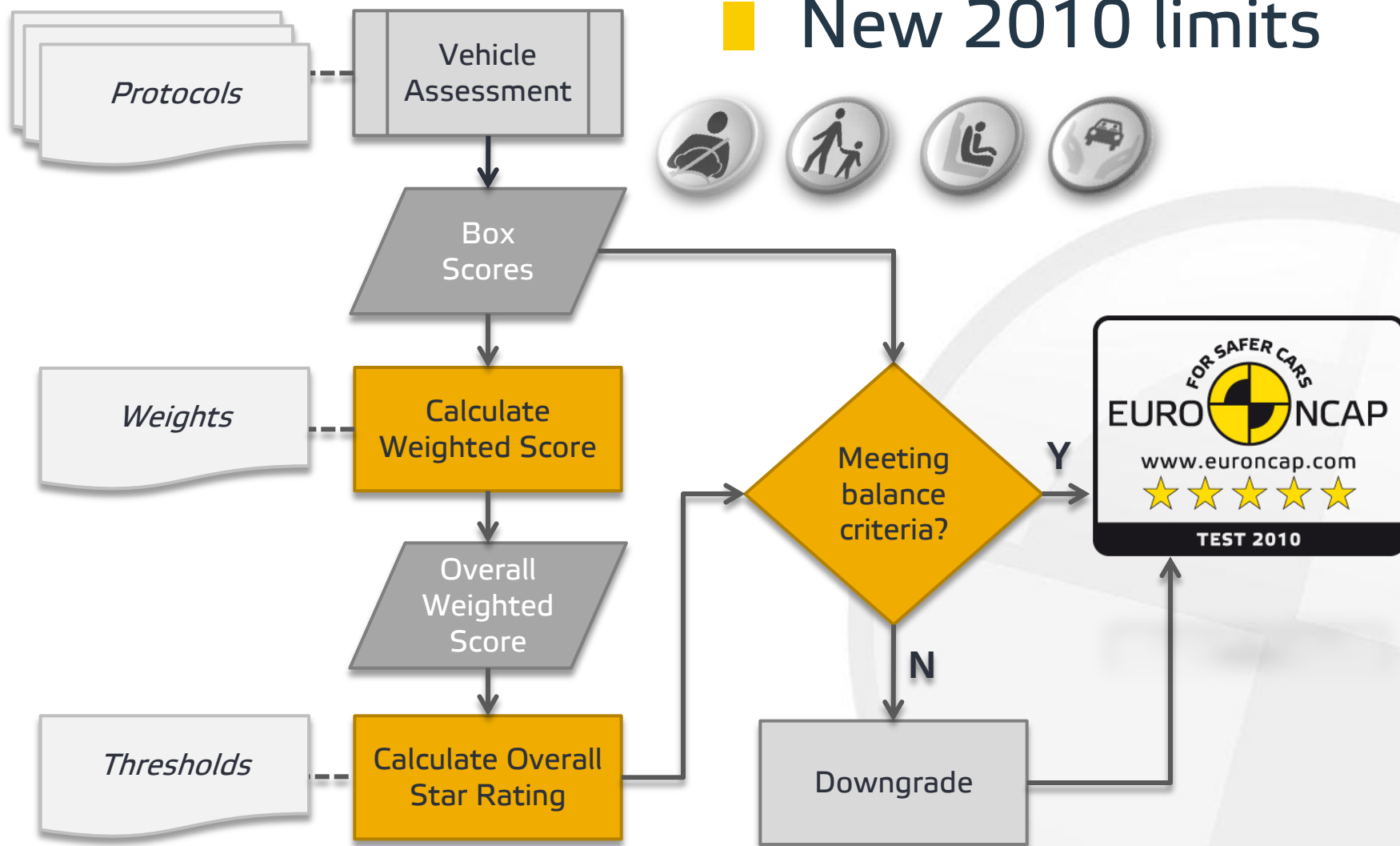


Areas of Assessment

	Frontal impact (ODB)	Side impact (MDB)	Side impact (Pole)	Pedestrian (Subsystem)	Seat belt (SBR)	Whiplash (Subsystem)	Stability control (ESC)	Speed limiter (SLD)
1997								
2001								
2003								
2009								

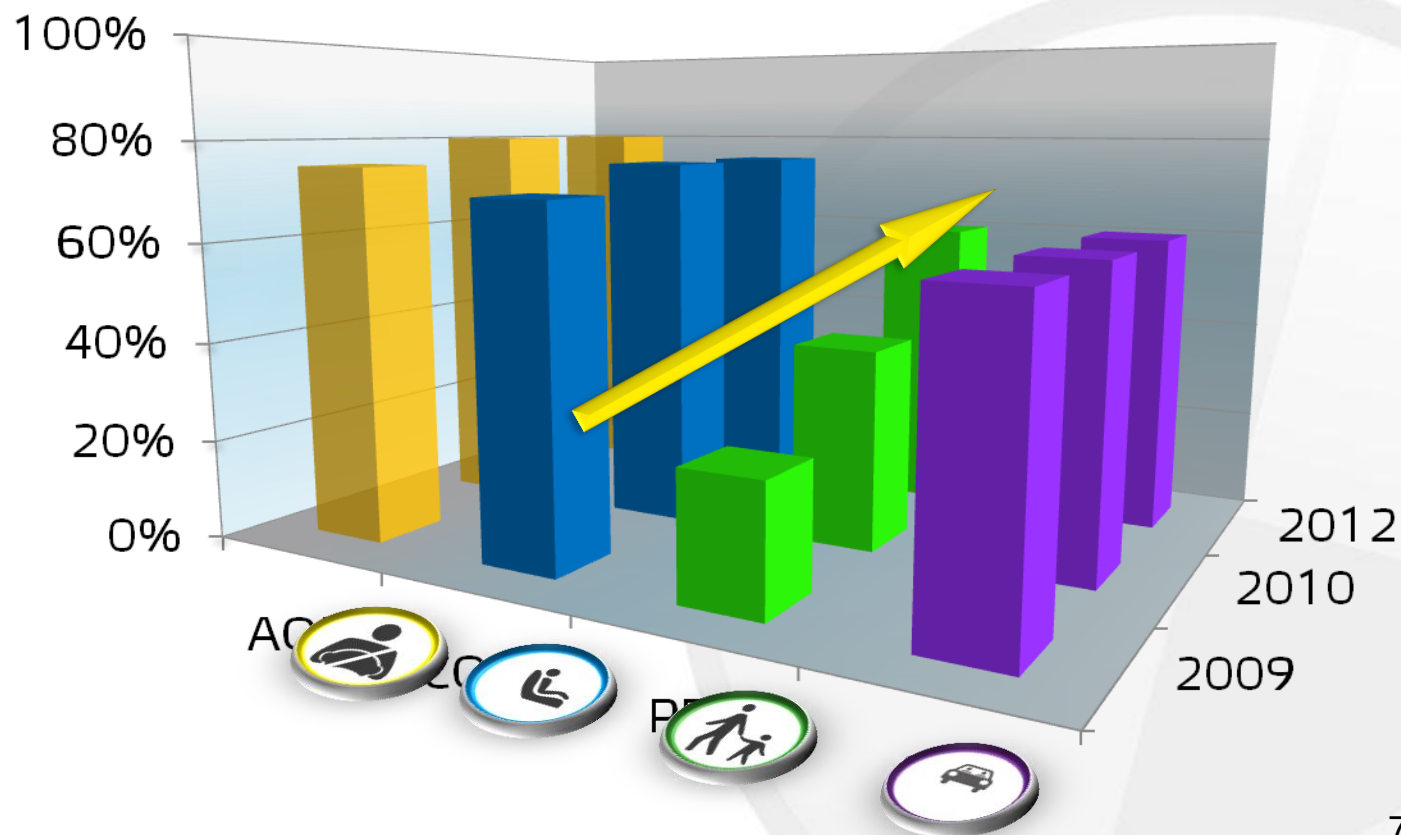
Euro NCAP Overall Rating

■ New 2010 limits



- step increase in limits after introduction of new rating

*“Balance”
criteria for 5
stars*



Strategic Agenda 2015

Improve Methods to
Assess Occupant
Protection

Sustain Safety
Improvements for
Vulnerable Road Users

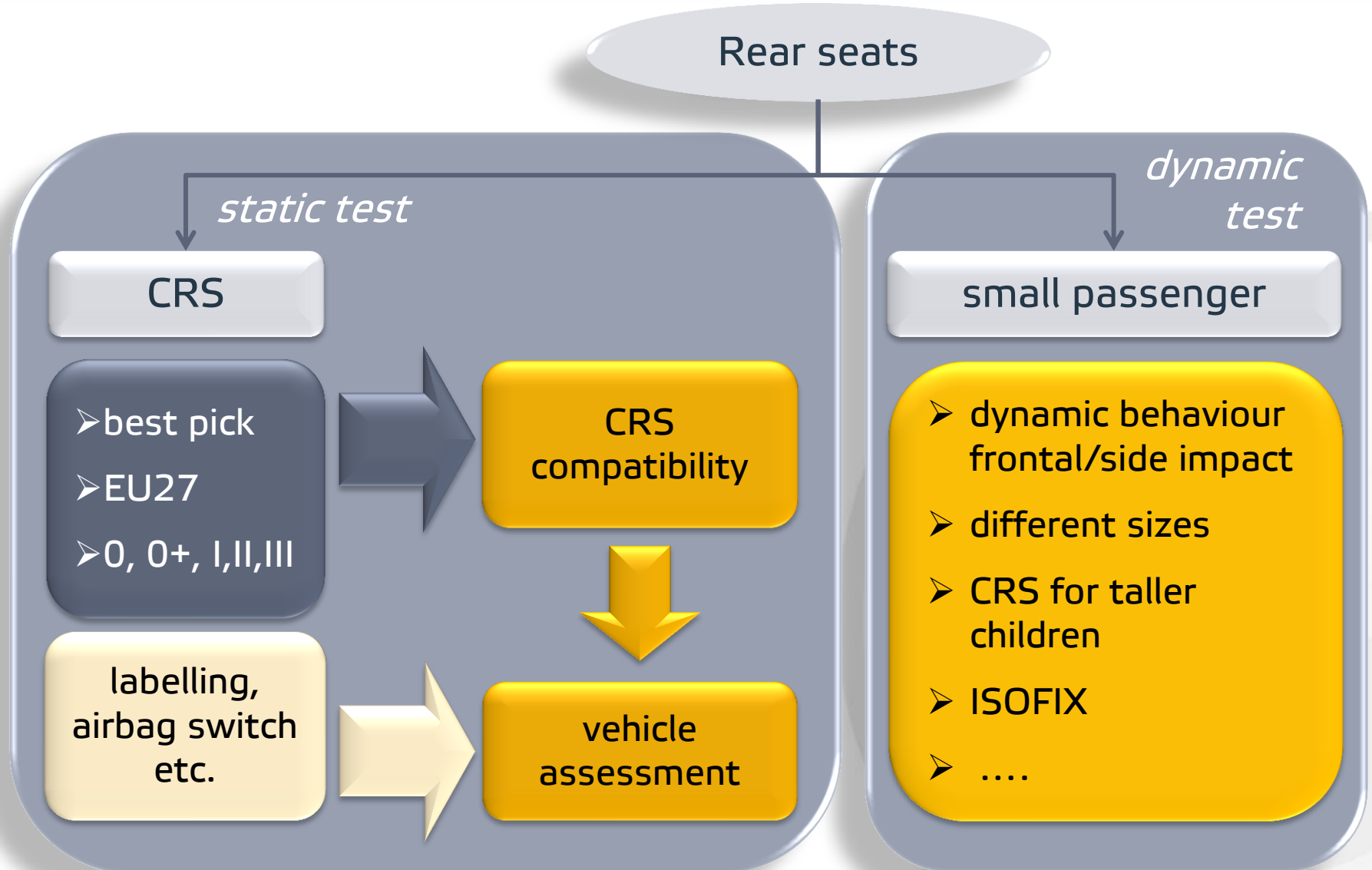
Reward & Assess
Emerging Avoidance
Technologies



