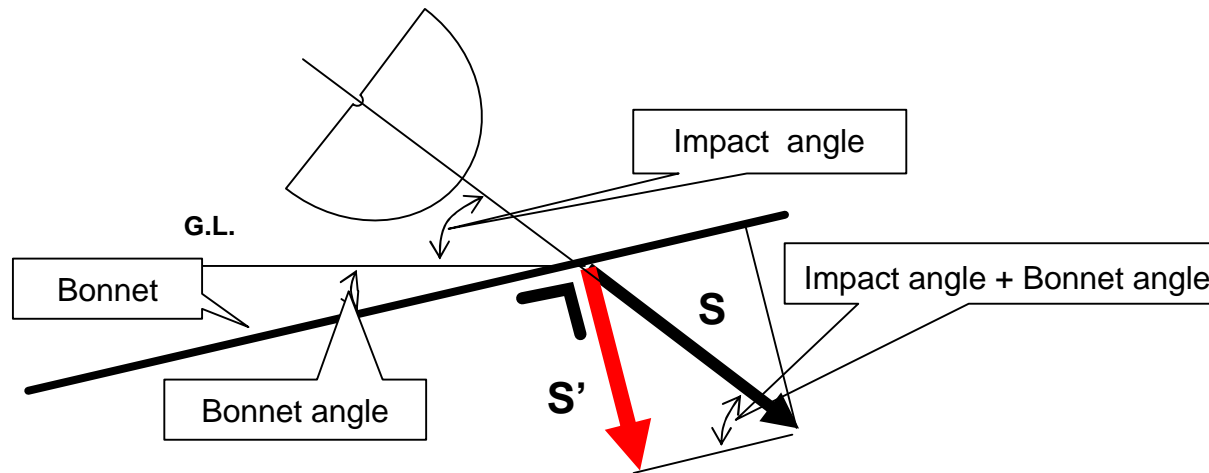


## **Comparison of the severity between Japanese regulation based on IHRA and Phase 2 proposal based on EEVC**

"To be more stringent than Japanese regulation" being one condition for accepting phase 2 as GTR, the phase-2 test angle was examined.

