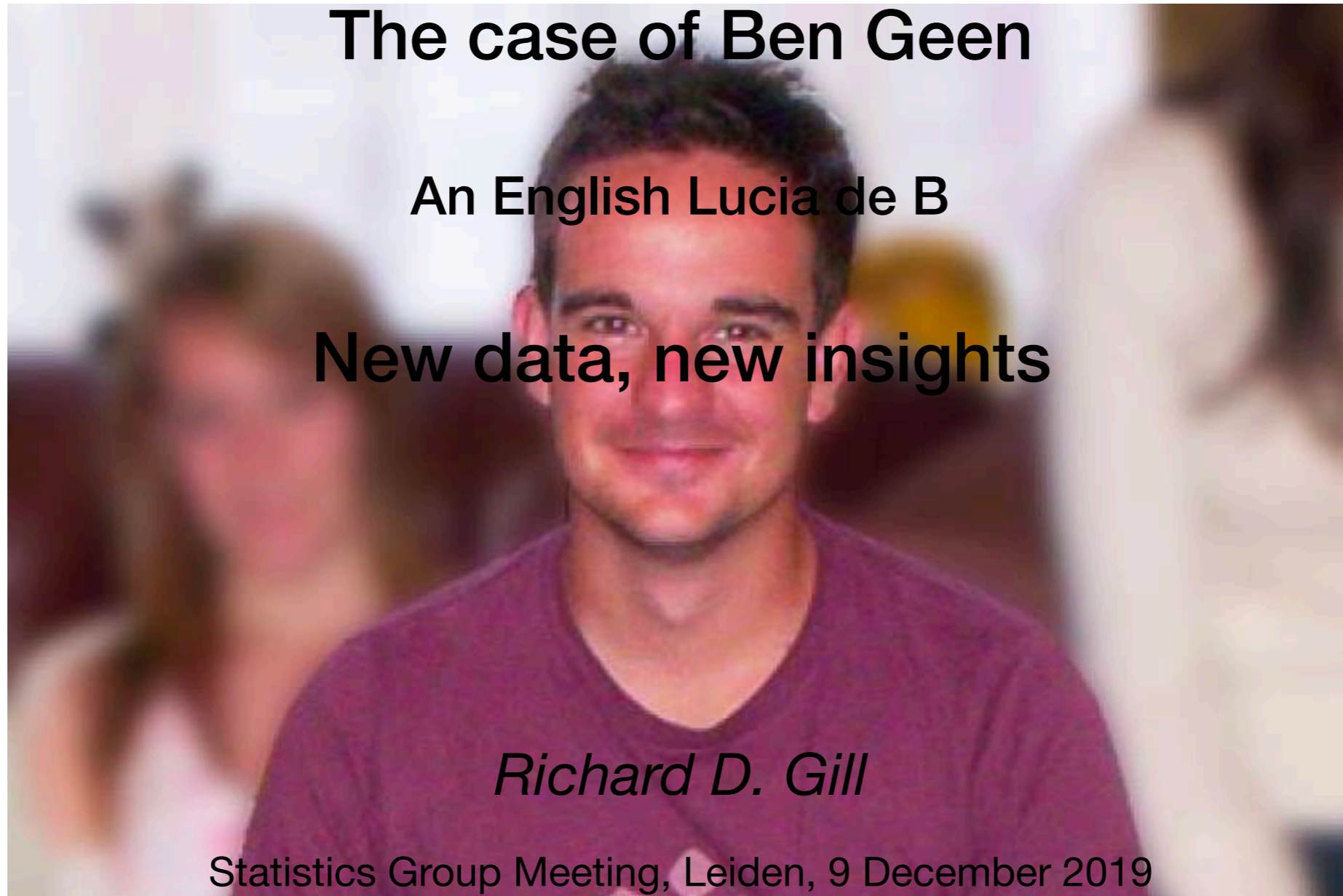


Lies, damned lies, and statistics



<https://www.math.leidenuniv.nl/~gill>

<https://www.richardgill.nl>

This version: 11 February, 2020

EXCLUSIVE by JAMIE PYATT

A NURSE has been arrested after ten A&E patients mysteriously collapsed and needed life-saving treatment.

Health chiefs became concerned about a sudden increase in patients suffering breathing failure and called in cops.

Detectives arrested a 23-year-old male nurse who came on duty carrying a syringe full of insulin.

A hospital source said: "He had no reasonable explanation for possessing it and there's no way any nurse should be coming on duty with a full hypodermic syringe."

Over two months ten men and women fell unconscious in the emergency department while being treated for minor complaints. A 22-year-old

NURSE ARRESTED AS 10 COLLAPSE IN A&E

Suspect caught with a syringe

man who complained of feeling unwell after smoking cannabis collapsed 40 minutes after being treated.

A 40-year-old man keeled over after being tended for a

stomach complaint and an elderly woman collapsed 30 minutes after arriving with a dislocated shoulder.

Each had to be resuscitated by a full emergency crash

team at Horton General Hospital in Banbury, Oxfordshire.

Bosses then discovered they had all been seen by the same nurse, who cannot be named for legal reasons.

Police said: "We are investigating ten cases of patients suffering respiratory difficulties."

A hospital spokesman added: "The member of staff was immediately suspended."

The Sun's medical expert Dr Carol Cooper said: "If a patient who did not need insulin was given an injection of it, their blood sugar levels would drop very dangerously."



Last Updated: Tuesday, 18 April 2006, 15:10 GMT 16:10 UK

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Nurse guilty of killing patients

A hospital nurse has been convicted of murdering two of his patients.

Benjamin Geen, 25, was also convicted of causing grievous bodily harm to a further 15 patients at Horton General Hospital in Oxfordshire.