Adult Occupant Protection

- Updates to frontal/side/pole test
- Scenarios under review:
 - Adding full width frontal test
 - Using 5th and 50th percentile dummies
 - WorldSID for side impact
 - Include adult rear seat protection
- New protocols delivered by 2012-2013
- Costs may be limiting factor

Child Occupant Protection



Active safety - ESC Performance

- Develop and validate an assessment method for ESC
- Timing – Depending on Board decision



- Focus on systems that (voluntarily) assist driver to keep correct speed using map data and/or traffic sign recognition

- Intention to add Autonomous Emergency Braking assessment to the rating scheme
- First systems assessed in "Advanced NCAP"
- Avoidance technologies – Car-2-car & Car-2-Pedestrian

Euro NCAP Advanced

- Technology dossier
- Assessment group
- Consensus meetings
- Reporting



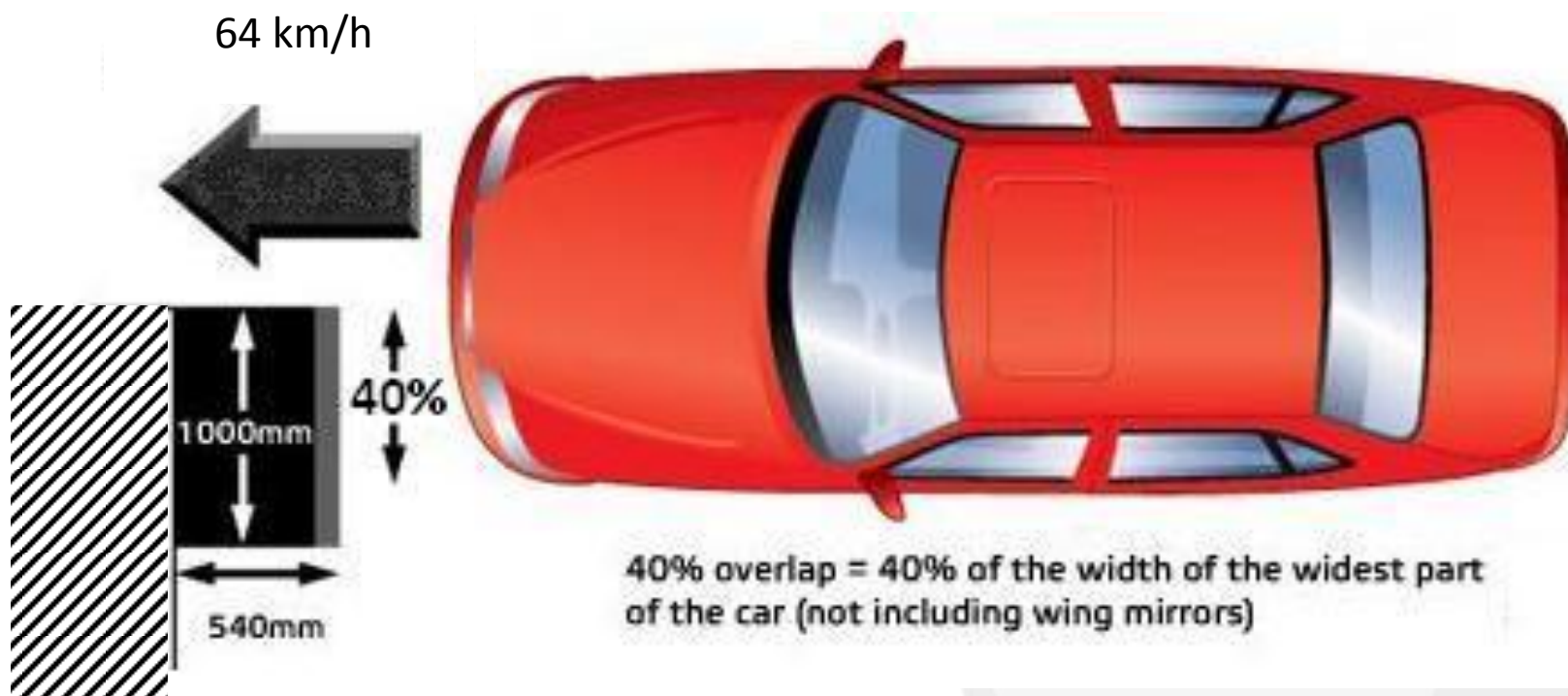
- Currently 14 systems rewarded
- Range of different technologies – AEB, eCall, LDW, blindspot, etc.
- After a few years some technologies might become mandatory to get 5 star rating (transferred to Active Safety box)



Latin NCAP



Test: Frontal crash 40% offset



WHO ARE THE OCCUPANTS IN THE CAR?

Adults



50th percentile Hybrid III dummy (x2)

Child dummies



P3 (3 years old)



P1.5 (18 months old)

Summary of 2010 results



Toyota Corolla XEI + Airbag



Chevrolet Meriva GL Plus + Airbag



Fiat Palio ELX 1.4 Emotion + Airbag



VW Gol Trend 1.6 + Airbag



Peugeot 207 Compact 5p 1.4 + Airbag



Peugeot 207 Compact 5p 1.4 - NO Airbag



VW Gol Trend 1.6 - NO Airbag



Fiat Palio ELX 1.4 - NO Airbag



Geely CK1 1.3 - NO Airbag



Next steps in Latin NCAP:

- **Phase 2: Publication (10 cars) in November 2011**
- **Involve more governments and other stakeholders**
- **Extend programme to include side impact and active safety (ESV)**



GLOBAL NCAP

www.globalncap.org

Promoting Safer Cars

IN THE UN DECADE
OF ACTION



Mission Statement

GNCAP aims to support the development of new NCAPs in emerging markets where vehicle growth is strong but independent consumer information on crashworthiness is frequently not available. To achieve this GNCAP will offer support to NCAPs in emerging economies and regions by offering technical support guidance and quality assurance.

GNCAP will also provide a platform for cooperation for NCAPs and like organisations around the world to share best practice, to further exchange information, and to promote the use of consumer information to encourage the manufacture of safer cars across the global automotive market.

GNCAP will carry out research on innovations in vehicle safety technologies, their application in global markets, the range of policies that will accelerate their use, and monitor the progress of vehicle safety across the globe.

GNCAP will also develop a global awards scheme to recognise achievement in vehicle safety, innovation in safety related technologies, and products.



First steps

Yearly congress for NCAPs

Support Latin NCAP

Investigate feasibility ASEAN NCAP

Investigate feasibility Indian NCAP





Summary

- **Increase in awareness of safety aspects of cars by the consumers**
- **Increased transparency in usefulness of safety features thanks to publications by NCAPs**
- **Proliferation of new NCAPs in emerging countries**
- **Strengthening of passive safety criteria**
- **Steep increase in sales of new active safety options**



Thank you for your attention

Guido Adriaenssens

ICRT

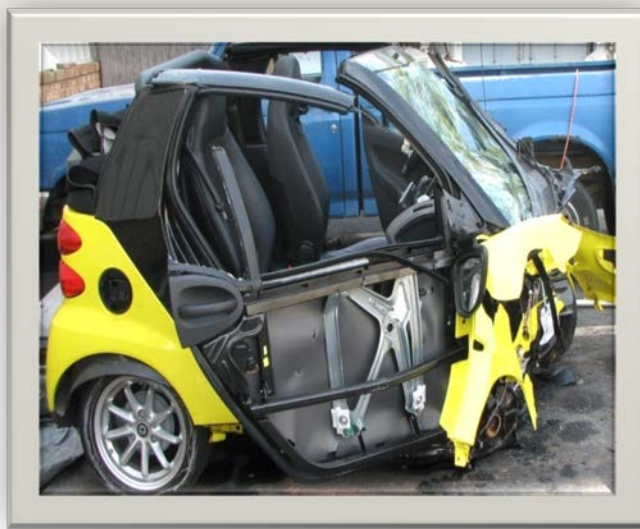
2 Marylebone Road, London NW1 4DF, UK

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www.international-testing.org



