

UNIVERSITY OF BERGEN

Department of Psychosocial Science

# Illicit Anabolic Steroid Use: Global and Nordic Prevalence

**Dominic Sagoe**

[dominic.sagoe@psysp.uib.no](mailto:dominic.sagoe@psysp.uib.no)

**Seminar on Anabolic Steroids**

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# Outline

- ❖ Human enhancement drugs & methods
  - Anabolic steroids
  
- ❖ Prevalence
  - Global
    - Methods
    - Results
  
  - Nordic
    - Methods
    - Results
  
  - Norway
    - Emerging Issues



# Human Enhancement Drugs & Methods



# Anabolic-Androgenic Steroids (AAS)

- A group of hormones
  - Testosterone (the natural male hormone)
  - Synthetic testosterone
- All AAS have two effects:
  - Anabolic: “muscle building” and
  - Androgenic: “masculinizing”
- ✧ Increased protein synthesis resulting in muscle growth
- Why popular? Users:
  - gain large amounts of muscle
  - burn large amounts of body fat
    - beyond natural limits
- Negative effects? Others discuss soon!





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Annals of Epidemiology

journal homepage: [www.annalsofepidemiology.org](http://www.annalsofepidemiology.org)

## Review article

## The global epidemiology of anabolic-androgenic steroid use: a meta-analysis and meta-regression analysis

Dominic Sagoe MPhil, PhD Cand<sup>a,\*</sup>, Helge Molde PhD<sup>b</sup>, Cecilie S. Andreassen PhD<sup>a,c</sup>,  
Torbjørn Torsheim PhD<sup>a</sup>, Ståle Pallesen PhD<sup>a</sup>

<sup>a</sup> Department of Psychosocial Science, University of Bergen, Bergen, Norway

<sup>b</sup> Department of Clinical Psychology, University of Bergen, Bergen, Norway

<sup>c</sup> The Competence Center, Bergen Clinics Foundation, Bergen, Norway

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## ABSTRACT

**Purpose:** To estimate the global lifetime prevalence rate of anabolic-androgenic steroid (AAS) use and investigate moderators of the prevalence rate.

**Methods:** A meta-analysis and meta-regression analysis was performed using studies gathered from searches in PsycINFO, PubMed, ISI Web of Science, and Google Scholar among others. Included were 187 studies that provided original data on 271 lifetime prevalence rates. Studies were coded for publication year, region, sample type, age range, sample size, assessment method, and sampling method. Heterogeneity was assessed by the  $I^2$  index and the  $Q$ -statistic. Random effect-size modeling was used. Sub-group comparisons were conducted using Bonferroni correction.

**Results:** The global lifetime prevalence rate obtained was 3.3% (95% confidence interval [CI], 2.8–3.8;  $I^2 = 99.7$ ,  $P < .001$ ). The prevalence rate for males, 6.4% (95% CI, 5.3–7.7,  $I^2 = 99.2$ ,  $P < .001$ ), was significantly higher ( $Q_{test} = 100.1$ ,  $P < .001$ ) than the rate for females, 1.6% (95% CI, 1.3–1.9,  $I^2 = 96.8$ ,  $P < .001$ ). Sample type (athletes), assessment method (interviews only and interviews and questionnaires), sampling method, and male sample percentage were significant predictors of AAS use prevalence. There was no indication of publication bias.

**Conclusion:** Nonmedical AAS use is a serious widespread public health problem.

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# Global Prevalence

- Lifetime Prevalence – ‘Ever’ use
- Literature search
  - PubMed, PsycINFO, ISI Web of Knowledge, Google Scholar, websites, reference checks
  - 16,626 hits
  - 187 articles
  - Multiple prevalence rates: 84
  - Total original prevalence rates: 271
- Statistical analysis
  - Meta-analysis:
    - Comprehensive Meta-Analysis 2.0 (Biostat Inc.)



# Overall Prevalence

|                     | N   | p%  | 95% CI  | Q        | df(Q) | I <sup>2</sup> |
|---------------------|-----|-----|---------|----------|-------|----------------|
| Overall             | 271 | 3.3 | 2.8–3.8 | 86828.2* | 270   | 99.7           |
| Male                | 112 | 6.4 | 5.3–7.7 | 13626.6* | 110   | 99.2           |
| Female <sup>a</sup> | 83  | 1.6 | 1.3–1.9 | 2525.1*  | 82    | 96.8           |

$P < .001$ .

a: p% is significantly lower than p% for males ( $P < .001$ ).