SUPPLEMENT



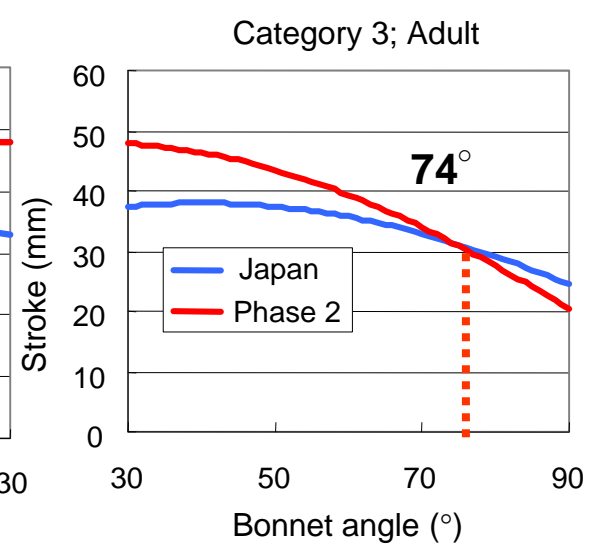
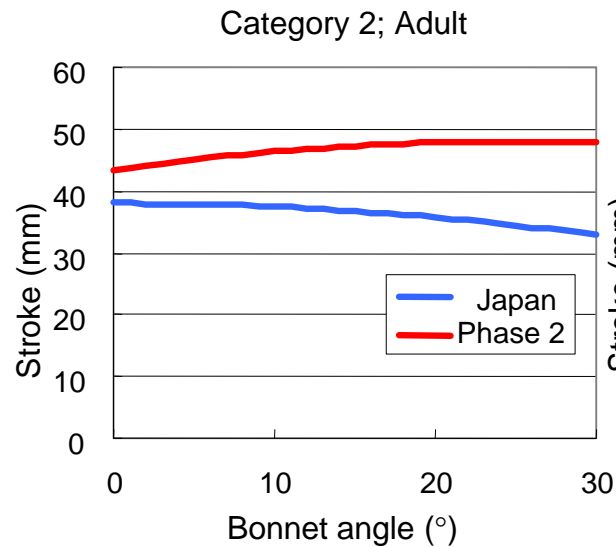
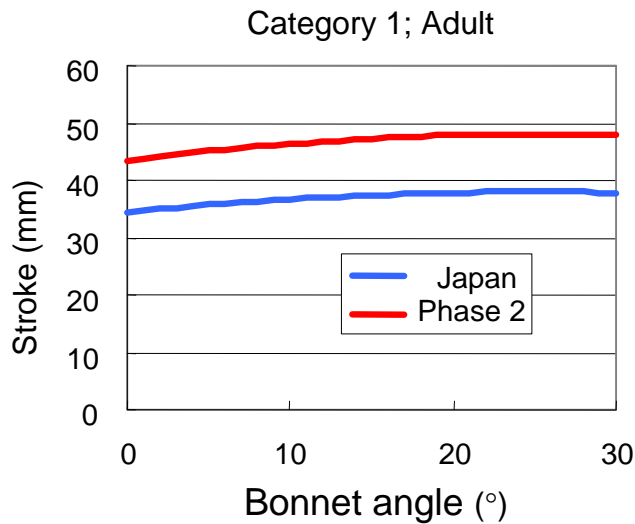
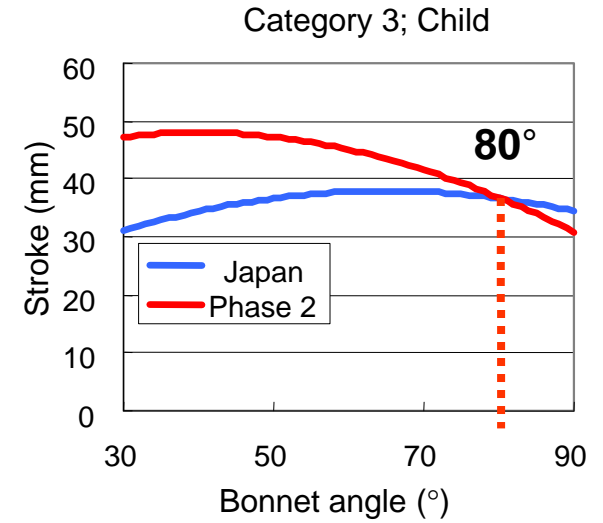
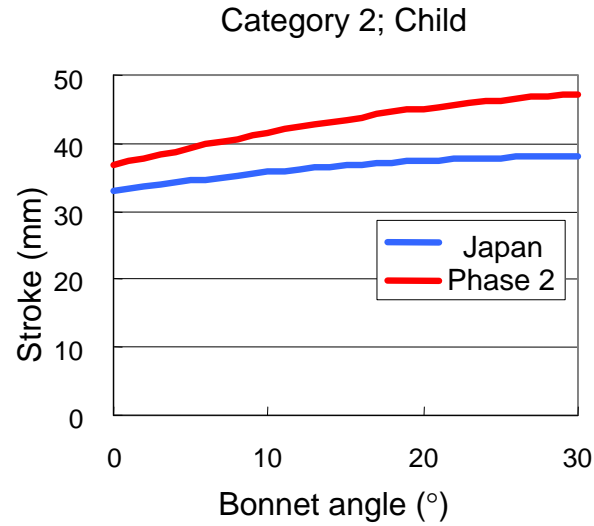
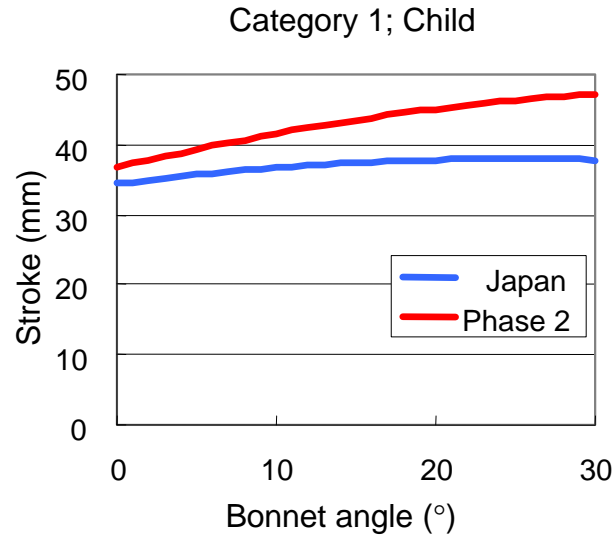
Perpendicular stroke to bonnet at HIC 1,000  
 **$S' = S \times \sin(\text{impact angle} + \text{bonnet angle})$**

