Whiplash Prevention Campaign Initiative:

BC Provincial Results for an Observational Study Assessing Proper Head Restraint Use

Payam Saffari, Dr. Douglas P. Romilly – Dept. of Mechanical Engineering

Dr. Marc White – Dept. of Family Practice

Dr. Ediriweera Desapriya – Dept. of Emergency Medicine & VGH

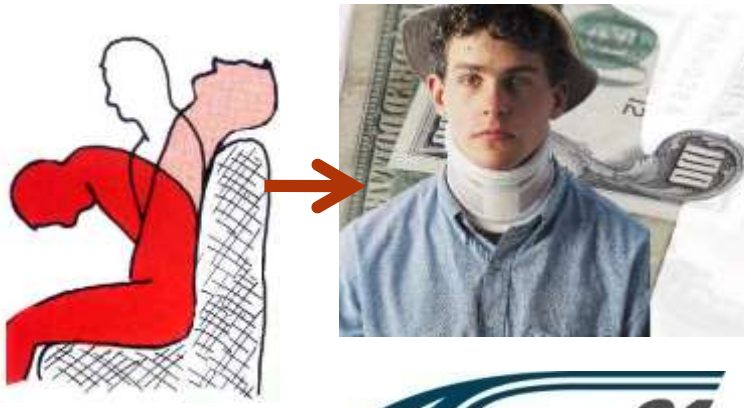
University of British Columbia

Why Focus on Whiplash?

- More than 65% of people injured in a crash report a soft tissue injury to their neck and/or back (ICBC 2012)

- In British Columbia alone, the economic costs exceed C$850 million/year (ICBC)

- Cost is in terms of
  - Lost work productivity
  - Disability Sick leave
  - Litigation Medical care



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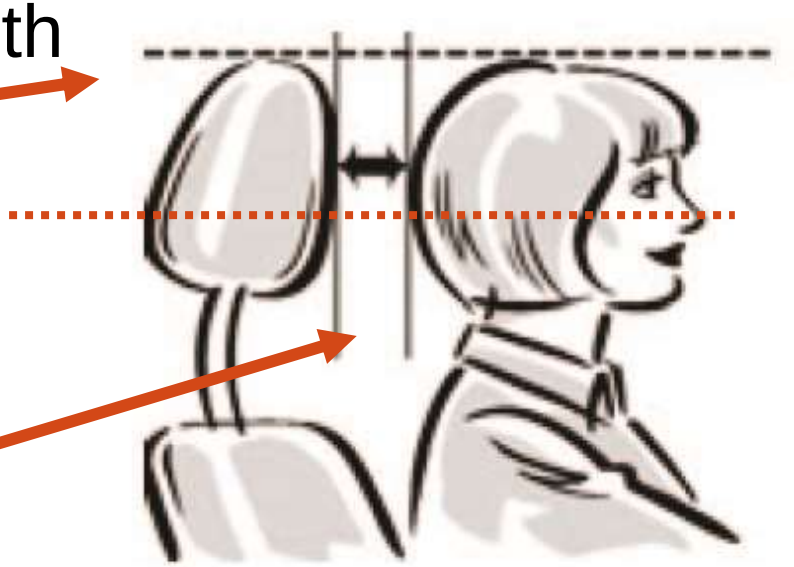
How can whiplash be prevented?

- The head restraint (HR) is positioned so that the head restraint is aligned with or above the head.



- The head restraint should be 2 - 5 centimeters from the back of your head

- When positioned properly the head restraint can be very effective in preventing whiplash (i.e. 35% of serious injuries can be prevented)

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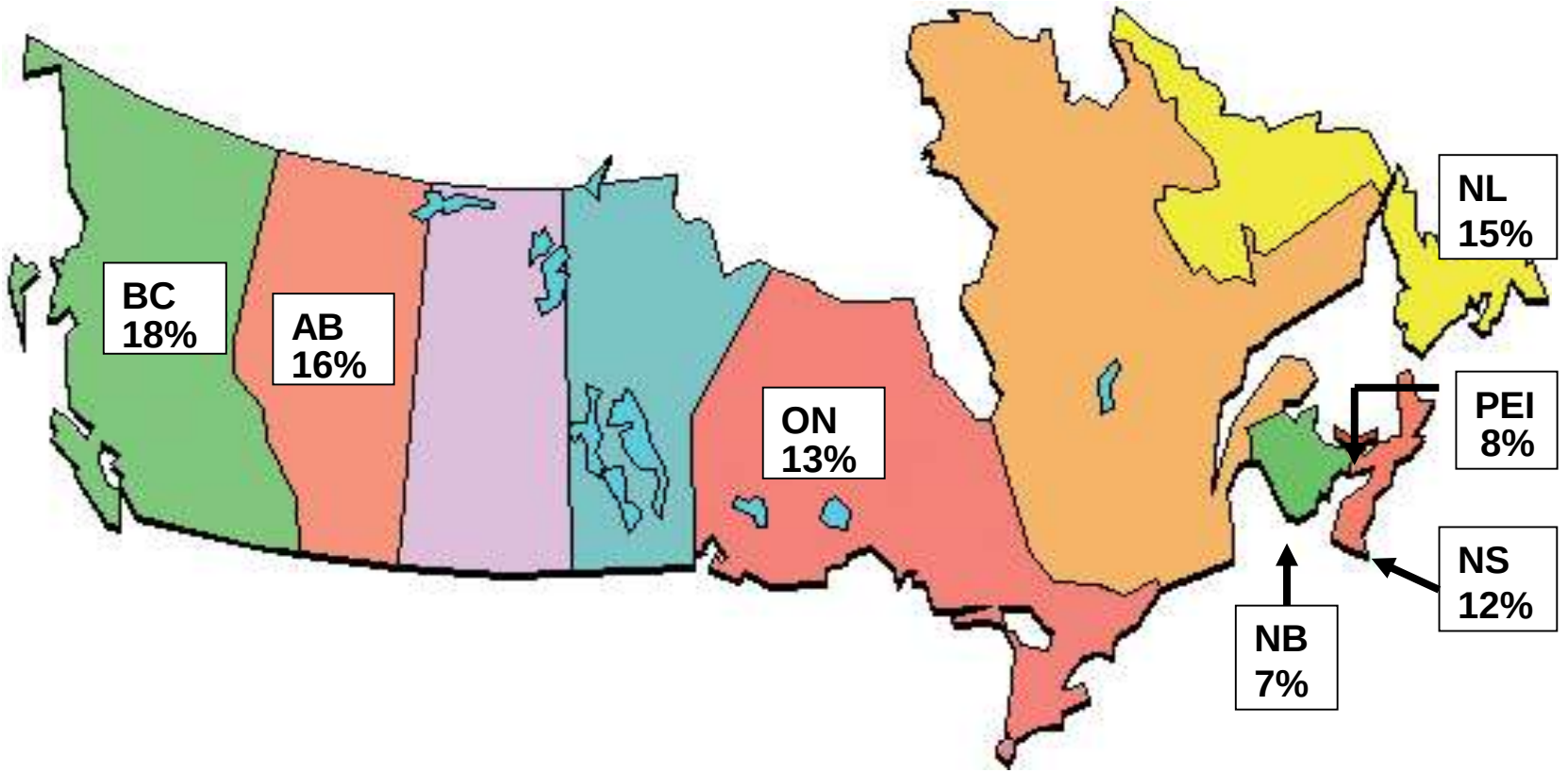
What is the Problem?



