



A time series dataset and Bayesian RNN for predicting drug prescription volumes

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Background

24%

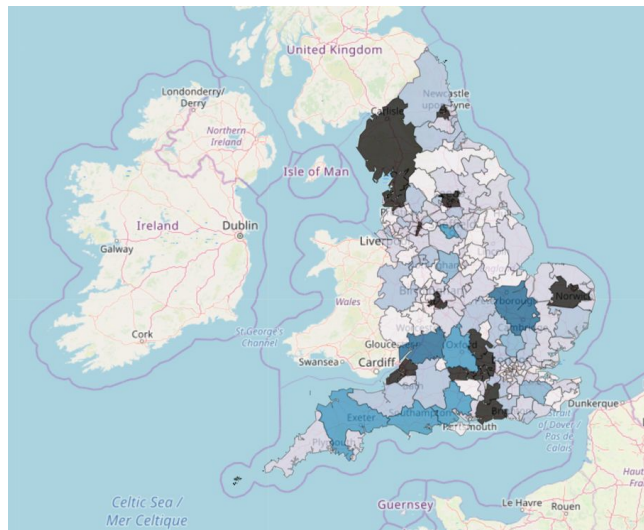
of people over the
age of 65 by 2042*

Given the increased prevalence of disease in the elderly it is important that our health system is sufficiently prepared to handle the increased burden.

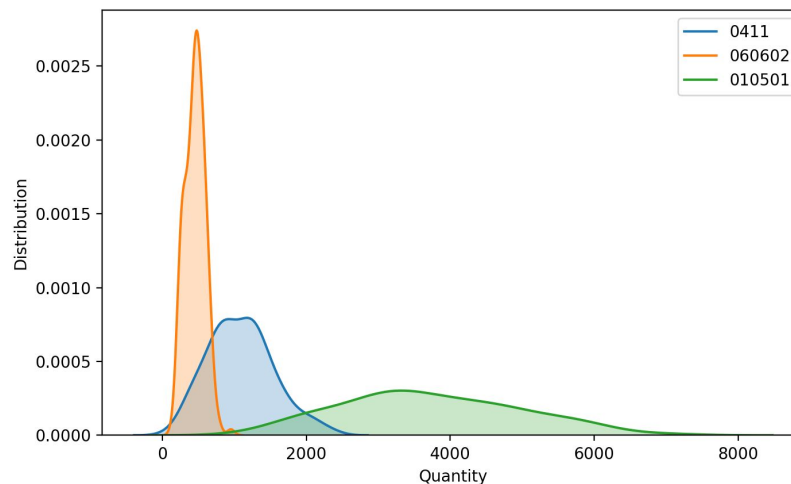
Here we aim to use NHS data to help better manage resources and predict future disease burdens in the near future.

*per office for national statistics

Exploratory Analysis - Spatio-temporal correlation



Spatial variation in Dementia



Time density plots for variables showing high spatio-temporal correlation

Top 3 categories that show closest spatial variation – 06,01,04 - Endocrine, Gastro-intestinal, CNS (excl. Dementia)