Stroke at 32km/h, HIC1,000: S = 38mm  
Stroke at 35km/h, HIC1,000: S = 48mm

- Premise -  
The entire impact energy is absorbed by the bonnet.

# Japanese Regulation vs. EU Phase 2 proposal

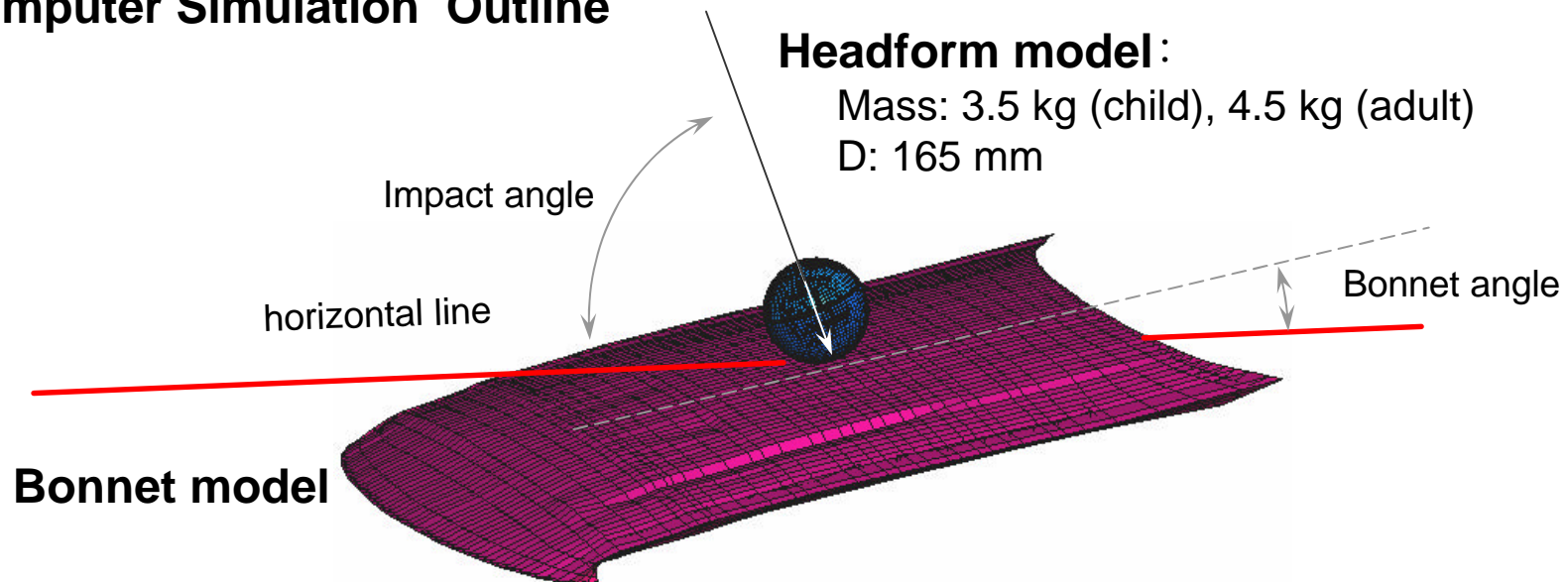
# JAMA's Comparison of Stroke



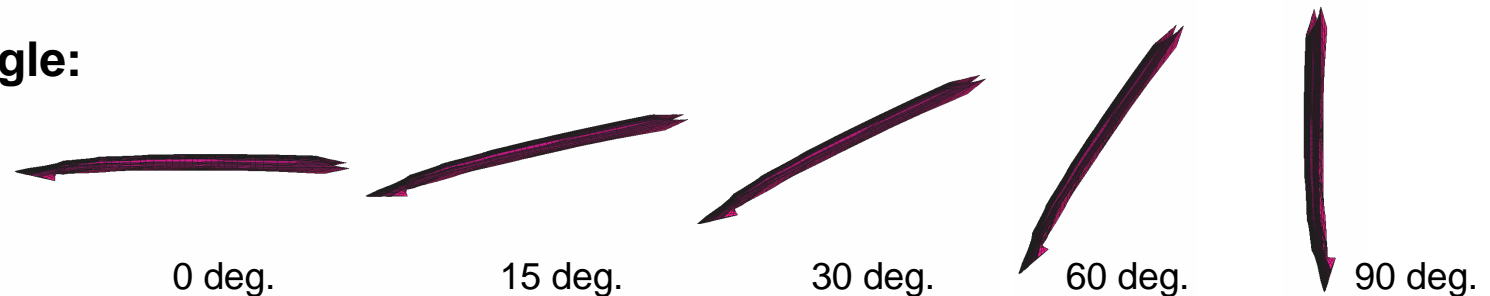
Atsuhiko Konosu and Takahiro Issiki  
JARI

A headform model collided into the design bonnet model to compare HIC.  
(Simulation of headform rotation and friction with the bonnet)

## Computer Simulation Outline



## Bonnet angle:



Computer simulation conditions and analytical results (HIC)

**Child**

Car type	Impact condition	Headform Model	Impact Angle Ang. (deg.)	Impact Speed Vel (km/h) (m/s)		Bonnet angle and HIC					
						Angle 1		Angle 2		Angle 3	
						(deg.)	HIC_15	(deg.)	HIC_15	(deg.)	HIC_15
Sedan	IHRA based	Child 3.5	65.0	32	8.89	0	642.6	15	764.7	30	771.9
	EEVC based	Child 3.5	50.0	35	9.72	0	557.3	15	874.2	30	1037.8