- IBC (2002) study – in Canada on average, only 14% of occupants had their head restraints properly positioned!

Whiplash Prevention Campaign

GOAL:

- To reduce occupant injury in rear-end collisions

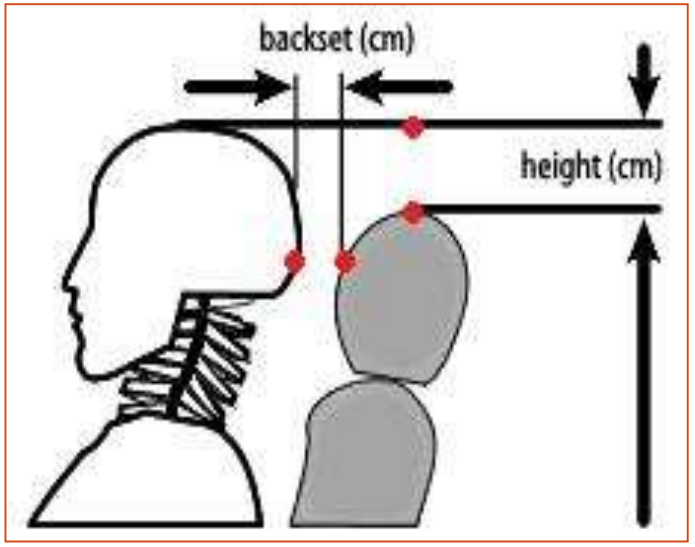
STRATEGY:

- To increase both awareness and proper HR use by educating public

ASSESSMENT:

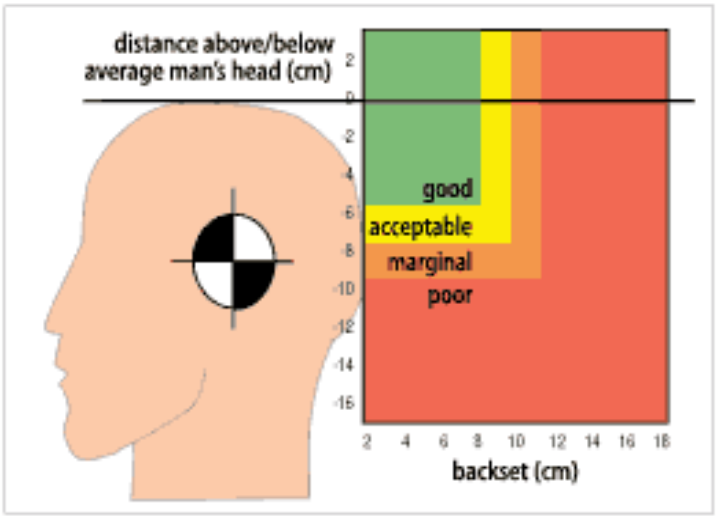
- Up-to-date statistics on HR usage is needed: **Observational Study**

Observational Study - Methodology



Compare vertical and horizontal distances to height and backset

	Vertical	Horizontal
Poor	>10 cm	>12 cm
Marginal	8-10 cm	12-10 cm
Acceptable	6-8 cm	8-10 cm
Good	< 6 cm	< 8 cm



Sample Results

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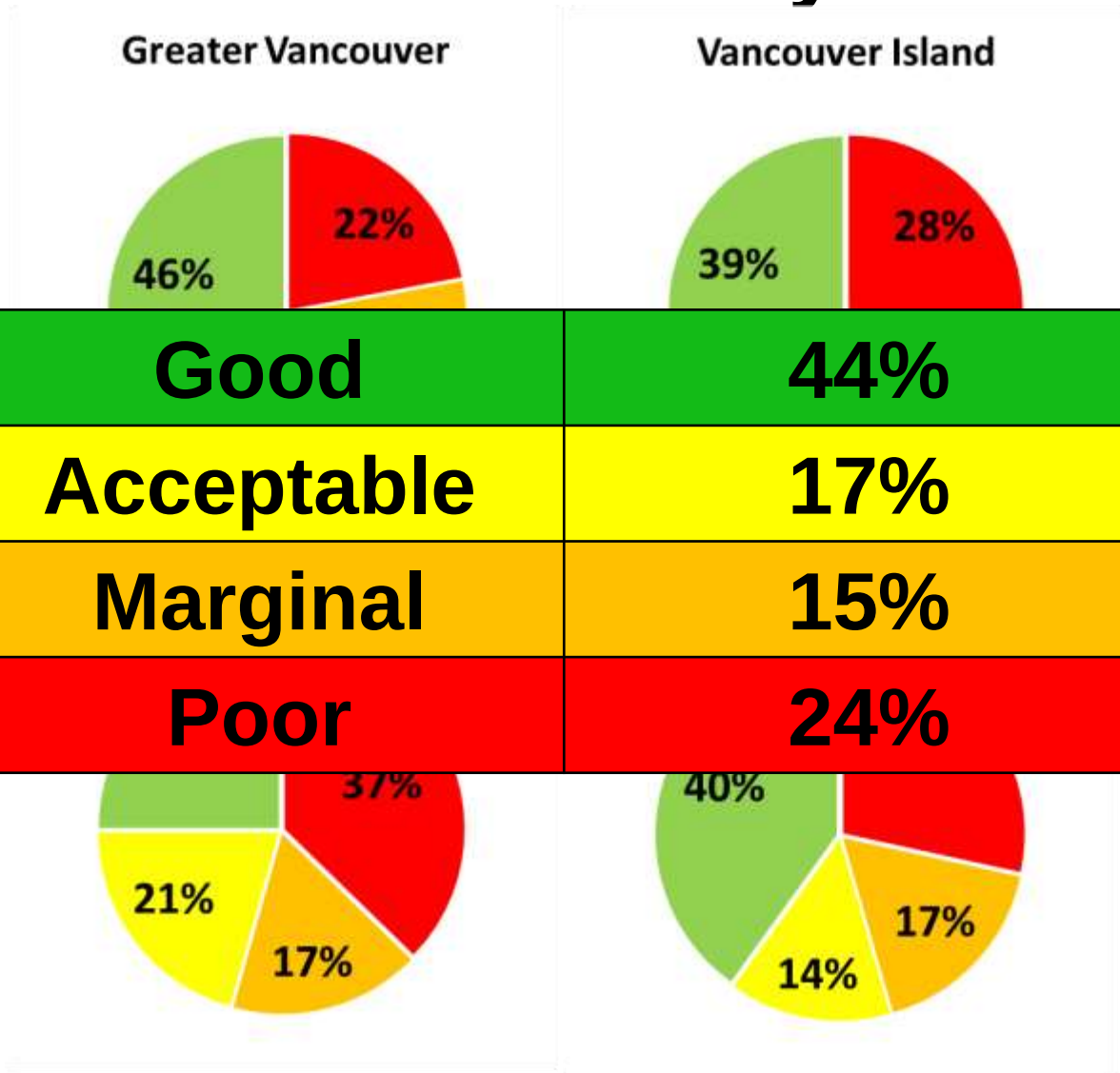
The Reported Data Sample

