

# Life expectancy and other epidemiological evidence in civil cases.

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Statistics and Probability in Forensic Science  
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One party claims damages (or actions) from a second party.

- How long will this person live?  
Cancer, cerebral palsy: brain injury at birth; traumatic brain injury; spinal cord injury.
- “If anticoagulants had been administered sooner, my client would not have died.”
- “This drug damaged the sight of my patient.”
- Association of vioxx with cardiovascular events: “The weight of scientific evidence supported, and continues to support, that in VIGOR, naproxen provided a cardioprotective effect.”  
Therefore no evidence that vioxx increased the risk?

Expert witness reports usually for court, not instructing solicitor.

# Challenges for the statistician

<http://www.birthinjuryguide.org/about-us/>

What is the Life Expectancy of a Child with CP?

“Although **there have been no general studies of life expectancy in people with cerebral palsy**, most children affected by CP live between 30 and 70 years, depending on the severity of the condition. In general, a child with a mild case of CP usually lives longer than a child with mobility and intellectual limitations. . . . However, most children with even the mildest form of CP tend to have slightly shorter life spans than the general population.”

**Really no studies?**

# What is the Life Expectancy of a Child with CP?

-  PM Evans, S JW Evans, and EAberman. Cerebral palsy: why we must plan for survival. *Arch. Dis. Ch.*, 65:1329–1333, 1990.
-  JL Hutton, TCooke, and POD Pharoah. Life expectancy in children with cerebral palsy. *Brit. Med. J*, 309:431–435, 1994.
-  DStrauss, RM Shavelle, and TW Anderson. Life expectancy of children with cerebral palsy. *Ped. Neurol.*, 18:143–149, 1998.
-  JL Hutton, AF Colver, and PC Mackie. Effect of severity of disability on survival in north east England cerebral palsy cohort. *Arch. Dis. Ch*, 83:468–474, 2000.
-  JL Hutton and POD Pharoah. Effects of cognitive, sensory and motor impairment on the survival of people with cerebral palsy. *Arch. Dis. Ch*, 86:84–89, 2002.

# What is the Life Expectancy of a Child with CP?

-  K Hemming, JL Hutton, A Colver, and MJ Platt. Regional variation in survival of people with cerebral palsy in the United Kingdom. *Pediatrics*, 116:1383–1390, 2005.
-  K Hemming, JL Hutton, and POD Pharoah. Long term survival for a cohort of adults with cerebral palsy. *Dev. Med. & Child. Neur.*, 48:90–95, 2006.
-  SM Reid, JB Carlin, and DS Reddihough. Survival of individuals with cerebral palsy born in Victoria, Australia, between 1970 and 2004. *Dev. Med. & Child. Neur.*, 54:353–360, 2012.
-  JC Brooks, DJ Strauss et al. Recent trends in cerebral palsy survival. Part I: period and cohort effects. *Dev. Med. & Child. Neur.*, 56:1059–1064, 2014.

**Really no studies? c.f. Cancer**

# Survival After Spinal Cord Injury

Do you think there has been an improvement over time?

## Logistic regression models for deaths

Variable	2006 article		2015 article	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Sex: male	1.303	(1.20-1.42)	1.325	(1.25-1.40)
Other $x_i$	...	...	...	...
Study period				
1973-1979	1.000		1.000	
1980-1989	0.829	(0.67-1.03)	0.802	(0.64-1.00)
1990-2004	0.856	(0.69-1.06)	0.826	(0.67-1.03)
2005-2012	Not applicable		0.857	(0.69-1.07)

Interesting year grouping. What might 1980-2004 or 1980-2012 give? 0.84 with CI (0.76, 0.94)?

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# Survival After Spinal Cord Injury

“Conclusions: There was no evidence of improvement. Long-term survival has not changed over the past 30 years.”

Shavelle, DeVivo, Brooks et al (2015 96:645-51)

*Archives of Physical Medicine and Rehabilitation*

- STROBE “Checklist of items that should be included in reports of cohort studies”: Total score zero?
- The original 50,661 patients were reduced to 31,531 patients. In Table 1, the total number of people “represented” is 66,940.
- “. . . for the 59% of patients with complete information.”
- Five exclusion criteria: the two relating to missing data on critical covariates are not discussed.