▶ **The nurse who killed for kicks**

Oxford Crown Court heard the staff nurse from Banbury, injected patients with unauthorised lethal doses of drugs which caused them to stop breathing.

The offences took place between December 2003 and February 2004. Geen had denied all the charges.

Fifteen patients at the Horton General Hospital recovered shortly after they developed breathing difficulties.

However, the trial heard David Onley, 77, from Deddington, died on 21 January, 2004 and Anthony Bateman, 66, from Banbury, died on 6 January, 2004.

Initially, doctors could not explain the abnormally high level of respiratory arrests between December 2003 and February 2004.

Suspicion fell on Geen, a lieutenant in the Territorial Army, when it emerged that the incidents had taken place while he was on duty.

“ It is clear that he [Geen] wanted to be the centre of attention and in order to fuel this desire, brought some of his patients to the brink of death and coldly murdered two of them ”

Det Supt Andy Taylor

when he was subsequently arrested at the hospital on 9 February, 2004, police found a syringe filled with a potentially lethal muscle relaxant in his pocket.

Robert Robinson - one of Geen's first victims - was admitted to hospital after he drank a bottle of gin and took painkillers.

He stopped breathing when he was given an anaesthetic which he did not need, the court heard.

The 51-year-old said his life had been devastated: "I have no idea what happened when I was in hospital.

“ It's hard to describe what the guy did, why he did it, I just don't know, I'm just relieved it's over ”

Robert Robinson, one of Geen's victims

"It's hard to describe what the guy did, why he did it, I just don't know, I'm just relieved it's over."

The court heard how Geen looked "elated" as his patients went into respiratory arrest and even "boasted" to one doctor: "There is always a resuscitation when I'm on duty."

He used different methods to send his victims to the point of death including overdoses of insulin and sedatives.

Prosecutor Michael Austin Smith QC told the jury that toying with patients' lives was a price Geen was willing to pay in order to satisfy his perverse needs.

'Death's door'

When patient Timothy Stubbs was admitted with stomach pains and later transferred to the intensive care unit, the drugs midazolam, a sedative, and vecuronium, a muscle relaxant, appeared in his urine sample.

The drugs had not been prescribed by the doctors at the hospital.

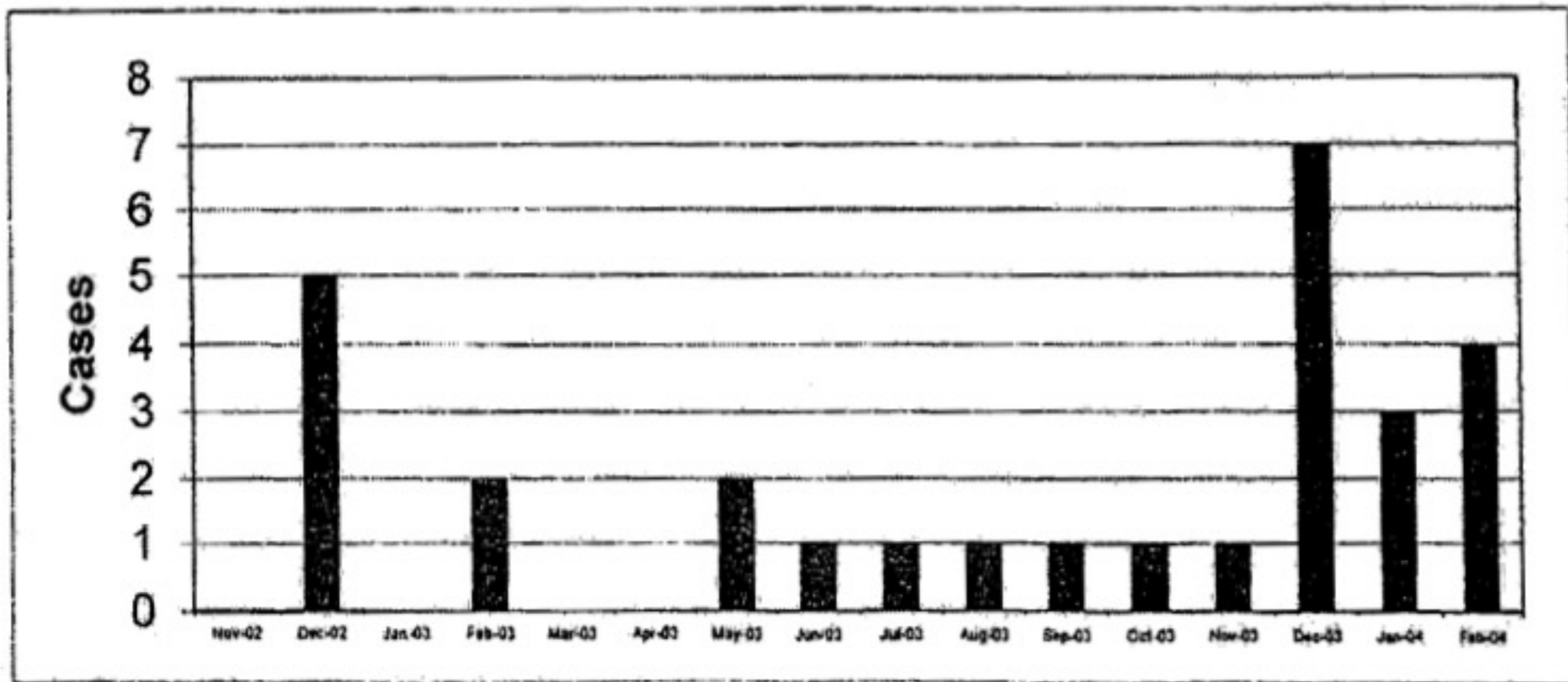
Mr Smith said: "People were at death's door. Most were lucky - two were not."

