

TMS-062: Matematisk statistik

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Statistics is...

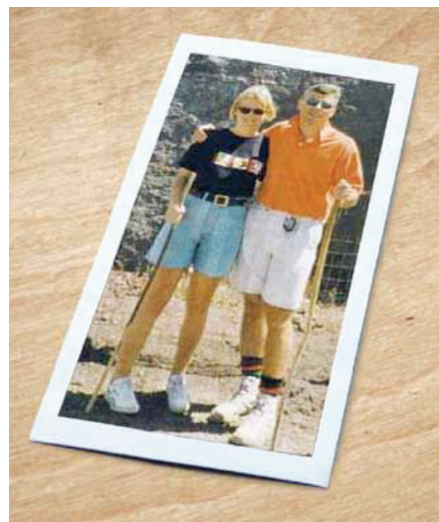
Mark Twain, attributing to the British Prime Minister Benjamin Disraeli (1804-1881):

- "There are three kinds of lies:
- lies, damned lies,
- and **statistics**."



Sally Clark

- Solicitor from Cheshire, England
- Married to a solicitor
- Their first son, Christopher, born in 1996



Cot Death

- Christopher **dies aged 11 weeks** in his sleep without any apparent reason: no signs of functional failures nor physical abuse
- **Cot death** = Sudden infant death syndrome (**SIDS**)
- Affects about 1 in 1300 of newborns, seems to depend on social standing of the family



Arrest

- The second baby, Harry, born in 1998, **dies** from SIDS **aged 8 weeks**
- The couple is arrested for **double-homicide** and tried



RSS Rings the Bells

- October 2001: The Royal Statistical Society alarms on **misuse of statistics** in the arguments of the prosecution team
- January 2003: the second appeal Court clears Sally of the accusation and released her from prison.
- The Attorney-General orders review of similar cases, and two other women had their convictions overturned.



The Court

Pediatric expert presents **statistical evidence** in the Court:

- SIDS rate in affluent nonsmoking family, with the mother over 26, like Clarks, is 1/8500, so the probability of 2 SIDS cases in one family is

$$(1/8500) \times (1/8500) \approx 1/73 \text{ million.}$$

- Given 650.000 annual live births in England and Wales, one has to wait for **over 100 years** for such a case to happen!
- **Sally is convicted in 1999 to life imprisonment**



Fundamental Flaws

- The rate is more likely to be 1/1300: **other factors**, like both babies are boys, were **ignored** when arriving to 1/8500.
- $(1/8500) \times (1/8500)$ assumes **independence** of cases. Prof. Ray Hill concluded (2004), using SIDS statistics for England, that the second SIDS is **5-10 times more likely**. This brings probability down to at most **1 to 338 000**



Fundamental Flaws

- The Court committed the **"Prosecutor's Fallacy"**: 1 to 338 000 is still too small, but in a large country like England one expects to have **a few such cases** annually. Are we going to prosecute them all without evidence just because it is rare?
- Instead, the Court should have weighed the odds **against alternative** of double-homicide. Double-SIDS is rare, but the double-homicide is still more rare: statistically **chances** of Sally's **double-SIDS to double-homicide** are about **10:1!**



"There are three kinds of lies: lies, damned lies, and statistics."

must NEVER apply to YOU!



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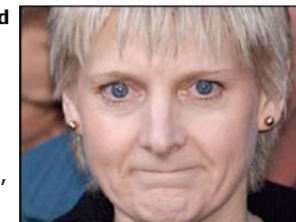
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Alcohol killed mother Sally Clark

A mother wrongly convicted of killing her two children died accidentally of acute alcohol intoxication, an inquest has ruled.



Freed Lawyer's accidental death

Solicitor Sally Clark, 42, of Hatfield Peverel, near Witham, Essex, was found dead at her home in March.

Mrs Clark was cleared of murdering her two sons, Christopher and Harry, who died in 1996 and 1998.

Essex coroner Caroline Beasley-Murray said there was no evidence Mrs Clark intended to commit suicide.

Mrs Clark was found guilty of murdering eight-week-old Harry



Stats VLE

The course is built around the **Virtual Learning Environment**. VLE is a web-based system developed at the University of Strathclyde, UK and at Chalmers integrating

- a system of computer generated **quizzes** on Probability and Statistics
- comprehensive **support tools**: statistical tables, teaching guide, demos
- means to **organise work**, schedule classes, contact peers, etc.
- instant up-to-date self **performance results**

Accessible anytime from anywhere



Components of the Course

Shifting the weight from formal lectures towards self-studying with the help of the VLE complemented by Matlab.

- Theory **lectures**
- Computer **labs**
- **Discussion/Project** sessions (not obligatory: bring your laptops!)
- **Test** sessions

You should read the theory (desirably, try quizzes also) **BEFORE** coming to the lab or discussion session!



Alternative Study Sessions

There are two **alternative lab sessions** on Thursdays:

- Thursday 8:00 – 9:45; and
- Thursday 10:00 – 11:45



Alternative Test Sessions

There are two **alternative test sessions** on Thursdays 8:00 – 8:55 and 9:00 – 9:55 (this will change to Monday later for the second test on Week 18)

When you log in for the first time, you will be prompted to choose the session available. Provided there is a place, you'd be able to change your booking later.



Assessment

Based on:

- **3 tests** on Thursday April 10th (33%), Monday 28th (33%) and Thursday 15th of May(34%) in VLE
- **Project** work (Pass/Fail)
- Final **examination** (optional for the those who passed by Tests)



Final Mark

- If the sum of test marks $T \leq 39$, the final mark is $M = E$, where E is the exam mark.
- If $40 \leq T \leq 79$ the student **may** choose
 - either **not to sit** the exam, the final mark is then $M = T$;
 - or **to take the exam**, then $M = \max\{40, E\}$.
- If $T \geq 80$, then $M = T$, i. e. the students accumulated 80% or more at the tests are **exempt from the final exam!**



Course Literature

- The main source is **the Study Guide** available from within the VLE.
- Also recommended:
D. C. Montgomery and G. C. Runger, **Applied Statistics and Probability for Engineers**, Wiley, 2010.



Grading

Final mark: M	Grade
$M \leq 39$ or Project is Fail	Fail
$40 \leq M \leq 59$	Satisfactory
$60 \leq M < 79$	Good
$M \geq 80$	Excellent

- **Exam**: 28th of May 2014, 10:00 am;
- **Resit exam**: End of August 2014, 10:00 am (to be confirmed)



Main link

`vle.math.chalmers.se`



Student Reference Group

- Blomstrand, Elias
- Ekermo, Jakob
- Eriksson, Sandra
- Kuznecovs, Artjoms
- Petrusson, Andreas
- Utbult, Juliette



LURN educational platform

- www.lurn.se/chalmers
- If interested in testing, send email to carladam.hellqvist@lurn.se



Looking forward to fruitful collaboration!



Any questions?

