Segal's law:

"A man with a watch knows what time it is. A man with two watches is never sure."

Prof Andrea Petróczi

Kingston University London

Doping prevalence figures

- Adverse Analytical Findings (AAF) **≈ 2%**
- Athlete Biological Passport (ABP): IAAF, haematological module (blood doping) **≈ 14% - 20%**
- Self-reports: UQM (random response model to provide full protection) **≈ 50%**

Sports Medicine
pp 1–9 | Cite as

Doping in Two Elite Athletics Competitions Assessed by Randomized-Response Surveys

Authors | Authors and affiliations

Rolf Ulrich, Harrison G. Pope Jr., Léa Cléret, Andrea Petróczi, Tamás Nepusz, Jay Schaffer, Gen Kanayama, R. Dawn Comstock, Perikles Simon

The tale of two cities

DAEGU (South Korea)

- 13th IAAF World Championship
  Aug 27 – Sept 4, 2011

IAAF World Championships 2011 Daegu

2011대구세계육상선수권대회
IAAF World Championships Daegu 2011

DOHA (Qatar)

- 12th quadrennial Pan-Arabic Games
  December 6-23, 2011

دورة الألعاب العربية 2011
ARAB GAMES DOHA

Selected methods

Unrelated Question Model (UQM)

- Established but limiting (df = 1)

EXAMPLE: If your birthday falls between 1st and 10th of the month (inclusive), answer Question A; otherwise answer Question B.

- QUESTION A: Is your birthday in the first half of the year? (Yes/No)
- QUESTION B: *Did you do X....? (Yes/No)*

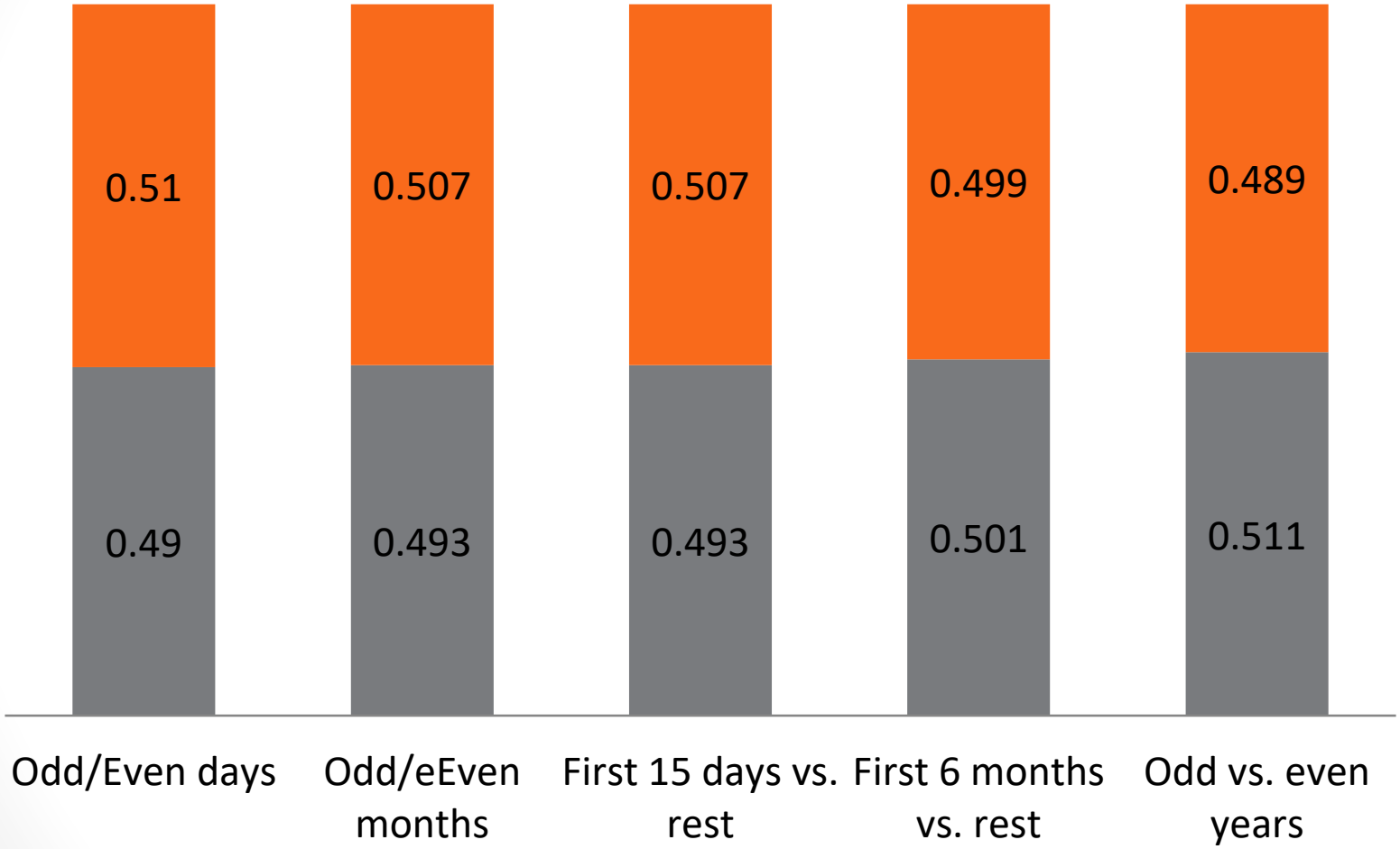
Single Sample Count (SSC)

- Promising (df > 1) but very new (in 2012) and under development

EXAMPLE: How many 'Yes' answers do you have in total?