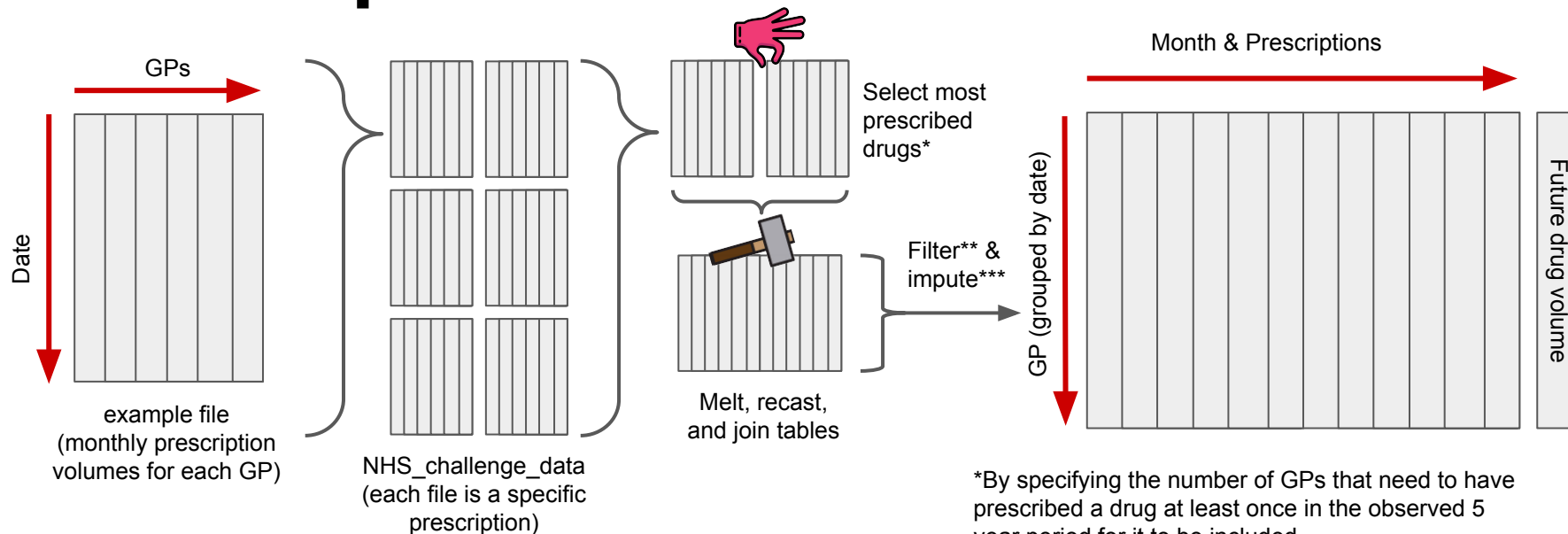
Variables that show high spatial relationship and temporal correlation (ranking methodology - top 10%) - 060602, 10501 (Biphosphonates - osteoporotic fractures, Aminosalicylates - Inflammatory Bowel Disease)

Correlation coefficients - 0.728, 0.705 (variables were tested for normality) , VaR shows reasonable performance -but lots of non-linearities!

Problem & Data

- **To predict future drug prescription volumes** for a GP based on their previous prescription data
- **Dataset:** *Prescription dataset*
 - For each GP, the final curated dataset contains:
 - Records spanning 58 months (2015 - 2020)
 - Monthly prescription volumes for 32 common drugs

Data Preparation

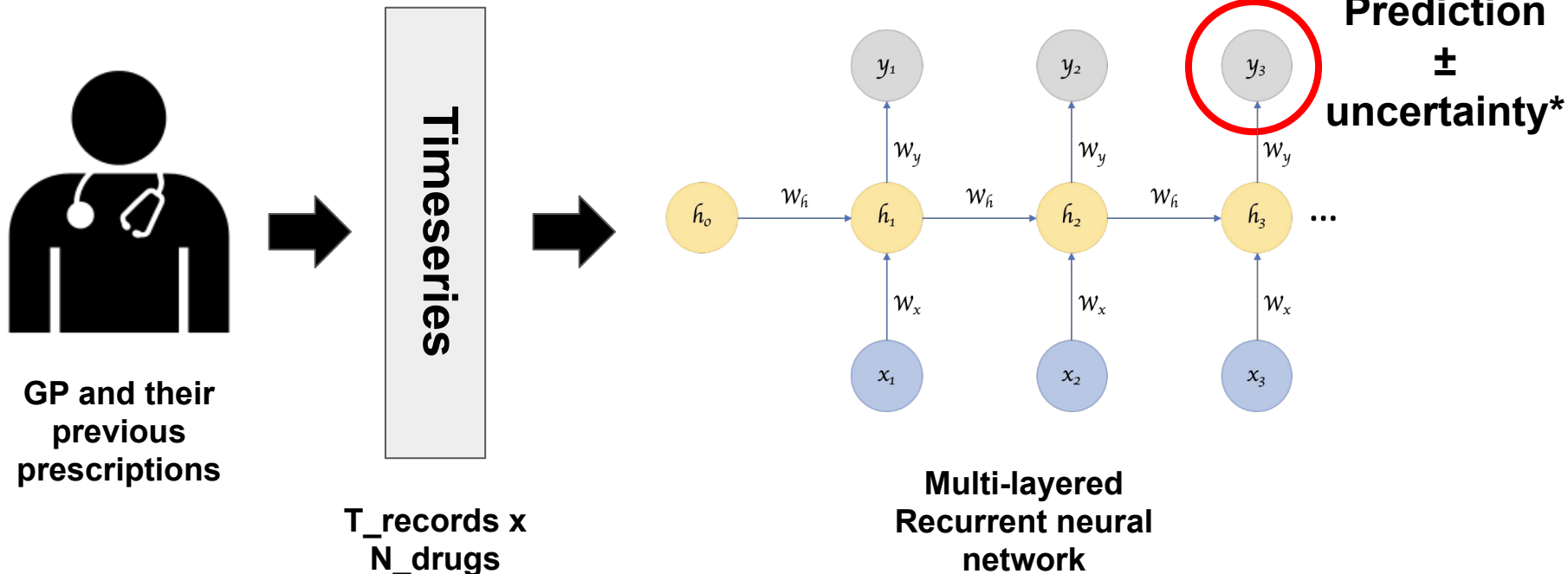


*By specifying the number of GPs that need to have prescribed a drug at least once in the observed 5 year period for it to be included.

