



# DOPING AUTORITEIT

## **Prevalence of doping use in elite sports**

Olivier de Hon

Play The Game, 29 November 2017



# **Contents**

- Warming-up
- Methods of assessing prevalence
- Known prevalences in elite sports
- Directions/Conclusions



**DOPING  
AUTORITEIT**

# **Important topic; rarely addressed**

---

REVIEW ARTICLE

---

J SPORTS MED PHYS FITNESS 1997;37:218-24

## **Epidemiologic approach of doping in sport**

A review

---

P. LAURE

---



**DOPING  
AUTORITEIT**

# **Important topic; rarely addressed**

Sports Med (2015) 45:57–69  
DOI 10.1007/s40279-014-0247-x

REVIEW ARTICLE

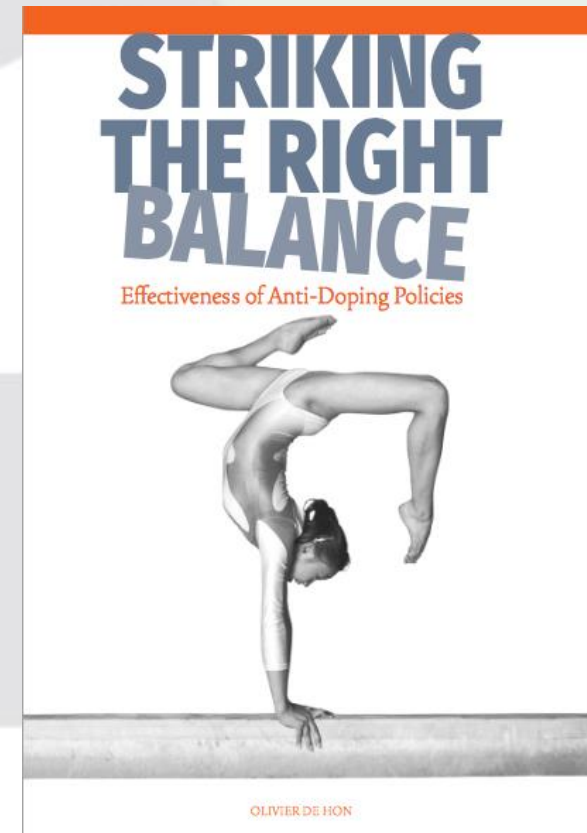
## **Prevalence of Doping Use in Elite Sports: A Review of Numbers and Methods**

Olivier de Hon · Harm Kuipers ·  
Maarten van Bottenburg



## Starting point of this discussion

“Accurate data on the prevalence of doping use are necessary elements of evaluations of the effectiveness of anti-doping policies.”





# Intentional versus non-intentional

- We will never know for sure
- Big difference in perceived degree of guilt
- Big difference in level of sanctions
- Big difference in preventive approaches





DOPING  
AUTORITEIT

**What is the percentage of intentional doping users in elite sports?**





# **Methods of prevalence studies**

1. Laboratory-based chemical analyses
  - Doping control test results
  - Population estimates based on biological parameters
2. Questionnaires
  - Standard questionnaires
  - Randomized Response method
3. Inferences from performances
4. Inferences from ego-documents





