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# Update on the WorldSID injury risk curves

on behalf of ISO/WG6 and ACEA-TFD

GRSP WorldSID Informal Group  
2nd of March, 2011  
Brussels

# WorldSID 50th injury risk curves: TR12350

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- The development of the WorldSID 50th injury risk curves was performed on behalf of ISO/WG6 and ACEA-TFD and aimed at promoting a **scientific consensus** from biomechanical experts from international institutions, car manufacturers as well as universities regarding the proposed injury risk curves
- The **ISO/WG6/TR12350** present the methodology developed as well as the WorldSID 50th injury risk curves

# WorldSID 50th injury risk curves: TR12350

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- The methodology developed includes several steps
  1. In depth literature review of PMHS data in side impact
  2. Selection of the appropriate PMHS data to be used in the construction of the injury risk curves
  3. Scaling of the data to account for the differences of anthropometry between the PMHS and the 50<sup>th</sup> percentile dummy (Based on 2 masses-spring model and on scaling factor from Mertz)
  4. Adjustment of the scaled data to account for the influence of age on the injuries
  5. Gathering of the test results for the WorldSID 50<sup>th</sup> percentile
  6. Construction of the injury risk curves pairing the scaled WorldSID data adjusted to 45 year old with the PMHS injuries, using the statistical methods commonly used in the literature

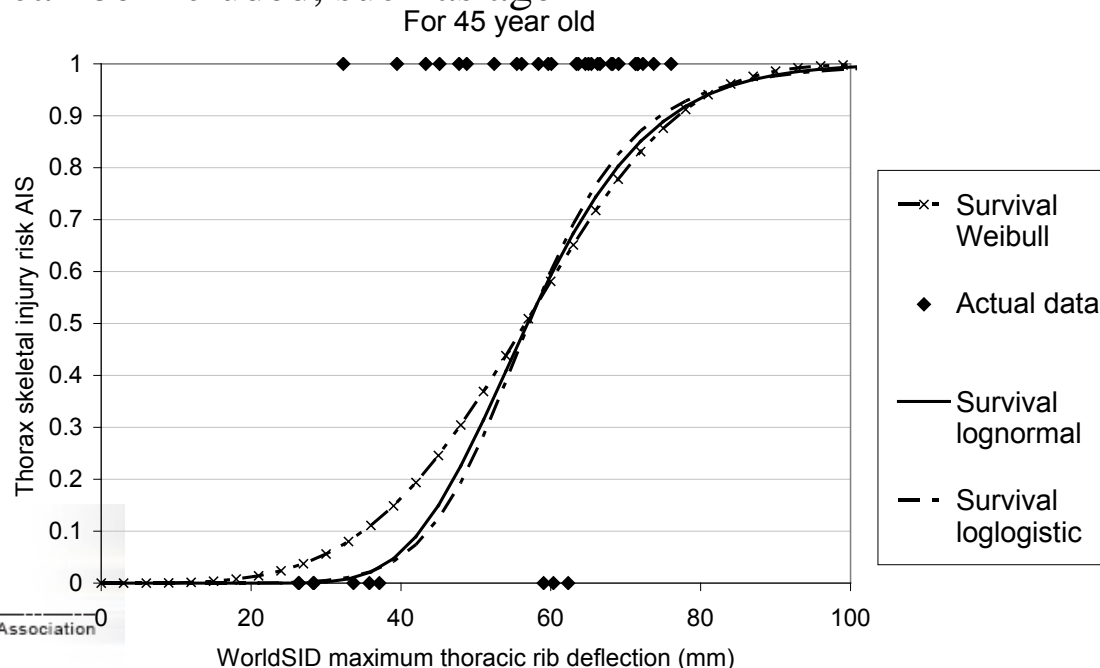
# WorldSID 50th injury risk curves: TR12350

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- Injury risk curves were build:
  - For different body regions (shoulder, thorax, abdomen, pelvis)
  - With several statistical methods because there was no consensus on the method to be used in the literature
  - As a function of commonly used measurements