Detective Superintendent Andy Taylor, who led the murder investigation, said: "Ben Geen abused this position of trust.

"We may never know what motivated him to select and poison his victims.

"It is clear that he wanted to be the centre of attention and in order to fuel this desire, brought some of his patients to the brink of death and coldly murdered two of them."

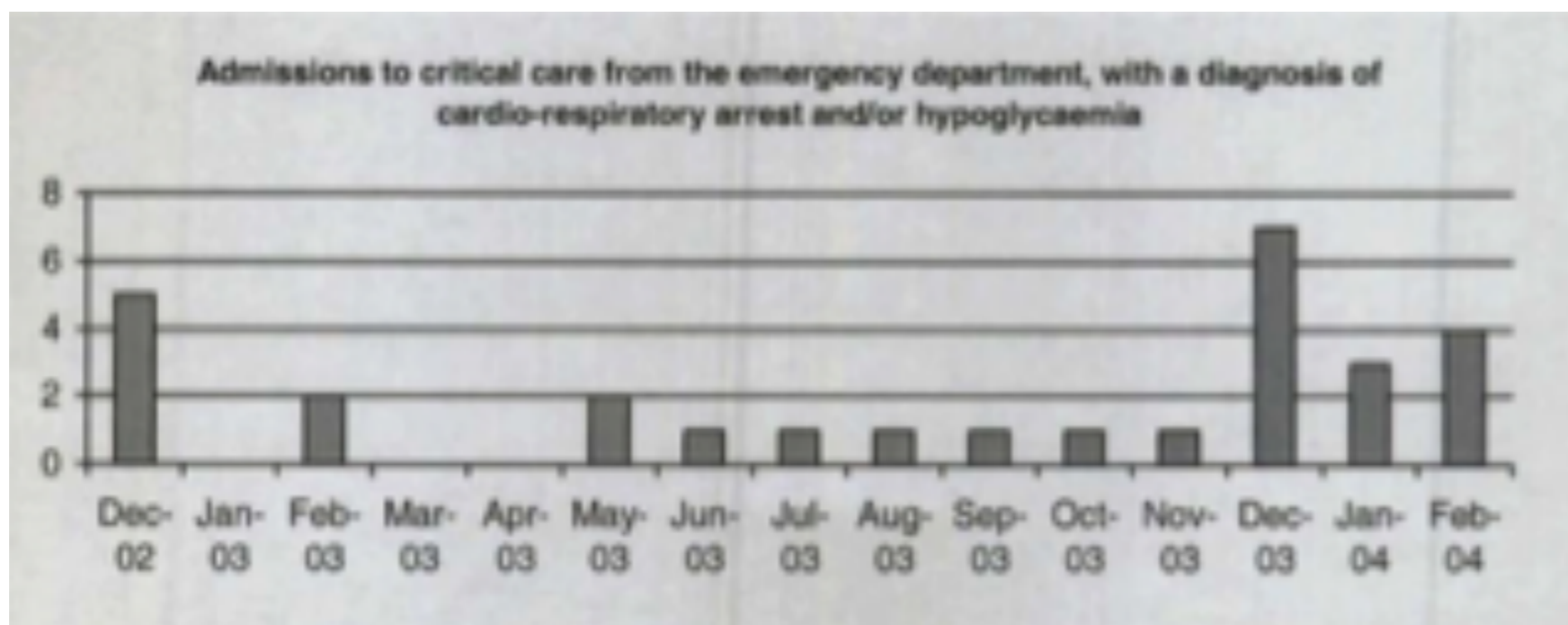
Patients admitted to CCU from ED with diagnosis of cardio-respiratory arrest and/or hypoglycaemia (27th November 2002 to 7th February 2004)



Malcolm Benson Notes review (CCU admissions)

Ideas in this talk

- If a picture can tell a thousand words, then a statistical graphic can tell a thousand **lying words**
- A graphic can be telling the truth, and nothing but the truth, but not necessarily ***the whole truth***



ANALYSIS



Medical error—the third leading cause of death in the US

Medical error is not included on death certificates or in rankings of cause of death. **Martin Makary** and **Michael Daniel** assess its contribution to mortality and call for better reporting

Martin A Makary *professor*, Michael Daniel *research fellow*

Department of Surgery, Johns Hopkins University School of Medicine, Baltimore, MD 21287, USA

