ART-T

# Geoff McDonald & Associates Pty Ltd

A.C.N: 010 043 759
A.B.N: 46 040 291 294

11 Medinah Ct
Cornubia
Queensland 4130
Australia

Ph : (07) 3287 7079
(07) 3803 5252
Email: gmcdsafety@bigpond.com

## WHAT YOU SEE ON PAGE 3

**G. L. McDonald M.E. (Mech.), B.Sc. (Psych)**

What you see on page 3 shows the dark side of Workplace Health and Safety, probably world-wide, but certainly in Australia, UK, USA and NZ.

The shortage, almost an absence of knowledge of scientific method and of recognition of the need for use of factual veridical information, makes an essential contribution to perpetuating Class I personal damage.

In 1994, the UK Health and Safety Executive and, in 1998, the US Consumer Product Safety Commission gave Dynamic Research, Inc. (DRI) 59 and 54 quadbike rollover case descriptions respectively.

DRI developed a computer program to compare simulated rider injuries from quadbike rollovers, with and without a Rollover Protective Structure. DRI saw no need to validate the simulated rollover injuries against the actual injuries - a normal scientific process.

In 2007, they evaluated the Robertson Quadbar. That report gave rise to the contents of Page 3. The whole episode from the giving of case histories, to the preparation of the content of Page 3 and displaying it violates both scientific and ethical principles.

Page 3 is wrong in concept and in every detail, except in naming Can-am, Honda, Kawasaki, Polaris, Suzuki, Yamaha, Kymco, and the Federal Chamber of Automotive Industries and Wear It or Park It.

No person with a realistic command of the English language, a minimal understanding of science and an objective outlook, having read DRI's report on the Quadbar, could have written '*cause more harm than good'* or '*increase rather than decrease the likelihood of injury'* when referring to the fitment of the Quadbar, because the report did not say that.

DRI (2007), at the bottom of pp. 11 under the heading 'Results', write:

'***The results of the analysis indicate that the risks and benefits*** **(increase in injury and decrease in injury)** ***of the V-bar ROPS*** **(Robertson Quadbar)** ***are generally small and nearly equal, with no statistically significant net benefit, overall or for any body region.'*** (parentheses added)

The Page 3 claim *'Studies that meet global standards have shown…'* is wrong.

There are no applicable global standards that controlled and disciplined DRI's simulation. The main standard referred to was 'ISO13232 Motorcycles – Test and analysis procedures for

research evaluation of rider crash protection devices fitted to motorcycles' which, as explained by DRI, '*is applicable to two wheeled motorcycle-to-car impacts'.* Further, DRI explains '*the motorcycle impact sample of n = 501 cases* (was) *used in ISO 13232 to define a set of 200 general types of impact'.*

ISO13232 Part 2 '*Definition of impact conditions in relation to accident data'* has not been seen but, as a Standard, it should make it necessary for users to perform the same impacts.

The Standard applies to '*one helmeted dummy in a normal seating position on an upright motorcycle'*

There are major differences between:

- Quadbikes and motorcycles
- Quadbike and motorcycle usage
- Rollovers and impacts
- Crush injury and impact injury.

There is no way DRI's 'studies' met the requirements of ISO 13232 or any other global standard which could legitimise these studies, because there are none.

It is up to the organisations named on Page 3 to explain how and why their names endorsed the Page 3 content.

DRI simulation testing of the Robertson Quadbar in 2007 and subsequently in 2012 are both demonstrably invalid by application of normal scientific methods. This applies to any simulation test of protective structures by DRI.

By 2012, DRI acknowledged the need for comparison of actual and simulated injury, but argued it could not be done on a case-by-case basis, but could only be done by '*aggregated comparison of simulated and actual injury distribution'.*

For the 2012 simulation, DRI claims *'In terms of Correlation Coefficients, the results indicate a close agreement between modelled and actual aggregated injury severity distributions (correlation coefficients $r^2$= 0.97 on average and in excess of 0.99 for some body regions, between modelled and actual frequency of injury, across all body regions, and overturn cases/types.'*

DRI's results did not. It showed a complete lack of understanding of the significance (meaning) of the numbers they created.

