Science and Liability

7 years on

10.45 Tuesday 13th Sept 2011

Agenda

To discuss:

1. Probabilistic Methods, a proactive FSA
2. Scientific test of difference
    1. *Causation (de minimis)*
    2. *Harm (de minimis)*
    3. *Duty of care (reasonable, not precautionary)*
3. *Two 'look ahead' examples only.*
    1. *Heart disease*
    2. *biodiversity*

FSA

- April 2011 FSA expect to see probabilistic methods (or equivalent) for proactive risk management. [Reactive expected too.]
- Essentially:

  risk (£) = probability x magnitude (£)

- PM provide measures of loss and uncertainty; the rest is standard procedure.
- An emerging risk is then quite simply one where probability, or magnitude, or both, increase.

FSA motivation ?

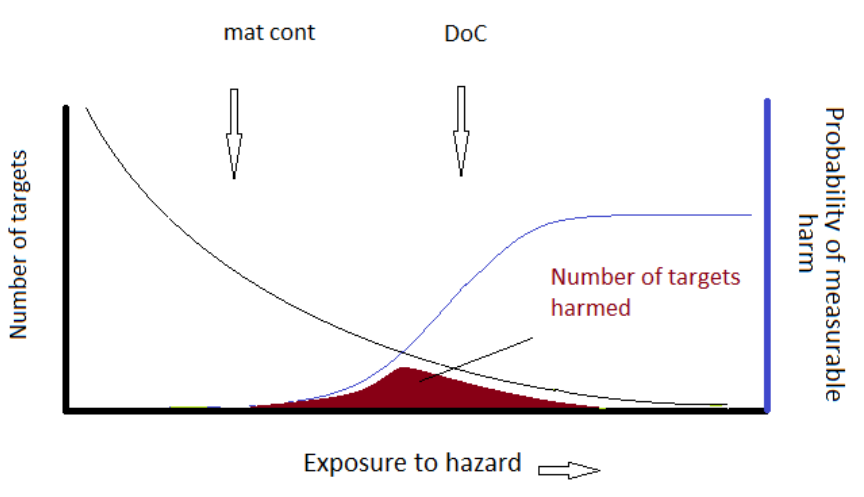
risk (£) = probability x magnitude (£)

- Overtly Proportionate,
- Systematic,
- Explicit model parameters,
- Reviewable,
- Intervention focussed,
- Investment scaling,
- Gap analysis,
- <u>Losses and uncertainties will be summed</u>

Science

Probability factors	Magnitude factors
Generic Causation *	Number exposed (+growth)
Diagnosis*	Degree of biological harm
Dose response relationship	Duty of Care threshold*
Degree of biological harm	Portfolio accumulation
Latency	Age profile
Age profile	Vulnerability profile

Example



Skills

- Finding the information (epidemiology)
- Converting it using common law principles
- Quality-weighted synthesis of results
- Numerical modelling (12 standard models should be enough)
- Statistics

- If it can be done, why choose not to?

Three scientific rules are proposed:

1) if the probability that there has been an increase in risk is below 50% then there was no increase in risk.

2) if the probability that the person has been injured is below 50% then they have not been injured.

3) The lowest possible duty of care threshold is at the point where harm to an individual becomes detectable.

Contrast with Medical philosophy

1) all increases in risk contribute to the harm done.

2) If a person 'could be' injured then assume he is. Precaution in the face of uncertainty.

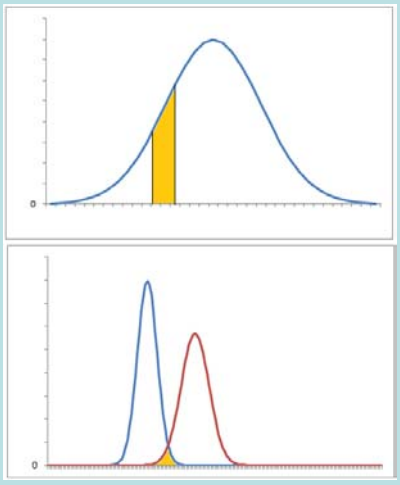
3) The lowest possible duty of care standard is zero exposure. Failing that, if any coherent biological change is observed in a large study then exposure was too high.