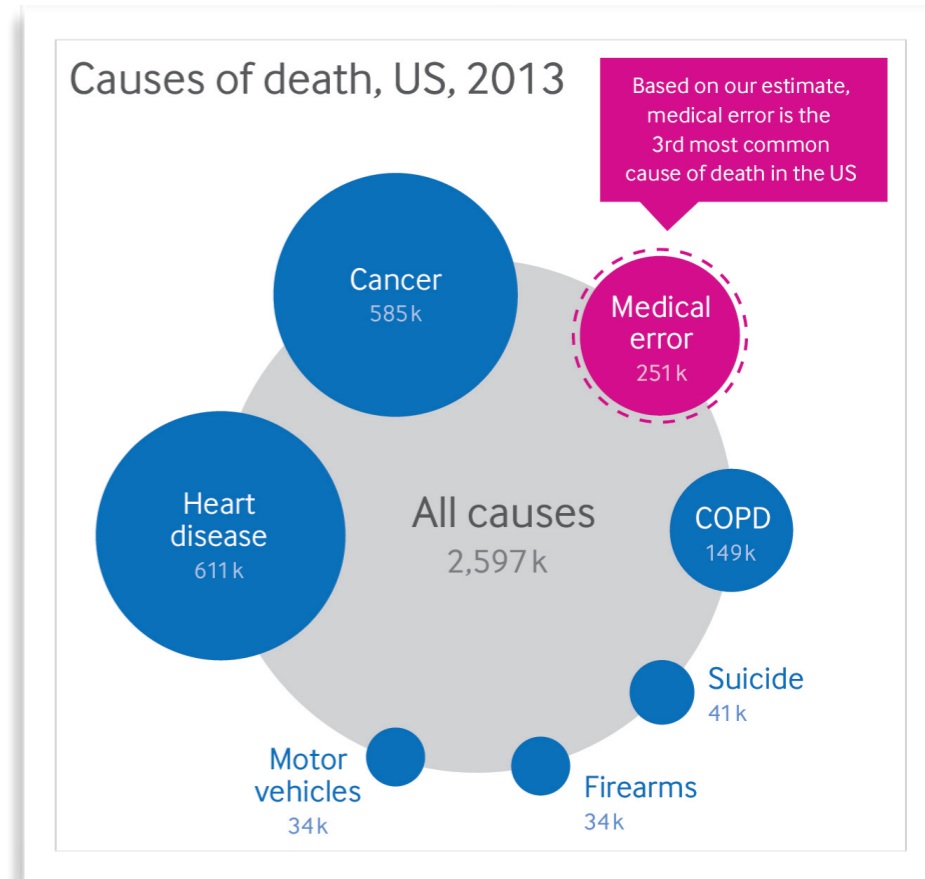
The annual list of the most common causes of death in the United States, compiled by the Centers for Disease Control and Prevention (CDC), informs public awareness and national research priorities each year. The list is created using death certificates filled out by physicians, funeral directors, medical examiners, and coroners. However, a major limitation of the death certificate is that it relies on assigning an International Classification of Disease (ICD) code to the cause of death.¹ As a result, causes of death not associated with an ICD code, such as human and system factors, are not captured. The science of safety has matured to describe how communication breakdowns, diagnostic errors, poor judgment, and inadequate skill can directly result in patient harm and death. We analyzed the scientific literature on medical error to identify its contribution to US deaths in relation to causes listed by the CDC.²

Death from medical care itself

Medical error has been defined as an unintended act (either of omission or commission) or one that does not achieve its intended outcome,³ the failure of a planned action to be completed as intended (an error of execution), the use of a wrong plan to achieve an aim (an error of planning),⁴ or a deviation

How big is the problem?

The most commonly cited estimate of annual deaths from medical error in the US—a 1999 Institute of Medicine (IOM) report⁷—is limited and outdated. The report describes an incidence of 44 000-98 000 deaths annually.⁷ This conclusion was not based on primary research conducted by the institute but on the 1984 Harvard Medical Practice Study and the 1992 Utah and Colorado Study.^{8,9} But as early as 1993, Leape, a chief investigator in the 1984 Harvard study, published an article arguing that the study's estimate was too low, contending that 78% rather than 51% of the 180 000 iatrogenic deaths were preventable (some argue that all iatrogenic deaths are preventable).¹⁰ This higher incidence (about 140 400 deaths due to error) has been supported by subsequent studies which suggest that the 1999 IOM report underestimates the magnitude of the problem. A 2004 report of inpatient deaths associated with the Agency for Healthcare Quality and Research Patient Safety Indicators in the Medicare population estimated that 575 000 deaths were caused by medical error between 2000 and 2002, which is about 195 000 deaths a year (table 1↓).¹¹ Similarly, the



Lucia de B.

- Life sentence, 7 murders and 3 murder attempts, three hospitals in the Hague between 1995 [must check exact year] & Tuesday 4 September 2001
- Lucia's presence at so many "incidents" couldn't be a coincidence
- Initial conviction based on statistical calculation by statistician Henk Elffers (1 in 342 million)
- On appeal, no statistical calculation used to justify conviction
- Indisputable scientific proof Lucia poisoned baby Amber + "chain argument"
- Case reopened in 2008, Lucia **completely** exonerated in 2010
- This was the biggest miscarriage of justice in the Netherlands, ever.

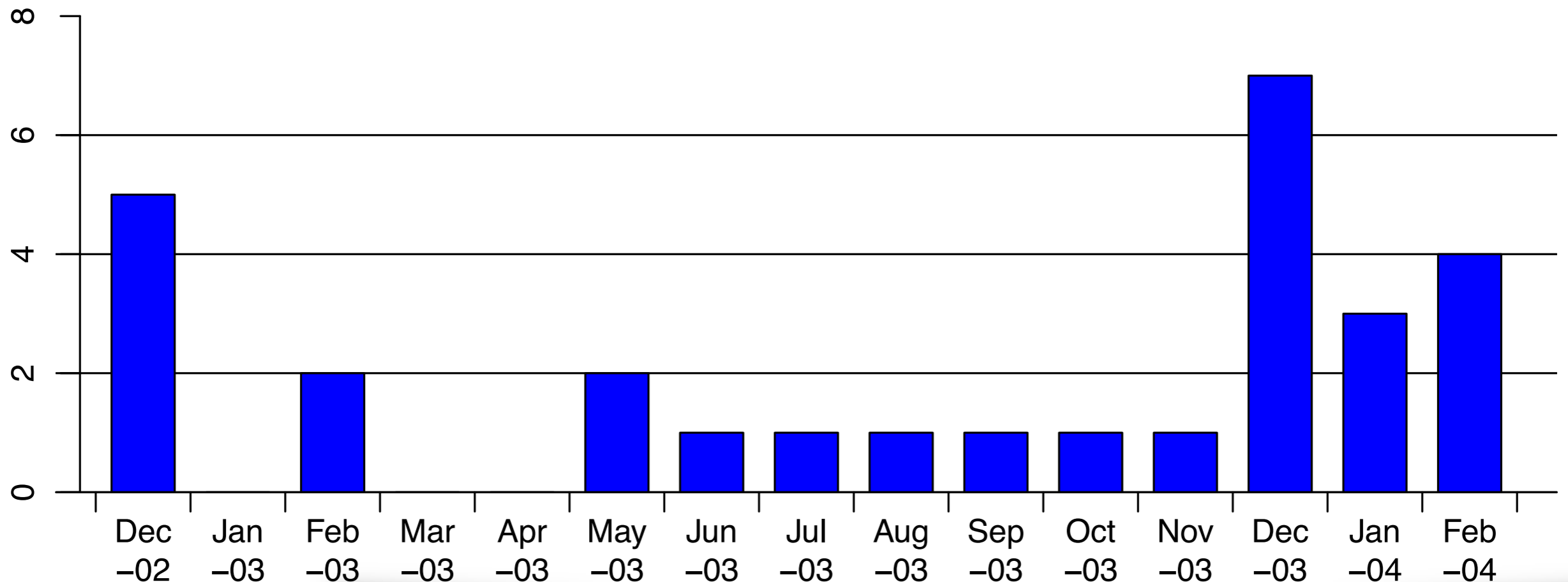
**This slide is for non-Dutch and/or for the young.
Details unimportant for today's story**