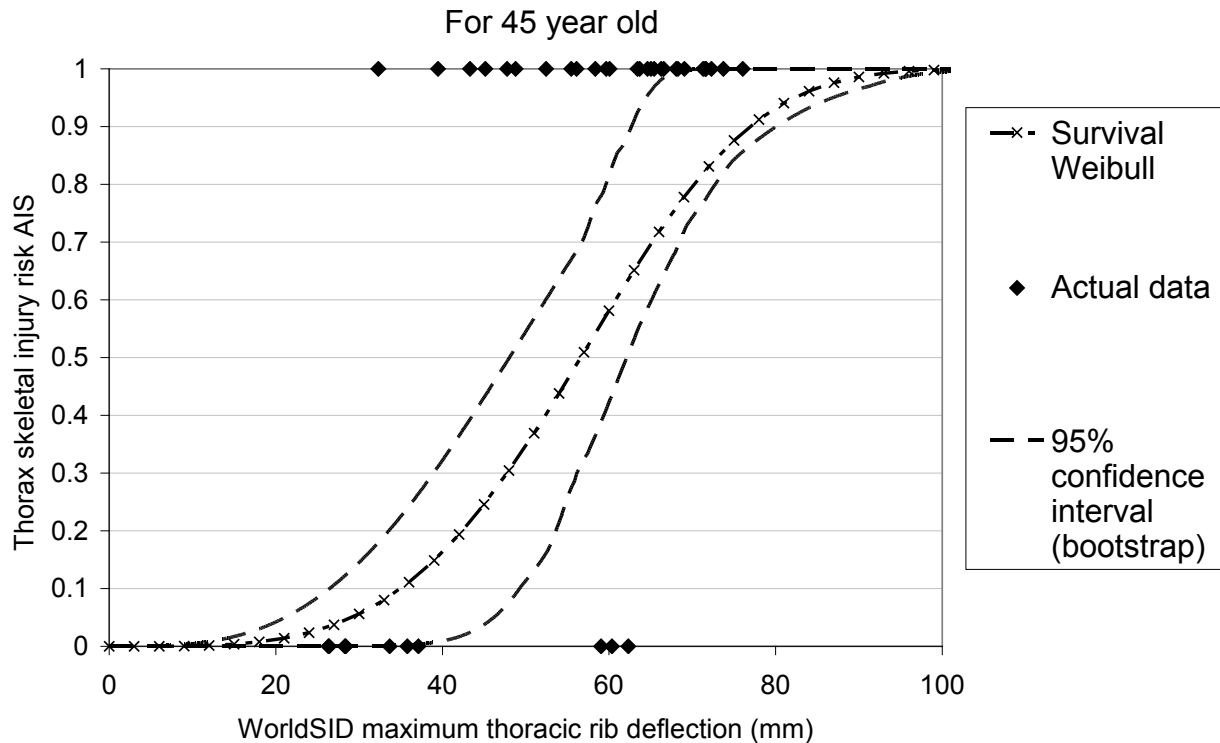
# WorldSID 50th injury risk curves: under progress

- Work on the statistical methods within ISO/WG6
  - **Guidelines** to build injury risk curves drafted by PDB
  - **Statistical simulations** to study the influence of several parameters (theoretical distribution, level of censoring, sample size, distribution of the test sample)
- At the last ISO/WG6 meeting, it was **agreed** to choose the **survival analysis** as a **basis** to build the injury risk curves
  - The process for choosing the more appropriate distribution to be used in survival analysis (weibull, lognormal, loglogistic) is currently evaluated
  - Covariable can be included, such as age



