

Work progress regarding Self-Protection and Partner-Protection

Definition and objective

- Compatibility:
 - Capacity of 2 vehicles to distribute in a balanced way the energy (proportionally to its mass) of an impact to offer to their occupants the same chances of survival as equal as possible, without degrading the level of protection offered.
 - It is characterized by 2 indicators:
 - **Self-protection:** number of injured people (slightly injured, seriously injured or fatal) observed in the considered car model (internal injuries).
 - **Partner-protection:** number of injured people (slightly injured, seriously injured or fatal) observed in the impacted vehicle by the considered car model (external injuries).
 - Classify vehicles involved in accidents according to their Self-Protection.

Definition and objective

- SR=Severity Rate indicator (fatalities + serious injuries) internal (frontal protection):

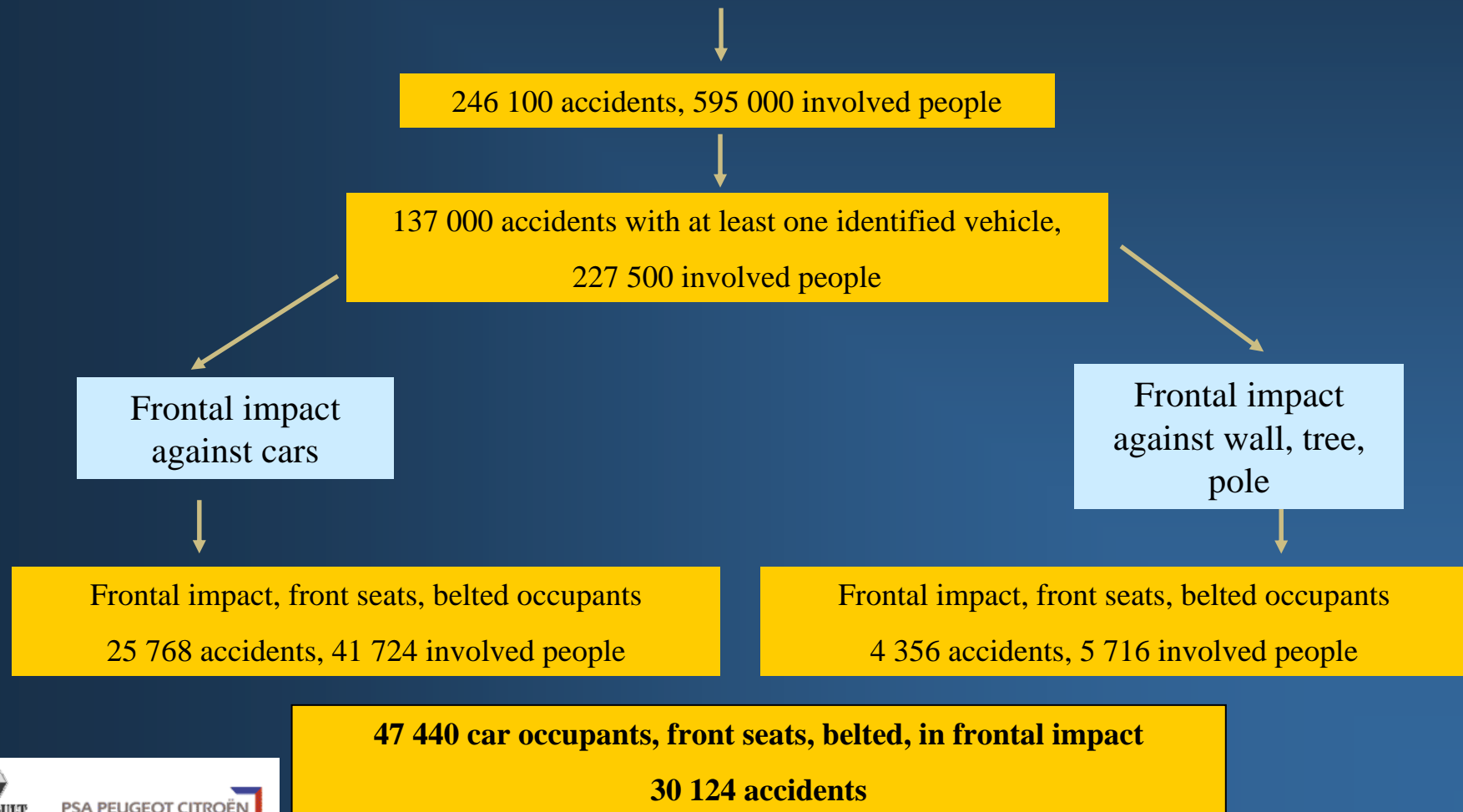
$$SR(\textit{protection}) = \frac{(\textit{Fatalities} + \textit{Severe_injuries})_{\textit{int}}}{(\textit{Fatalities} + \textit{Severe_inj} + \textit{Slight_inj} + \textit{Not_inj})_{\textit{int}}}$$