New Frontiers in Vehicle Safety



Stephen A. Ridella
IRCOBI
September 14, 2011





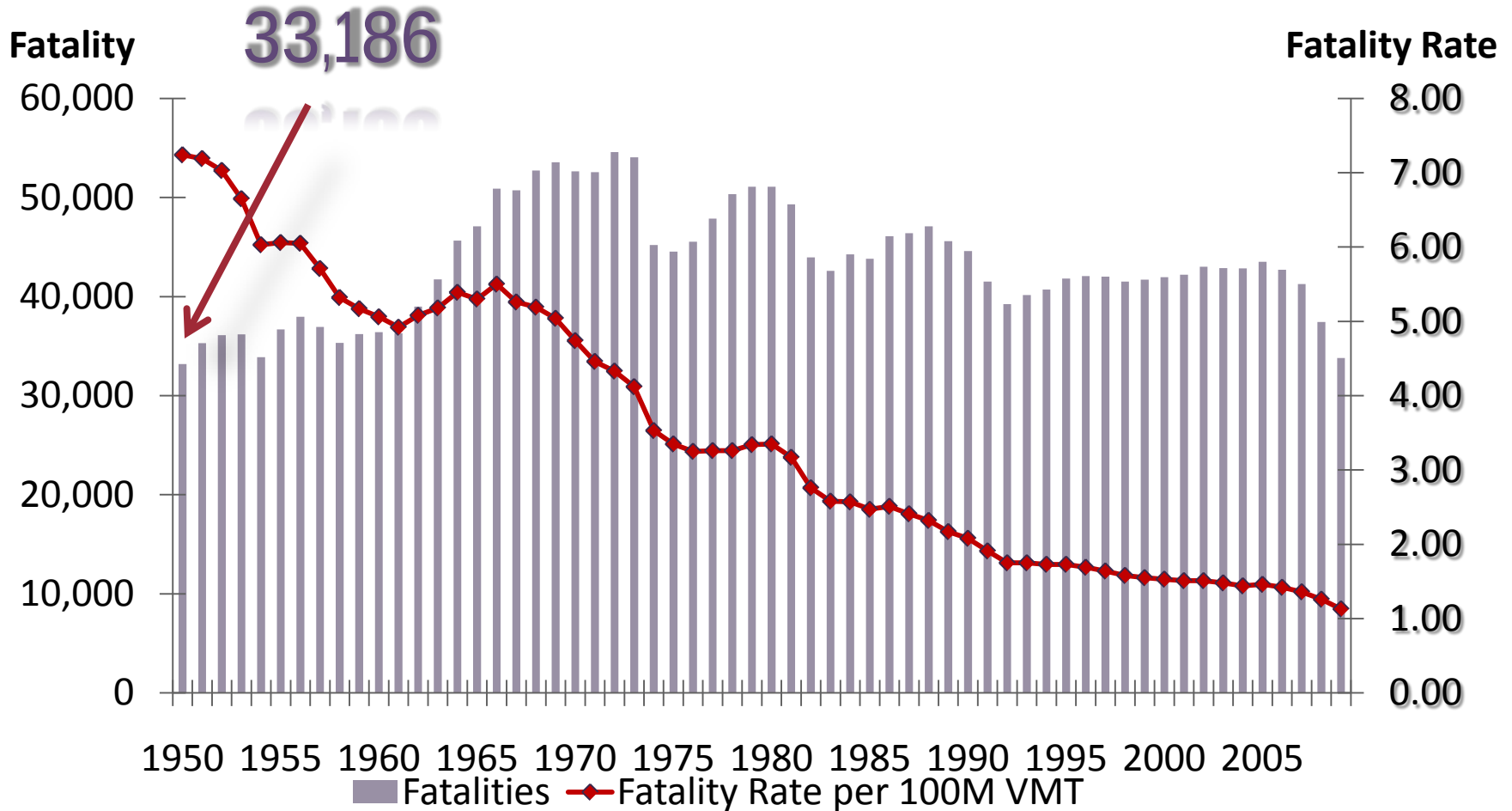
VEHICLE SAFETY RESEARCH

DATA OVERVIEW

RESEARCH STRATEGIC PLANNING PROCESS
RESEARCH PROGRAM AREAS



2009 Data - Fatalities and Fatality Rate, by Year



Strategic Planning Process

- Data Drives Priorities



- Develop 3 year NVS Priority Plan

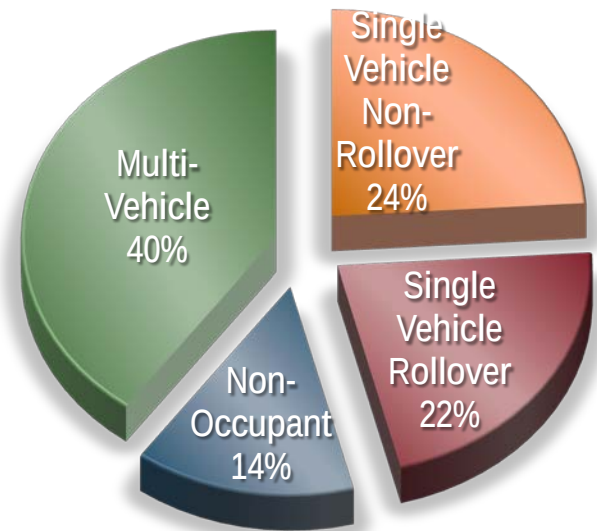
-And-

- Develop 3-5 year & longer- term Research Plans



Strategic Planning - Data Driven

- NHTSA's Research and Rulemaking programs are data driven
- These data are analyzed in various perspectives
 - Crash Type
 - Vehicle Type
 - Crash Partners
 - Countermeasures
 - Crashworthiness
 - Crash avoidance



Crash Avoidance

Crashworthiness



	NORMAL DRIVING	CRASH IMMINENT	CRASH EVENT	POST- CRASH
PASSENGER CARS/TRUCKS	• Driver Distraction • Driver Support Systems • Blind Spot Detection • Alcohol Detection • Drowsy Driver Detection • ...	• Forward Crash Warning • Lane Departure Warning • Automatic Braking • Lane Keeping • V2V & V2I •	• Advanced Airbags • Dynamic Rollover • Oblique/Off-set Frontal • Adaptive Restraints • Child Side Impact • Elderly Occupants •	• Auto Crash Notification • Advanced ACN • Medical Outcome (CIREN) • First Responder Safety
HEAVY VEHICLES - Truck/Bus	• Driver Distraction • Drowsy Driver Detection • Enhanced Vision Systems • Blind Spot Detection	• ESC/RSC • Forward Collision Warning • Lane Change Warning • V2V & V2I	• Underride	• Electronic Data Recorders • ACN?
MOTORCYCLES	• Conspicuity	• ABS/CBS • V2V	• Helmet Use • Airbags	• ACN?
PEDESTRIANS	• Quiet Car Detection • Lighting Systems for Peds	• Pedestrian Warning • Automatic Braking • P2V	• Pedestrian Impact – Hoods / Bumpers	• ACN?
BATTERY ELECTRIC VEHICLES	• Charging Safety • Lithium Ion Battery	• Shut-Down Strategies	• Lithium Ion Battery • Electrical Isolation	• First Responder Safety
ELECTRONICS RELIABILITY & SECURITY	• Fail-Safe Strategies • Software Reliability • Fault Detection & Reporting & HMI	• Control System Management Strategies & HMI	• Control System Management Strategies	• Electronic Data Recorders



VEHICLE SAFETY RESEARCH

DATA OVERVIEW



RESEARCH STRATEGIC PLANNING PROCESS

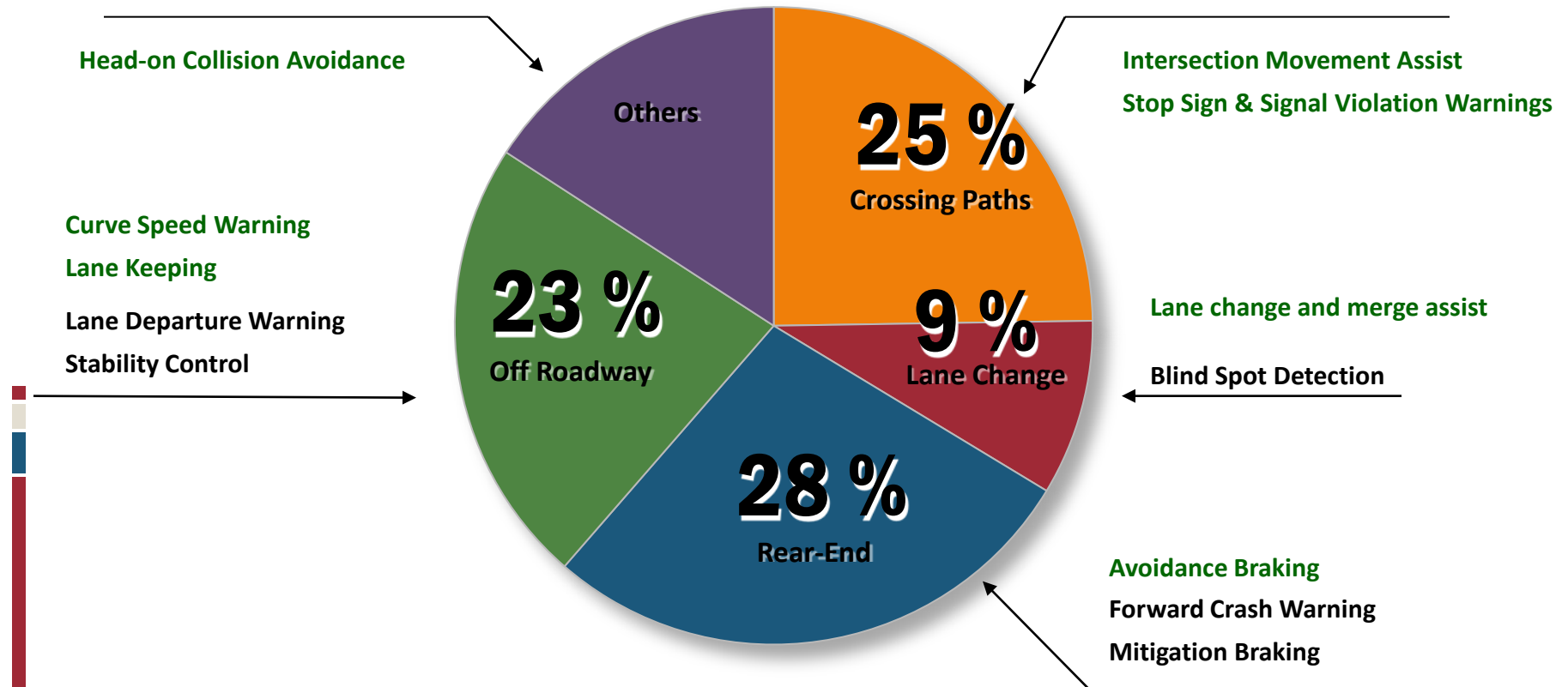
RESEARCH PROGRAM AREAS



Crashes of all Severities

2007 GES

Communicative Crash Avoidance Systems can address
82% of Crash Scenarios involving unimpaired drivers





V2V - It's All About Connectivity

- Opportunity for Safer Driving
- Greater situational awareness
 - Your vehicle can “see” nearby vehicles and knows roadway conditions you can’t see
- Reduce or eliminate crashes thru:
 - Driver Advisories
 - Driver Warnings
 - Vehicle Control
- Opportunity for Greater Mobility & Efficiency
- Create an information-rich environment for multi-modal transportation solutions.
- Enable environmental management through V2I capability

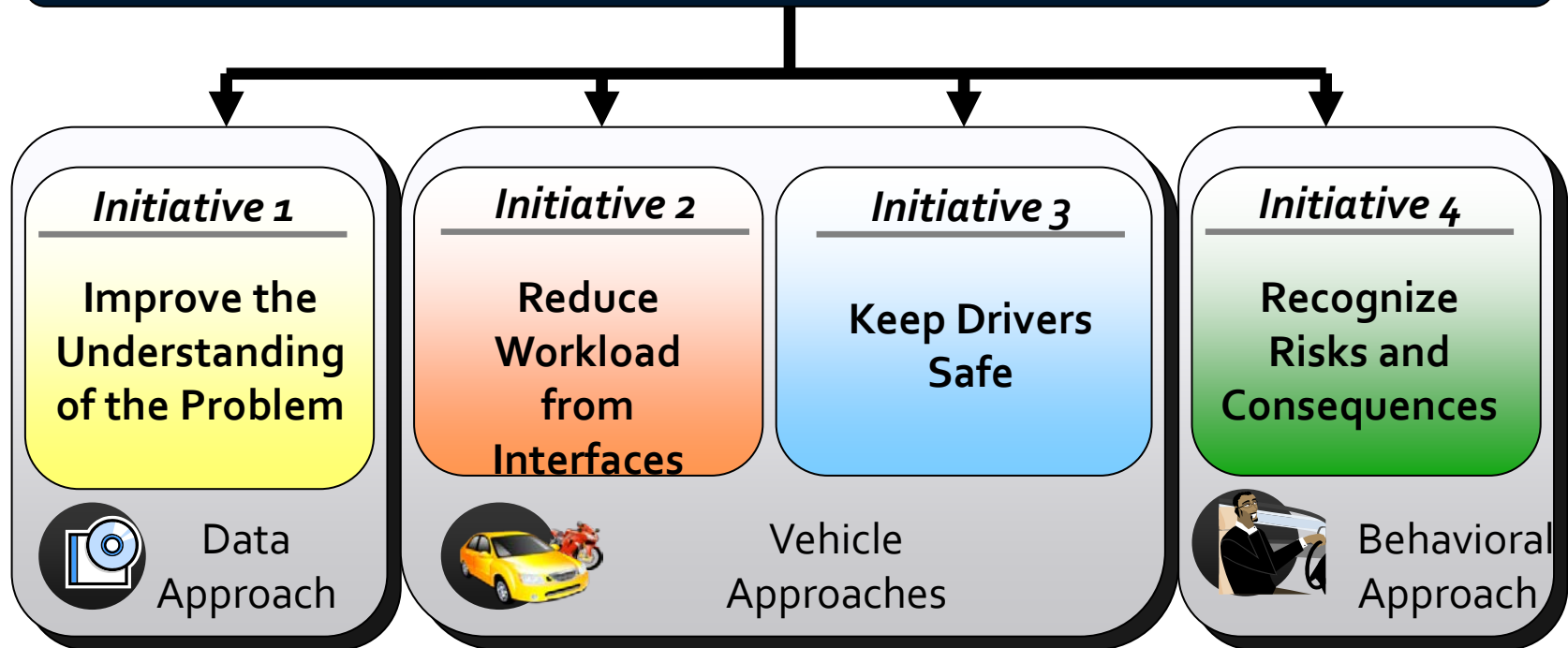


Vehicle Communication has the potential to address **82%** of the vehicle crash scenarios involving unimpaired drivers



NHTSA Distraction Program

Eliminate Crashes Due to Distraction



Pedestrian Crash Avoidance Mitigation (PCAM)

- Identify the top pedestrian crash scenarios
- Assess current and near-term (within 5 years) forward-looking
- Develop objective test procedures





Research Needs

Potential Future Crash Avoidance Topics

- CA or “Near-Miss” Data Sets & Mining Tools
- Accelerated Deployment of Crash Avoidance Technologies
- Minimizing Driver Distraction & Workload
- Deployment of Connected Vehicles & Roads
- Reliability and Security of Electronic Control Systems
- Semi-Autonomous Driving
- Other ideas....