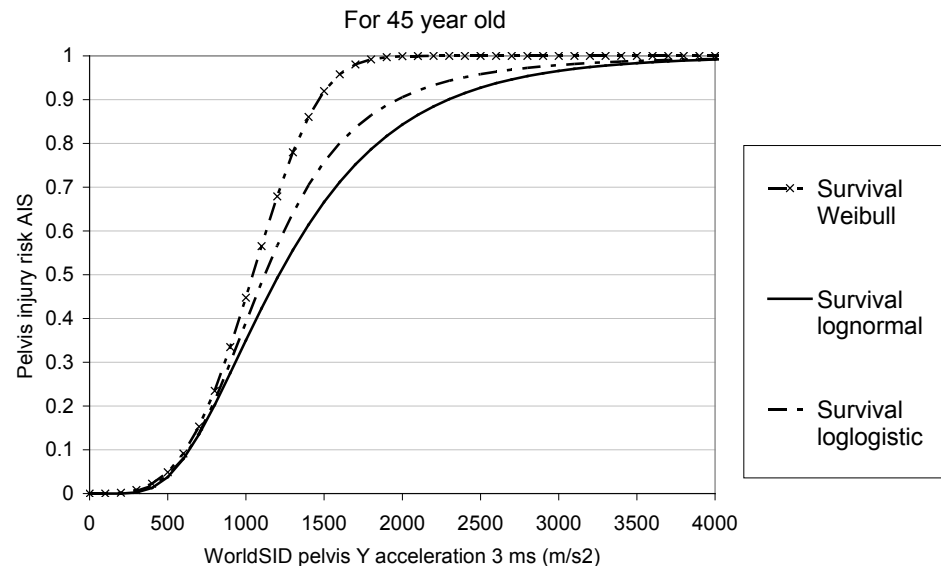
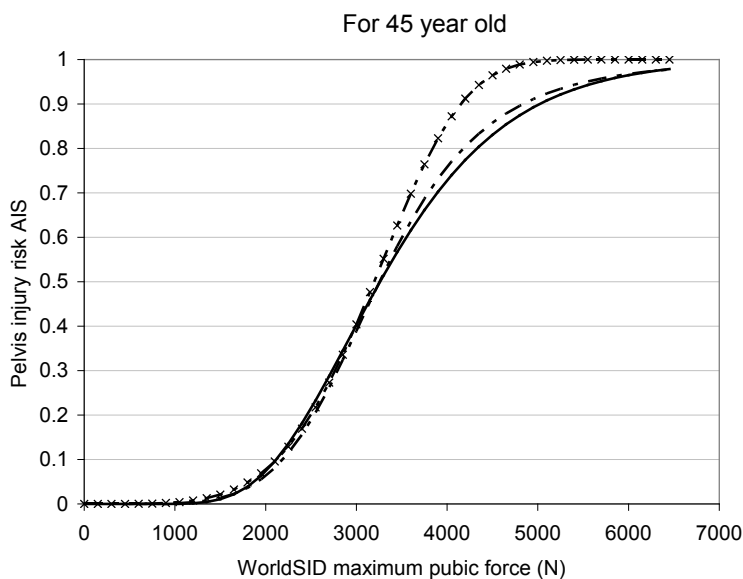
# WorldSID 50th injury risk curves: under progress

- The injury risk curves should be provided with 95% confidence intervals
  - The process for building the confidence intervals is currently evaluated
  - Could be done with bootstrap method



# WorldSID 50th injury risk curves: under progress

- The WorldSID 50th injury risk curves were built as a function of the **commonly used measurements**
- Some work is needed to define what are the **good injury criteria** among those commonly used measurements and/or with additional measurements
  - For example, the pelvis injury risk curves were built as a function of the Y 3 ms pelvis acceleration and of the pubic force → what is the more relevant injury risk curve?
  - For example, measurements from rib eye should be considered if relevant



# WorldSID 5th injury risk curves

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- As for the WorldSID 50th, the development of the **WorldSID 5th injury** risk curves will be performed on behalf of ISO/WG6 and ACEA-TFD and will aim at promoting a **scientific consensus** from biomechanical experts
- The methodology developed in **TR12350** will be applied
- There is no 5th PMHS tests to be used for the construction of the injury risk curves
  - The PMHS samples used to develop the injury risk curves for the WorldSID 50th will be used
- Additional work is needed on the **scaling of the test conditions**
  - To be discussed among ISO/WG6 and volunteer biomechanical experts
  - Discussions begun during a webex meeting on the 22nd of February
    - Agreement for the impactor characteristics for thorax impactor tests (14.7 kg and 120 mm diameter)
    - More information needed to decide for the sled wall geometry
    - Further steps includes the scaled test conditions for the shoulder and pelvis impactor tests



# WorldSID 5th injury risk curves

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- Once the test conditions to be reproduced with the WorldSID 5th are agreed (impact speed, impactor mass, geometry of the impacting surface, measurements required), they will be circulated to ISO/WG6 and to the organizations who are planning to evaluate the WorldSID 5th
- The results of the tests performed in the configurations corresponding to those defined will be used to build the injury risk curves and ISO/WG6/TR12350 will be updated

# Injury risk curves: TR12350

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- The process of construction of injury risk curves begun with the selection of the appropriate PMHS data to be used
- Then the scaled dummy responses are paired to PMHS injuries
- Finally the injury risk curves are constructed
  
- **Not all the test configurations** were reproduced with the WorldSID 50th percentile
  - Impactor tests: shoulder 19/82, thorax 8/46, abdomen 0/8, pelvis 59/110; Sled tests: 31/58
  - The reliability of the WorldSID 50th injury risk curves could be improved if more PMHS test configurations are reproduced with the dummy
  
- As for the WorldSID 50th, the more numerous test configurations are reproduced, the more reliable the WorldSID 5th injury risk curves will be