# Regional

|                            | N   | p%                | 95% CI    |
|----------------------------|-----|-------------------|-----------|
| Middle East                | 7   | 21.7*             | 13.5–32.9 |
| Trans-Region               | 2   | 6.0*              | 0.1–79.5  |
| South America              | 5   | 4.8*              | 1.2–16.7  |
| Europe                     | 81  | 3.8*              | 2.4–5.8   |
| North America <sup>a</sup> | 126 | 3.0*              | 2.7–3.4   |
| Oceania <sup>a</sup>       | 38  | 2.6*              | 2.1–3.3   |
| Africa <sup>a</sup>        | 11  | 2.4*              | 1.2–4.8   |
| Asia                       | 1   | 0.2 <sup>ns</sup> | 0–3.5     |

$P < .001$ .

a: p% is significantly lower than p% in the Middle East ( $P < .05$ ).

ns: not significant





# Sample Type

|                           | N   | p%    | 95% CI    |
|---------------------------|-----|-------|-----------|
| Recreational sportspeople | 18  | 18.4* | 11.2–28.6 |
| Athletes                  | 48  | 13.4* | 9.7–18.2  |
| Prisoners and arrestees   | 6   | 12.4* | 5.8–24.7  |
| Drug users                | 20  | 8.0*  | 3.6–16.8  |
| High school               | 109 | 2.3*  | 2.1–2.5   |
| Non-athletes              | 70  | 1.0*  | 0.7–1.3   |

$P < .001$ .



# Publication year

|                        | N   | p%   | 95% CI   |
|------------------------|-----|------|----------|
| 1970–1979              | 3   | 9.2* | 0.6–62.2 |
| 1980–1989              | 16  | 7.8* | 3.9–15.2 |
| 2000–2013              | 174 | 3.2* | 2.6–3.9  |
| 1990–1999 <sup>a</sup> | 78  | 2.9* | 2.6–3.4  |

$P < .001$ .

a: p% is significantly lower than p% in the 1970s ( $P < .008$ ).



## Research report

# Anabolic-androgenic steroid use in the Nordic countries: A meta-analysis and meta-regression analysis

DOMINIC SAGOE & TORBJØRN TORSHEIM & HELGE MOLDE & CECILIE SCHOU ANDREASSEN  
& STÅLE PALLESEN

## ABSTRACT

**AIMS** – To investigate the lifetime prevalence and moderators of non-medical AAS use in the five Nordic countries. **METHODS** – We conducted a meta-analysis and meta-regression using studies gathered from searches in PsycINFO, PubMed, ISI Web of Science, Google Scholar, and reference checks. Included were 32 studies that provided original data on 48 lifetime prevalence rates based on a total of 233,475 inhabitants of the Nordic countries. **RESULTS** – The overall lifetime prevalence obtained was 2.1% [95% confidence interval (CI): 1.3-3.4,  $I^2 = 99.5$ ,  $P < 0.001$ ]. The prevalence for males, 2.9% (95% CI: 1.7-4.8,  $I^2 = 99.2$ ,  $P < 0.001$ ), was significantly higher ( $Q_{bet} = 40.5$ ,  $P < 0.001$ ) than the rate for females, 0.2% (95% CI: 0.1-0.4,  $I^2 = 90.5$ ,  $P < 0.001$ ). Sweden has the highest prevalence of AAS use: 4.4%, followed by Norway: 2.4%, Finland: 0.8%, Iceland: 0.7%, and Denmark: 0.5%. Country, sample type, and male sample percentage significantly predicted AAS use prevalence in a meta-regression analysis. No indication of publication bias was found. **CONCLUSION** – Though subject to some limitations, our findings suggest that non-medical AAS use should be regarded as a serious public health problem in the Nordic countries.

**KEYWORDS** – anabolic steroids, Nordic countries, Scandinavia, prevalence, meta-analysis, meta-regression

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*Nordic Studies on Alcohol and Drugs* – Forthcoming



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# Prevalence in the Nordic Countries

- Nordic specific version of the global
- Literature search
  - PubMed, PsycINFO, ISI Web of Knowledge, Google Scholar, websites, reference checks
  - Global: 16,626 hits → 187 articles
  - Nordic-specific search: + 25 new articles
  - Articles included: 32
  - Total original prevalence rates: 48
- Statistical analysis
  - Meta-analysis:
    - Comprehensive Meta-Analysis 3.0 (Biostat Inc.)



# Overall Prevalence

|         | N  | p%  | 95% CI  | Q       | df(Q) | I <sup>2</sup> |
|---------|----|-----|---------|---------|-------|----------------|
| Overall | 48 | 2.1 | 1.3–3.4 | 8724.4* | 47    | 99.5           |
| Male    | 41 | 2.9 | 1.7–4.8 | 5107.5* | 40    | 99.2           |
| Female  | 32 | 0.2 | 0.1–0.4 | 326.8*  | 31    | 90.5           |

$P < .001$ .