- MR=Mortality Rate indicator (fatalities) internal (frontal protection):

$$MR(\textit{protection}) = \frac{(\textit{Fatalities})_{\textit{int}}}{(\textit{Fatalities} + \textit{Severe_inj} + \textit{Slight_inj} + \textit{Not_inj})_{\textit{int}}}$$

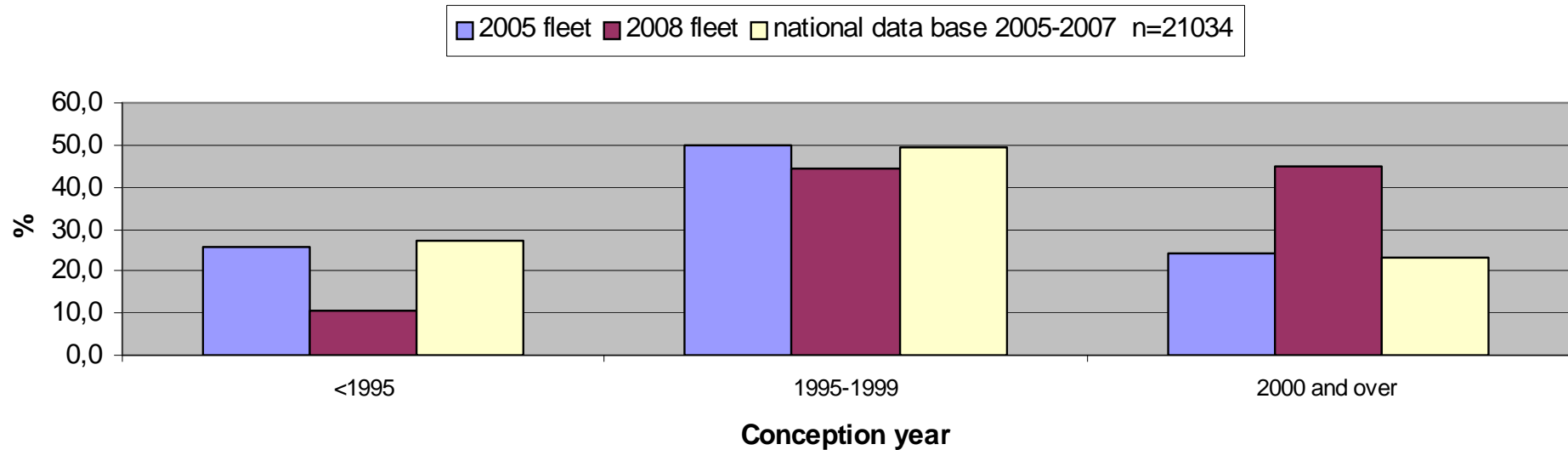
- New french injury definition (year 2005):
 - Severely injured = injured people hospitalized more than 24 hours.
 - Slightly injured = injured people hospitalized less than 24 hours.
- Filter:
 - Frontal impact against cars or against fixed obstacles (wall, tree,...).
 - A least 1 slightly injured people involved in the accident.
 - Minimum of 30 involved people for the same car model.
 - Front occupant belted.
 - 4 vehicle samples:
 - Vehicle not tested at the Euro NCAP.
 - Vehicle tested A, B or C class according to their Euro NCAP frontal note.
 - Vehicle tested D class according to their Euro NCAP frontal note.
 - Vehicle tested E class according to their Euro NCAP frontal note.

- French National data base: ONISR (BAAC: Bulletin d'Analyse d'Accident Corporel de la Circulation), for years 2005 to 2007.



- Comparison between french fleet vs french accident data base.