- The three proposals are essentially the same:

  The measurement of difference

- Science has been doing this in an objective way for >250 years
- Its not that hard to extract the appropriate evidence from misaligned science.

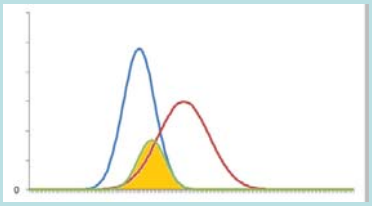
Measurement



De minimis 1

Causation

- If the with-negligence risk is, on the balance of probabilities, greater than the background risk then causation is possible. If not, there is no case to answer.



Supreme Court

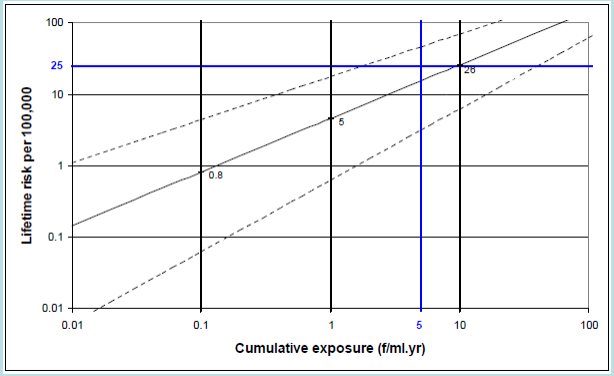
[2011] UKSC 10 Sienkiewicz, Knowsley etc.

[Meso: the wronged will always win <u>unless</u>…]

- ***risk** of contracting the disease [..is such that..] wrongful exposure was **insignificant** compared to the exposure from other sources.*

- [Obviously exposure within 5 (or 10, or 20) years isn't counted.]

Chrysotile.



How do you put this?

- The minimum detectable risk occurs at 26 f.ml^{-1}.years.
- That is a lifetime risk of 54 per 100,000.
- Background is 25 per 100,000
- *Sienkiewicz* was 29.5 per 100,000
- *Knowsley* was very likely lower.
- For amosite the maths gives you a minimum detectable level of 0.86 f.ml^{-1}.years. 80 per 100,000

Smoking and asbestos

- *Ellis v Amaca* [2010] HCA 5
- Using the data presented in the case notes, can test whether the multiplicative risk is different from smoking alone. Not until $RR_{asbestos}$ = 1.8 or higher.
- This would get lower if the precision of $RR_{smoking}$ was improved.
- *HSE RR833 (2011)*
- no effect of asbestos when $RR_{asbestos}$ = 1.45

so

- When you know *de minimis* for causation you can:
  - Improve Defence strategy.
  - Improve Underwriting strategy.
- Why would you choose not to?

De minimis 2

Harm

- If the with-negligence condition is, on the balance of probabilities, less good than x, then assess the degree etc. If not, then there is no case to answer.

- x depends on your assumptions.

Whiplash

- Rate of demonstrable initial impairment falls significantly. (by ~ 15% to 20%).
- Prognosis shifts from 6 months to 3 months.
- Physiotherapy makes no measureable difference if measured at 3 months.

3. Duty of care test

- If in an individual it is less than 50% probable that there is harm, then there is no harm.
- What degree of negligence is required to cause the smallest 'detectable' harm? Then surely that is the lowest possible common law duty of care standard!

Duty of care

Parkes v Meridian Ltd [2007] EWHC B1 (QB) 14th Feb 2007

- *[where hearing loss is marginal]* ***or so small as not to be identifiable in individuals but only in a statistical sense there could in my view be no liability at common law for breach of duty in exposing employees at such levels.***
- i.e. Harm to an individual must be identifiable in that individual. If identifiable then breach is possible. If not, it isn't.