Severity of Injury was presented in terms of the Abbreviated Injury Scale.

| | | | |
|---|---|---|---|
| AIS 0 | No injury | AIS 4 | Severe |
| AIS 1 | Minor e.g. headache | AIS 5 | Critical |
| AIS 2 | Moderate e.g. broken lower leg | AIS 6 | Maximum, presumably death |
| AIS 3 | Serious e.g. broken upper leg | | |


WE WON'T HAVE A BAR OF IT...
AND NEITHER SHOULD YOU.
WARNING! Roll over protection devices cause more harm than good.
Studies that meet global standards have shown without exception that ROP and Crush Proof Devices installed on ATVs increase rather than decrease the liklihood of injury.
You are urged not to fit roll over protection or crushproof devices to ATVs.
This is a safety message issued by the Federal Chamber of Automotive Industries on behalf of ATV distributors
Visit www.atvsafety.com.au for more info.
can-am
HONDA
Kawasaki
POLARIS
SUZUKI
YAMAHA
KYMCO
FEDERAL CHAMBER OF AUTOMOTIVE INDUSTRIES
Get the real facts, visit www.atvsafety.com.au
WEAR IT OR PARK IT

In a quadbike rollover, the rider can damage tissue or function which, in turn, can damage their life, Permanently (Class I, fatal or non-fatal), Temporarily (Class II, lost time injury) or Insignificantly (Class III, first aid or medical treatment).

The above concept was first proposed in 1985 together with the claim that safety was predominantly a Class I problem The claim has been substantiated by four government surveys which, when transcribed, show that over 90% of the cost of damage comes from Class I occurrences with the largest cost coming from Class I non-fatal cases. See also pp. 14.

**Class I Non-fatal Damage**

| | Cases | Damage |
|---|---|---|
| 1992-93 | 137 (50,018 per year) | 80.5% |
| 2000-01 | 134 (48,900 per year) | 88.5% |
| 2005-06 | 175 (64,000 per year) | 88.0% |
| 2008-09 | 235 (85,800 per year) | 85.1% |
| | per day<br>365 days per year | of total cost |

**SNAPSHOTS OF ANNUAL PERSONAL WORK DAMAGE IN AUSTRALIA**

| | | |
|---|---|---|
| 1992-93 | Industry Commission | 1995 |
| 2000-01 | National Occupational Health and Safety Commission (NOHSC) | 2004 |
| 2005-06 | Australian Safety and Compensation Council (ASCC) | 2009 |
| 2008-09 | SafeWork Australia | 2012 |

Comparison of injury severity should be restricted to AIS 3-6. Including AIS 0-2 would produce ‘noise’ which would mask the AIS 3-6 ‘signal’.

Prior to 2012, DRI’s 113 case histories had 94 AIS 0-2; 11 AIS 3-6; and 8 unknown. The dummy could not simulate the actual injury in 75 cases. According to DRI , there were only 11 AIS 3-6 cases. When fuller facts were known, there were only 9 AIS 3-6 out of 110 cases in 2007 i.e. 8.2 % signal to 91.8% noise.

The case histories supplied by UK HSE and US CPSC were grossly inadequate in many different ways, were not representative, and were inappropriate to enable a highly influential simulation study to exist.

## Correlation Coefficients

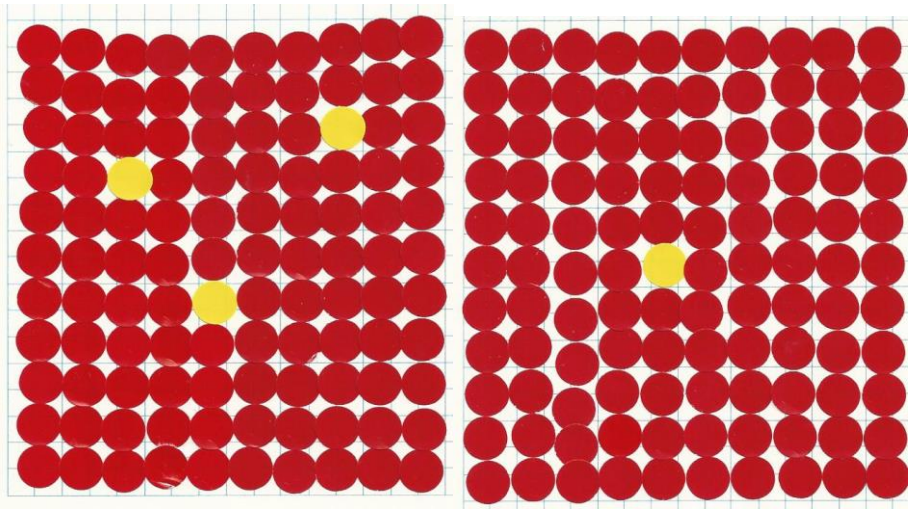
Correlation Coefficient is a number between 0 and 1 which shows how different or how alike two things are. O is totally different and 1 is exactly the same (identical).