- **Sampled areas:** Greater Vancouver**,** BC Interior (Kamloops, Kelowna), Northern BC (Prince George) and Vancouver Island (Nanaimo)

- **Data set:** 2770 occupants (i.e. 2572 drivers, 198 passengers)

- **Vehicle types:** Sub-compact to large pick-up & SUV

Observational Study - Results



Good	44%
Acceptable	17%
Marginal	15%
Poor	24%

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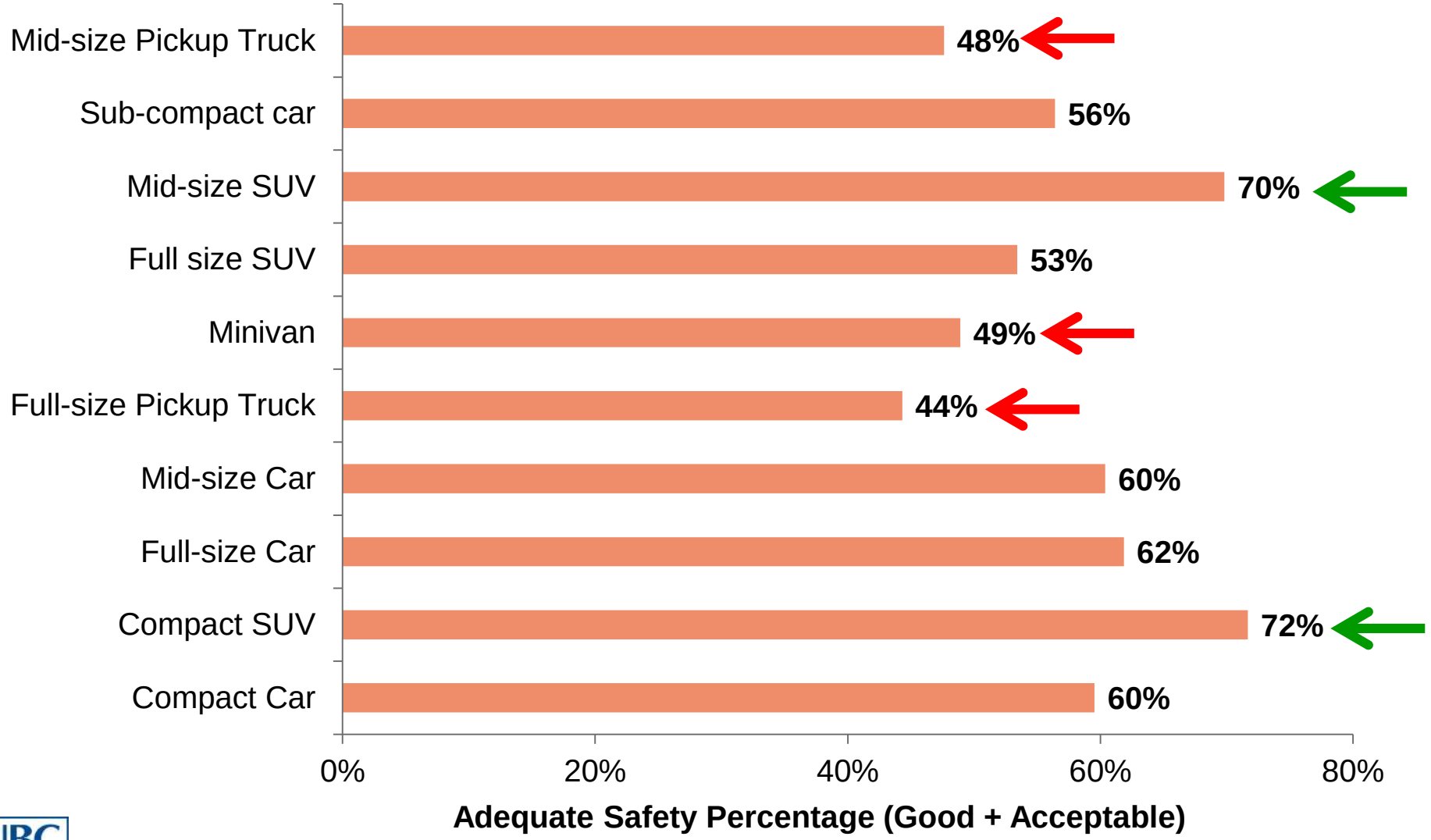
Observational Study - Results



