

Developing the Public Health Scotland Whole system model

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Public Health Scotland

- Public Health Scotland is Scotland's lead national body for improving and protecting the health and wellbeing of all of Scotland's people.
- Our vision is for a Scotland where everybody thrives. Focusing on prevention and early intervention, we aim to increase healthy life expectancy and reduce premature mortality by responding to the wider determinants that impact on people's health and wellbeing.
- To do this, we use data, intelligence and a place-based approach to lead and deliver Scotland's public health priorities.



Problem Statement

- Public Health Scotland has a simulation model of the hospital system. It provides projections for the number of beds required for a hospital over a 3 month and 6-month time frame. These are based on transition statistics of patients going in and out of the system, as well as their length of stay in different parts of the system.
- Our problem is that we want to add diagnosis as part of the model and there are many ways this can be done and we are unsure of which direction to follow.
- In addition we need support in how to present the uncertainty of models to our customers, and how we make it easier to do more collaboration like this one.



Step 1: Diagnosis Modelling

- The key goal of the study week would be to help us create some example models using our data that focus on our next key challenge which is adding in diagnosis as a predictor of patient length of stay (LoS) in hospital.
- We want to look at all conditions over time but we are likely to focus on heart conditions, dementia, and respiratory conditions during the study week.
- In each case we will use a mixture of open data, disclosive data, and fake data to better understand what data is needed to help build models.
- The goal would be not only to find good models for this data that can predict LoS but also to understand the process of making such models. This is covered in the next two elements, Presenting Uncertainty and Collaboration



Step 2: Presenting Uncertainty

- One of our major challenges with our models is presenting the uncertainty that they have. We need help to better present the uncertainty around the models we produce.
- The reason why it is a challenge is because we have several customers, and each will understand uncertainty in different ways.
- We want to present it to academics, healthcare professionals, analysts, government staff, and to the public. Giving us different ways of explaining or visualising the uncertainty will help us to build trust in our model.



Step 3: Collaboration

- The last step is thinking about how we as an organisation can easily set up more data challenges like this.
- The question is how do we collaborate with organisations to enable them to work on parts of our model and enable them to fit their code into our code.
- In essence how does PHS create many data challenges and make them available to any university akin to a platform like Kaggle. What do we need to think about in terms of data (e.g. open, disclosive, identifiable), how do we make it available, how do we frame the questions



Overview

- The goal of the challenge is to help refine our model but to do so in a way that could be repeatable in other challenges. Thinking about how academics could get access to the data they need and at what level to inform our model and to think about how we deal with multiple collaborators, intellectual property, funding etc.
- The models created during the study week will help to inform the way PHS progresses with disease based modelling within our simulation model including how we present the uncertainty that exists around all models.



Final Notes

- This challenge will be a mixture of modelling and discussion. We will be providing a range of datasets to help develop diagnosis based modelling but we also want to spend time talking about the process of running challenges like these.
- We are not beholden to any one methodology in terms of the modelling and we are open to thinking about new ways of working and presenting data and models to customers. This is a great opportunity to help a Public Health body to implement a working whole system model.



Links

- Public Health Scotland
 - <https://www.publichealthscotland.scot/our-organisation/a-scotland-where-everybody-thrives-public-health-scotland-s-strategic-plan-2020-23/>
- NHS Open Data
 - <https://www.opendata.nhs.scot/>