Crashworthiness – Key programs

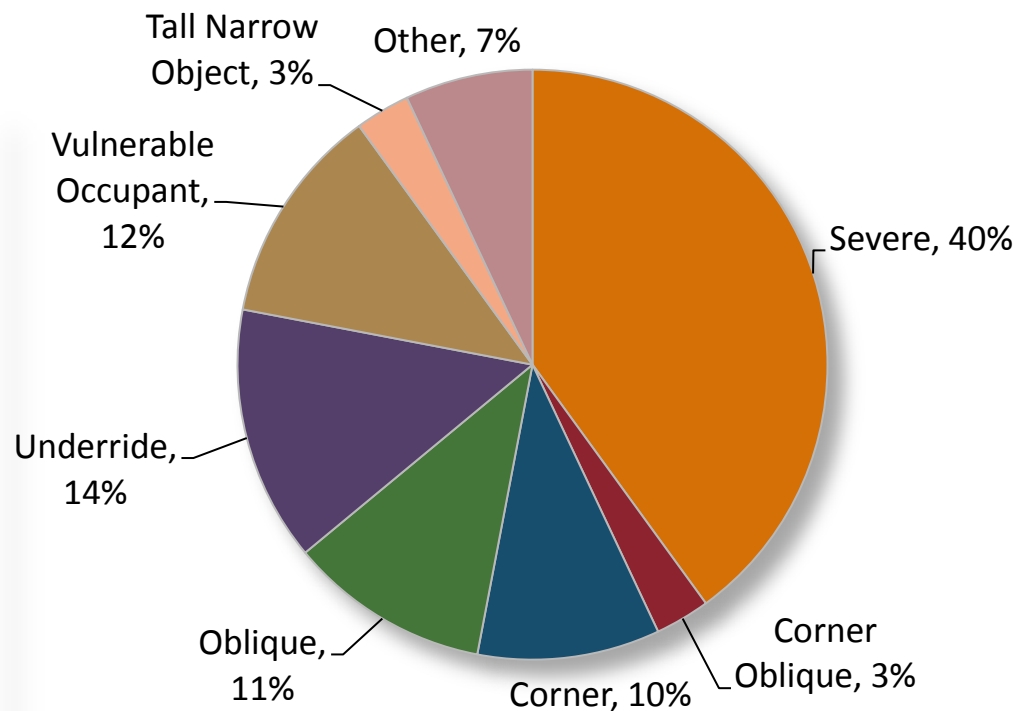
- Low Offset/Oblique Frontal
- Dynamic Rollover
- Child Safety Side Impact
- Lithium Ion Battery Safety
- Advanced Restraints
- Countermeasures for “lightweighted” vehicles
- Advanced Automatic Crash Notification



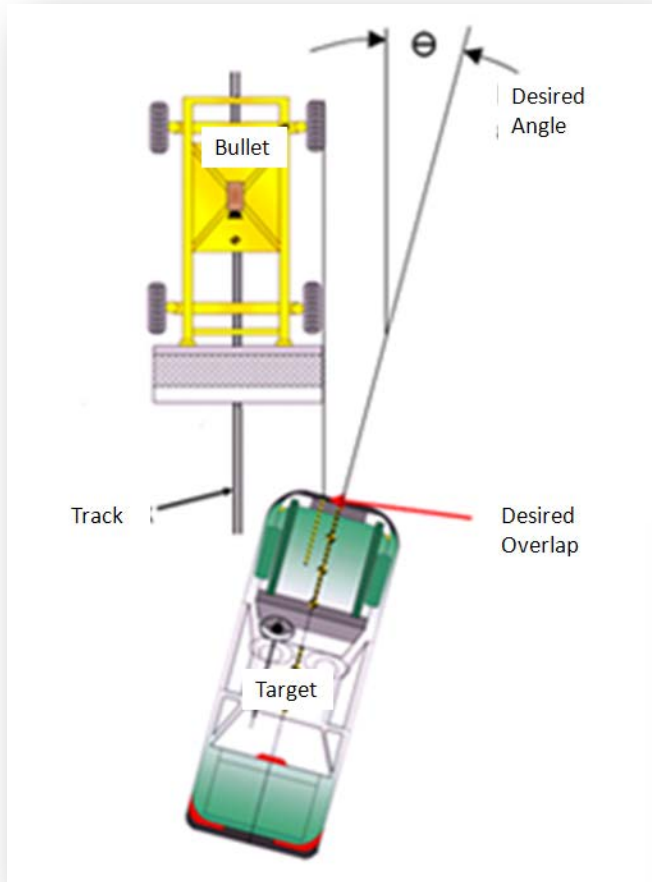
Fatalities in Frontal Crashes Despite Seat Belts and Air Bags

2000-2007 NASS

fatalities for model year vehicles 2000+ where occupant was restrained



Moving Deformable Barrier Test Procedure



Small Overlap

- Overlap $\approx 15\%$
- Angle ≈ 7 degrees
- Theoretical DV = 30 mph



THOR-NT
Dummy

Small Overlap Example



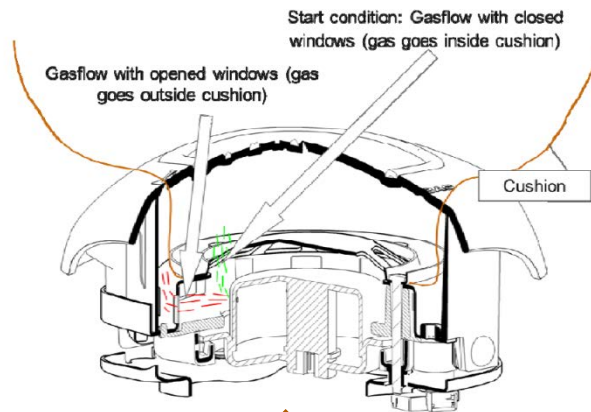
NASS case



Crash Test

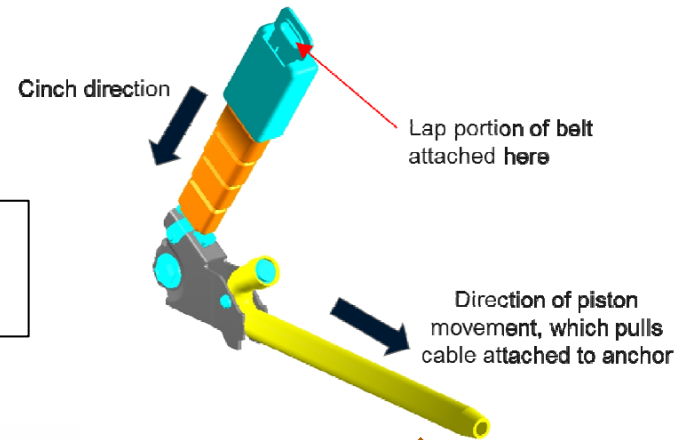
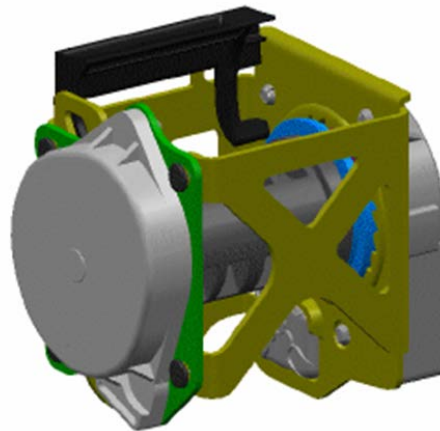
Advanced Restraints

- CAMP ARS demonstrated tailored restraints to occupant size and coupled with assumed pre-crash information resulted in improved overall occupant performance.



Programmable Vent Module

Dual stage load limiter



Lap and shoulder belt pretensioners



The baseline Ford Taurus rear seat evaluated using 5th percentile female and 50th percentile male ATDs.



Battery Vehicles – Research Activities

■ Lithium Ion Battery Safety Research

- Failure Modes and Effects Analysis
 - Identify Potential Critical Safety Issues
- Test Procedure Development
 - Cell, Pack, Vehicle level
- Controls Safety
 - Monitors cell/pack health, SOC, etc.
 - Hardware and software reliability





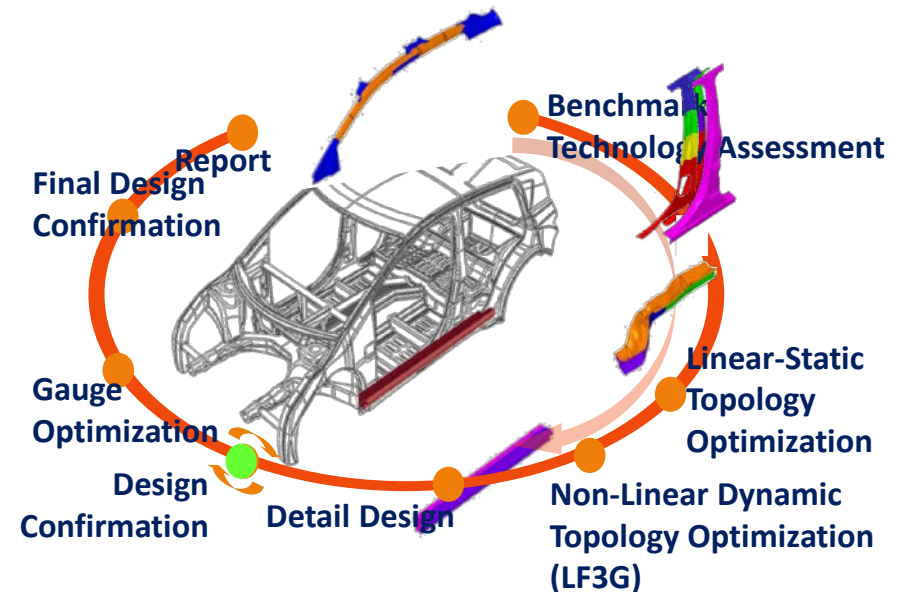
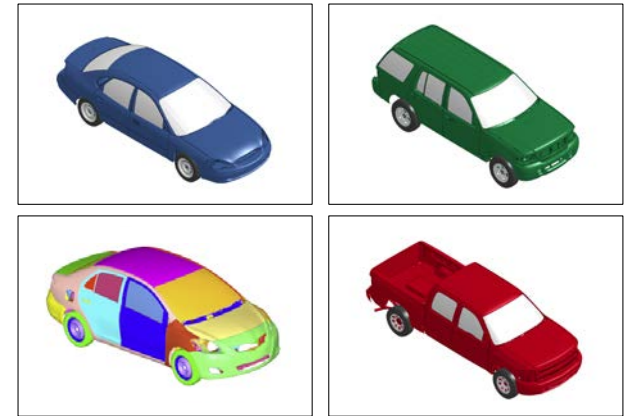
Lightweighting Objectives

- Utilize new and existing vehicle crash models to evaluate safety of future lightweight vehicles
 - Vehicle-to-vehicle and vehicle-to-structure crashes
 - Interaction with new and existing vehicles
 - Evaluate **potential** countermeasures
 - Develop safety estimates
 - Provide direction for future safety research



Simulations for Lightweight Safety

- Develop simulation tool to evaluate crash safety for future lightweighted vehicles
- Demonstrate safety countermeasures for lightweight vehicles for future research
- Utilize finite element models for existing and future lightweight vehicles