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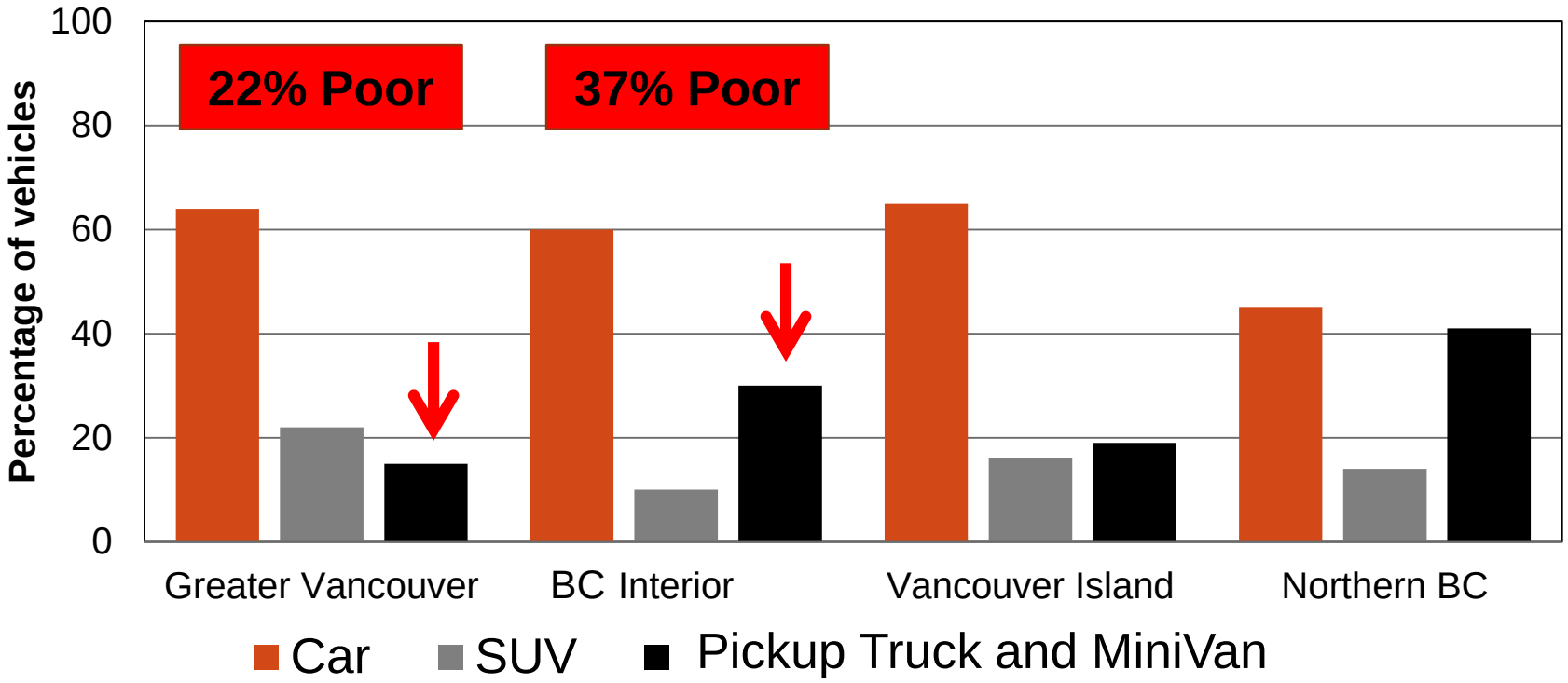
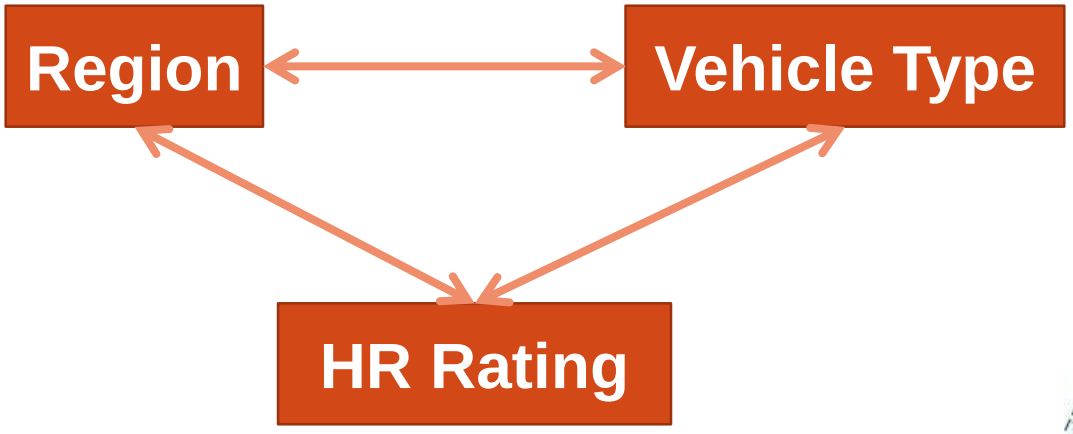
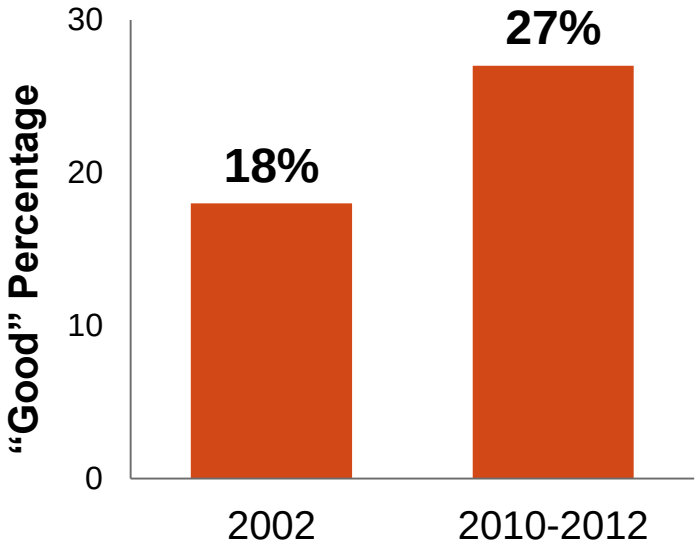
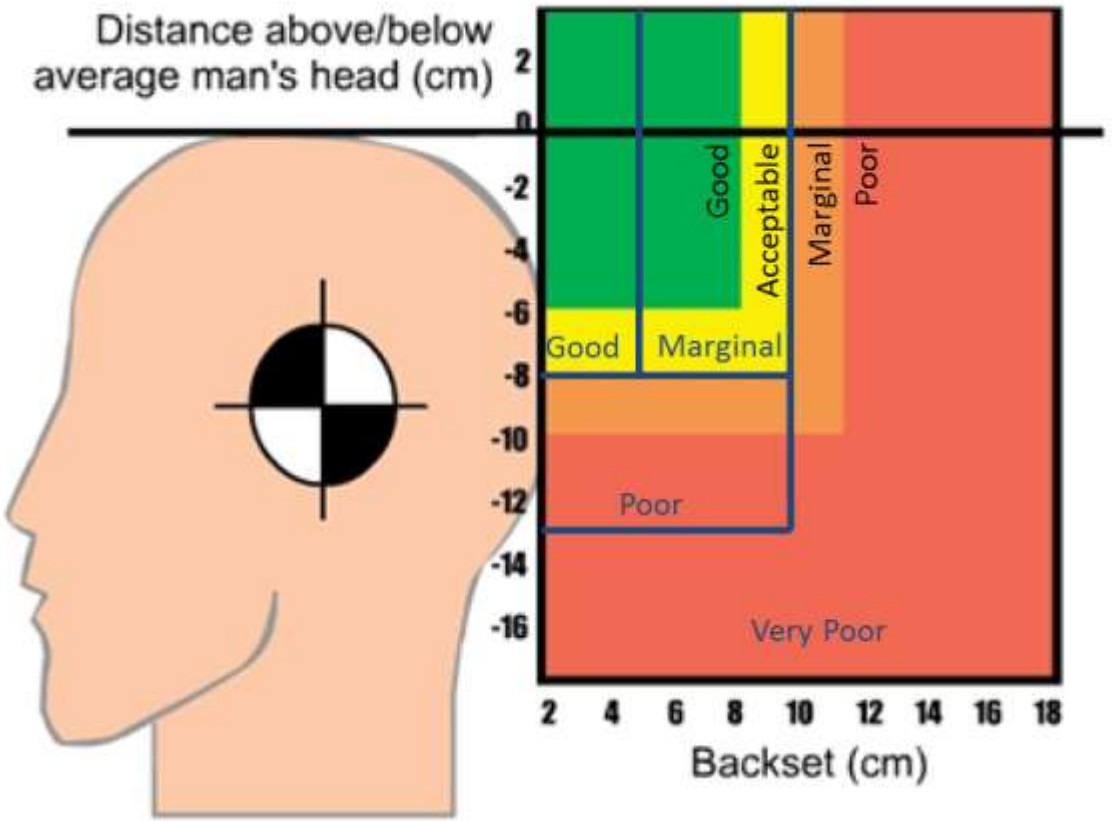
Observational Study - Results