Ben Geen

- Trainee nurse, working in *Accident and Emergency* department of *Horton General Hospital* (Banbury, Oxfordshire, UK) up to Monday 9 February 2004
- Fully qualified and hence able to work unsupervised early December 2003
- Arrested, Monday 9 February 2004, under suspicion he deliberately harmed ca. 30 patients under his care in period 1 December 2003 – Thursday 5 February, 2004
- *Tried* on 16 counts of *Grievous Bodily Harm* and 2 of murder
- *Convicted*, 2006, of 15 GBH + 2 murders
- 17 concurrent *life sentences*, each **minimal** 30 years (no earlier *parole*)
- Failed appeal, 2009
- London Innocence Project, 2010, application to CCRC
- Gill (2014) analyses data obtained by LIP through FOI requests
- CCRC Application rejected, 2015
- Court orders CCRC to continue investigation, 2019

Key statistical graphic

Admissions to critical care from the emergency department, with a diagnosis of cardio-respiratory arrest and/or hypoglycaemia, data: ????

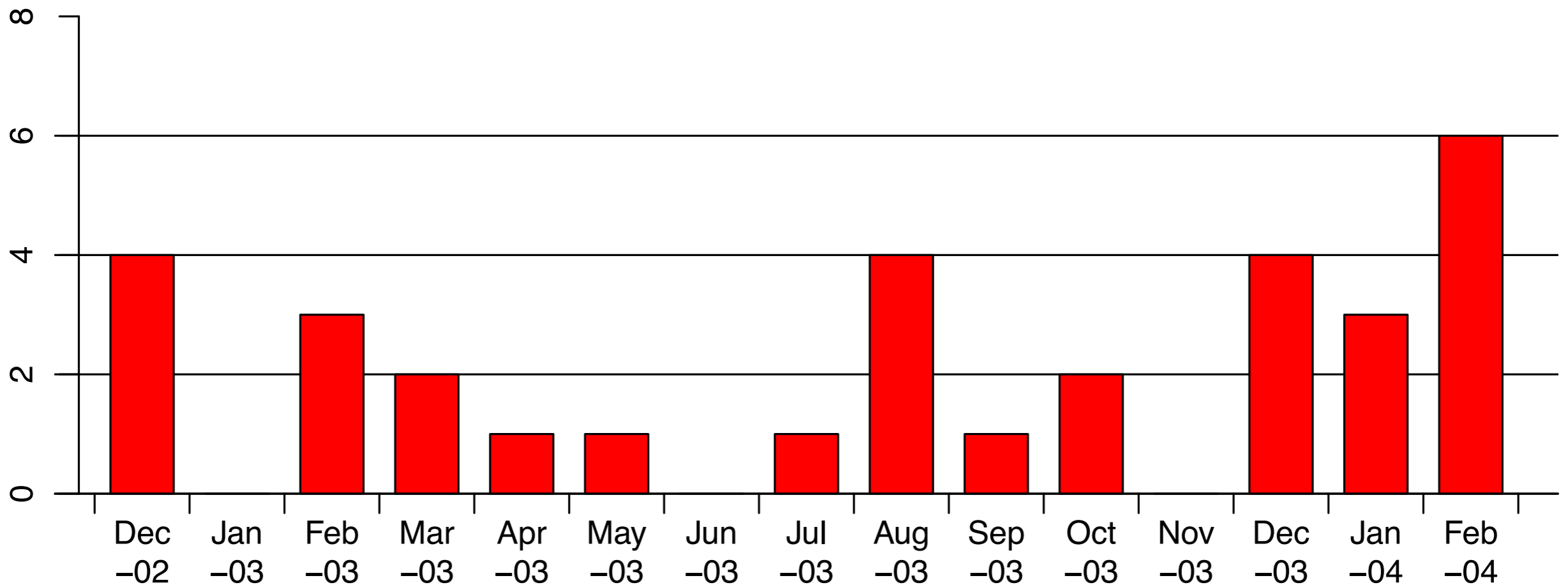


**From report on SUI 219 submitted to Crown Prosecution Service
by the Clinical Risk Management Committee,
Oxford Radcliffe Hospitals Trust, September 2004**