- My birthday is in the first half of the year
- My birthday is in Feb/Apr/Jun/Aug/Oct/Dec
- *I did.....*
- My birthday is in the first half of the month
- My birthday is on an even day

Distribution of birthdays



N = 31,159,563 (England & Wales, live birth between 1993 – 2009)

Data collection

DAEGU (IAAF WC)

- SSC and UQM in random order
- Identical target Q
- 21 languages
- N = 1,203

DOHA (Arab Games)

- Randomly allocated to SSC or UQM
- 2 sets
  - Doping
  - Nutritional supplement
- 3 languages
- N = 965 (UQM), 1,020 (SSC)

Results

DAEGU (IAAF WC)

UQM:

- past-year doping was 43.6% (95% confidence interval 39.4-47.9%)
- SSC ≠ UQM

DOHA (Arab Games)

UQM:

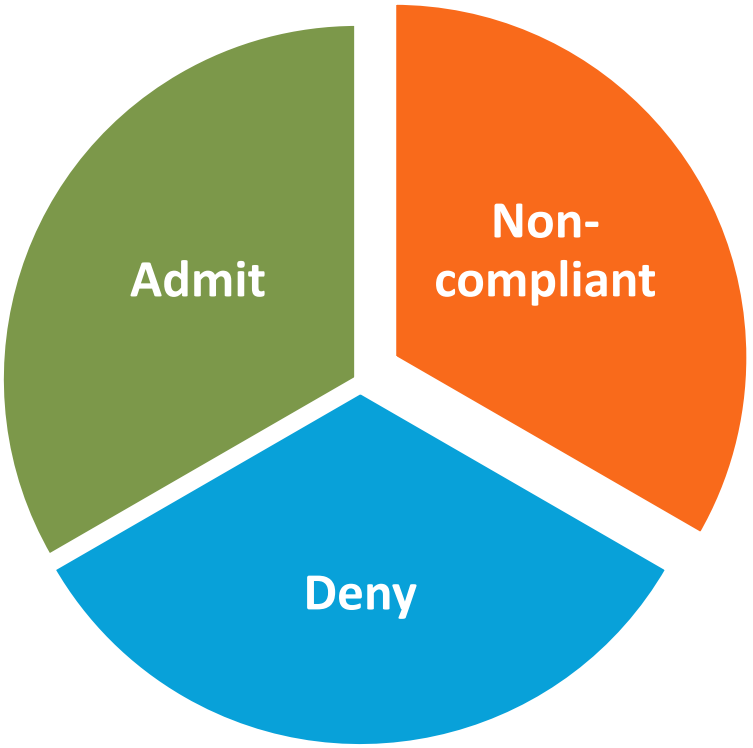
- past-year doping use was 57.1% (52.4-61.8%)
- past-year supplement use was 70.1% (65.6-74.7%)
- SSC ≠ UQM

How can we explain the difference…?

Noncompliance

- Proportion of the sample we do not know much about

- Major threat to Random Response / Fuzzy Response techniques



Noncompliance effect in UQM

REMEMBER: If your birthday falls between 1st and 10th of the month (inclusive), answer Question A; otherwise answer Question B.

- QUESTION A: Is your birthday in the first half of the year? (Yes/No) [p_2 = 50/50 or 0.5]
- **QUESTION B:** ***Have you violated anti-doping in the past 12 months by knowingly using prohibited substance or methods? (Yes/No)*** **[expected p_1 = 2/3 or 0.66]**

IF $p_1 < 2/3$ [= more than the expected 1/3 answers QA]
$\Rightarrow$ pulls p^ toward 50% (QA)

$$\hat{p} = \frac{\lambda - p_2(1 - p_1)}{p_1}$$

IF $p < 0.5 \Rightarrow$ inflates estimation
IF $p > 0.5 \Rightarrow$ deflates estimation

Detecting noncompliance in the SSC

- Possible with the '0 or 5' response option
- *p* of 0 is 0.0625 is irrespective of *d*; thus *p* of '0 or 5' is 1/16 (6.25%)
- The significant difference between the observed *p* and the expected *p* = .0625 is the evidence for noncompliance
- DAEGU: The observed *p* of '0 or 5' was 0.128 >> 0.0625 ($z = 8.358$, $p < 0.001$) $\Rightarrow$ evidence for noncompliance
- DOHA: The observed p of '0 or 5' was 0.087 for doping ($z = 3.1262$, $p = 0.0018$) and 0.0797 for dietary supplements ($z = 2.1947$, $p = 0.0282$) $\Rightarrow$ evidence for noncompliance

The behavioural side (UQM)

"I would cheat the rules (think of a different b-day) to make my answer seem technically 'truthful'".

Lessons & future directions

- "*Never go to sea with two chronometers; take one or three.*"

- Focus on the (long neglected) behavioural side
- Noncompliance must be better understood and handled
- Motivation must be considered
  - *It's safe, but why should I tell you?*
- Clean athletes' frustration with the (unnecessary) 'cloak & dagger stuff' must be addressed