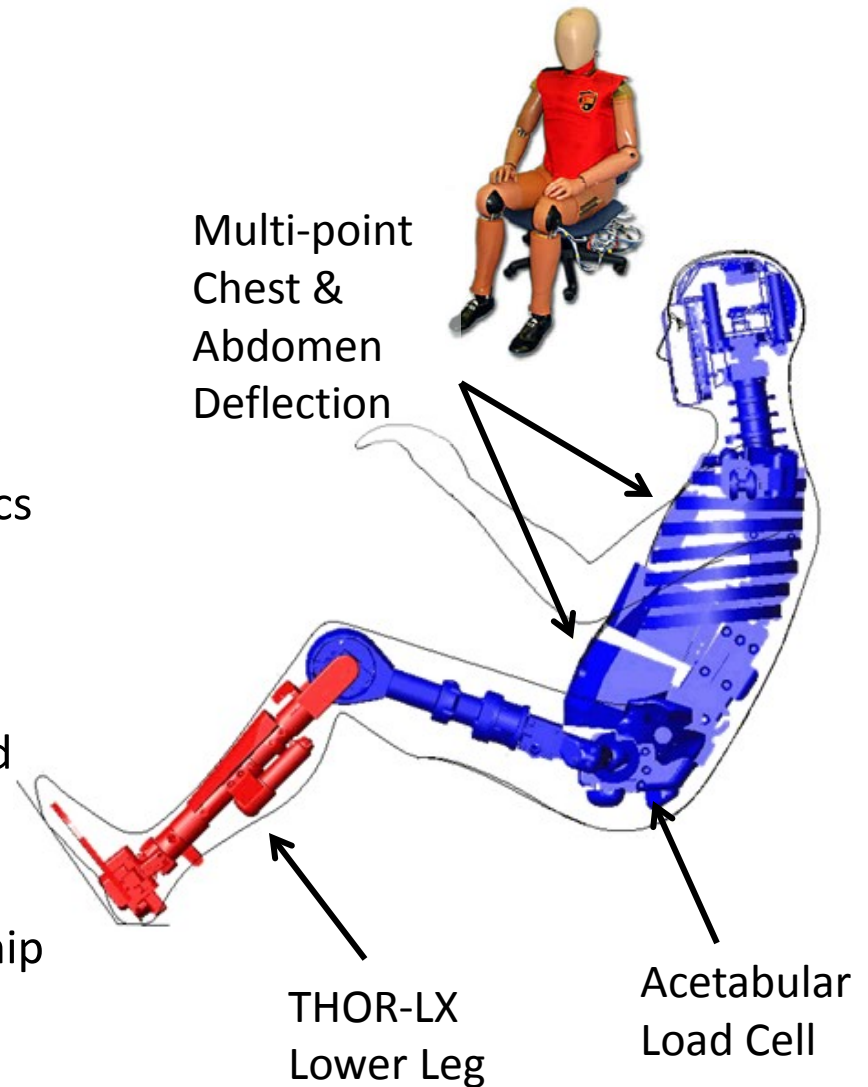
Biomechanics - Key Programs

- Anthropometric Test Device Research (crash dummies)
- Vulnerable Occupant Injury Analysis
- Computer Aided Engineering
- CIREN Program



THOR-NT Dummy

- THOR provides improved biofidelity and measurement capability
- Highlights:
 - Improved head/neck design allow for more biofidelic head kinematics and neck injury assessment
 - Enhanced multi-point chest and abdomen instrumentation for improved evaluations of advanced restraints and steering wheel and belt interactions
 - More biofidelic knee, femur and hip to assess lower extremity injury



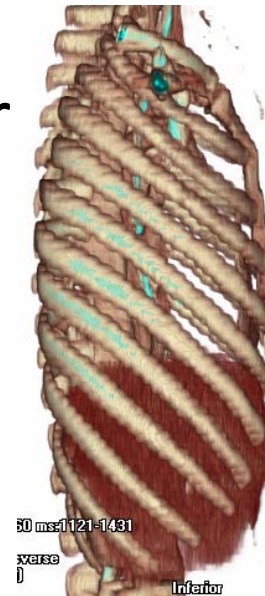
WorldSID Dummy

- Conduct fleet evaluation with WorldSID
- Test Matrix consist of current MY vehicles certified to the FMVSS 214 pole
- Testing ongoing with 50th
 - Future testing planned with WorldSID 5th
- WorldSID Dummy development
 - Ongoing as part of an international collaborative effort
 - Developing dummy family with 50th and 5th

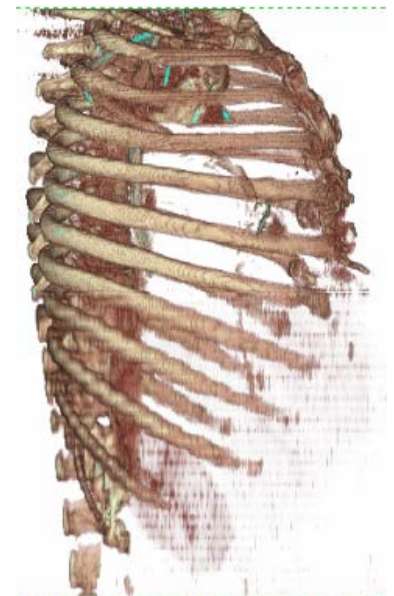


Older Occupant Research Efforts

- Well-established finding that older occupants have greater thoracic injury risk in frontal crash
- Analysis of NASS-CDS and CIREN data to determine effects of age on injury risk
 - In different crash modes
 - By body region and anatomical structure



Young thorax



Older thorax



Research Needs

Potential Future Crashworthiness Topics

- Accelerated dummy development
- Improved computer modeling capabilities
- Crash avoidance sensing information for adaptive restraints
- Adaptive restraints for vulnerable occupants
- Methods to improve belt use
- Other ideas....