Key statistical graphic

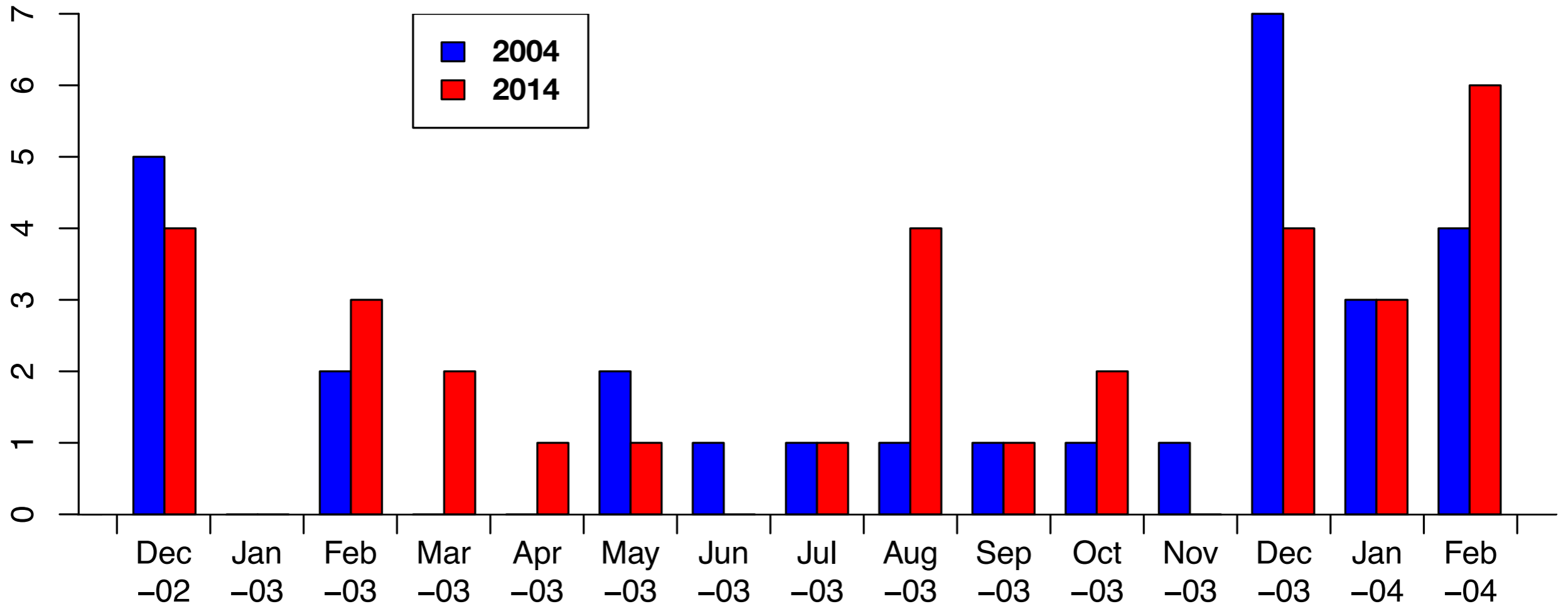
reconstructed (data: FOI)

Admissions to critical care from the emergency department, with a diagnosis of cardio-respiratory arrest and/or hypoglycaemia, ORHT (FOI)



Data from FOI requests, 2014 (RDG hired by defence for CCRC application)

Key statistical graphic



2004, SUI crisis team; 2014, FOI requests

Another data source

- Official *Enquiry* (2006)
- Purpose: why wasn't Ben Geen stopped earlier?
- “The number in December 2003 was six and this was only one more than in December 2002”

Why do the numbers keep changing?

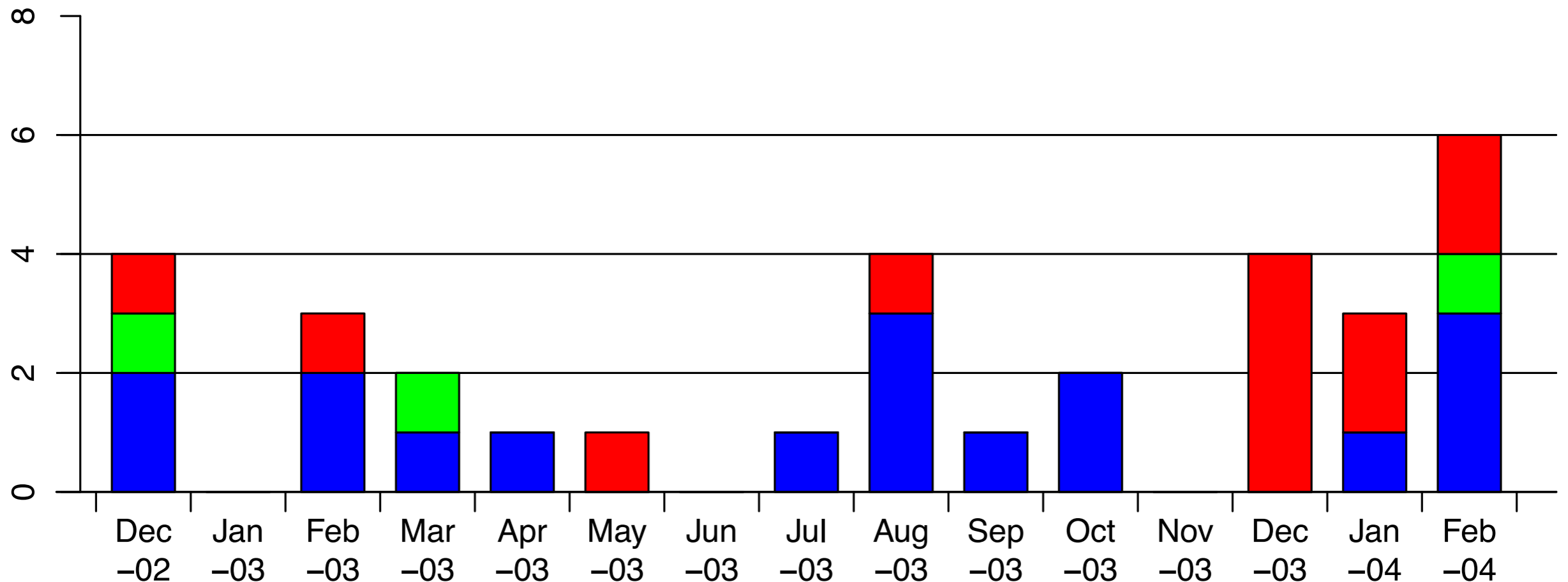
- I don't know. What do you think?

