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
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
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.”

Source: www.doping.nl
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
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

Sources: IOC and WADA publications
Population estimates

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

Source: Sottas et al. 2008
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
Randomized Response & doping

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

<table>
<thead>
<tr>
<th>Publication (non-peer reviewed)</th>
<th>Target group</th>
<th>n</th>
<th>Prevalence of doping use (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duiven &amp; De Hon 2015</td>
<td>Dutch elite (WC/OG/PG)</td>
<td>740</td>
<td>2-9 last year</td>
</tr>
<tr>
<td></td>
<td>Dutch elite (national)</td>
<td>3142</td>
<td>2-13 last year</td>
</tr>
</tbody>
</table>
Sources of variation in RR-results

- Choice of ‘chance’-element
- Wording of sensitive question
- Methodology of answering
- Behavior of interviewees
  - Target group
So how many?
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.”
Thank you!

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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

Source: Dopingautoriteit, 2015
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?

Source: Marclay et al. 2011
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:


Which yields a graph:
Population estimates (principle)

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

Source: Sottas et al. 2008