Telecare Predictive Data Analytics PhD Project

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Research Aim and Personal Overview

Start Date: October 2020 **Thesis Submission (anticipated):** July 2024

Research Aim

To investigate the extent to which predictive data analytics can be used to advance the delivery of telecare and/or social care services in Scotland.

Lead Researcher

Euan Anderson

BEng: 2:1 in Chemical Engineering at the University of Strathclyde, graduated: 2018

MSc: 1st with Distinction in Actuarial Science at the University of Strathclyde,

graduated: 2020

PhD Funding Source: TEC Scotland

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Research Objectives

RO1 – To understand the data that is currently collected for telecare and social care users in Scotland.

RO2 – To understand and map the systems and data collection processes that are currently in use for telecare and social care users in Scotland, with specific focus on referrals.

RO3 – To identify, classify and understand average users of telecare services in Scotland, are there factors available in the data that could be predictors of telecare usage?

RO4 – To understand barriers to data analytics use in telecare and social care services in Scotland.

RO5 – To investigate the feasibility of using routinely collected telecare and/or social care data in the creation of models to highlight individuals in need of intervention or improved service delivery.

Methods

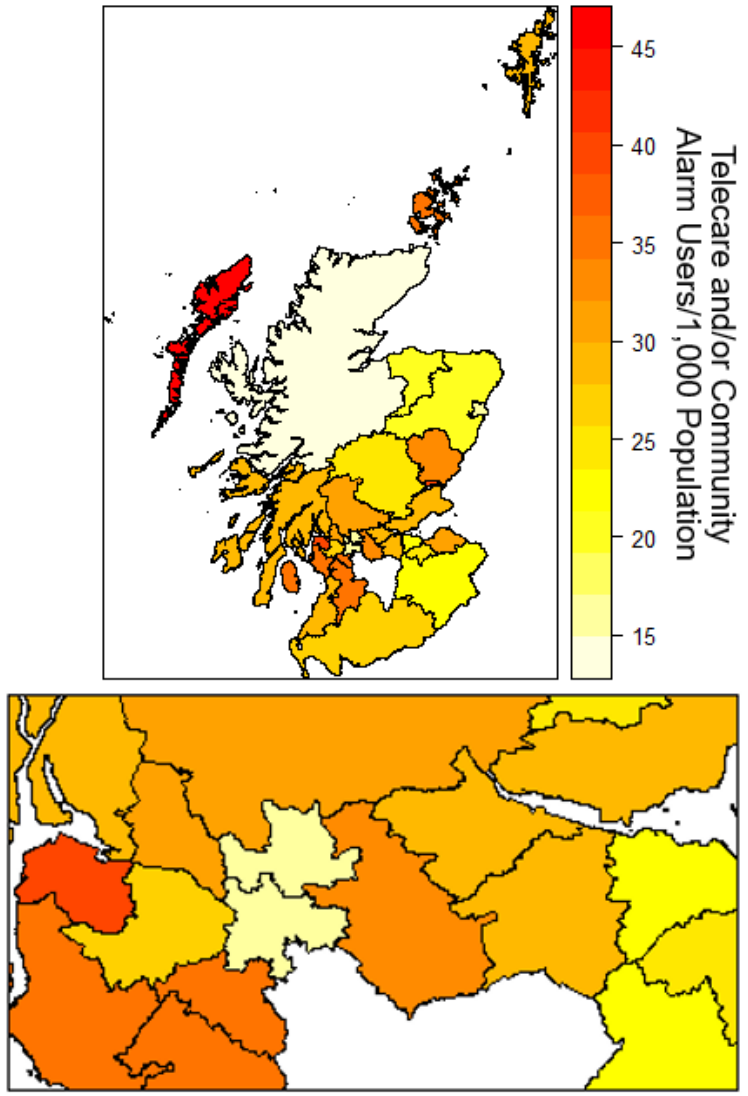
Qualitative	Quantitative
Qualitative Interviews with stakeholders involved in the delivery of telecare services in Scotland – e.g. TEC Leads and Technicians. **(RO1, RO2 and RO4)**	**Data Scoping** of telecare service datasets to sense check these and offer feedback on how data collection processes could be improved. **(RO1 and RO2**)
Process Mapping of telecare services in Scotland from qualitative interviews, with specific focus on the systems in operation, the data used and the referral process. **(RO1, RO2 and RO4)**	**Descriptive Statistics** of telecare service datasets to identify and group users of services. **(RO3)**
	Visualisations of datasets to facilitate further examination of data. Potential for interactive dashboards for interrogation of data by those employed in delivery of telecare services. **(RO3)**
	Machine Learning to create a predictive model to identify individuals who could benefit from a referral to telecare services or advanced care packages. **(RO5)**
Literature Review investigating the use of predictive data analytics techniques, including barriers to their use, in telecare and related services. **(RO4 and RO5)**	