**But: the *case* is really
about the case-mix
of three categories of “arrests”**

- Cardio-respiratory arrest
- Respiratory arrest
- Hypoglycaemic arrest

Key statistical graphic

Admissions to CC from ED with CR, Hypo or Resp arrest, FOI data:
Cardio-respiratory (blue), hypoglycaemic (green), respiratory (red)



Prepared by RDG, data (2014) from FOI requests in 2013

Why is (nearly) everything red December 2003 – February 2004?

- What do you think?

More questions

- When did it all get red?
- Who made it all red?
- What was it, before?

NB: “resus” vs “CC” (intensive care)

“Resus” can take place in A&E

What is going on?

- Let's look at a longer time period
- First of all, let's look at the monthly totals of *all* admissions from ED to CC over 13 years
- Decompose into seasonal effect, trend, remainder (R : "st1")

STL: A Seasonal-Trend Decomposition Procedure Based on Loess

Robert B. Cleveland,¹ William S. Cleveland,² Jean E. McRae,² and Irma Terpenning²

Abstract: STL is a filtering procedure for decomposing a time series into trend, seasonal, and remainder components. STL has a simple design that consists of a sequence of applications of the loess smoother; the simplicity allows analysis of the properties of the procedure and allows fast computation, even for very long time series and large amounts of trend and seasonal smoothing. Other features of STL are specification of amounts of seasonal and trend smoothing that range, in a nearly continuous way, from a very small amount of smoothing to a very large amount; robust estimates of the trend and seasonal components that are not distorted by aberrant behavior in the data; specification of the period of the seasonal component to any integer multiple of the time sampling interval greater than one; and the ability to decompose time series with missing values.

Key words: Seasonal adjustment; time series; loess.

1. Introduction

STL is a filtering procedure for decomposing a seasonal time series into three components: trend, seasonal, and remainder. Figure 1 shows an example. The data, graphed in the first (top) panel, are daily average measurements of atmospheric carbon dioxide (CO₂) made at the Mauna Loa Observatory in Hawaii (Komhyr and Harris 1977). The second panel graphs a trend component: the low frequency variation in the data together with nonstationary, long-term changes in level. The third panel graphs a seasonal component: variation in the data at or near the seasonal frequency, which in this case is one cycle per year. The remainder component, shown in the fourth panel, is the remaining variation in the data beyond that in the seasonal and trend components. That is, suppose the data, the trend component, the seasonal component, and the remainder component are denoted by Y_v , T_v , S_v , and R_v , respectively, for $v = 1$ to N . Then