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What might 1980-2012 give? **0.828 with CI (0.73, 0.94)**

## Vioxx: evidence of absence?

“The weight of scientific evidence supported, continues to support, that in VIGOR, naproxen provided a cardioprotective effect.”

- No direct numerical assessment of cardioprotective effect of naproxen: only verbal: “no thrombotic cardiovascular risk associated with Vioxx” was observed in osteoarthritis trials; “similar rates of thrombotic cardiovascular events [were found] among those taking Vioxx, placebo and comparator NSAIDS”
- “Subsequent studies provided further evidence of a cardioprotective effect of naproxen. A 2<sup>nd</sup> clinical pharmacology study found that naproxen at 500mg twice daily demonstrated a sustained anti-platelet effect **indistinguishable** from that of aspirin”: study on 9 healthy volunteers for 6 days - power!
- “A large clinical trial . . . provided further evidence of a cardioprotective effect of naproxen”: rates of myocardial infarction (clinical and silent) on naproxen > on the comparison drug, lumiracoxib.

# Challenges for the statistician

- 1 Numeracy of lawyers
- 2 Too little information: data on anti-coagulant administration
- 3 Too much information:  
Vigabatrin and visual field defect: 15 arch lever files  
Vioxx: several discs.
- 4 Weaselling: Vioxx, life expectancy
- 5 Legal aid fees?
- 6 'Property in a witness': Scotland, South Africa

# Advantages for the statistician

- 1 Numeracy of lawyers
- 2 England, Australia: disclosure of expert reports
- 3 England, Australia: joint statements of agreement and disagreement
- 4 Rare to have to go to court\*
- 5 Insurance company fees?
- 6 'No property in a witness': England

\*Dublin in May; Durban; London; Melbourne; (Manchester GMC)

# Who 'owns' an expert witness?

**Australia** 'There is no property in a witness of fact' . . .  
'The mere fact that a potential witness has given a statement to one side . . . she is not prevented from telling . . . information she has provided'

**Canada (BC)** 'There is no property in a witness, and a lawyer may properly seek information from any potential witness, whether or not the witness is under subpoena.'

**England & Wales, N. Ireland** No property in a witness of fact and opinion: pressure . . . not to liaise . . . constitute "improper interference"

**Scotland** Property in a witness: documents remain privileged, not disclosable even by the expert.

**South Africa** Property in a witness. 'Both' expert teams were instructed by plaintiff's solicitors.

# Procedures in civil cases

**Australia** Reports are exchanged, questions asked, 'hot tub' joint reports written. All writing disclosed.

**England & Wales** Reports are exchanged, questions asked, joint reports written. Examples.

**Ireland** Require the exchange of experts' reports prior to the hearing, but . . .

**Scotland** 'an expert appearing in the Scottish courts owes no greater duty to the court over and above those of any other witness under oath. Once an expert is in the witness box, his evidence will depend purely upon what is asked.'

Example: supervised discussion!

# Competence: or 'who is an expert?'

- Statisticians
- List and survey of who is active? (Sheila Bird)
  - I would like to encourage more statisticians to be 'experts'. Definition? Jurisdiction

- Scientists and medics
- Provide guidance on assessing adequacy of understanding of statistics & probabilities?
  - Role of professional bodies?

Solicitors ... adequacy of understanding ...

- Advocates, barristers
- Provide guidance on how to facilitate presentation of statistical evidence?
  - How to cross-examine regarding understanding of statistics and probabilities?

Judges ... adequacy of understanding ...

## Truth, whole truth, nothing but the truth.

- Social level: need for more statisticians.
- Effective communication of statistical concepts.
- Good assessment of expertise.
- Fair rate for fees.

# Conclusions and advice

Statisticians can contribute to civil law suits by finding evidence relevant to the particular case, evaluating it, and then presenting the information.

- Do not underestimate the value of simple statistics
- Be careful and patient in explaining concepts
- Be very specific about what you will read
- Be generous in estimates of time needed, and stage estimates
- Be generous in short telephone calls of explanation!

Please consider getting involved - jointly at first, if you prefer.

Thank you.