DRI 2012 claimed a correlation coefficient of 0.999558 for 'asphyxiation' when there were three actual and one simulated. How did DRI achieve this value, 0.0442% off a perfect correlation of 1.

**Figure 1** below shows Aggregation Diagrams which give a clear image of what is being compared for correlation.

Each red dot represents one case of 'no injury'. Each yellow dot represents one case of Asphyxiation.

Both the Actual and the Simulated Aggregation contain 110 dots representing 110 cases.



'Actual Aggregation DRI 2012' 'Simulated Aggregation' DRI 2012

**Figure 1**

It is the red dots which make the Actual and Simulated Aggregations look similar. Yellow dots, as seen below, do not make similar aggregations.

Actual Simulated

The 'no injuries', not the 'Asphyxiation' injuries, are providing the high correlation coefficient.

The 'noise' (red dots) swamp the 'signal' (yellow dots) and lead to a 0.999558 Correlation Coefficient which, as seen from Figure 1 is totally incorrect.

None of the correlation coefficients put forward by DRI 2012 and quoted below can be substantiated. They all suffer with the same problem as Figure 1.

In terms of correlation coefficient, the results summarized in Table G-2 indicate a close agreement between modeled and actual aggregated injury severity distributions (correlation coefficient $r^2 = 0.97$ on average, and in excess of 0.99 for some body regions, between modeled and actual frequency of injury, across all body regions and overturn cases/types).

Table G-2: Correlation Coefficients between Actual and Simulated Aggregated Abbreviated Injury Scale (AIS) Injuries, Unhelmeted, DRI Latest Results

| Body Region or Index | Correlation Coefficient |
|---|---|
| MAIS | 0.880617 |
| Head | 0.940405 |
| Neck | 0.994150 |
| Chest | 0.996379 |
| Abdomen | 0.999619 |
| Femur | 0.999267 |
| Knee | 0.996978 |
| Tibia | 0.999438 |
| Asphyxia | 0.999558 |
| Average | 0.974958 |

DRI's presentation of all the high correlation coefficients showed lack of understanding which resulted in invalid and unjustified claims.

## SEVERITY OF INJURY AND PART OF BODY INJURED

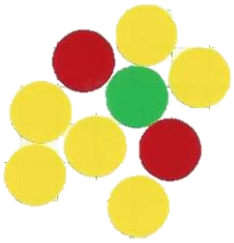
The visual comparison of Aggregation Diagrams of Actual and Simulated injuries (AIS 3-6) gives an understanding of the true level of correlation. These comparisons are presented for Severity of Injury and Part of Body injured.

To judge for similarity, look at overall size of each pair of Aggregation Diagrams and look for similarity of colour distribution/proportions. Look for similarity in size and in colour, while referring to the legend.

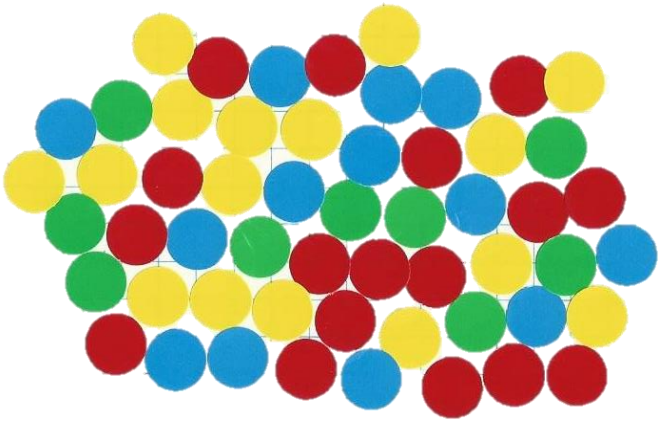
Compare the ‘Actual’ with ‘Simulated’ Severity of Injury for 2007 and for 2012, AIS 3-6.