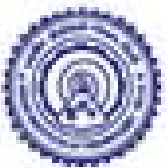
THANK YOU



**Traffic safety
around the
world – can
polices be the
same?**



Dinesh Mohan



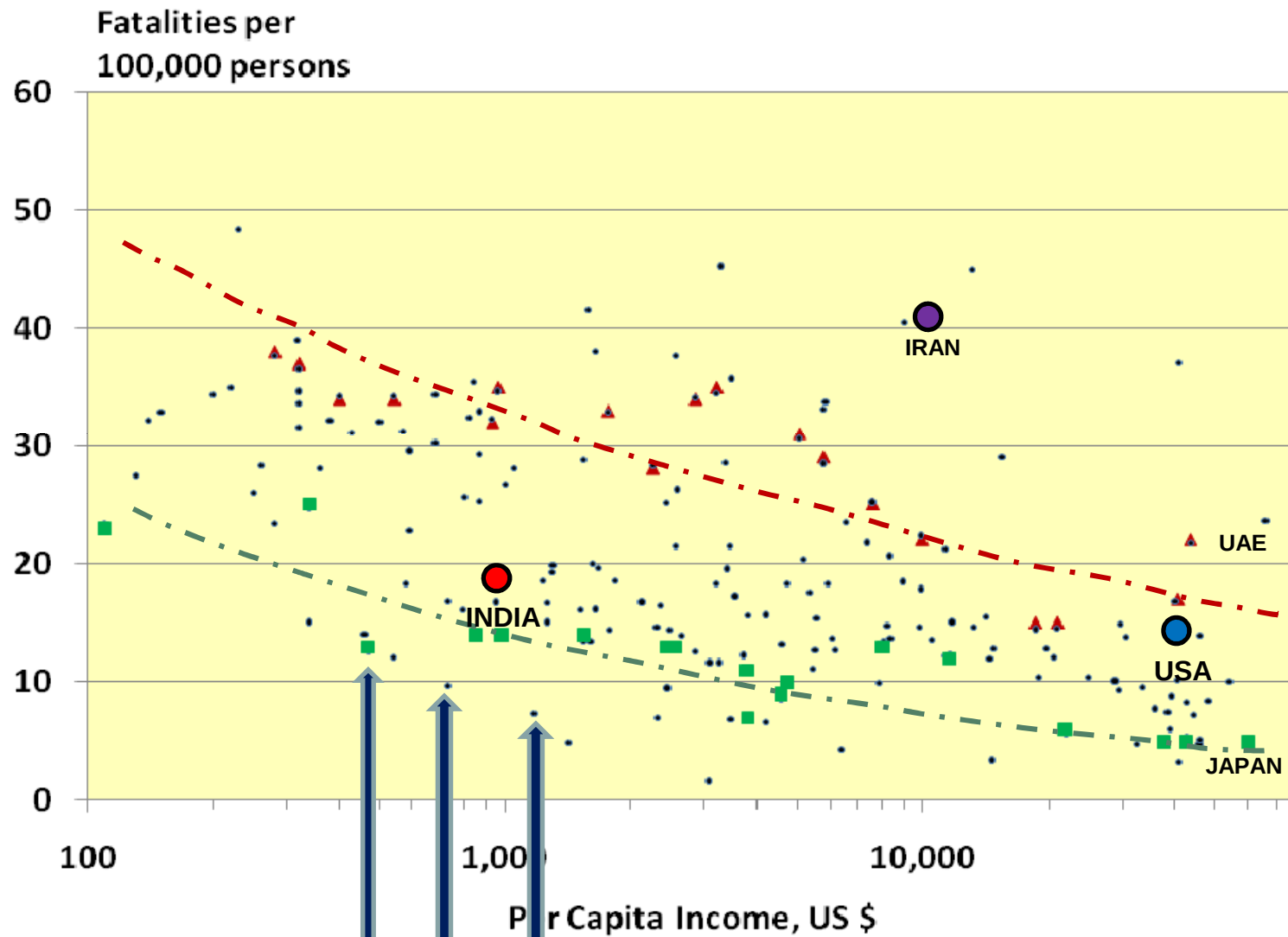
INDIAN INSTITUTE OF TECHNOLOGY DELHI

**Krakow, Poland
14 September 2011**

Road Traffic fatalities for 178 countries Self Reported



WHO Estimates for Road Traffic fatalities 178 countries

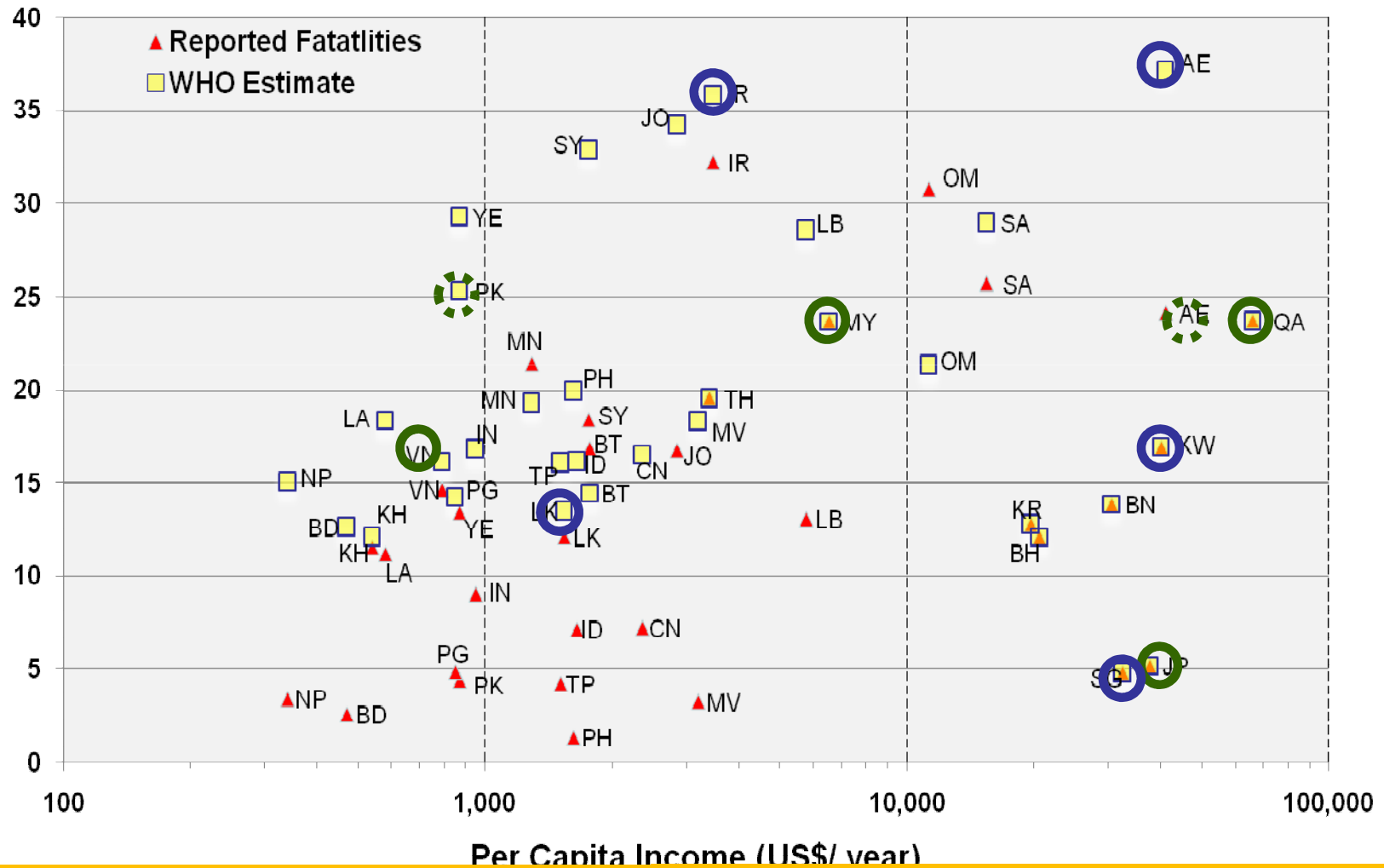


RTI need not be high at low incomes

September 2011

Road traffic fatalities in Asian countries

Fatalities/100,000
persons

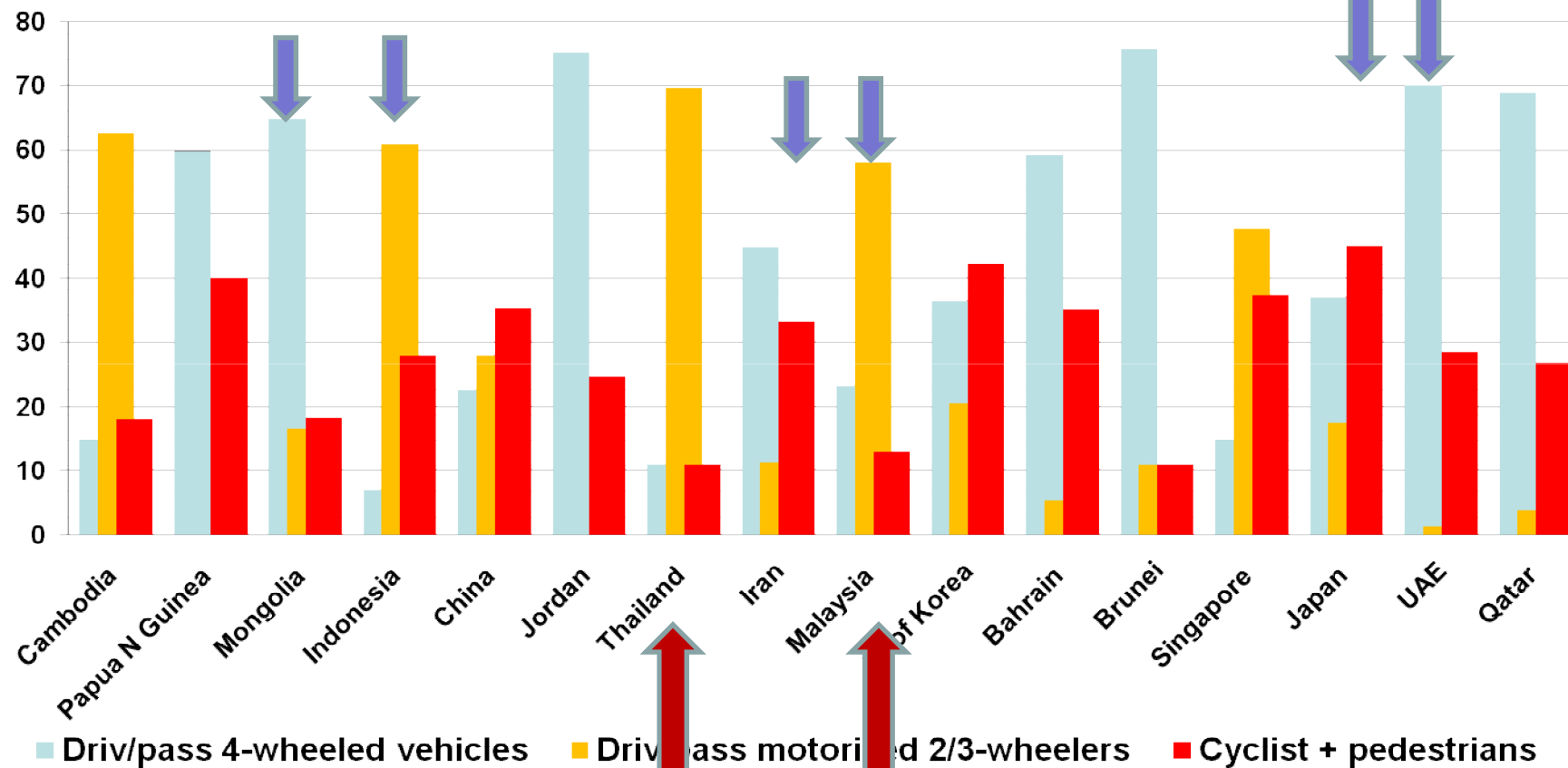


Data collection not necessarily
dependent on income

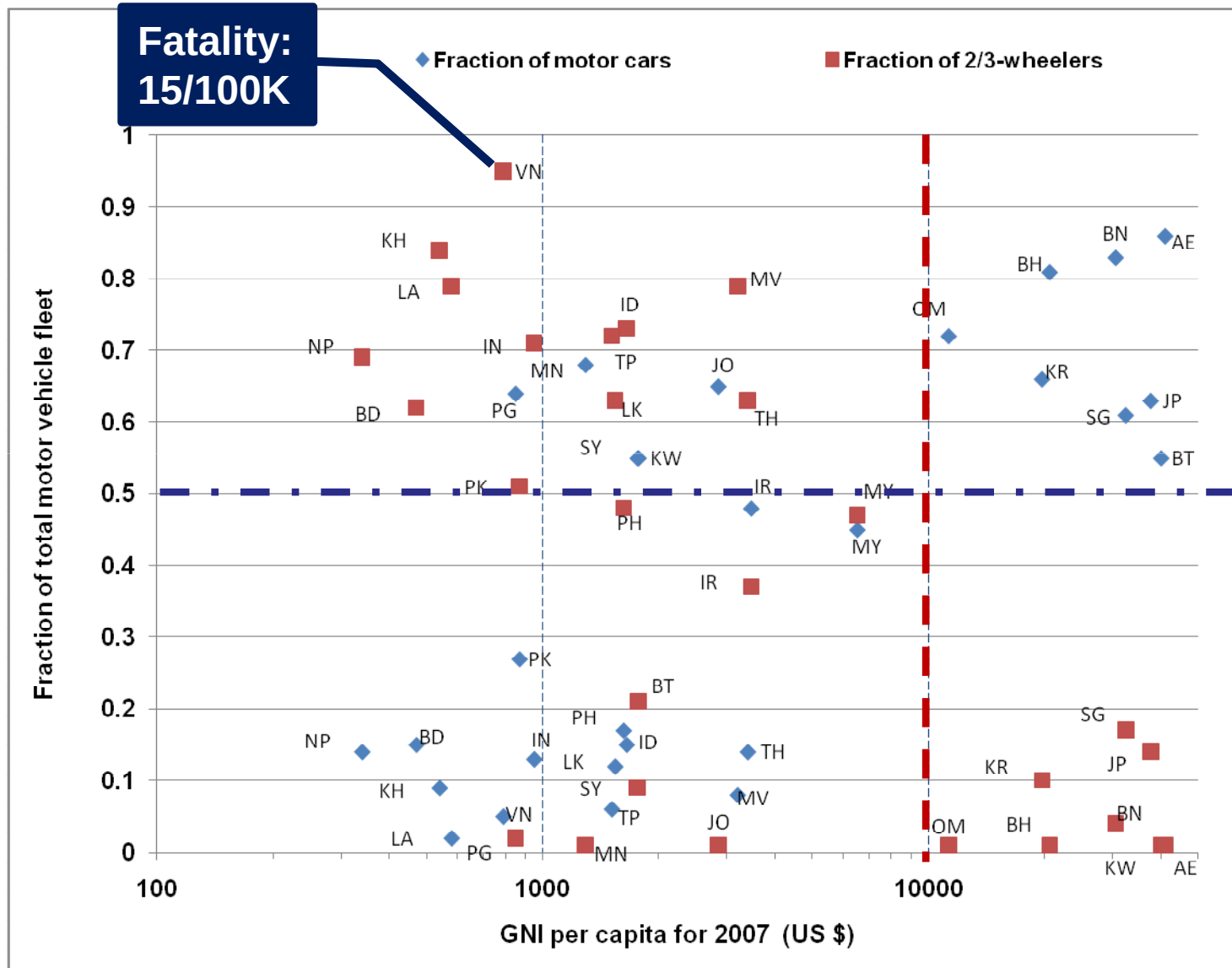
High rates possible in rich countries
& low in LMIC

Proportion of RTI fatalities by road user type. Countries are arranged in increasing income from left to right

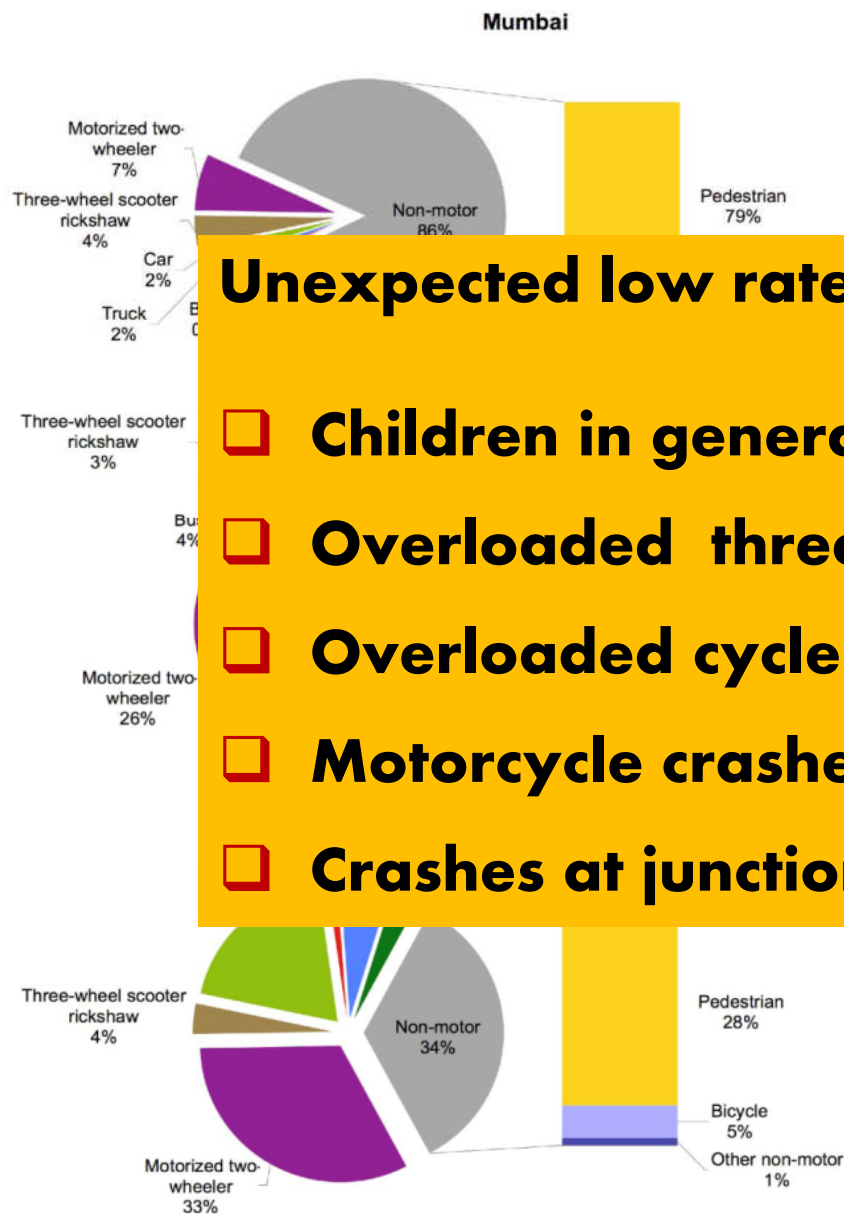
RTI modal shares not necessarily income dependent