SUV	IHRA based	Child 3.5	60.0	32	8.89	0	572.6	15	740.5	30	772.5
	EEVC based	Child 3.5	50.0	35	9.72	0	557.3	15	874.2	30	1037.8
1BOX	IHRA based	Child 3.5	25.0	32	8.89	30	493.2	60	773.8	90	627.4
	EEVC based	Child 3.5	50.0	35	9.72	30	1037.8	60	939.0	90	265.4

**Adult**

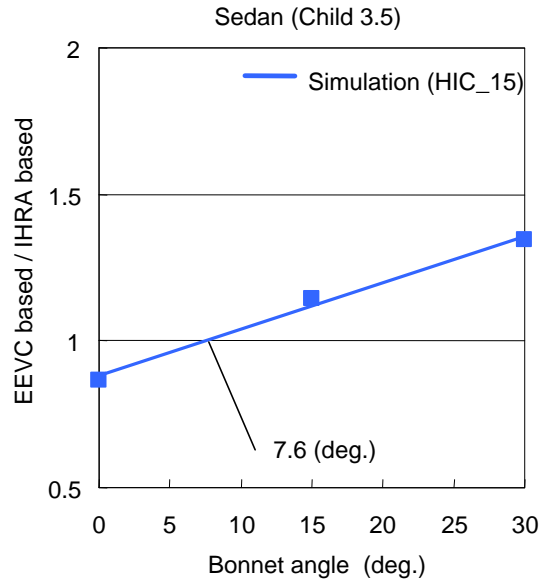
Car type	Impact condition	Headform Model	Impact Angle Ang. (deg.)	Impact Speed Vel (km/h) (m/s)		Bonnet angle and HIC					
						Angle 1		Angle 2		Angle 3	
						(deg.)	HIC_15	(deg.)	HIC_15	(deg.)	HIC_15
Sedan	IHRA based	Adult 4.5	65.0	32	8.89	0	475.3	15	563.9	30	567.7
	EEVC based	Adult 4.5	65.0	35	9.72	0	646.1	15	765.5	30	773.7
SUV	IHRA based	Adult 4.5	90.0	32	8.89	0	567.9	15	545.8	30	407.3
	EEVC based	Adult 4.5	65.0	35	9.72	0	646.1	15	765.5	30	773.7
1BOX	IHRA based	Adult 4.5	50.0	32	8.89	30	565.3	60	513.6	90	160.9
	EEVC based	Adult 4.5	65.0	35	9.72	30	773.7	60	470.1	90	60.1