Comparison with IBC Study (2002)





Conclusions

- 44% “Good”, 17% “Acceptable”, 15% “Marginal”, and 24% “Poor”
- Less than half of the BC motorists have their HRs “properly” positioned
- Motorists in Greater Vancouver region were more likely to have their HRs adequately positioned
- Only 9% improvement since IBC study in 2002 in BC

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Conclusions

- Improvement in seat design:
  - MiniVans and PU trucks – need improved designs for occupants
- More awareness! Vehicle purchasers
  - Long way to match seatbelt use! 44% vs. 95%
  - Public and fleet buyers – seek better designs!

Resources available:
www.whiplashprevention.org

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Contributions

- The findings of this study provide baseline data for evaluating the efficacy of the “Whiplash Prevention Campaign”

- Protocol developed in this study is low-cost and can be easily implemented

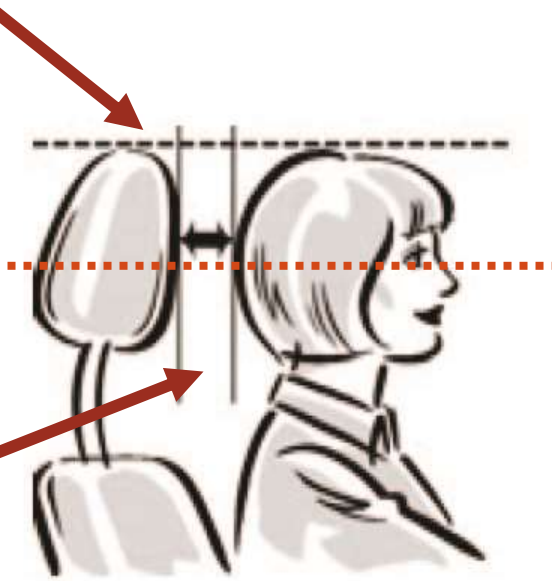
- Valuable results to stakeholders involved with vehicle design, regulations and occupant safety

Closing: Check your Head Restraint!

Proper Head Restraint Adjustment

- Raise the head restraint (HR) so that top of HR is at top of head (which should place the center of HR slightly above the top of the ear).
- The head restraint should be

  2 - 5 centimeters from the back of your head



- **When adjusted properly the head restraint can be very effective in preventing injuries**

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Acknowledgements

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- MEA Forensic Engineers and Scientists

Thank You for Your Attention

Questions?