Current Progress

A&B HSCP Transforming Together
Argyll & Bute Health & Social Care Partnership

Exploratory scoping exercise investigating TEC services in Scotland and relevant national demographic data.

Completed extended abstract investigating the factors that are determinants of telecare usage in Scotland through an analysis of publicly available data via Public Health Scotland.



Work with the Argyll and Bute HSCP:

Exploratory scoping investigation of the A&B HSCP structure and organization and the demographics of A&B.

Detailed descriptive statistics of initial A&B datasets.

Basic modelling of initial datasets, investigating factors which may be determinants of telecare usage in A&B.

Investigating the quality of datasets provided by A&B HSCP, highlighting potential issues with data collection.

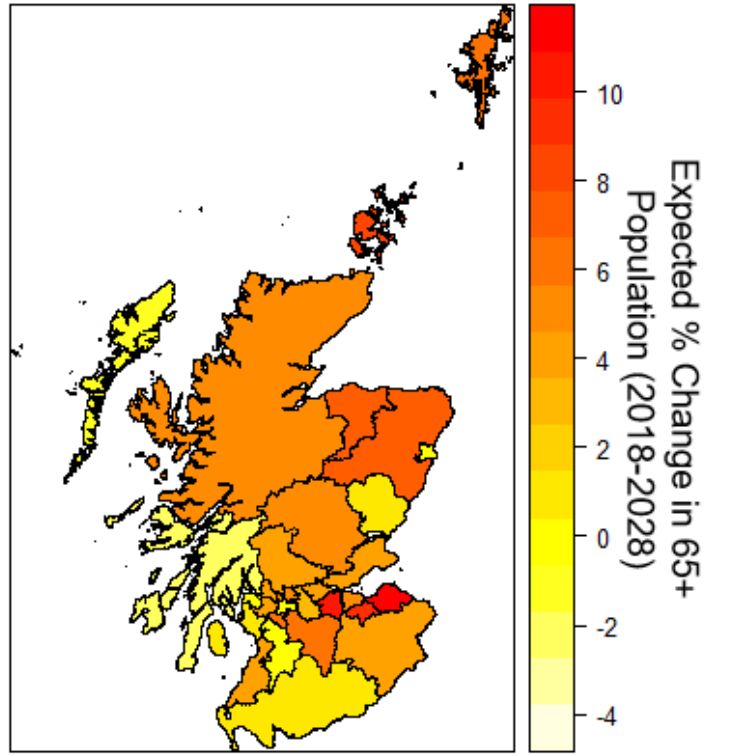
Initial Findings

Demographic Shifts

Demand for telecare services will only increase in the future with ageing population.

Population of over 75 year olds in Scotland predicted to double in the next 20 years.

In Argyll and Bute, the % of total population represented by those aged 65 or older will increase from 26% to 32% by 2038.

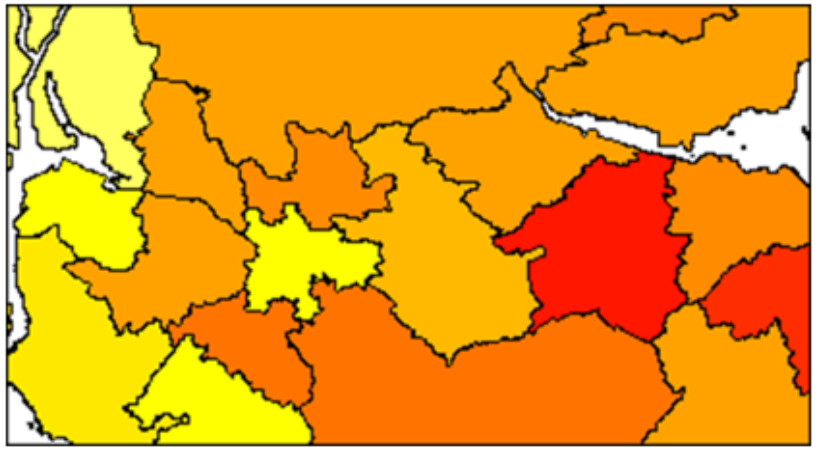


Initial Argyll and Bute Modelling

Investigating the relationship between age, gender and likelihood of telecare referral.

