

# Biomarker Analysis with Kalman Filtering

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The World Anti-Doping Agency is currently running the Athlete Biological Passport (ABP) programme to combat certain types of doping practices that cannot be screened for with analytical techniques. The ABP monitors selected biological variables over time and through statistical analysis, it intends to identify target athletes for specific testing. The current model used is a Bayesian network (BN) that aims to flag irregular results based on the previously collected data from the athlete. As is the case with all models, the ABP BN has certain weaknesses that can be exploited by dopers. To tackle one of these issues, focusing on the ABP's haematological module, I have upgraded the current model by adding a filtering step to the evaluation process. Based on a modified dynamic age-structure model of haematopoiesis, a type of Kalman filter could be set up to produce a better estimation of the BN model parameters. As an added result, the upgraded model can be used to test the ABP's detection capabilities by the simulation of various blood doping regimes.