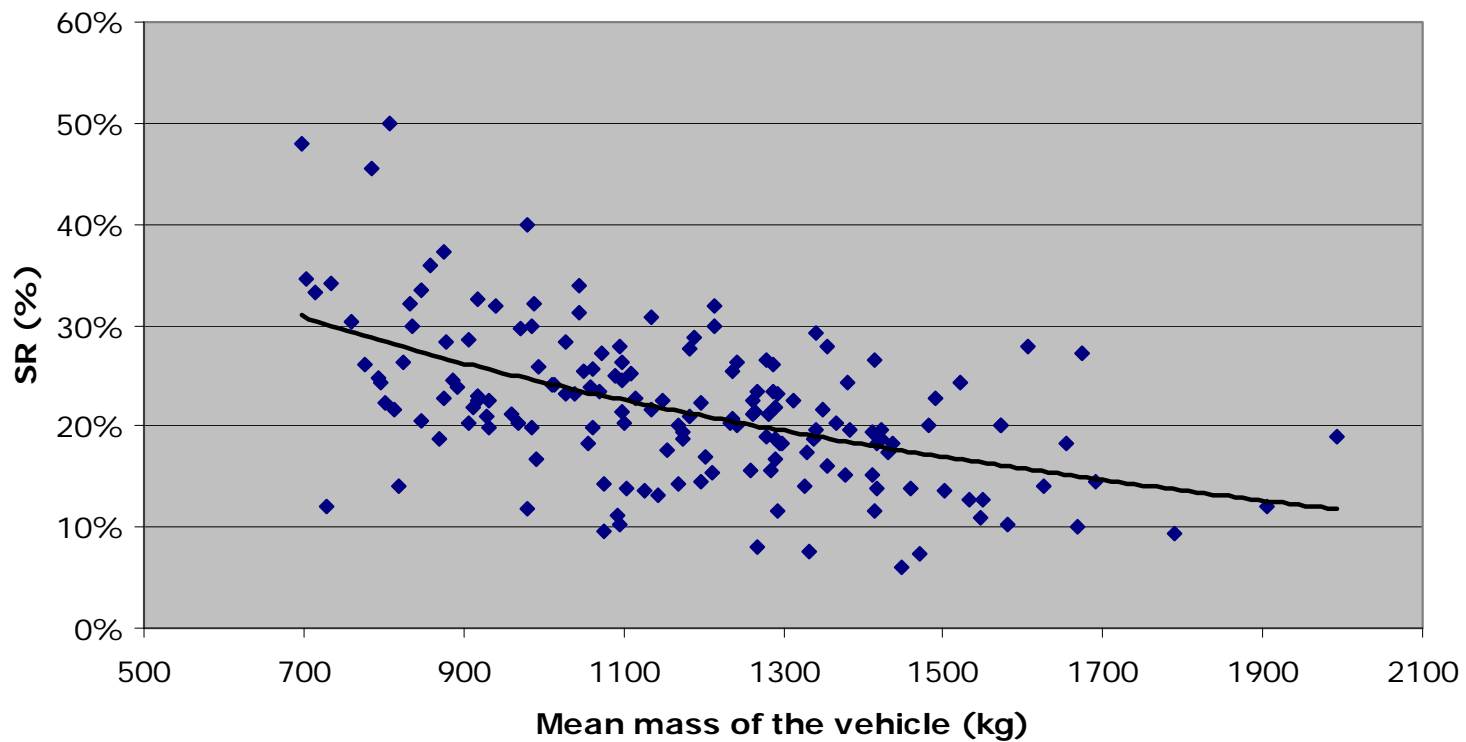
Vehicles < 10 years old: french fleet and national data base 2005-2007 frontal impact vp*vp and vp*fixed obstacles with at least each model involved in 10 accidents