## SEVERITY OF INJURY AIS 3-6


## 2007 ‘HIGH ENERGY’

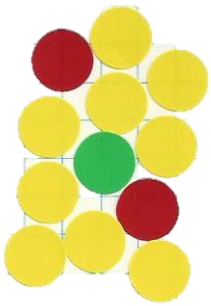


‘Actual’ Aggregation

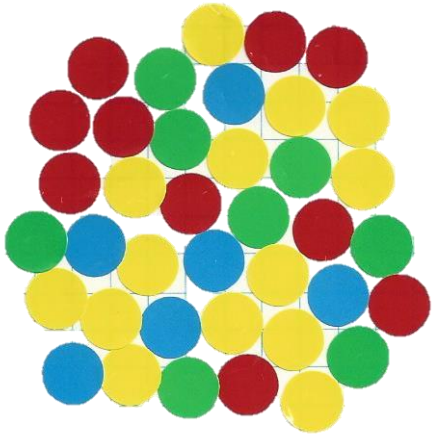


‘Simulated’ Aggregation

## 2012 ‘LOW ENERGY’



‘Actual’ Aggregation



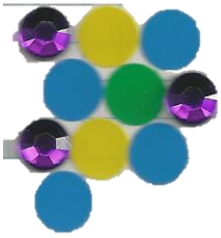
‘Simulated’ Aggregation

DRI 2012 reduced speed and slope angle to reduce energy to Low as compared with 2007 High.

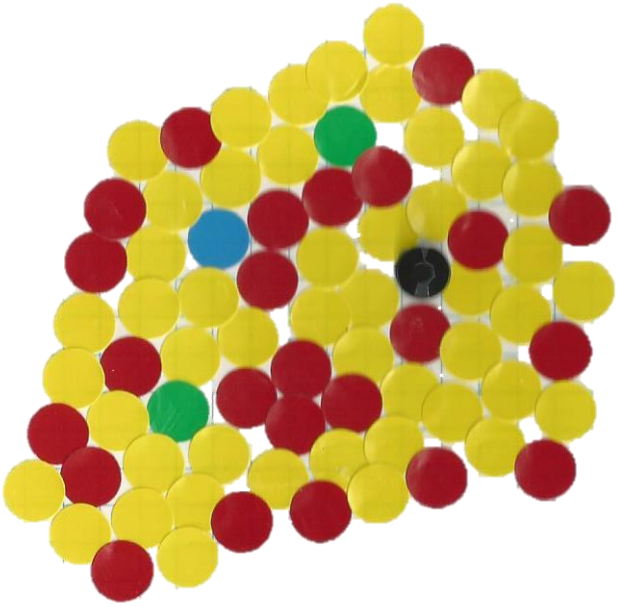
Compare 'Actual' with 'Simulated' Part of Body Injured (all AIS 3-6) for 2007 and for 2012.

## PART OF BODY INJURED AIS 3-6


## 2007 'HIGH ENERGY'



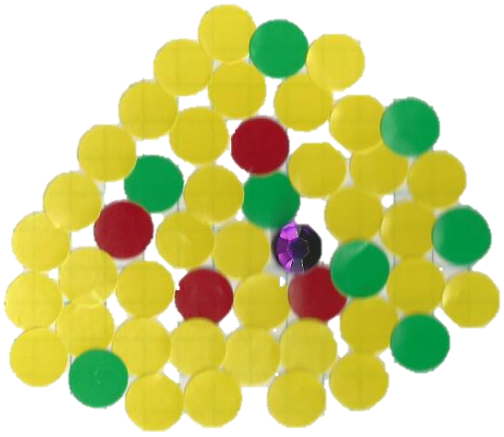
'Actual' Aggregation



'Simulated' Aggregation

## 2012 'LOW ENERGY'

'Actual' Aggregation



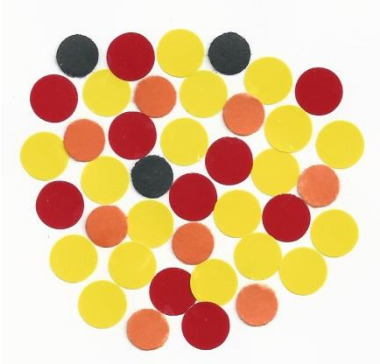
'Simulation' Aggregation

DRI claim that 16 or 17 variables were required from the scene of the quadbike rollover to run the simulation program and that all variables were supplied from the scene in 44 cases and not in 66 cases. The 66 cases had an average of 3.2 variables. The 44 cases with all variables should result in better simulations by removing the need for assumptions. It would be expected that the 66 cases averaging 3.2 data items would have a lower quality simulation.