# Japanese Regulation vs. EU Phase 2 proposal

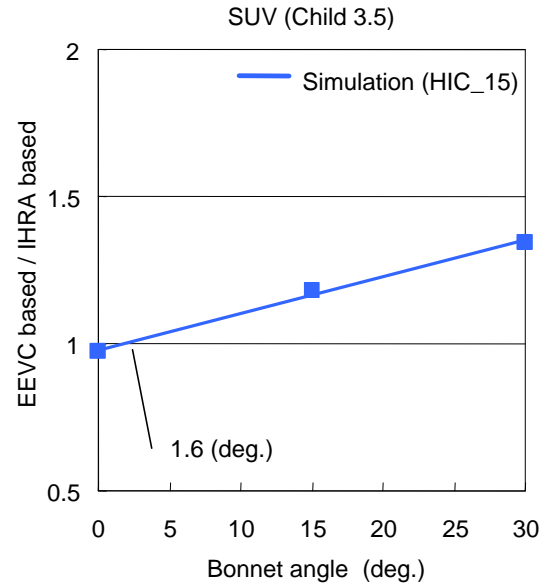
# Computer Simulation

## Child

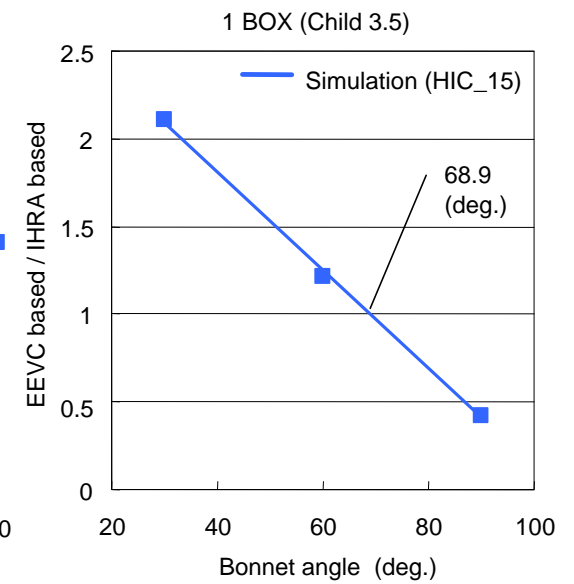
### Category 1



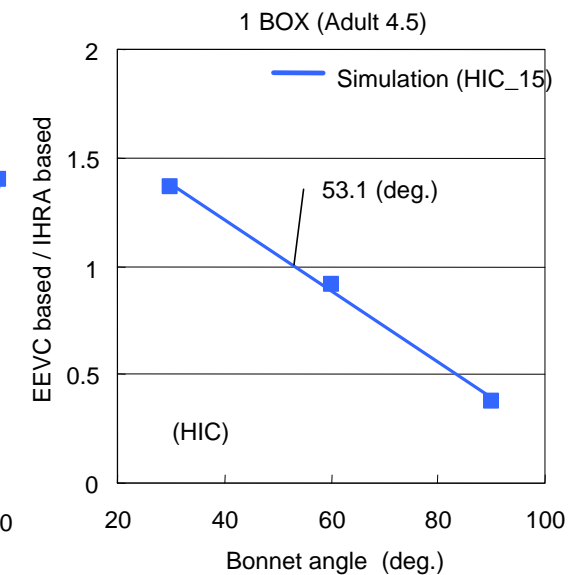
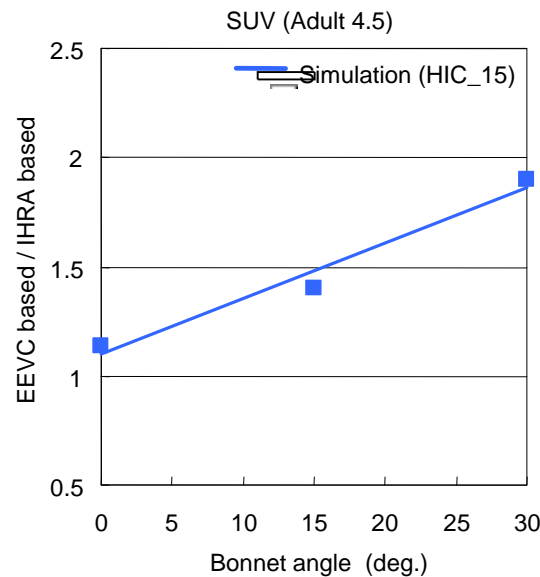
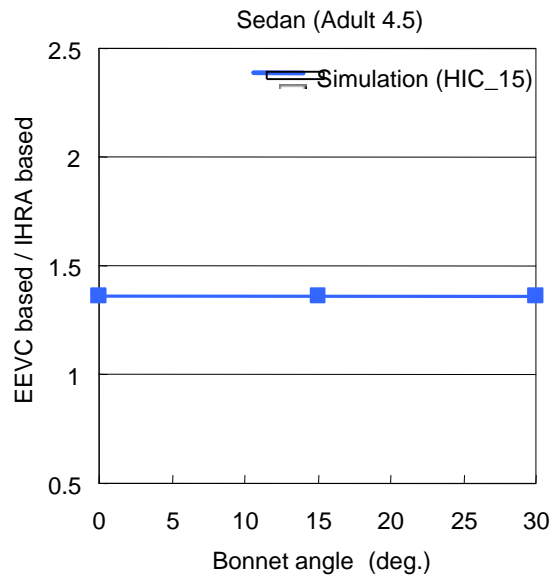
### Category 2



