INSTITUT NATIONAL DES SCIENCES APPLIQUÉES
DÉPARTEMENT DE GÉNIE ÉLECTRIQUE ET INFORMATIQUE

January 28, 2017

Big Data: Analysing Trends in Health-care for Heart Diseases

MS Innovative Smart Systems 2016-2017
BERTHÉ, MAMADOU
FAHMI, SOFIA
GAUTIER, RENAUD
PERSAND, KAVEENA
Supervisor :
PARQUA, ROBERTO

Contents

Introduction

The ageing world population is one of the problems identified by the UN. With the growing percentage of elderly person, health-care needs are expected to show a similar trend. Through this paper, we want to analyse the health-care trend for heart diseases in Scotland. Through this analysis we want to assess the importance of providing a rapid prognosis system (DomoPrev).

The open data used, Scottish Heart Disease Statistics - Year Ending 31 March 2015 (Heart Disease discharges - by diagnosis),was retrieved from ISD Scotland.

Few assumptions were made when handling the retrieved data. Assumptions:

- The number of discharges were representative of the population
- The number of discharges were representative of the number of admissions

The dataset retrieved had some missing information about some categories and were thus excluded from the analysis. Depending on the analysis, the dataset was filtered each time to exclude duplicated data, as the dataset contained redundant information about some categories, such as ”Both Sex” which added up the ”Male” and ”Female” categories.

1 Demography of Heart Diseases in Scotland

Our project emphasises on detecting heart related diseases. To better design the final product, a trend in heart diseases must be analysed so as to spot the heart disease most likely to affect someone.

The number of heart problems on a given year were normalised to be compared to the other years in figure 1.

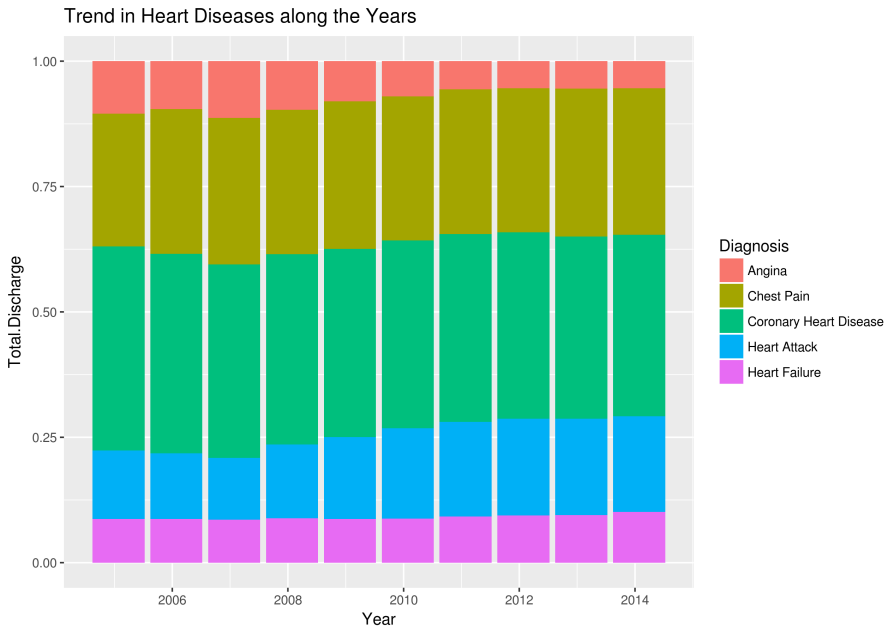

Figure 1: Trend in heart diseases in Scotland

As one may deduce from figure 1, heart attacks are becoming more frequent. Our system aims to provide first aid in case of heart attacks which need to be assisted as soon as possible. This trend corroborates the design of our system.

2 Health-care Trend with Respect to Heart Diseases

The emergency department of hospitals are sometimes unnecessarily solicited. In case of heart diseases, we want to test this hypothesis. To do so, we will look at all the emergencies in the different regions of Scotland. For each region, we will display the most important diagnosis received for emergency admissions, and the number of such admissions.