**e.g. removing records for GPs that don't have prescription volumes for all 58 months of the observed period

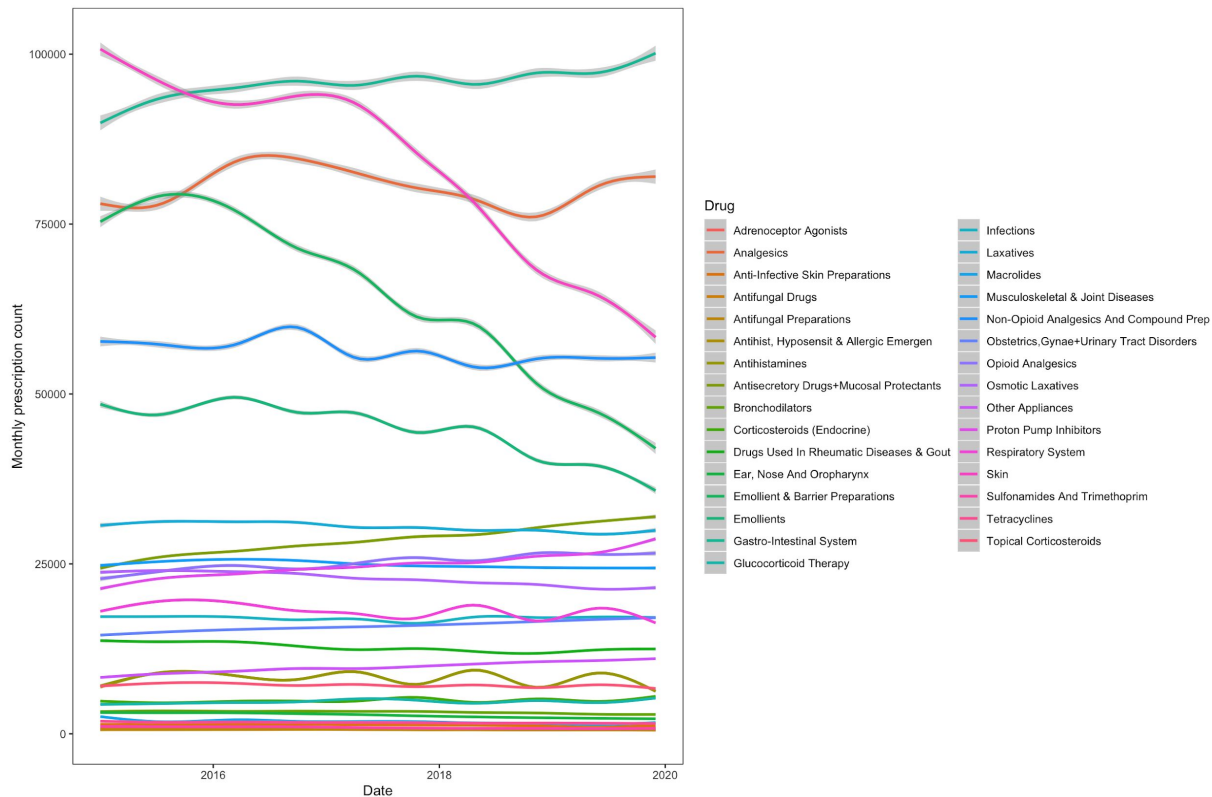
***e.g. By interpolation of results

Model training



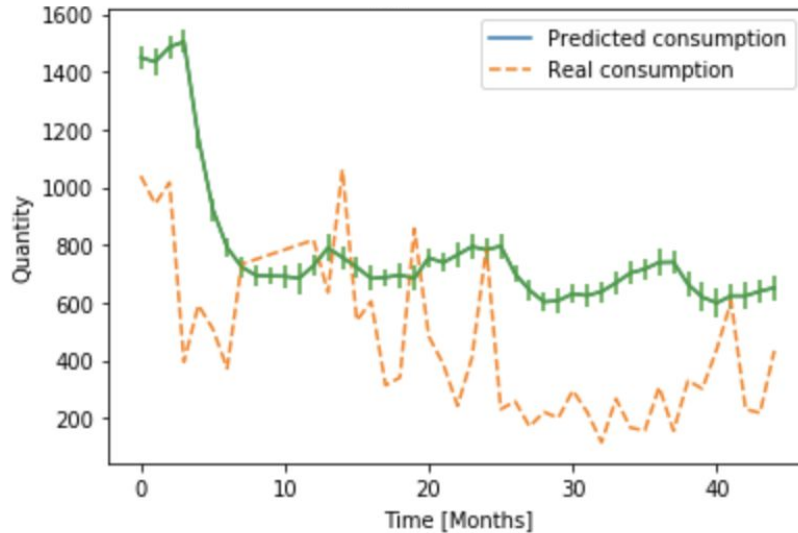
*Calculated using Monte Carlo drop-out

Results/Contributions



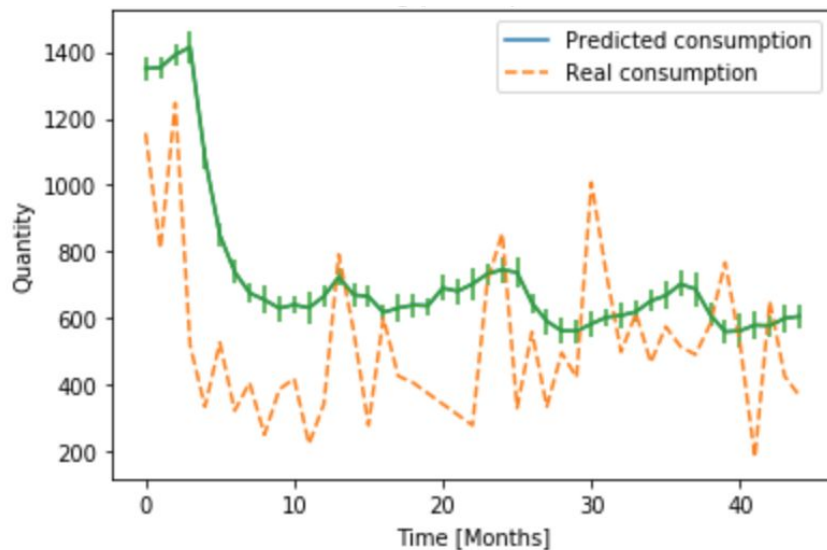
**Curated
Prescriptions