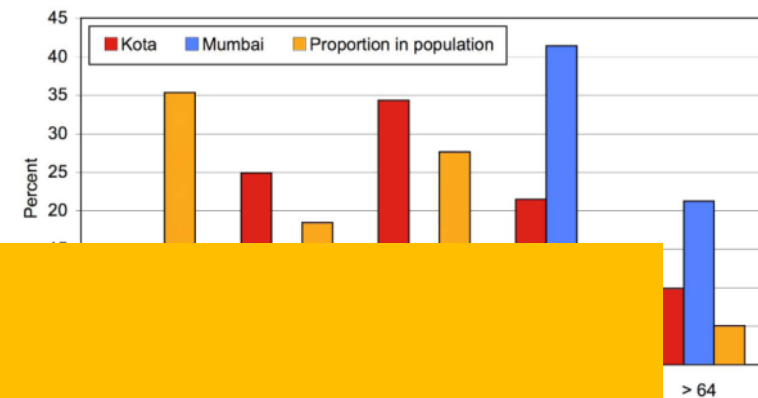
Not clear why pedestrians share low in...data?
than 4-wheel occupants



Fatalities by road user in Delhi (2001-2005), Mumbai (1996-1997), and Kota (2007)

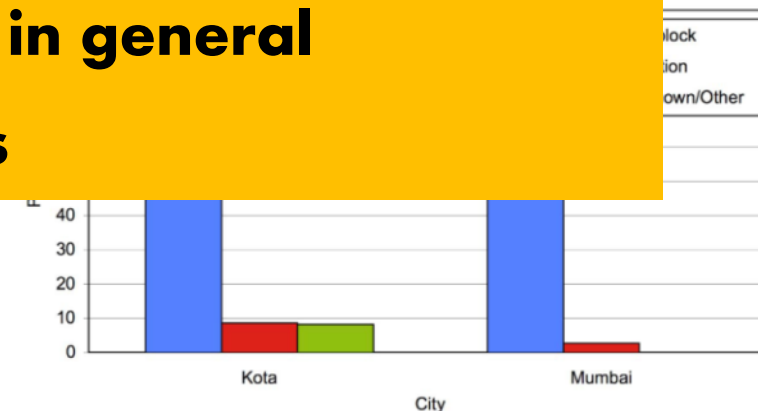


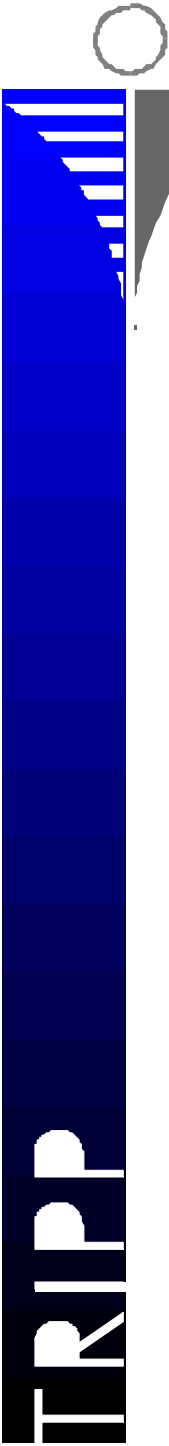
Traffic fatalities by age group in Kota and Mumbai



Unexpected low rates

- ☐ Children in general and on motorcycles
- ☐ Overloaded three-wheelers
- ☐ Overloaded cycle rickshas
- ☐ Motorcycle crashes in general
- ☐ Crashes at junctions





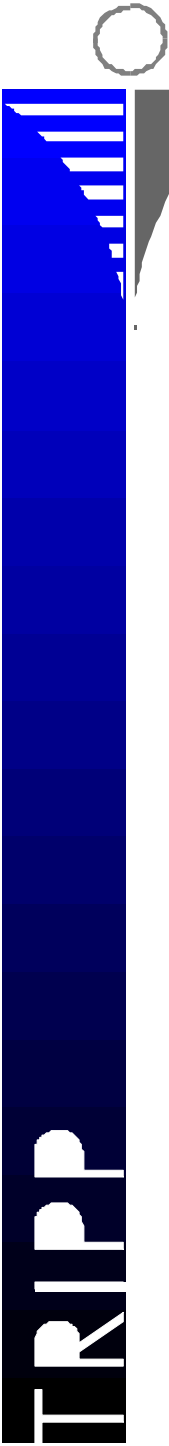
Safety priorities for low and middle income countries

❑ Pedestrians and other non-motorists in urban areas

- Separation of traffic on arterial roads and traffic calming in all other areas – clear & continuous pedestrian paths mandatory on all arterial roads
- Speed control, use of scientifically designed roundabouts instead of traffic lights, no free left turns
 - > Adaptive and generalized pre-crash braking
 - > Speed limiting systems
- Pedestrian impact standards for all vehicles

❑ Motorcycles and cars

- Daytime running lights for motorcycles
- Enforcement of motorcyclist helmet-use laws in all states
- Mandatory airbags, ABS, alcohol interlock for all cars



Safety priorities for low and middle income countries – contd.

- ❑ Pedestrians, other non-motorists, and slow vehicles on highways
 - Highway designs to be modified to separate slow vehicles and pedestrians – service lanes all along the highway
 - > Image recognition traffic control systems
 - Convenient road crossing facilities at frequent intervals
 - Speed control > vehicle- road communication systems
- ❑ Over-involvement of trucks and buses
 - Speed control > data loggers and GPS systems, alcohol interlock
 - Safer vehicle fronts and improved vehicle conspicuity
 - Research to understand the needs of local traffic and to develop standards for breaks in medians (to reduce wrong way driving)

Globalization!



IIT Delhi 15 September 2011



“FUTURE ROLE OF PASSIVE AND ACTIVE SAFETY”

Adam McNeill, IRCOBI 14th September 2011, Krakow, Poland

**BMW
GROUP**



“Future Role of Passive and Active Safety”

Vehicle Safety Performance

Vehicle Safety Performance

Integrated Safety

Preventative Front Protection

Future Rating Systems

Summary



BMW is strongly committed to providing our customers with the highest levels of safety

BMW 5 Series has received top safety ratings worldwide

“Future Role of Passive and Active Safety”

Vehicle Safety Performance

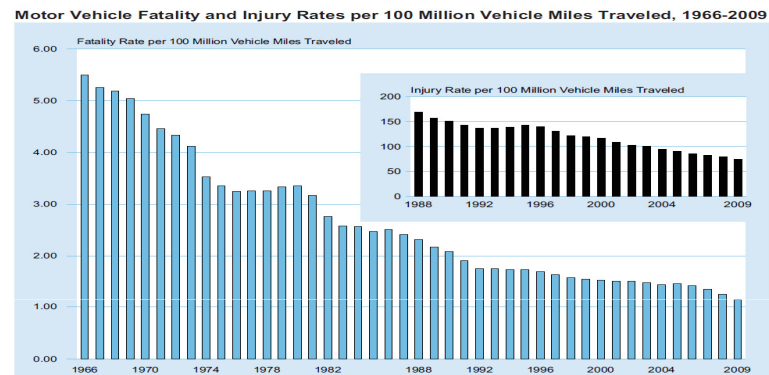
Vehicle Safety Performance

Integrated Safety

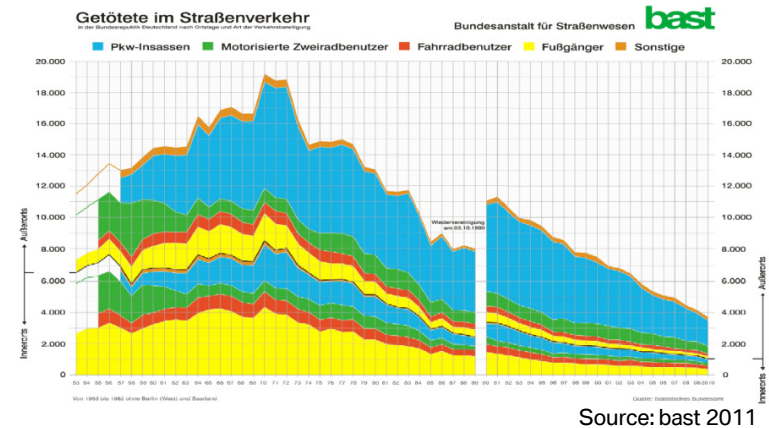
Preventative Front Protection

Future Rating Systems

Summary



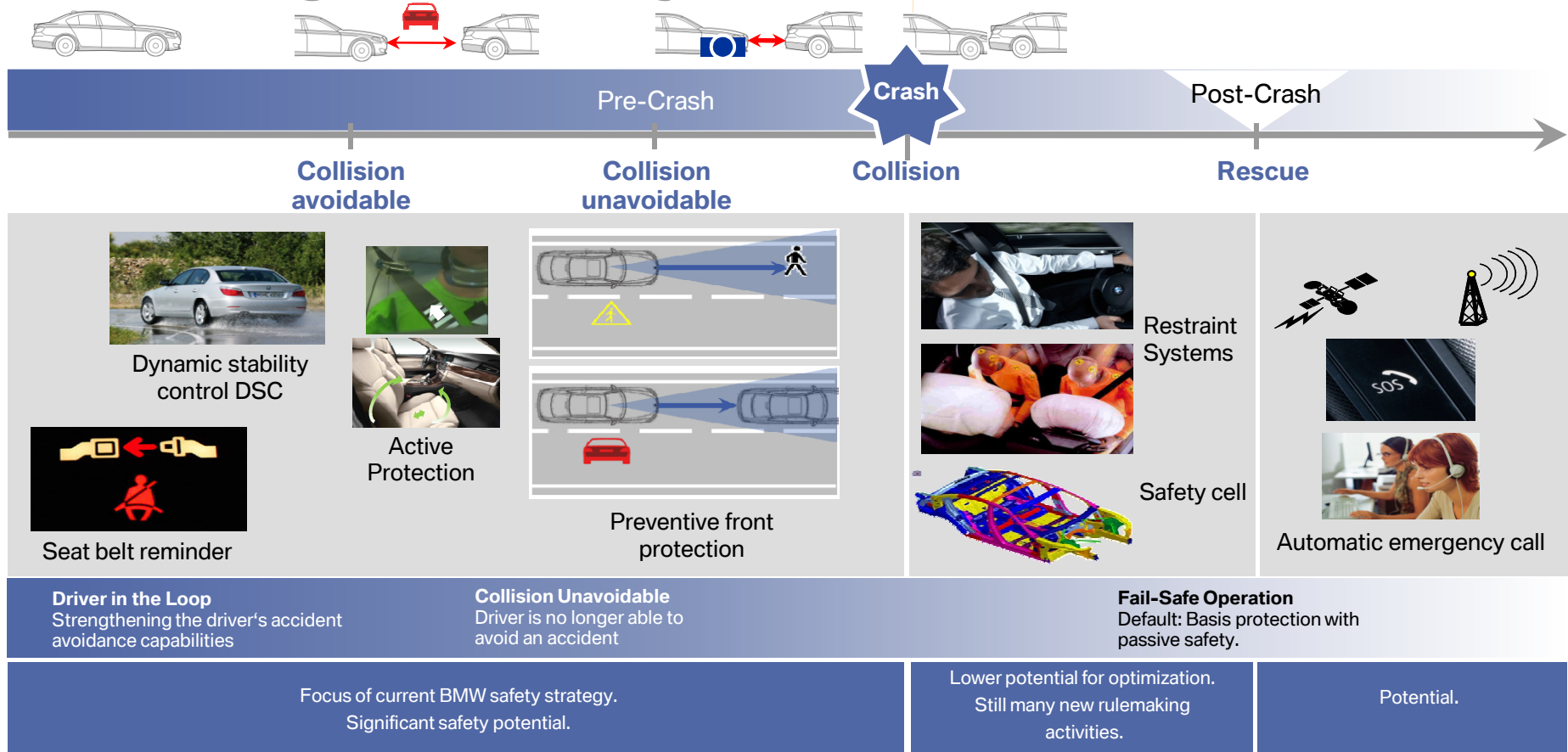
**Enormous progress
has been made in
improving traffic
safety by all parties**