Self protection

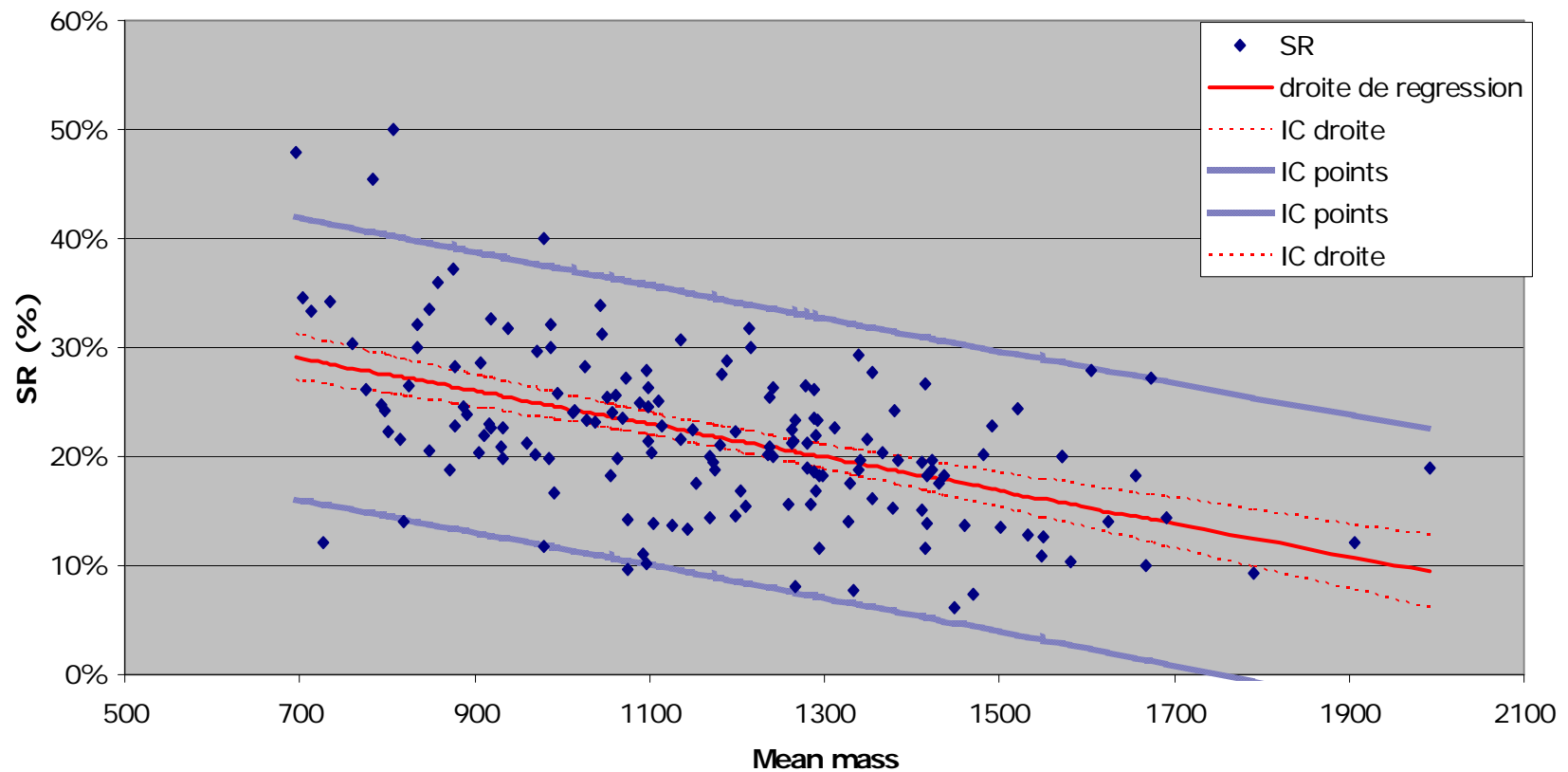
BAAC 2005-2007. Car occupants, belted, front seats, frontal impact against another car (n= 38 154). Severity Rate according to the mean mass of the vehicle.

162 car models. At least 30 occupants per models



BAAC 2005-2007. Car occupants, belted, front seats, frontal impact against a car (n= 38 150 - 162 car models). Severity Rate (SR) according to the mean mass of the vehicle.