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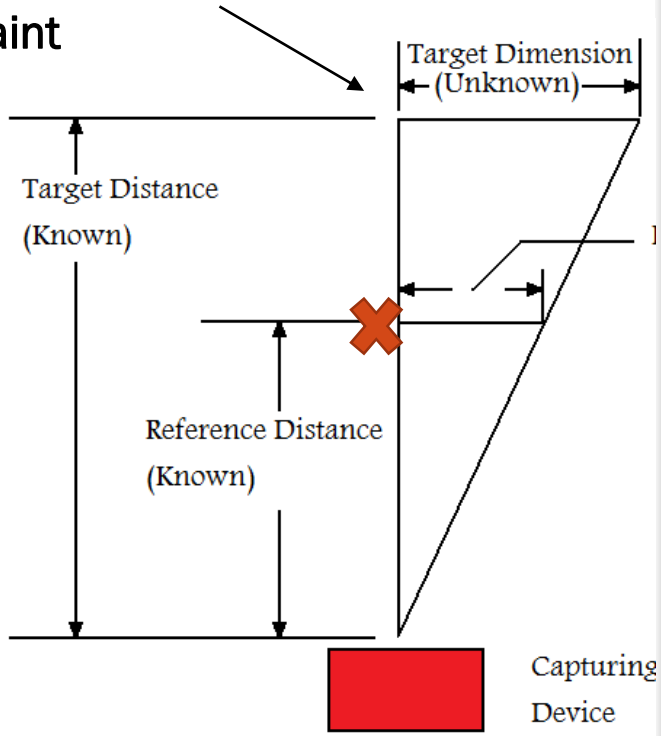
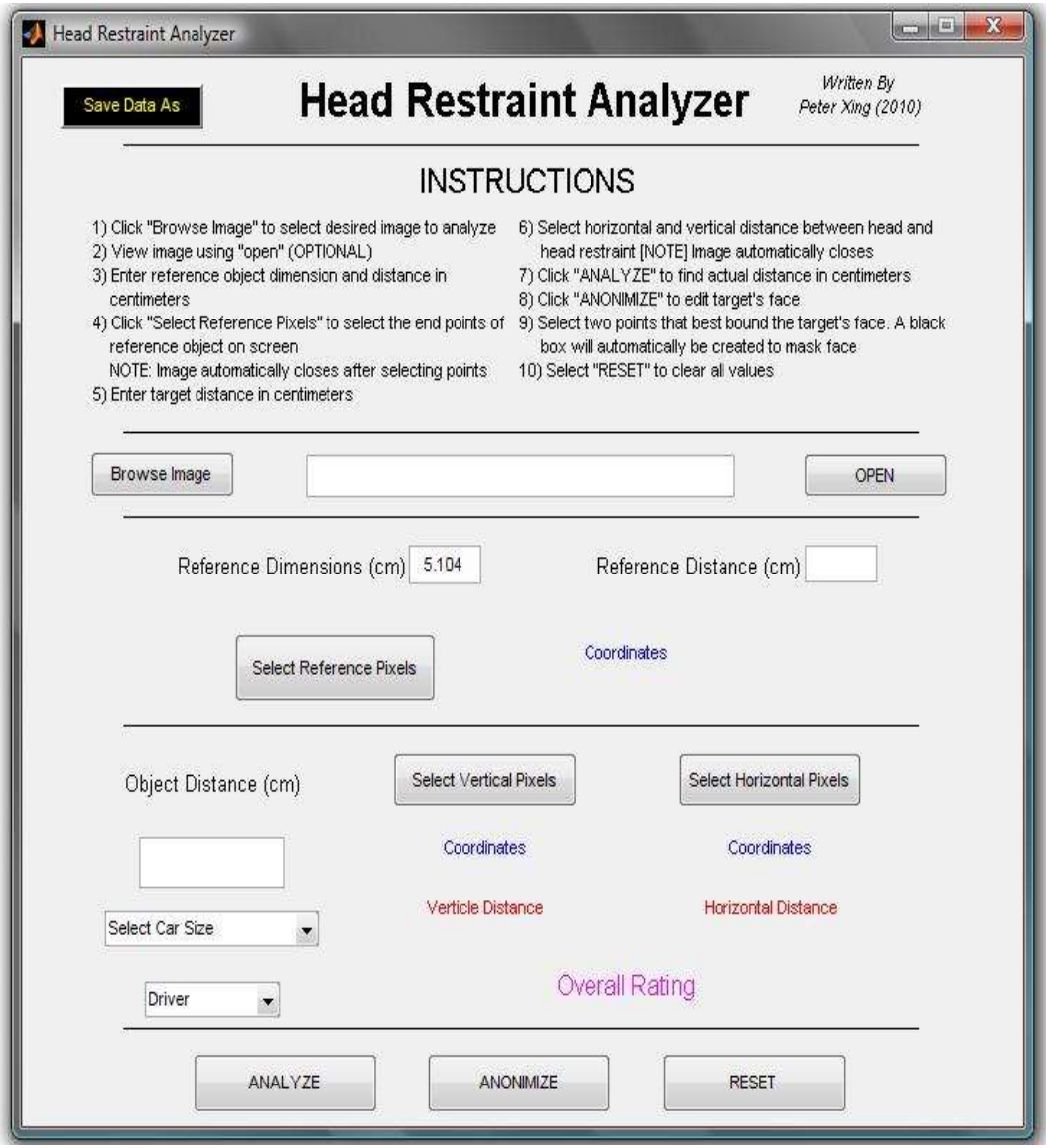
Confounding Issues

- Reflections? Polarizer
- Too Bright for Laser? Ultra Sonic
- B-pillar? Shoot from passenger side instead

Custom Analysis Software

Target - Head & head restraint





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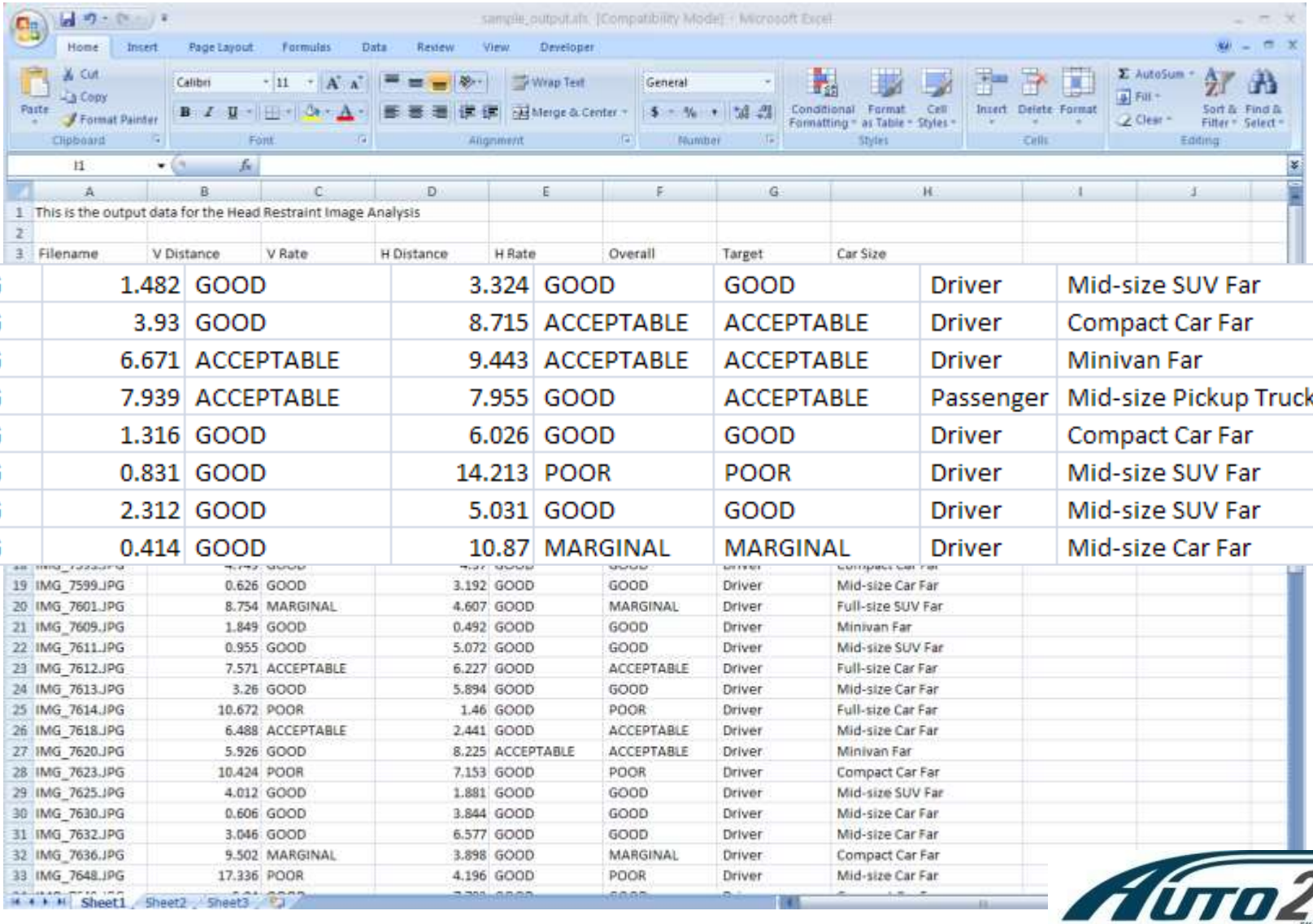
Sample Data Output