Compare the 'Actual' with the 'Simulated' Severity of Injury for 44 all variables supplied and 66 averaging 3.2 variables supplied in 2007.

## SEVERITY OF INJURY AIS 3-6


**44 cases - all variables supplied**



'Actual' Aggregation

'Simulated' Aggregation

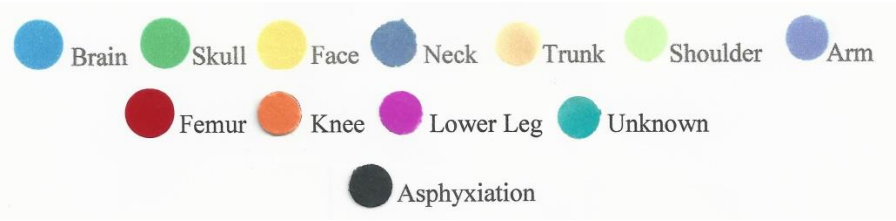
**66 cases - average 3.2 variables supplied**

'Actual' Aggregation

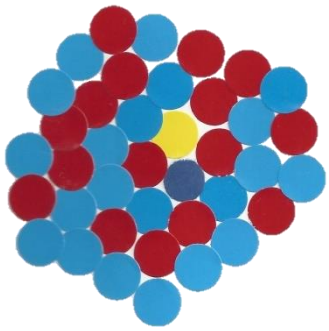
'Simulated' Aggregation

Compare Actual with Simulated Part of body injured AIS 3-6 for 44 all variables supplied and 66 averaging 3.2 variables supplied 2007.

## PART OF BODY INJURED AIS 3-6




**44 cases – all variables supplied**

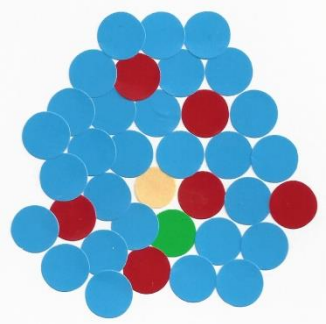


'Actual' Aggregation

'Simulated' Aggregation

**66 cases – average 3.2 variables supplied**

'Actual' Aggregation



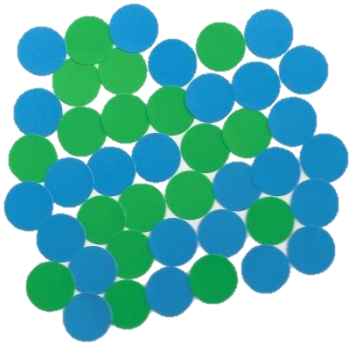
'Simulated' Aggregation

The sets of aggregation diagrams shown above have all presented figures for AIS 3-6 which provide the signal needed to guide valid assessment of what is required. Examples of AIS 1-6 for the 44 sample and the 66 sample are presented to illustrate the signal/noise ratio problem. AIS 3-6 gives a clear signal of 'what is', while AIS 1-6 introduces a high level of noise, particularly when the sample is heavily biased to the AIS 1-2 level.