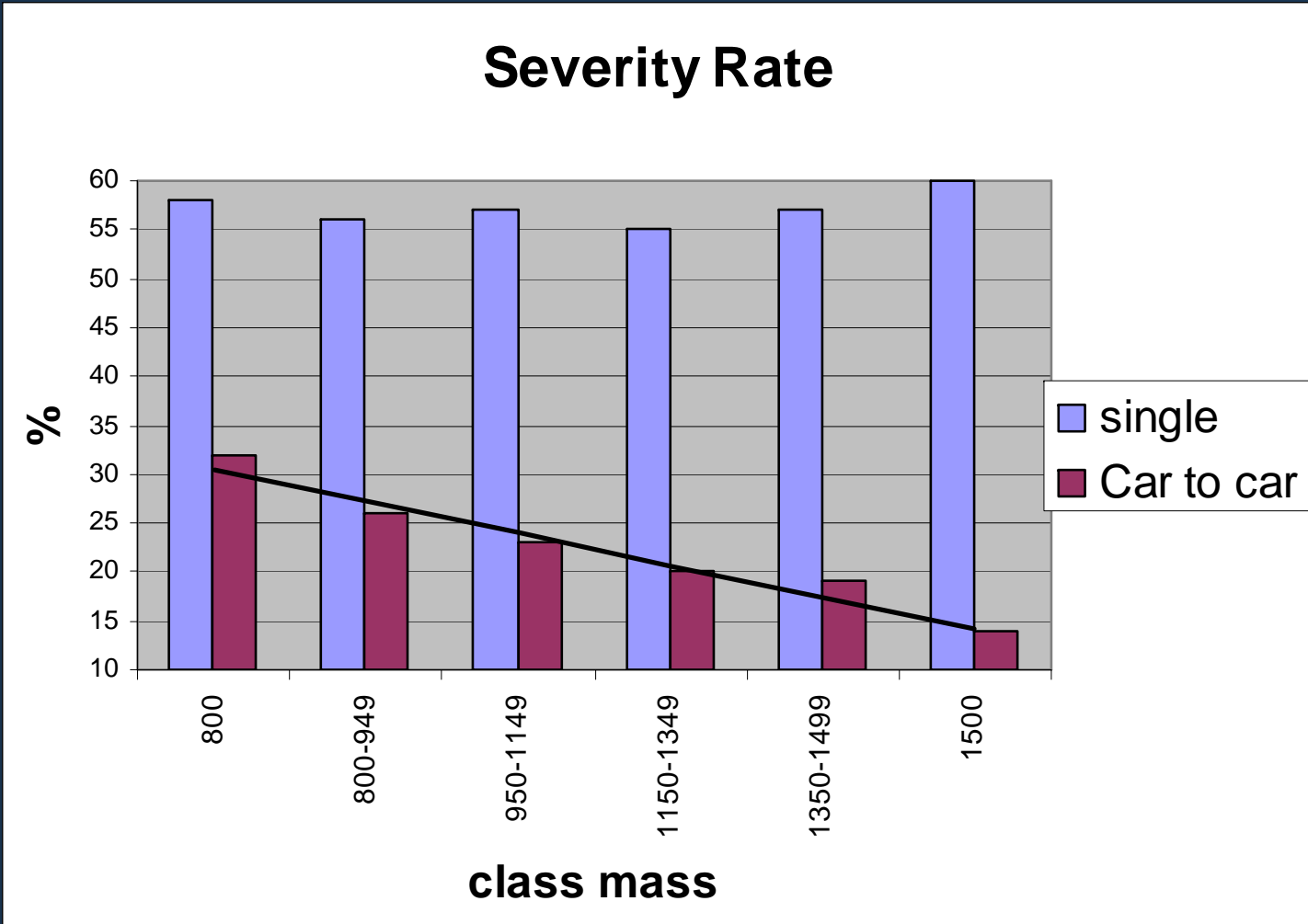
10 accidents, 30 occupants per models.



- B: Determine the new number of victims.
 - B2: The mean mass of the vehicle and accident typologies are taken into account.
 - The proportion of single vehicle accident is statistically different between the classes of mass (*).
 - There is less than one chance over 10 000 ($p < 0.0001$) that the % of single vehicle accident according to the mass are distributed at random: the relation between the typologies of accident and the mass of the vehicle is strongly statistically significant. The proportion of single vehicle accident decreases with increase of the mass of the vehicle.