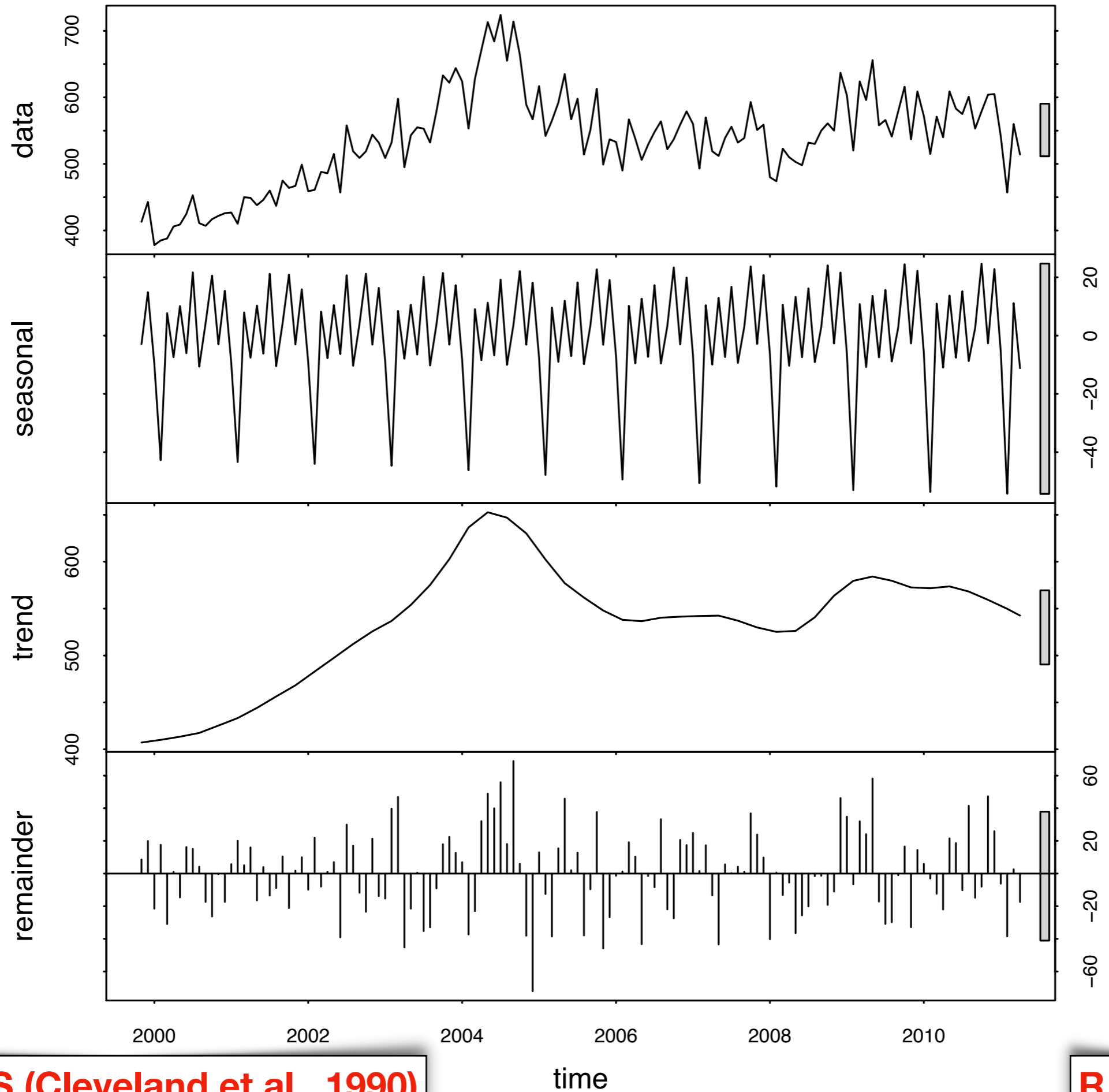
$$Y_v = T_v + S_v + R_v.$$

¹ University of Michigan, Ann Arbor, MI 48109, U.S.A.

² AT&T Bell Laboratories, 600 Mountain Avenue, Murray Hill, N.J. 07974, U.S.A.

Acknowledgements: We are very grateful to Trevor Hastie for discussions that led to the material in Section 5.

Monthly total admissions to ED

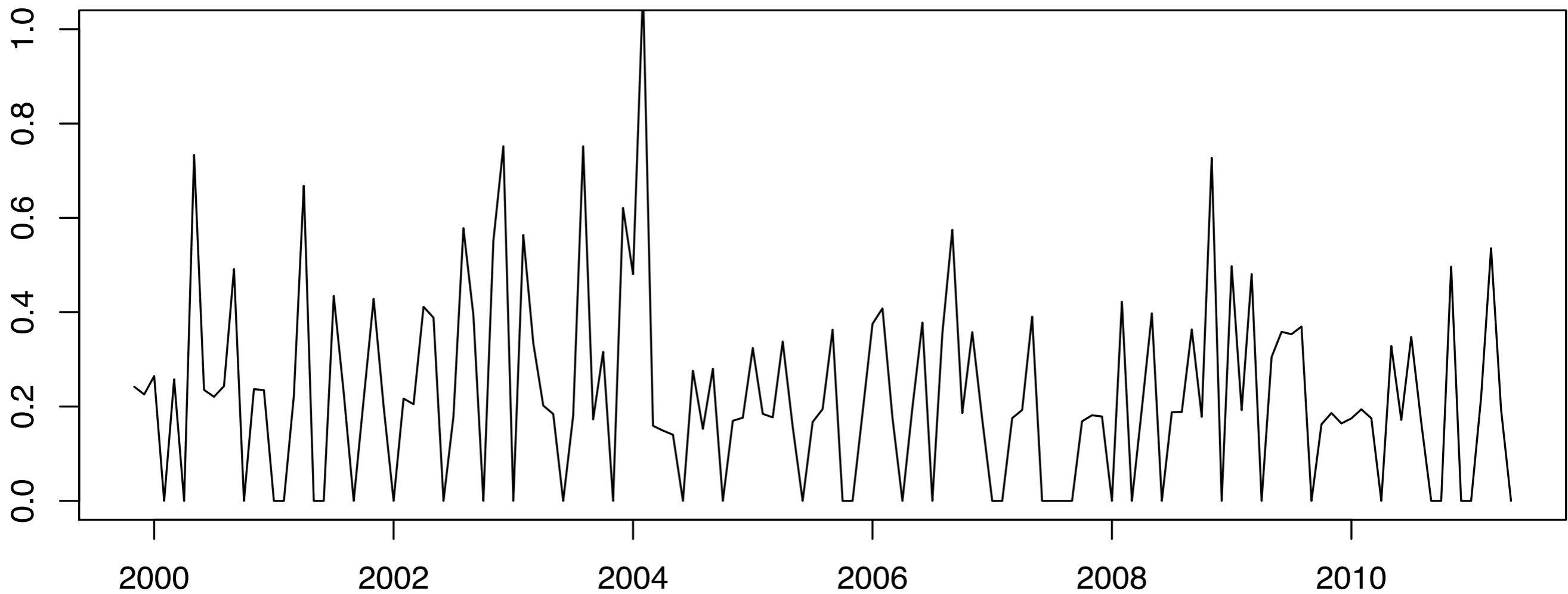


STL LOESS (Cleveland et al., 1990)

R function "stl"

Transfers / 100 admissions

From ER to CC with CR or Hypo arrest



What is going on?

- There's a lot to see here
- Maybe you have some ideas
- I'll give you some more info – the story of the syringe & the story of “unexplained respiratory arrests”
- I'll also tell you my ideas

Want to learn more?

- https://en.wikipedia.org/wiki/Benjamin_Geen
- <https://bengeen.wordpress.com/>
- <https://arxiv.org/abs/1407.2731> (“Rarity of RA in ED” by RDG)
- https://www.math.leidenuniv.nl/~gill/Statistics_and_Serial_Killer_Nurses.pdf
- <https://northseagrouplegal.nl/>
- <http://phpbb.northseagrouplegal.nl/>