

Project Westmattelmann (Germany)

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Unlocking the black box – Agent-based simulations to measure the effectiveness of sample storage and retesting

The aim of the project is to quantify the effect of different strategies for sample storage and subsequent retesting on the doping behavior of an athlete population (prevalence rate) using innovative simulation methods. This allows to determine the effectiveness of the sample storage and retesting strategy through modelling different scenarios for level of testing and duration of storage in a cost-effective way to inform testing plans of ADOs, sport federations and major event organizers.

Combining traditional social science methods (e.g., survey methodology and interviews) with Game Theory, simulation methods are applied to model the doping behavior of athletes and to address the following research questions:

- a) Amount (number or proportion) of anti-doping samples stored
- b) Duration of storage of these samples
- c) Selection process of the samples influence the doping behavior of competing athletes?
- d) How does the effectiveness of sample storage and retesting change with different test frequencies and test quality?
- e) How effective are the various storage and reanalysis strategies tested compared to other anti-doping measures?

The true extent of doping is difficult to estimate (de Hon et al, 2015; Gleaves et al., 2020). Empirical studies suggest that the estimates are often much higher (Faiss et al., 2020; Sottas et al., 2011; Ulrich et al., 2018) than the prevalence rates reported in the official statistics (WADA Laboratory Reports). In the absence of reliable prevalence figures, it is difficult to determine the effect of anti-doping measures on doping behavior and consequently to assess their effectiveness. To close this gap, social simulation can be used through the integration of findings from social science and game theory into one agent-based model (ABM).

To the primary research objectives, the doping behavior ABM (Westmattelmann et al, 2020) will be expanded to include long-term sample storage and retesting.

The research process will be divided into five stages:

- 1) Literature review
- 2) Expert interviews with representatives of anti-doping organizations, laboratories and sports federations to identify characteristics and challenges associated with long-term storage and retesting.
- 3) Conceptualization to transfer the findings from the interviews and literature into the simulation logic.
- 4) Social simulation to quantify the impact of long-term storage and retesting strategies
- 5) External validation of the simulation results with anti-doping experts.