**Passive safety
improvements have
contributed
significantly to
achieve this**

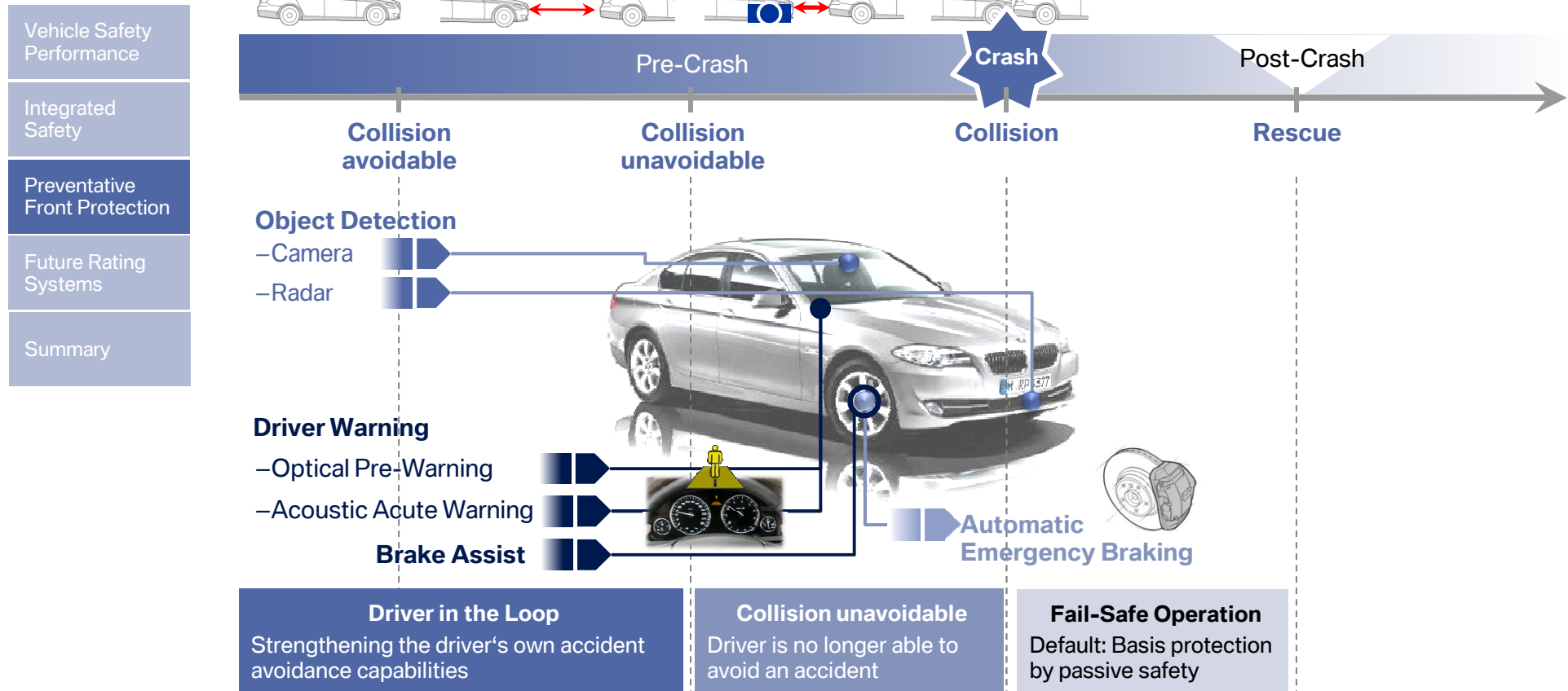
“Future Role of Passive and Active Safety”

Integrated Safety



“Future Role of Passive and Active Safety”

Frontal Protection – Vulnerable Road User



“Future Role of Passive and Active Safety”

Effect of Impact Speed Reduction on Pedestrian Head Injury.

Vehicle Safety
Performance

Integrated
Safety

Preventative
Front Protection

Future Rating
Systems

Summary

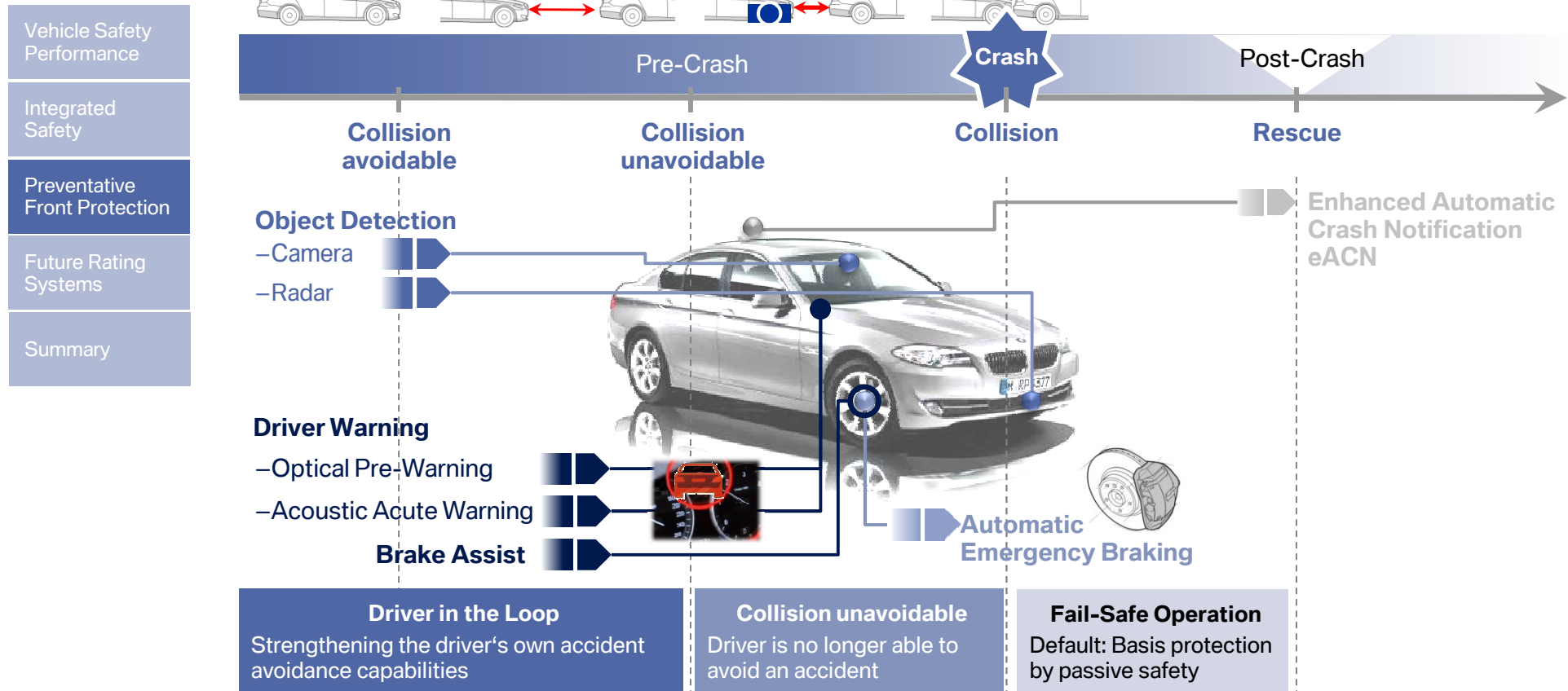
Reduction of HIC per 2.5 km/h
speed reduction.

v [km/h]	Child 50°		Adult 65°
	HIC _{05_08}	HIC _{03_15}	HIC _{09_15}
40.0	739	1713	1710
37.5	594	1459	1441
35.0	469	1229	1183
32.5	364	1017	958
30.0	276	830	766
27.5	205	657	624
25.0	148	511	489

An impact speed reduction of 10
km/h has the potential to reduce
the measured values by over 50%!

“Future Role of Passive and Active Safety”

Front Protection – Longitudinal Traffic



Laboratory Crash with Braking Intervention.

Significant Load Reduction by Emergency Braking

Delta V reduced by 24 km/h

Vehicle Safety
Performance

Integrated
Safety

Preventative
Front Protection

Future Rating
Systems

Summary

In cooperation with



Test results

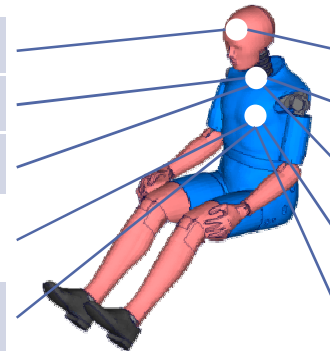
Driver



HIC 36:	-76%
Neck extension:	-36%
Neck tension:	-19%

Chest acceleration:	-35%
Chest deflection:	-47%

OCCUPANTS



Passenger



HIC 36:	-78%
Neck extension:	-47%
Neck tension:	+34%

Chest acceleration:	+9%
Chest deflection:	-45%

Is reduced by
adapting airbag deployment

“Future Role of Passive and Active Safety”

Future Rating Systems

Vehicle Safety Performance	Current Safety Assessment	Future Safety Rating Systems?
Integrated Safety	• Consumer ratings = legal requirements + X.	• A balanced and comprehensive active & passive safety assessment.
Preventative Front Protection	• High weighting of passive safety with a focus on restraint and structural performance.	• Weighting by real world effectiveness.
Future Rating Systems	• Performance measured by dummy injuries.	• Goal – Promote use of systems which have the highest effectiveness.
Summary	• Mainly separate assessment of active / passive safety → Pre crash features not assessed.	

“Future Role of Passive and Active Safety”

Summary

Vehicle Safety
Performance

Integrated
Safety

Preventative
Front Protection

Future Rating
Systems

Summary

- Huge Improvements have been made in traffic safety over the last years.
- Passive safety improvements are coming in to the area of diminishing returns.
- Preventative systems have the potential to bring a new era of injury reduction.
- Before further legislation and consumer test ratings are developed or modified the following needs to be taken into account:
 - Overall effectiveness in injury reduction.
 - A good balance need to be found utilising both active and passive systems.