# Doping control test results

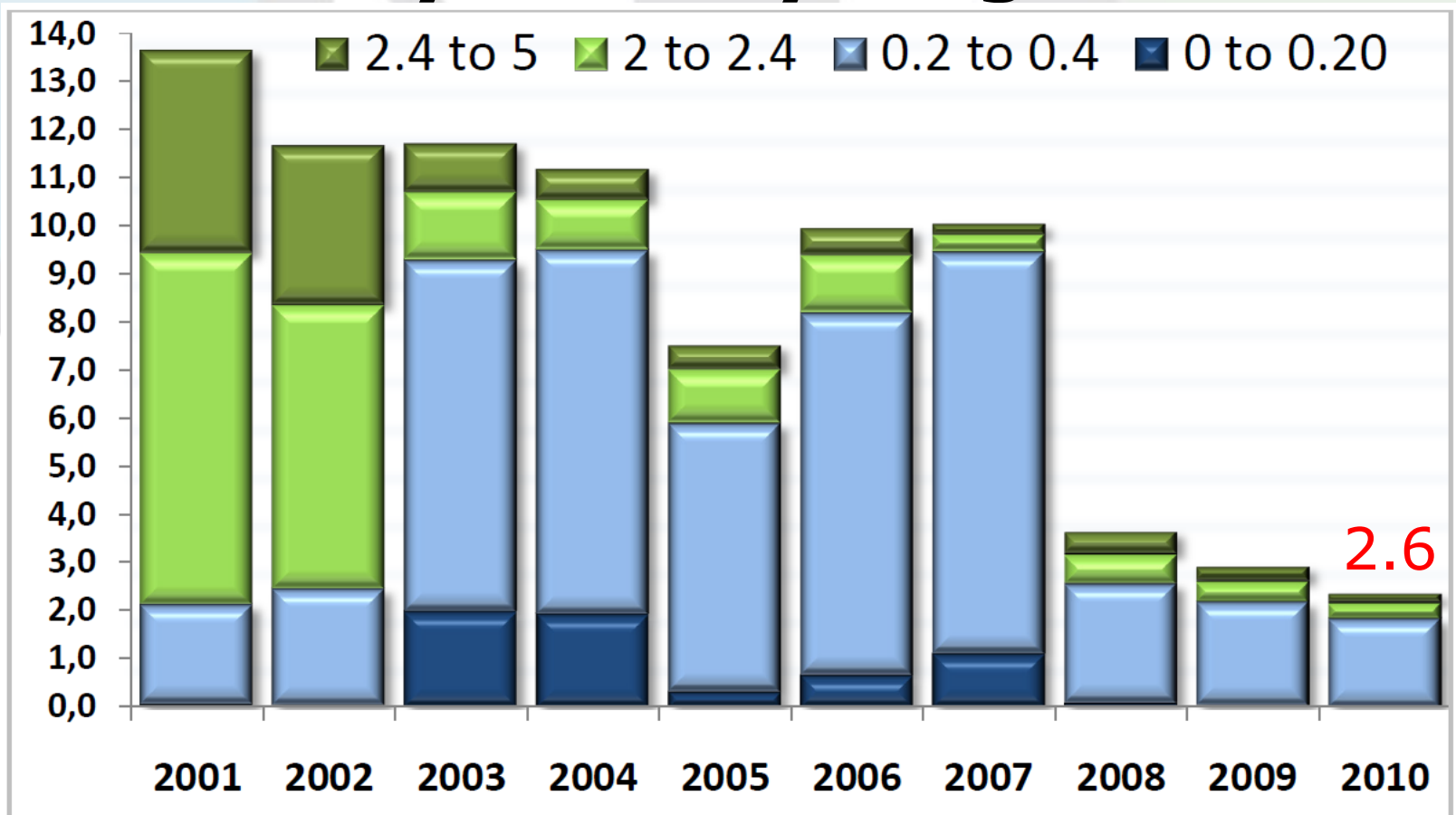
Adverse analytical findings (AAFs)

Since 1987: **1.0** – **2.5**%

- Too low? Not all substances can be found at all times
- Too high? This includes TUEs and ATFs