# Country

|         | N  | p%                | 95% CI  |
|---------|----|-------------------|---------|
| Sweden  | 20 | 4.4*              | 2.0–9.4 |
| Norway  | 13 | 2.4*              | 1.2–4.7 |
| Finland | 7  | 0.8*              | 0.3–1.8 |
| Iceland | 5  | 0.7**             | 0.5–0.9 |
| Denmark | 3  | 0.5 <sup>ns</sup> | 0.4–0.6 |

\* $P < .001$

\*\* $P < .01$

<sup>ns</sup> not significant



# Sample Type

|                           | N  | p%                | 95% CI    |
|---------------------------|----|-------------------|-----------|
| Drug users                | 2  | 59.2*             | 16.5–91.4 |
| Athletes                  | 5  | 32.3*             | 22.0–44.7 |
| Prisoners and arrestees   | 3  | 26.2*             | 11.5–49.3 |
| Recreational sportspeople | 1  | 2.1 <sup>ns</sup> | 1.5–2.8   |
| Non-athletes              | 3  | 1.2*              | 0.8–1.7   |
| High school               | 34 | 0.9*              | 0.7–1.1   |

$P < .001$ .

<sup>ns</sup> not significant



# Publication year

|           | N  | p%     | 95% CI    |
|-----------|----|--------|-----------|
| 1970–1989 | 3  | 44.8** | 18.5–74.4 |
| 1990–1999 | 7  | 3.8*   | 1.3–11.1  |
| 2000–2013 | 38 | 1.4*   | 0.8–2.6   |

\*  $P < .001$ .

\*\*  $P < .01$ .





# Norway: Emerging Issues

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ORIGINAL ARTICLE

## Prevalence and Correlates of Anabolic–Androgenic Steroid Use in a Nationally Representative Sample of 17-Year-Old Norwegian Adolescents

Dominic Sagoe<sup>1</sup>, Cecilie Schou Andreassen<sup>1,2</sup>, Helge Molde<sup>3</sup>, Torbjørn Torsheim<sup>1</sup>  
and Ståle Pallesen<sup>1</sup>

<sup>1</sup>Department of Psychosocial Science, University of Bergen, Christiesgate 12, 5015 Bergen, Norway; <sup>2</sup>The Competence Centre, Bergen Clinics Foundation, Vestre Torggate 11, 5015 Bergen, Norway; <sup>3</sup>Department of Clinical Psychology, University of Bergen, Christiesgate 12, 5015 Bergen, Norway

*Substance Use & Misuse*



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# Methods

- 3000 17-year-olds (1500 female)
  - Selected from the National Population Registry
  - Survey
    - Questionnaires (Post + online option)
    - Incentive: NOK 200 gift card
    - < 2 reminders
    - Final sample = 2055 (RR = 70.4%)
      - 1088 female, 963 male, 4 undisclosed gender