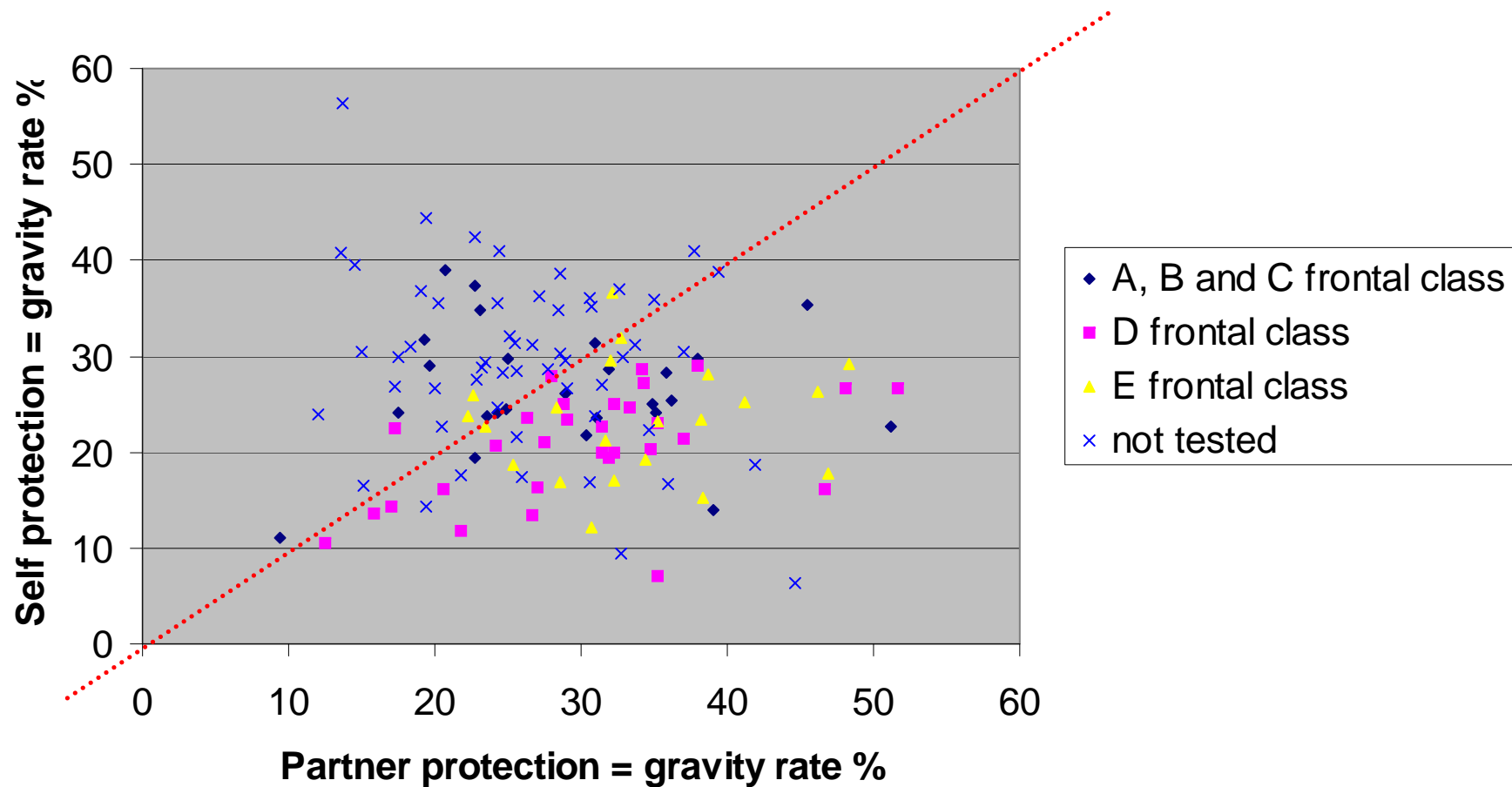
class of mean of vehicle mass	SR for single vehicle accident	SR for VL vs. VL	% of single vehicle accident	% of VL vs. VL	n	B2 : victims if taking into account typologies
< 800 kg	57.8%	31.3%	15%	85%	2793	$m1 = 2793 * (15% * 60% + 85% * 13,9\%)$
800 - 949 kg	56.2%	26.4%	12.7%	87.3%	12325	m2
950 - 1149 kg	56.9%	23.5%	13.6%	86.4%	16322	m3
1150 - 1349 kg	54.7%	19.9%	9.9%	90.1%	9227	m4
1350 - 1499 kg	56.8%	18.6%	9.7%	90.3%	4325	m5
1500 kg and over	60%	13.9%	7.2%	92.8%	2415	m0





Self protection Versus Partner protection

French national data base, years 2005-2007, car to car head on collision, front passengers, belted, according to frontal classes, with at least 30 people involved in the accident



Future works

- Self-Protection study:
 - Remove all « modifier » from the frontal note of car models.
 - Give new distributions and efficiency evaluation without « modifier ».

- Self-Protection / Partner-Protection study:
 - Study in progress.
 - First step presented in this document.

- PDB efficiency evaluation:
 - Link between accidentology and crash tests.
 - Gain of the barrier (safety, ecology).

PDB website:
www.pdb-barrier.com