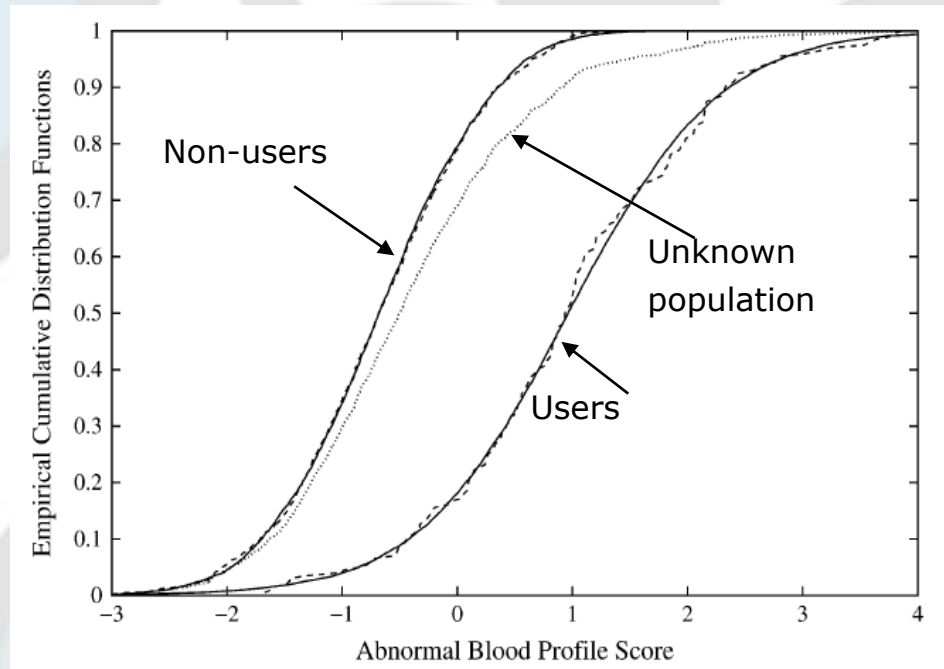


# Reticulocytes in cycling





# Population estimates



- Blood profile indicators  
(here: 16% estimate of blood-based doping)

16



## Estimates in elite Track & Field

- Population estimates based on blood values
- Samples from 2001 – 2010
- 7289 samples in 2737 athletes
- Great variation between countries
- Average: **14%** (range countries **1-48%**)



## 2. Questionnaires

- Straightforward question “Have you ever...”:
  - **1-3%** of Dutch elite athletes
  - 1-**12%** of (athletic) students
  - 1-**70%** if fitness athletes are included
- But do they speak the truth?



# Randomized Response Method

- Used in many 'socially sensitive' subjects
- Offers protection by means of deliberate mathematical confounder
- Example:

Have you ever used doping in order to improve your athletic performance?







## Simplistic example of RRM

- Coin toss (do NOT show outcome to others)
- Finger in air when tails & intentional doping
- In this example: 20% intentional doping use

In room

100





# Randomized Response & doping

Publication (peer reviewed)	Target group	n	Prevalence of doping use (%)
			26 <sub>48</sub>
Pitsch et al. 2007	German adult elite	448	26-48 ever; 20 20-39 last year 39
Striegel et al. 2010	German junior elite	480	3-11 ever 3 11
Simon et al. 2006	Fitness centre visitors	500	8-17 ever 8 17
Stubbe et al. 2013	Fitness centre visitors	447	5-23 last year 5 23
Ulrich et al. 2017	Elite Track & Field (WC)	1203	39-48 last year 39 48
Ulrich et al. 2017	Elite Arab athletes	965	52-62 last year 52 62

Publication (non-peer reviewed)	Target group	n	Prevalence of doping use (%)
Duiven & De Hon 2015	Dutch elite (WC/OG/PG) Dutch elite (national)	740 3142	2-9 last year 2 9 13 2-13 last year 2



# **Sources of variation in RR-results**

- Choice of 'chance'-element
- Wording of sensitive question
- Methodology of answering
- Behavior of interviewees
- Target group



4.2

# So how many?

1.0



# DOPING AUTORITEIT

14



48



70

2.5



62

18



## Summary: prevalence doping use

- Research on this important issue is very rare
- Population-based estimates (based on biological parameters) & Randomized Response give the best estimates
- Highly variable between sport, level, country



## Directions for future studies

- More transparency in passport data (group level)
- Unified approaches for Randomized Response (chance element, questions, etc.)
- Separation of intentional / non-intentional use
- Keep discussions & research going (wastewater, perceptions of doping influence, re-analysis of old samples, ...)





**DOPING  
AUTORITEIT**

## **Stone cold figures**

- 4-62% in various international elite groups
- More to come...



## General conclusion

“Tools to evaluate the prevalence of doping use in sports are readily available; they only need to be used more often.”



# DOPING AUTORITEIT

**Thank you!**

Mail: [o.dehon@dopingautoriteit.nl](mailto:o.dehon@dopingautoriteit.nl)

Web: [www.dopingautoriteit.nl](http://www.dopingautoriteit.nl)

Tel: +31 – (0)10 – 201 01 50



## Dutch elite athletes (OG/PG/WC level)

- Last year intentional use: **4.2%** (1.5-8.5%)
- Mostly used: blood manipulations (3.7%)
- Most frequent combination use: all groups
- There are no ex-users