Dataset**

Results/Contributions



Bronchodilators
(Respiratory diseases)

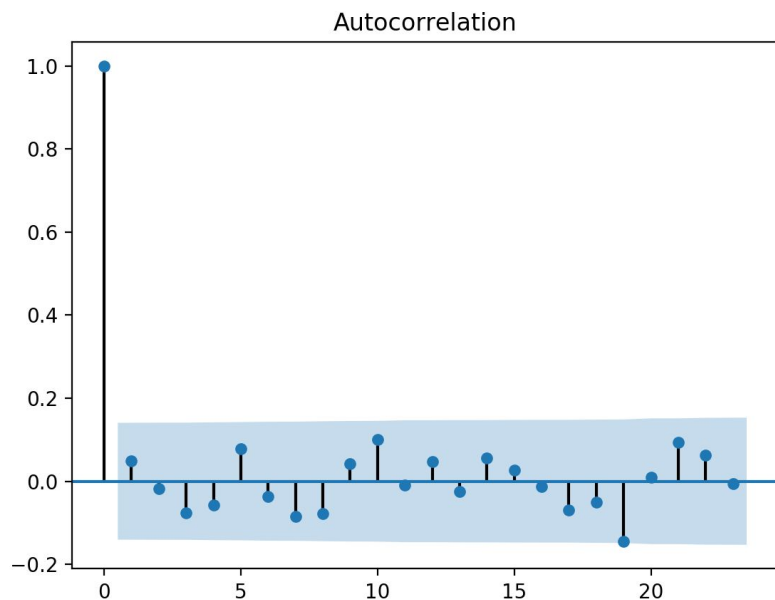
Results/Contributions



**Dementia
prescription**
(neurodegeneration)

Appendix

Other



ADF test - p-value - 1.4779718887287002e-24



Anomalous variation in distribution due to spike in dementia in
“Kent” (2017-2019)
0302, 2012 and 1914 showed similar anomalous change