

Challenge 1: Remote monitoring to predict and prevent COPD exacerbations

Background: Global Access Diagnostics (GADx) have developed a remote patient monitoring platform 'Headstart' (<https://www.globalaccessdx.com/respiratory-diseases>) for measuring biomarkers in urine from lateral flow devices. Its purpose is to monitor COPD patients between clinical visits for biomarkers of that indicate increased risk of an exacerbation in the near future, enabling early intervention. The inflammatory responses preceding a COPD exacerbation are heterogeneous and complex, therefore the challenge is for Headstart to identify early or confirm the first signs of exacerbation with sufficient reliability and clarity for the patient to know when to seek medical attention or not. Early intervention on COPD exacerbations can avoid further damage to the patient's lungs, and so overall will result in reduced hospitalisations, Improved clinical and economic outcomes.

The problem: A machine learning algorithm has been developed to monitor urine biomarkers but requires further development, potentially including some mechanistic modelling. The problem is to make the algorithm more generalisable, so that a patient-specific 'baseline' can be calculated and a multitude of elevated biomarker signals can be interpreted correctly.

Data available: Over 25,000 daily measurements are available for 5 biomarkers collected from 89 patients over a period of approximately 6 months.

Relevant expertise: Participants will require knowledge of techniques in Data Science and Machine Learning. Anybody with expertise in inflammatory markers and pathways would also be able to make valuable contributions to this challenge.