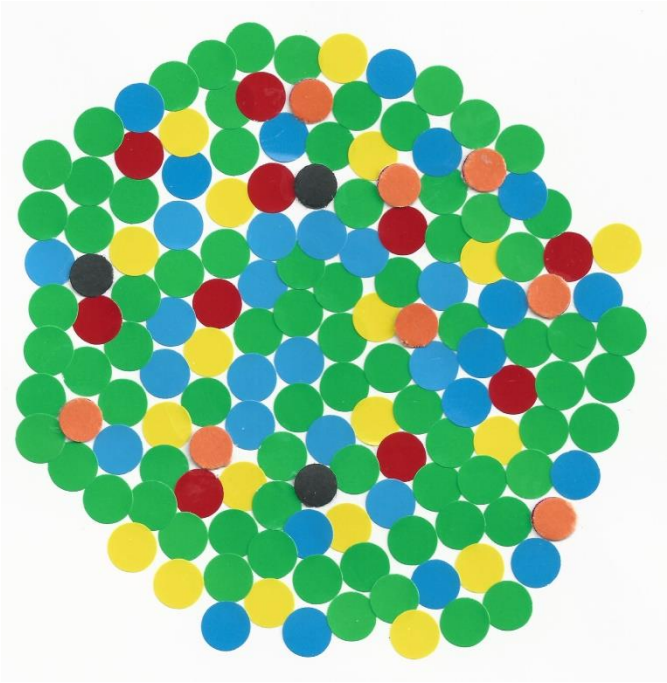
While comparing the following AIS 1-6 diagrams, look back at the corresponding AIS 3-6 diagrams and identify the AIS 3-6 cases within the AIS 1-6 diagrams.