This is the output data for the Head Restraint Image Analysis

Filename	V Distance	V Rate	H Distance	H Rate	Overall	Target	Car Size
IMG_7668.JPG	1.482	GOOD	3.324	GOOD	GOOD	Driver	Mid-size SUV Far
IMG_7670.JPG	3.93	GOOD	8.715	ACCEPTABLE	ACCEPTABLE	Driver	Compact Car Far
IMG_7683.JPG	6.671	ACCEPTABLE	9.443	ACCEPTABLE	ACCEPTABLE	Driver	Minivan Far
IMG_7690.JPG	7.939	ACCEPTABLE	7.955	GOOD	ACCEPTABLE	Passenger	Mid-size Pickup Truck Close
IMG_7691.JPG	1.316	GOOD	6.026	GOOD	GOOD	Driver	Compact Car Far
IMG_7692.JPG	0.831	GOOD	14.213	POOR	POOR	Driver	Mid-size SUV Far
IMG_7693.JPG	2.312	GOOD	5.031	GOOD	GOOD	Driver	Mid-size SUV Far
IMG_7696.JPG	0.414	GOOD	10.87	MARGINAL	MARGINAL	Driver	Mid-size Car Far
IMG_7599.JPG	0.626	GOOD	3.192	GOOD	GOOD	Driver	Mid-size Car Far
IMG_7601.JPG	8.754	MARGINAL	4.607	GOOD	MARGINAL	Driver	Full-size SUV Far
IMG_7609.JPG	1.849	GOOD	0.492	GOOD	GOOD	Driver	Minivan Far
IMG_7611.JPG	0.955	GOOD	5.072	GOOD	GOOD	Driver	Mid-size SUV Far
IMG_7612.JPG	7.571	ACCEPTABLE	6.227	GOOD	ACCEPTABLE	Driver	Full-size Car Far
IMG_7613.JPG	3.26	GOOD	5.894	GOOD	GOOD	Driver	Mid-size Car Far
IMG_7614.JPG	10.672	POOR	1.46	GOOD	POOR	Driver	Full-size Car Far
IMG_7618.JPG	6.488	ACCEPTABLE	2.441	GOOD	ACCEPTABLE	Driver	Mid-size Car Far
IMG_7620.JPG	5.926	GOOD	8.225	ACCEPTABLE	ACCEPTABLE	Driver	Minivan Far
IMG_7623.JPG	10.424	POOR	7.153	GOOD	POOR	Driver	Compact Car Far
IMG_7625.JPG	4.012	GOOD	1.881	GOOD	GOOD	Driver	Mid-size SUV Far
IMG_7630.JPG	0.606	GOOD	3.844	GOOD	GOOD	Driver	Mid-size Car Far
IMG_7632.JPG	3.046	GOOD	6.577	GOOD	GOOD	Driver	Mid-size Car Far
IMG_7636.JPG	9.502	MARGINAL	3.898	GOOD	MARGINAL	Driver	Compact Car Far
IMG_7648.JPG	17.336	POOR	4.196	GOOD	POOR	Driver	Mid-size Car Far

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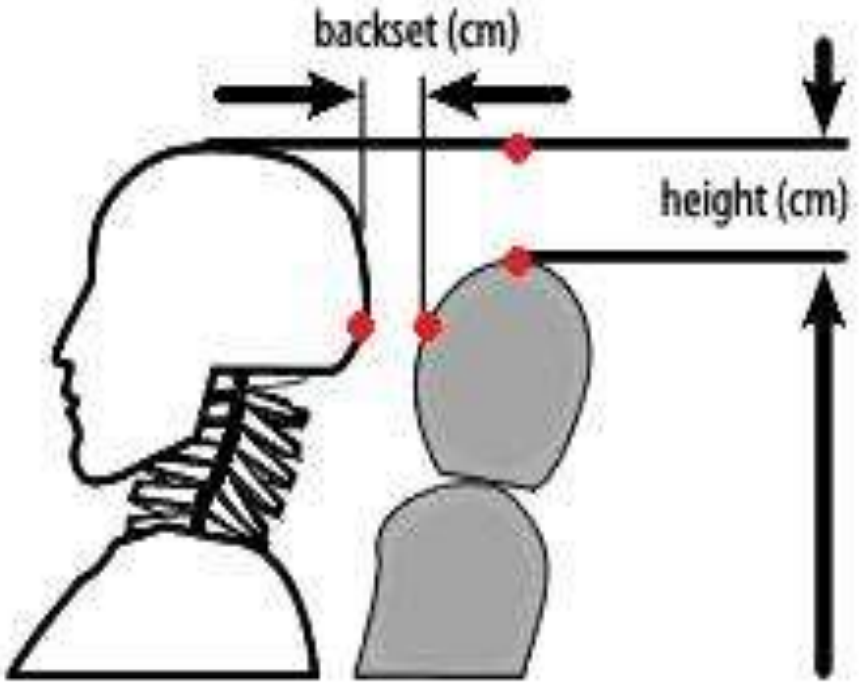
Why such a big difference?