NIHL

- 10 dB(A) is the least “harm” that can be identified. From this, the common law NIL threshold can be decided.
- The common law duty of care standard.
- ~ 85dB(A).
- If you could define common law duty of care thresholds then why would you choose not to?

e.g. Lung function

NF Chaisson et al. JOEM (2010) Vol52#11 p 1119 – 1123

- Average age-related decline in FEV_1 is 30 ml per annum.
- Trial to trial variation on the same day = at best 150 ml for an individual but is more usually 200 ml.
- Annual decline must be at least 250 ml if it is to be detected at the 50% probability level for an individual. (6% per annum).
- In an annual diacetyl study, 19% vs 6% had a detectable loss. NIOSH 2001.
- Lifetime decrement of less than 6% is meaningless.
- *Beddoes* was 1.6%. (48 to 64 ml)

For injury by degree:

- Asbestosis (FEV_1 measures impairment)
- Silicosis (FEV_1 measures impairment)
- NIHL (pure tone audiometry)
- Disability (test scores)
- Osteoarthritis? (% x-ray)
- Psychiatric (test scores)
- Neuro degeneration
- Kidney failure
- VWF

For indivisible injury

- *De minimis* change in risk.

Heart disease

- There are around 1 million men and 500,000 women who are alive but obviously vulnerable
  - Should they receive a higher standard of care at work?
- Material contribution ⇨ 100% of the liability.
- Inflation
  - CVD rates increase as population ages
  - obesity rates are increasing
  - working lives are extending
- Amplification by retrospective action.
- Amplification by switch from DoC to mat cont.

Known risk factors ~ 50%

- Indirect
  - Obesity, low aerobic fitness, poor sleep, mental illness, M/F
  - Smoking, alcohol, age, medication (The Pill), illnesses, poor food,
  - Low socioeconomic status, geography,
- Proximal
  - Blood pressure, blood fats, arterial stiffness, artery calcium, IMT thickness, C reactive protein, previous CVD events, diabetes (HbA_{1c}), claudication

Proposed risk factors

- Indirect!
  - Shift work, chronic stress, vibration, loud noise, fine dust, physically demanding work, sleep disruption (annoyance)
  - Duty of care standards are either already in place or soon will be. But based on other endpoints.
  - Retrospective liability???? (uncertainty costs money)

Radar 2005-2010

8 common law-valid studies:

- Acceleration of CVD by physically demanding work is evidenced by measures of artery wall health (IMT) and by blood pressure increases. Dose response effect.
- Some doubts about the correct measure of physically demanding.

2010 Date of knowledge?

- *Scand J Work Environ Health* (2010) Vol.36(5) p 357–365
- *Scand J Work Environ Health (2010) Vol.36(5) p 366–372*
- *Scand J Work Environ Health (2010) Vol.36(6) p 466–472*

- 30 year prospective study, most known risk factors accounted for, aerobic fitness was actually measured.
- Adjusted RR increased with strain except for those with the highest fitness levels and those diagnosed with CVD before the study began.

Exposure Estimate

low fitness.high demands = 2.6% . RR = 2.0 after adjustment for risk factors

AF = 2.5% of 124,000 UK events a year.

- **3,100** attributable events a year.

moderate fitness.high demands = 11%. RR = 1.7 – AF = 6%,

- **8,200** events a year.

A heart attack is indivisible

Causation

- Applying the usual tests of reasoning the estimate is up to 74% likelihood of the courts finding generic causation.
- Specific outright causation depends on there being no other significant risk factors and is more likely if there is evidence of low aerobic fitness.
- Material contribution depends on the mechanism being cumulative. [IMT and BP clues.] *Bailey.*

Duty of Care

HSE Indg 143 Manual Handling Regulations.

  - *you must make the work less demanding if it is reasonably practicable to do so.*
  - *there are certain things to look out for, such as people puffing and sweating, excessive fatigue.*
- Rate of breach ~ 20%
- From the research VO_{2max}> **39** ml/kg/min should be safe enough from the effect of demand.

- 2010 Energy Institute defined the acceptable level of aerobic fitness for manual tasks. > **31** *ml/kg/min*

What to do

1) FSA would expect you to estimate your injury liability exposure;
   1) duty vs. material contribution
   2) retrospective risk
2) Is your action threshold exceeded?
3) If yes, manage the risk, if no add to your emerging risks pool (but review it).

Biodiversity