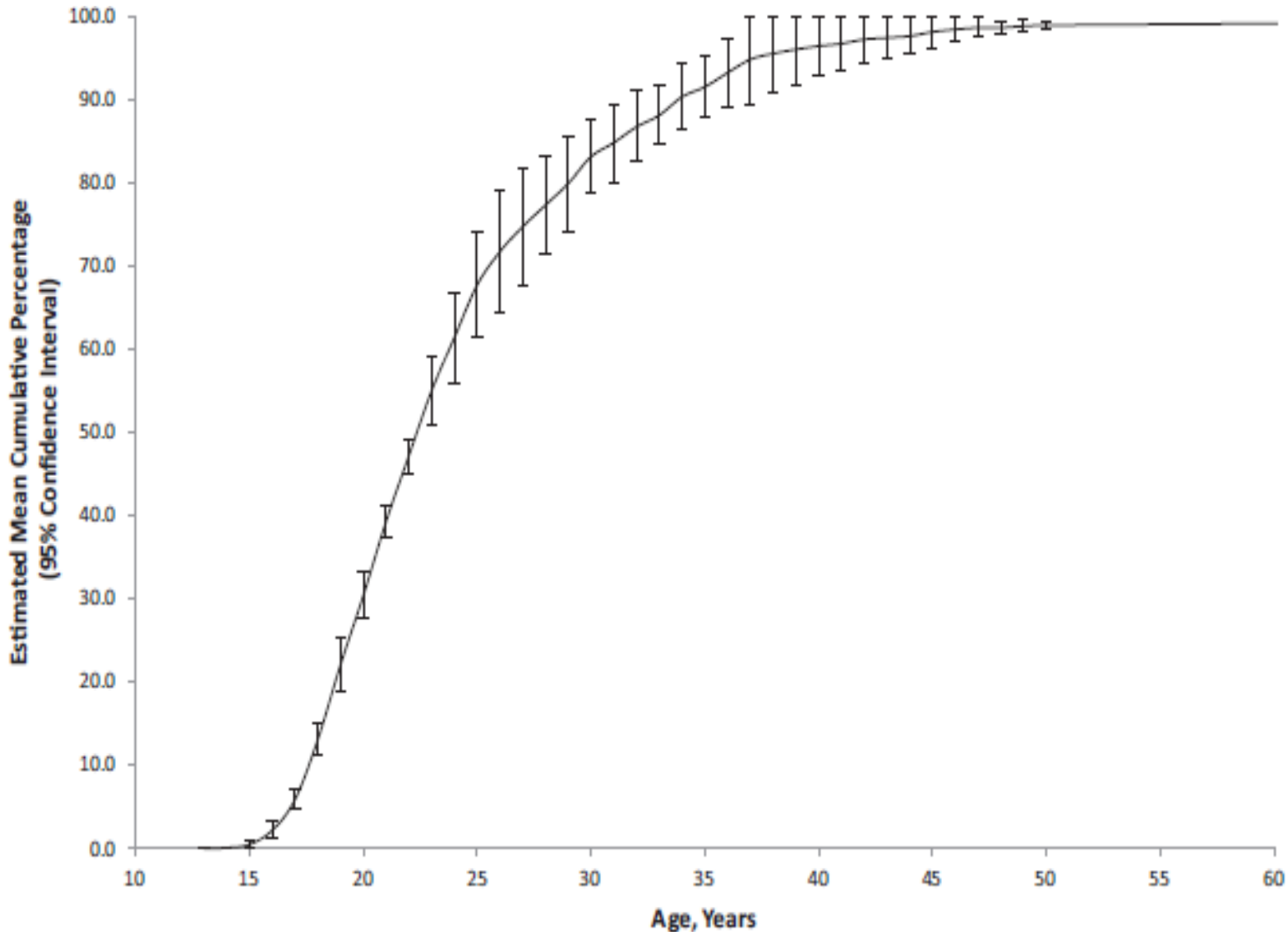
# Results

## Prevalence

|             | p%    | 95% CI      |
|-------------|-------|-------------|
| Lifetime    | 0.30  | 0.28–0.32   |
| Current     | 0.25  | 0.23–0.30   |
| Male        | 0.52  | 0.47–0.53   |
| Female      | 0.09  | 0.084–0.096 |
| 'Know' user | 19.39 | 19.37–19.41 |



# Why is 0.3% prevalence in 17-year-old Norwegians high?



Pope et al. (2014). The lifetime prevalence of anabolic-androgenic steroid use and dependence in Americans: Current best estimates. *The American Journal on Addictions*, 23, 371–377.



# Why high? Other recent statistics

Journal of Sports Science 1 (2013) 26-36



## Hidden Patterns behind Doping Use among Norwegians 18-19 Years Old

Jan Ove Tangen<sup>1</sup> and Bjørn Barland<sup>2</sup>

1. Department of Sport and Outdoor Life Studies, Telemark University College, Bø i Telemark 3800, Norway

2. Norwegian Police University College, Slemdalsveien 5, 0369 Oslo, Norway

- 2.6% of Norwegian youth have used a doping substance



# Why high? Other recent statistics

Body Image 12 (2015) 6–13



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Body Image

journal homepage: [www.elsevier.com/locate/bodyimage](http://www.elsevier.com/locate/bodyimage)



Aggression and body image concerns among anabolic androgenic steroid users, contemplators, and controls in Norway



Ida Heimly Jenssen<sup>a,\*</sup>, Kim Berg Johannessen<sup>b</sup>

<sup>a</sup> Østfold Hospital, Addiction Services, Department of Diagnosis and Treatment, Moss, Norway

<sup>b</sup> Center on Autobiographical Memory Research, Department of Psychology and Behavioral Sciences, Aarhus University, Denmark

- Survey
  - 396 male high school students (16–21 years)
  - Prevalence: 4.0% (16/396)
  - Contemplation: 5.1% (20/396)



# Conclusion

Global – Nordic Region – Norway

Illicit AAS use is a serious widespread  
public health problem

[dominic.sagoe@psysp.uib.no](mailto:dominic.sagoe@psysp.uib.no)

Twitter: [@sagoedominic](https://twitter.com/sagoedominic)





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