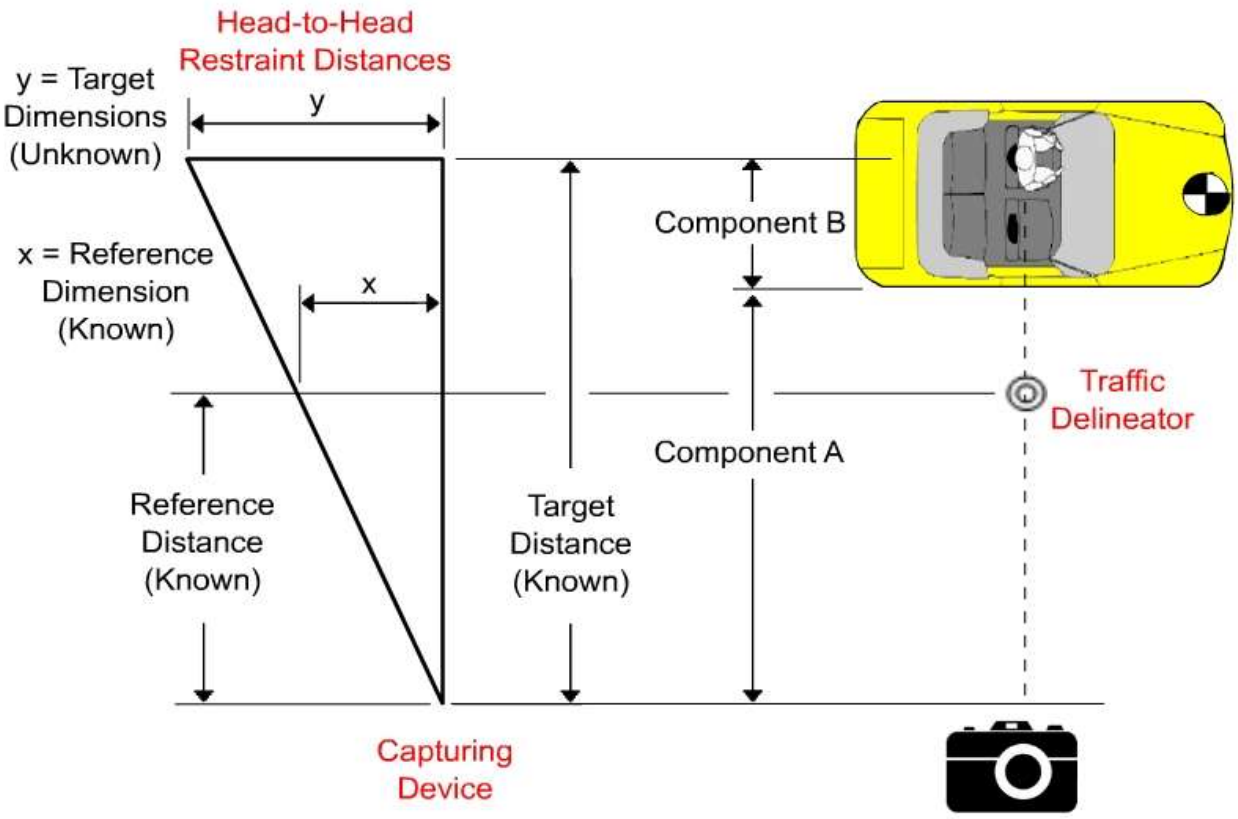
- Reason #3 (emphasizes the need for one standard)
  - Horizontal position “GOOD” rating
    - IIHS = distances less than 8 cm
    - IBC = “less or equal to ear width”
  - Typical male human ear is 5 cm
    - Difference of 3 cm
    - IIHS will have a 60% higher chance of “good”
    - IIHS based on measurements – yet less conservative?

The Process: Step 2



- Measure height & backset distances in image “pixel” units

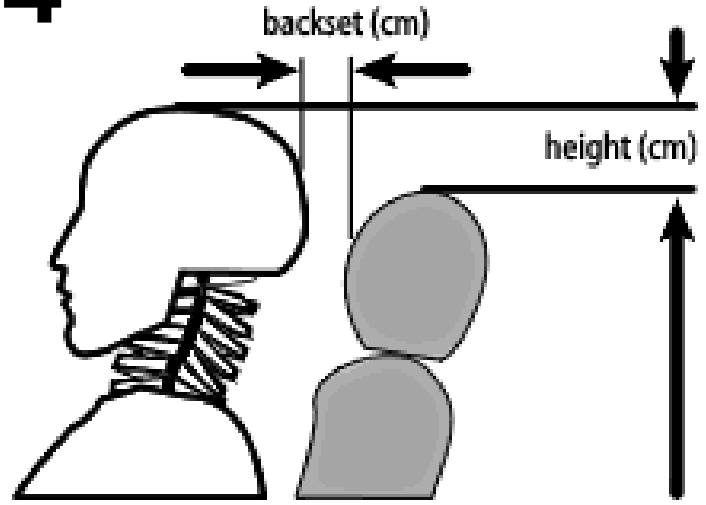
The Process: Step 3



- Convert “pixel” data to real “physical” head-to-head restraint distances

The Process: Step 4

- The HR position data is compared to the IIHS guideline to assess whiplash protection rating



- Procedure:
  - Compare vertical and horizontal distances to height and backset

	Vertical	Horizontal
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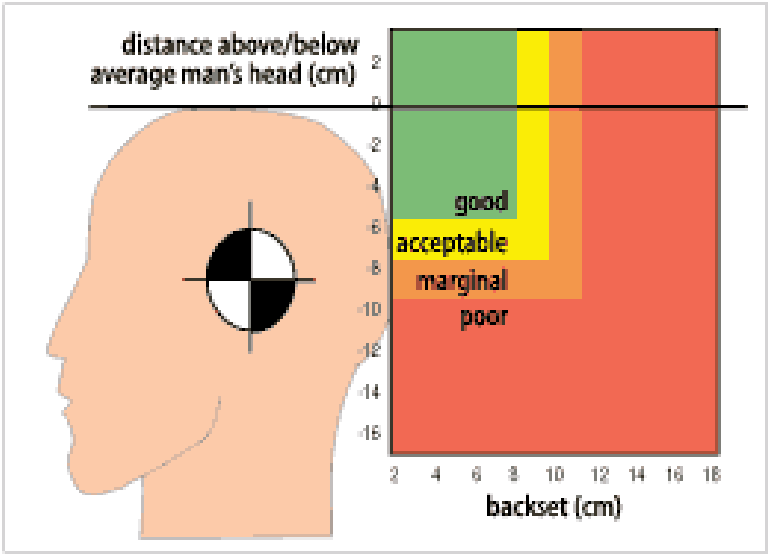

Vehicle Drivers	Vehicle Size Class	GOOD	ACCEPTABLE	MARGINAL	POOR	Total
Car	Subcompact Car	16	6	9	8	39
	Compact Car	209	75	74	119	477
	Mid-size Car	316	131	106	174	727
	Full-size Car	147	62	43	81	333
SUV	Compact SUV	119	43	32	25	219
	Mid-size SUV	152	40	34	49	235
	Full-size SUV	57	21	29	39	146
Pickup Truck	Mid-size Pickup Truck	24	16	15	29	84
	Full-size Pickup Truck	25	14	10	39	88
Minivan	Minivan	63	31	34	56	184
	Subtotal	1128	439	386	619	2572
	Percentage	44%	17%	15%	24%	
Vehicle Passenger	Vehicle Size Class	GOOD	ACCEPTABLE	MARGINAL	POOR	Total
Car	Subcompact Car	4				4
	Compact Car	31	8	5	12	56
	Mid-size Car	33	13	10	17	73
	Full-size Car	10	5	4	5	24
SUV	Compact SUV	7			5	12
	Mid-size SUV	10	2		2	14
	Full-size SUV					
Pickup Truck	Mid-size Pickup Truck	3	1			4
	Full-size Pickup Truck			1	2	3
Minivan	Minivan	4	1	2	1	8
	Subtotal	102	30	22	44	198
	Percentage	52%	15%	11%	22%