# SEVERITY OF INJURY AIS 1-6


**44 cases – all variables supplied**

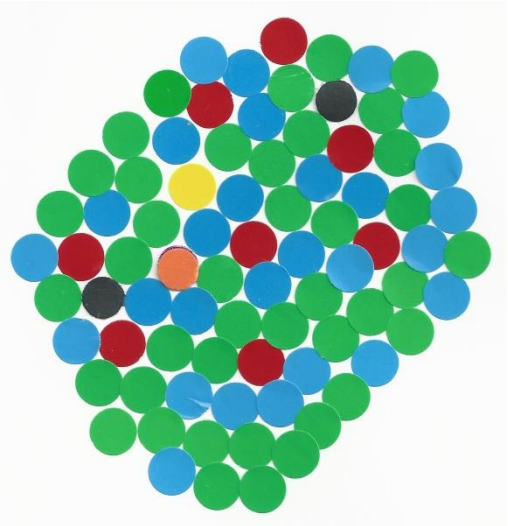


'Actual' Aggregation

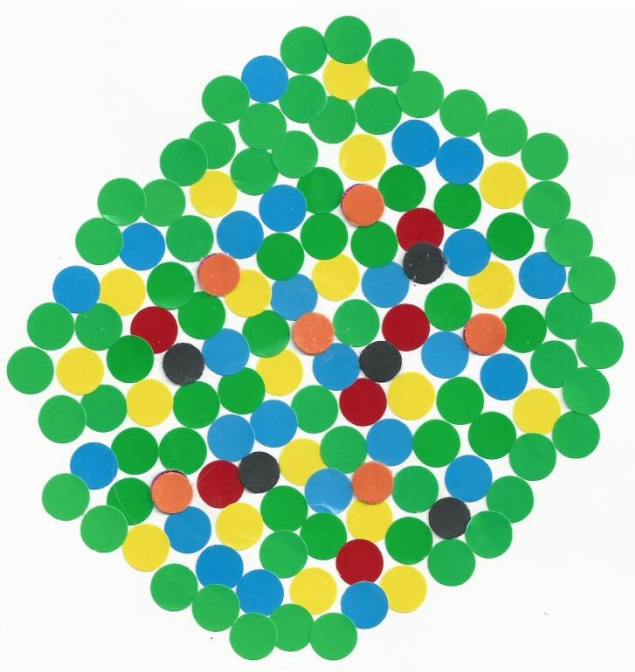


'Simulated' Aggregation

**66 cases – average 3.2 variables available**



'Actual' Aggregation

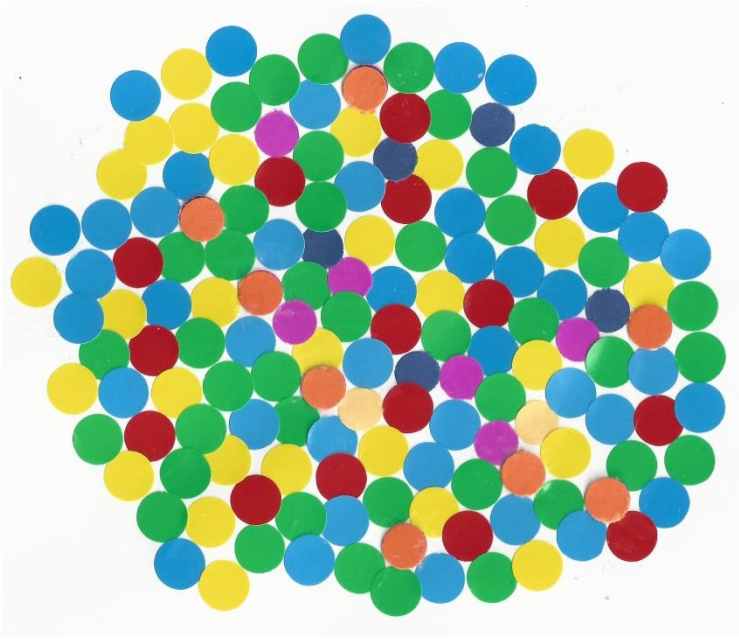


'Simulated' Aggregation

# PART OF BODY INJURED AIS 1-6


**44 cases – all variables available**

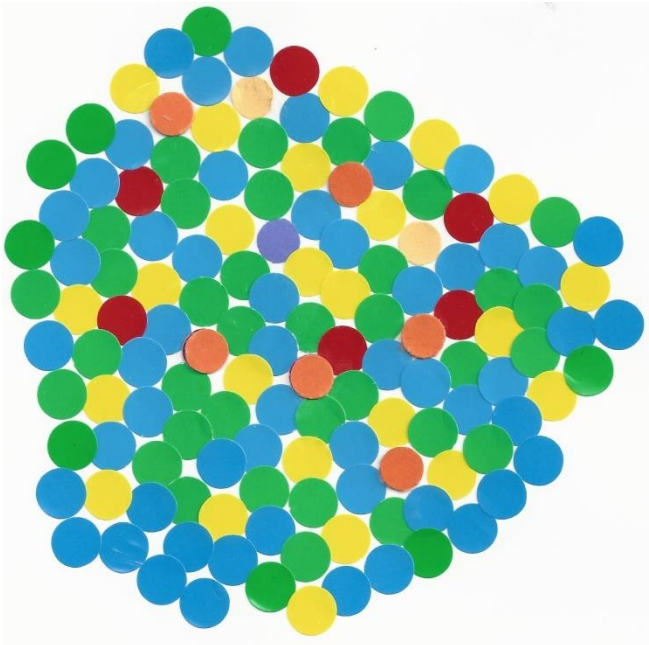
'Actual' Aggregation



'Simulated' Aggregation

**66 cases –average 3.2 variables available**

'Actual' Aggregation



'Simulated' Aggregation

## REDRESS (remedy or rectify a wrong)

Dynamic Research, Inc., Can-am, Honda, Kawasaki, Polaris, Suzuki, Yamaha, Kymco, and their industry association, the Federal Chamber of Automotive Industries, have to be held to account for the loss of life from their retarding of the fitment of Rollover Protection Structures for around 15 years, by creating, adopting and promoting invalid information (What you see on page 3) and the bullying that went with it.

There is a second story to be told, although not here in full. The UK HSE and US CPSC, by supplying inadequate case histories, and by passively allowing the promulgation of invalid information based on those cases, effectively endorsed the anti-fitment campaign. They too must be held to account.

So too does Safety generally; but specifically Workplace Health and Safety worldwide as indicated above and as illustrated by what happened here in Australia. In 2010, the official structure was handed, on a plate, factual, soundly based scientific evidence which was the forerunner of what can be seen here. The system was structurally, intellectually and conceptually unable to accept such information so the offer was rejected. The invalid influence against fitment continued.

## THE CHALLENGE (building better safety)

There is a broader problem than quadbikes. Look back at page 4 (and forward to page 14) specifically for the year 2008-09. 10 people an hour had their lives permanently altered because they went to work. We are here for a 2 day conference – 48 hours. While we confer, socialise, eat and sleep, 480 more people have had their lives permanently altered from work here in Australia.

There is too little room in Safety for evidence based, scientifically sound knowledge, methods and information – structurally, intellectually and conceptually.

There is too much room for and dominance of consultative consensus seeking processes, and for consignorance. Consignorance is the result of a group of people using consensus to combine their collective ignorance. The process gives ignorance authority and occurs regularly.