A one year increase in age corresponds to an increase in the odds of telecare referral by between 3.62% and 4.35%.

No link established between gender and referral.



National Telecare Uptake Investigation

Through the use of publicly-available social care data taken from Public Health Scotland, an extended abstract has been completed, investigating the factors that determine telecare uptake at a national level.

The odds of telecare uptake will decrease with an increase of the following:

Unit increase of X corresponds to a unit decrease of telecare uptake
Population Density
Average Wage
Number of home care recipients

The odds of telecare uptake will increase with an increase of the following:

Unit increase of X corresponds to a unit increase of telecare uptake
Long-term condition rate
Proportion living rurally
SIMD deprivation

Argyll and Bute Initial Datasets

The variables featuring in the obtained Argyll and Bute datasets are shown below:

Personal Details	Referrals	Assessments	Observations
Gender	Adult/Child	Context	Date Notified
Age	Topic	Assessment Type	Time Notified
Deceased?	Presenting Issue	Date Assessment Started	Context
Year Deceased	Referral Type	Date Assessment Ended	Subject
Postcode Sector		Outcome	Complete?
Address Type			
Accommodation Type			
Tenure Type			
Household Composition			
Disability			

Argyll and Bute Initial Datasets

Personal Details

10,029 individuals, 2,951 individuals deceased.

Gender breakdown: Male = 41%. Female = 59%.

Average age: 75.7. Modal age: 86.

Postcode sector: 299 individuals out with A&B.

Majority of individuals living at home.

Majority of individuals with no accommodation, tenure type or household composition listed.

62.2% of disabilities listed as hard of hearing/blind.

Referrals (01/01/16 – 07/07/21)

Total of 28,221 referrals for 8,265 individuals.

91.6% of referrals for adults, 1% for children.

Most individuals have multiple referrals. One individual has 78 referrals in total.

Most common presenting issues: health (22.3%), occupational therapy (21.8%) and telecare (16%).

Assessments (02/19 – 07/21)

Total of 186,430 assessments for 7,936 individuals.

Most common assessment context: district nursing (67.6%) and occupational therapy (27.1%).

Observations (01/16 – 07/21)

Total of 279,245 observations for 4,281 individuals.

76.6% of observations from adult social care context.

Key issue with these datasets: lack of granularity of data.

Next Steps

A&B HSCP Transforming Together
Argyll & Bute Health & Social Care Partnership

Work with the Argyll and Bute HSCP:

Investigate the manual creation of additional variables within obtained structured data which could be used as predictors of telecare usage (e.g. temporal and geographical variables).

Access free-text entry care notes using pre-trained “safe word” language model for de-identification of entries. Previously Natural Language Processing model through Python.

Combine de-identified case notes with structured variables to investigate the creation of a predictive model to highlight individuals in need of intervention or enhanced service delivery.

Planned scoping interviews with A&B HSCP stakeholders to enhance understanding of the systems in operation, the data collected and the referral process (to take place in Spring 2023).

Nearing completion of literature review investigating the use of predictive data analytics in telecare and related services.

Call to Action

More social care data than ever before is being routinely collected. The challenge now is to facilitate the intelligent use of such data to allow for improvements to services.

To this end, I am putting out an open call to action where I am seeking:

Access to more varied and diverse social care datasets.

E.g. data recorded through telecare services, home care data, anonymized demographic data, service referral data and free-text entry care observations.

Access to linkable health datasets to combine health and social care data.

Engagement from different HSCPs with a unique aspect to their services.

If you wish to take part in this project and help facilitate improvements to telecare services then please contact either:

Euan Anderson – PhD Researcher for this project. Email: Euan.Anderson.100@strath.ac.uk

Dr. Marilyn Lennon – Primary Supervisor for this project. Email: Marilyn.Lennon@strath.ac.uk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