### Category 3



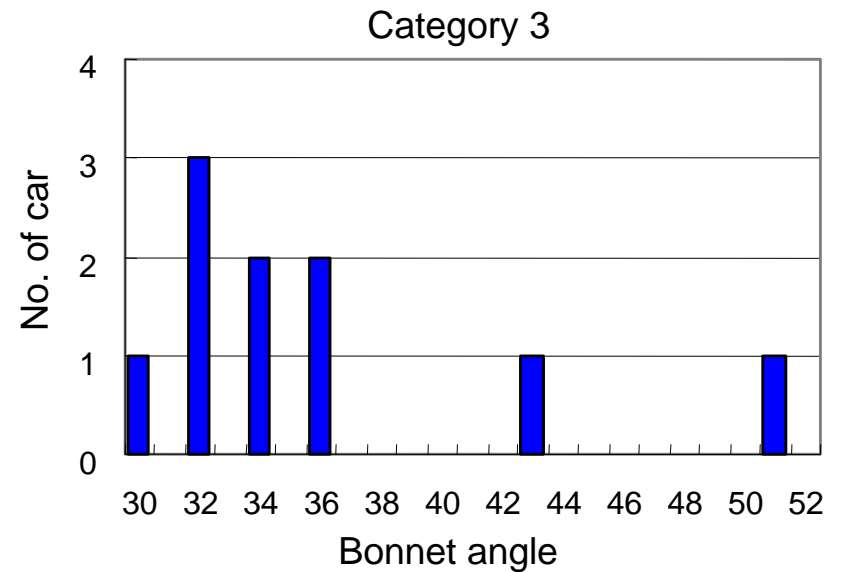
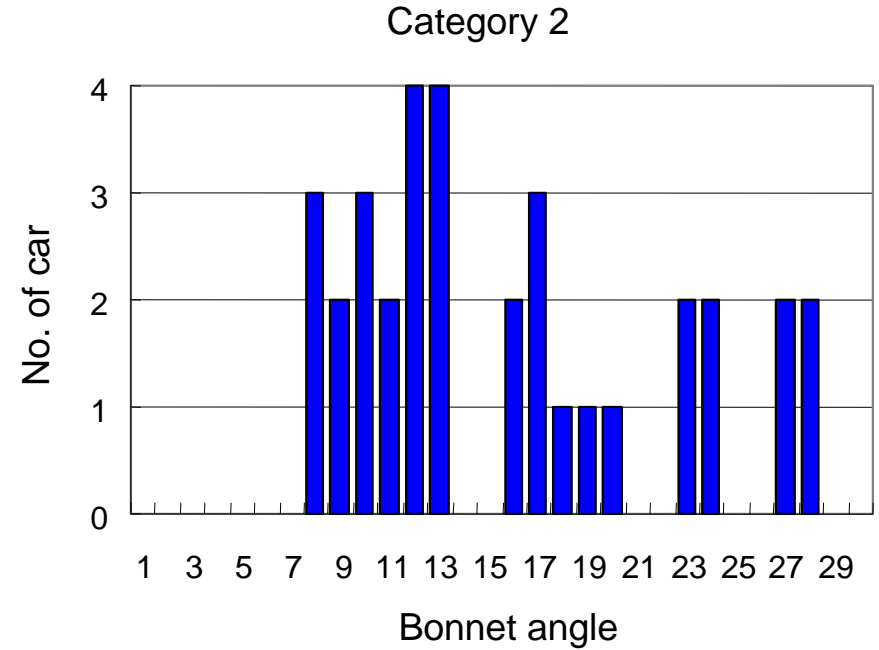
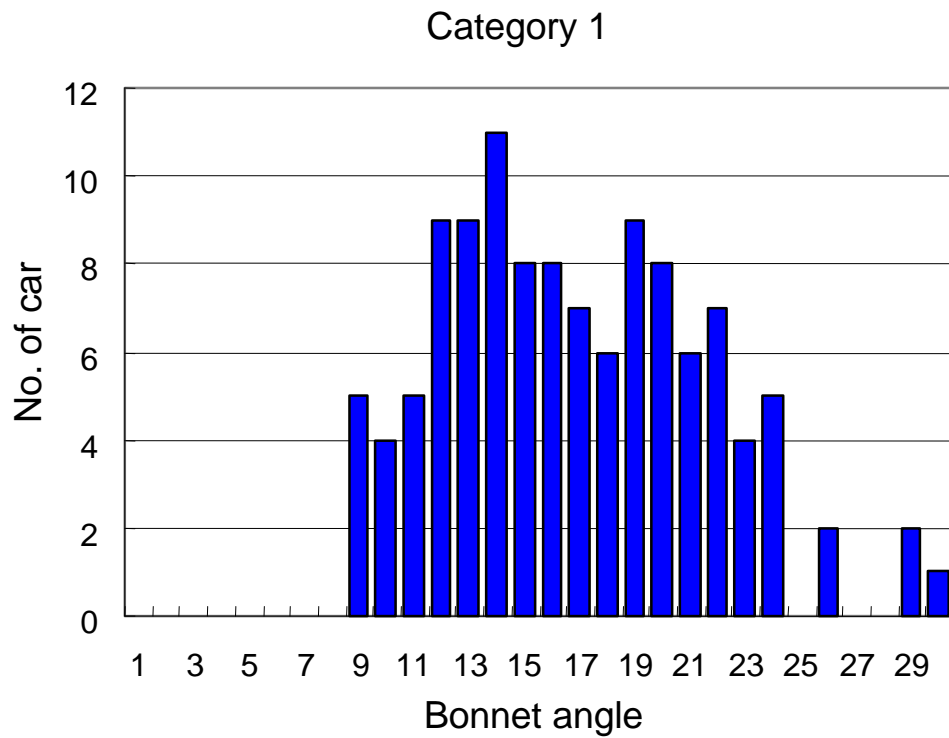
## Adult



# Japanese Regulation vs. EU Phase 2 proposal

# Bonnet Effective Angle

Vehicle distribution by bonnet angle



4. Summary

		Category1 (SEDAN)	Category2 ( SUV)	Category3 (1BOX)
Bonnet angle Japanese-HIC ? Phase2-HIC	Child	7.6° or less	1.6° or less	68.9° or more
	Adult	-	-	53.1° or more
Applicable to cars in Japanese market		No	No	No

The bonnet angle range: 0-30° for Categories 1&2, 30-90° for Category 3

Conclusion

- \* FEM's 3D simulation also indicated that the Japanese regulation could be stricter in a certain range of possible bonnet angles, but there is no real-world bonnet angle in that range.
- \* The proposed HIC 1,700 for relaxation area in phase 2 is an additional strictness factor.