In a scientifically soundly based safety system, DRI's rollover simulations would, from the start, have been seen to be irrelevant.

## COST OF WORK PERSONAL DAMAGE IN AUSTRALIA

| 2000-01 Workforce 9.09 million | Class II Absence | | Class I Incapacity | | Class I Fatal | Total |
|---|---|---|---|---|---|---|
| Occurrences | Short <5 days | Long ≥5 days | Partial | Full | | |
| No. of Occurrences | 186,402 | 114,900 | 22,000 | 26,900 | 2,640 | 352,842 |
| % of Occurrences | 52.8 | 32.6 | 6.2 | 7.6 | 0.75 | 100 |
| Cumulative % | 52.8 | 85.4 | 91.6 | 99.2 | 100 | 100 |

**COSTINGS – No allowance for pain, suffering and early death**

| | | | | | | |
|---|---|---|---|---|---|---|
| Cost of Occurrences $b | 0.4 | 2.4 | 4.9 | 25.6 | 1.2 | 34.3 |
| % of cost | 1.2 | 7.0 | 14.3 | 74.0 | 3.5 | 100 |
| Cumulative % | 1.2 | 8.2 | 22.5 | 96.5 | 100 | 100 |

**COSTINGS – Allowance for pain, suffering and early death**

| | | | | | | |
|---|---|---|---|---|---|---|
| Cost of Occurrences $b | 0. 4 | 2.5 | 21.4 | 53.1 | 5.4 | 82.8 |
| % of cost | 0.5 | 3.0 | 25.8 | 64.2 | 6.5 | 100 |
| Cumulative % | 0.5 | 3.5 | 29.3 | 93.5 | 100 | 100 |

| 2005-06 Workforce 10.20 million | Class II Absence | | Class I Incapacity | | Class I Fatal | Total |
|---|---|---|---|---|---|---|
| Occurrences | Short <5 days | Long ≥5 days | Partial | Full | | |
| No. of Occurrences | 227,000 | 164,000 | 33,100 | 30,900 | 2,603 | 457,603 |
| % of Occurrences | 49.6 | 35.8 | 7.2 | 6.8 | 0.6 | 100 |
| Cumulative % | 49.6 | 85.4 | 92.6 | 99.4 | 100 | 100 |

**COSTINGS – No allowance for pain, suffering and early death**

| | | | | | | |
|---|---|---|---|---|---|---|
| Cost of Occurrences $b | 0.7 | 4.3 | 10.5 | 40.2 | 1.9 | 57.5 |
| % of cost | 1.2 | 7.5 | 18.2 | 69.8 | 3.3 | 100 |
| Cumulative % | 1.2 | 8.7 | 26.9 | 96.7 | 100 | 100 |

**COSTINGS – Allowance for pain, suffering and early death**

| | | | | | | |
|---|---|---|---|---|---|---|
| Cost of Occurrences $b | 0.74 | 4.51 | 45.64 | 83.43 | 8.33 | 142.65 |
| % of cost | 0.5 | 3.2 | 32.0 | 58.5 | 5.8 | 100 |
| Cumulative % | 0.5 | 3.7 | 35.7 | 94.2 | 100 | 100 |

| 2008-09 Workforce 10.93 million | Class II Absence | | Class I Incapacity | | Class I Fatal | Total |
|---|---|---|---|---|---|---|
| Occurrences | Short <5 days | Long ≥5 days | Partial | Full | | |
| No. of Occurrences | 337,300 | 185,600 | 82,100 | 3,700 | 2,610 | 611,300 |
| % of Occurrences | 55.2 | 30.4 | 13.4 | 0.6 | 0.4 | 100 |
| Cumulative % | 55.2 | 85.6 | 99.0 | 99.6 | 100 | 100 |

**COSTINGS – No allowance for pain, suffering and early death**

| | | | | | | |
|---|---|---|---|---|---|---|
| Cost of Occurrences $b | 0.4 | 4.9 | 41.8 | 9.8 | 3.2 | 60.6 |
| % of cost | 1.5 | 8.0 | 69.0 | 16.2 | 5.3 | 100 |
| Cumulative % | 1.5 | 9.5 | 78.5 | 94.7 | 100 | 100 |

**Pain, suffering and early death figures do not exist.**