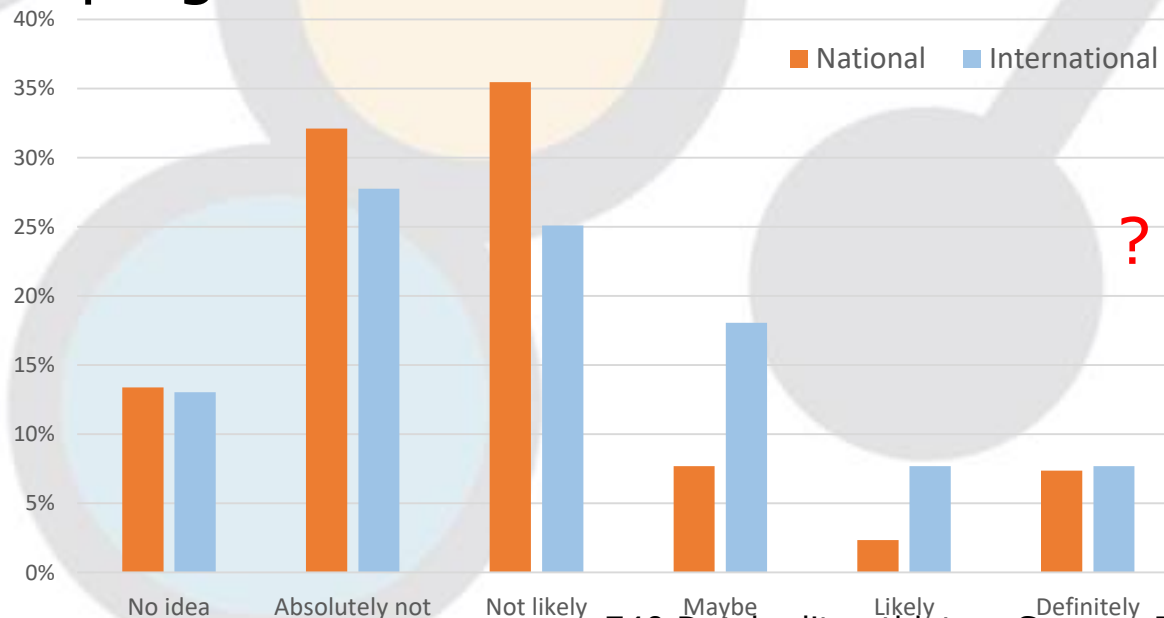
→ 95.8% is not an intentional user of doping  
→ 'cheaters' are persistent





# The “Graeme Steel”-question

“In the previous 12 months I have participated in an athletic event where the result was influenced by doping use”





## Estimating too high = normal?

- According to the 'Availability Heuristic' theory humans will overestimate the chance of something happening that can be recalled easily, but in fact is very rare

Examples:

- Planecrash
- Meningitis
- Doping in elite sports?





## **Something to think about**

- Prevalence of nicotine-use in various sports:  
19-56%
- Are permitted substances used as often as prohibited substances?



## On 'Population estimates' (1)

- For example: 20 random hemoglobin-values:

A: 13,0; B: 15,1; C: 17,2; D: 13,3; E: 13,6;  
F: 16,9; G: 14,3; H: 16,6; I: 13,1; J: 15,5;  
K: 15,9; L: 16,3; M: 17,6; N: 16,7; O: 13,9;  
P: 17,1; Q: 13,2; R: 17,3; S: 17,5; T: 14,6 g/dl.



## On 'Population estimates' (2)

- You list the values in order:

13,0 – 13,1 – 13,2 – 1

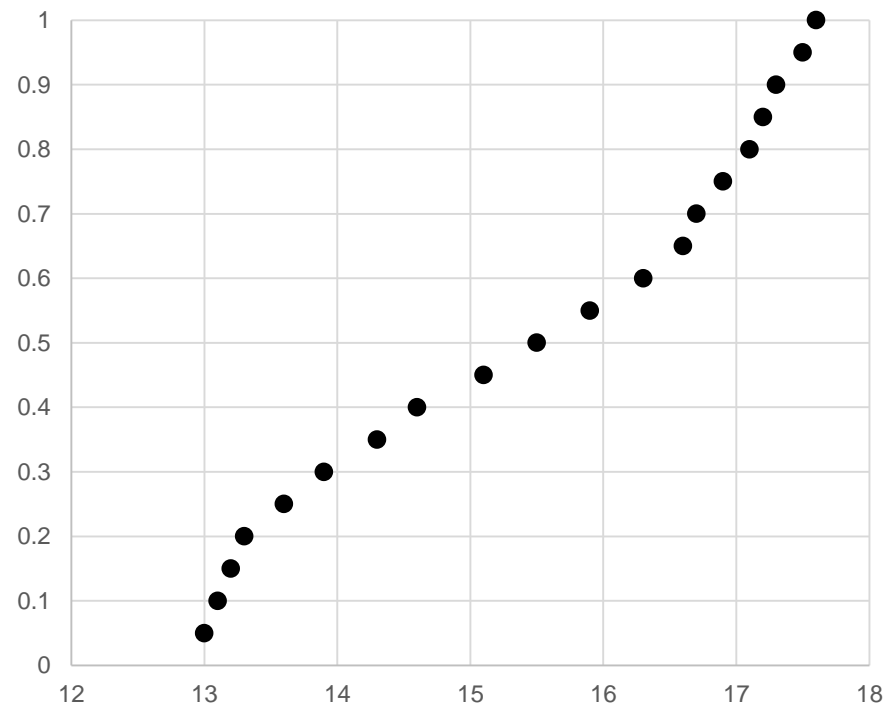
13,9 – 14,3 – 14,6 – 1

15,9 – 16,3 – 16,6 – 1

17,1 – 17,2 – 17,3 – 1

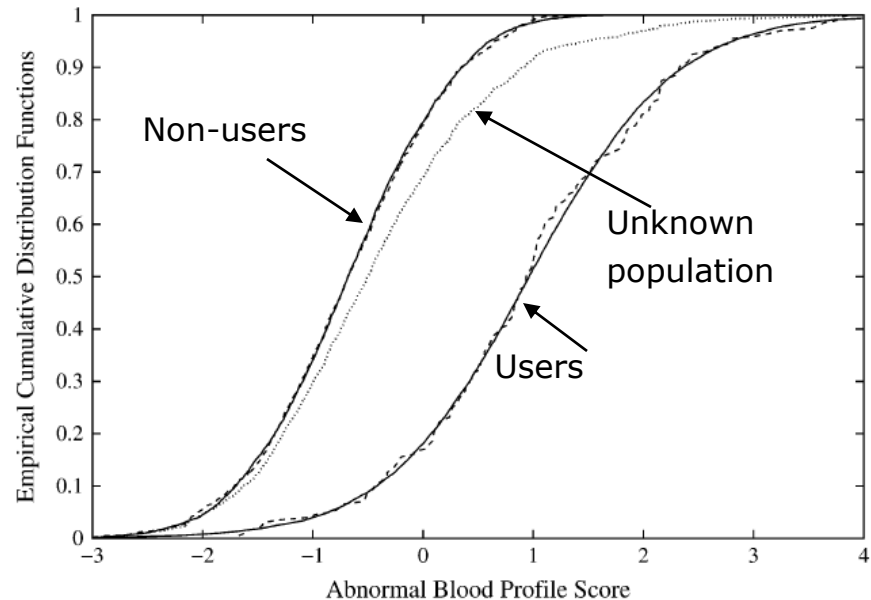
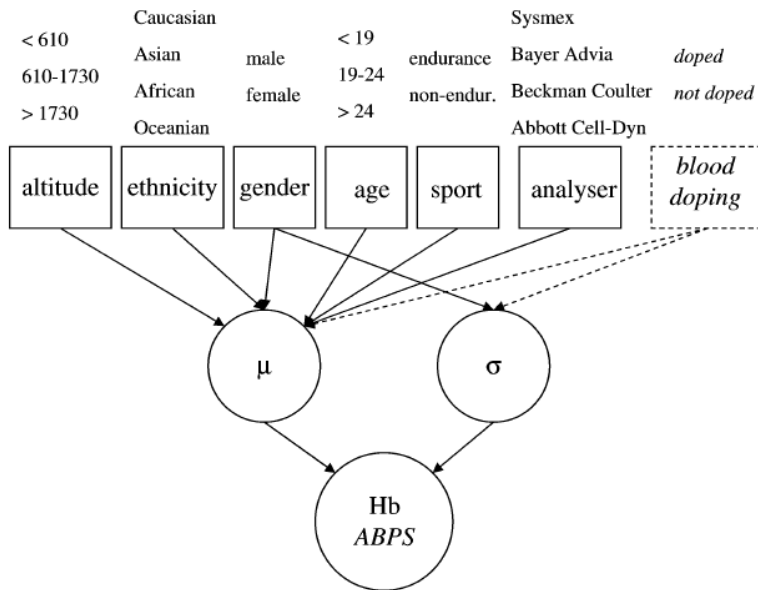
Which yields a graph:

Cumulative Distribution Function





# Population estimates (principle)



- Bayesian network

- Blood profile indicators (Hb, Hct, ABPS, ...)