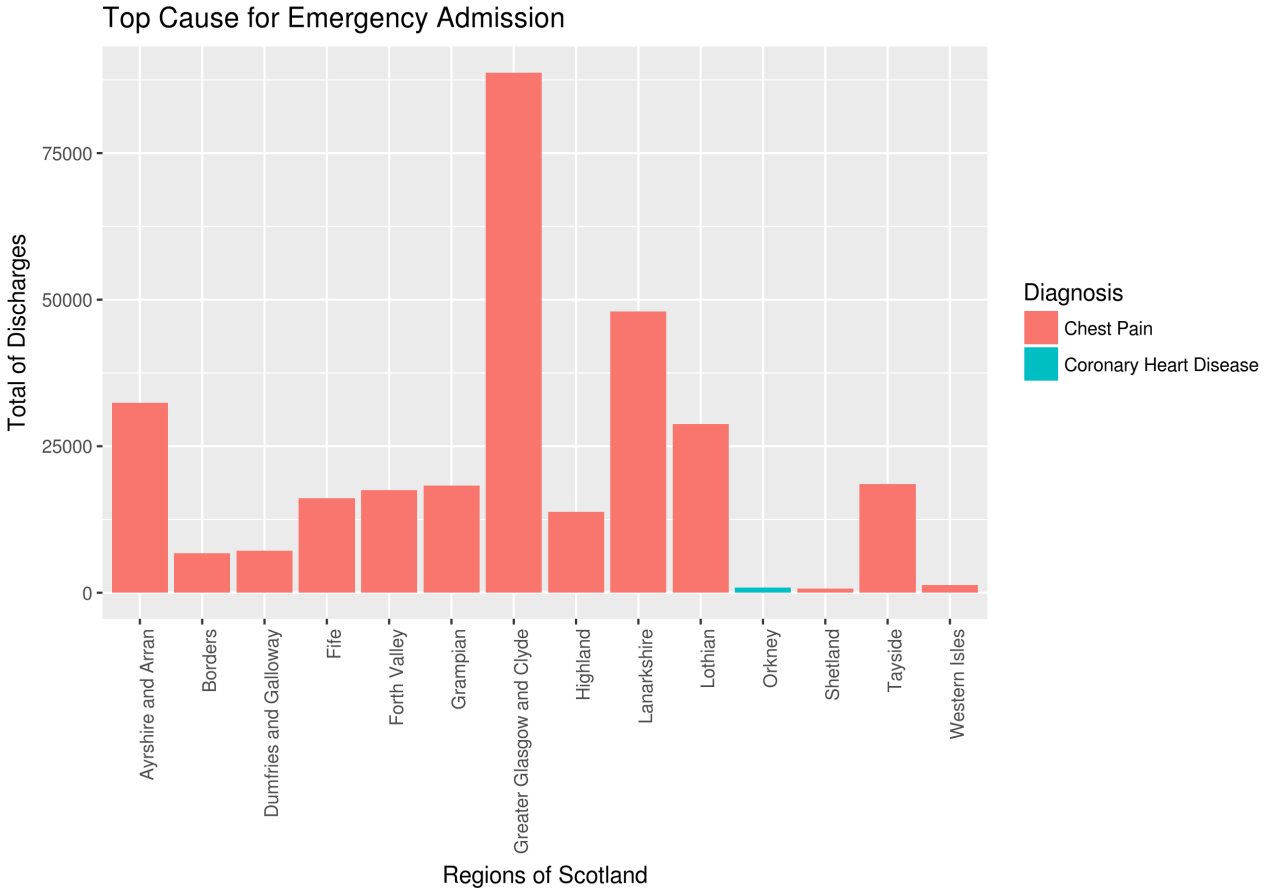

Figure 2: Top heart related cause for admission in emergency department

As one may deduce from figure 2, the top admission cause is not a fatal one. The diagnosis revealed that in most regions, chest pain were admitted into the emergency service, which is not optimal. This could have been avoided by a prognosis before admission.

3 Heart Disease and Age Correlation

Our system is also expected to be marketed for elderly people. For this purpose, it is wise to analyse trends specific to that age demography.

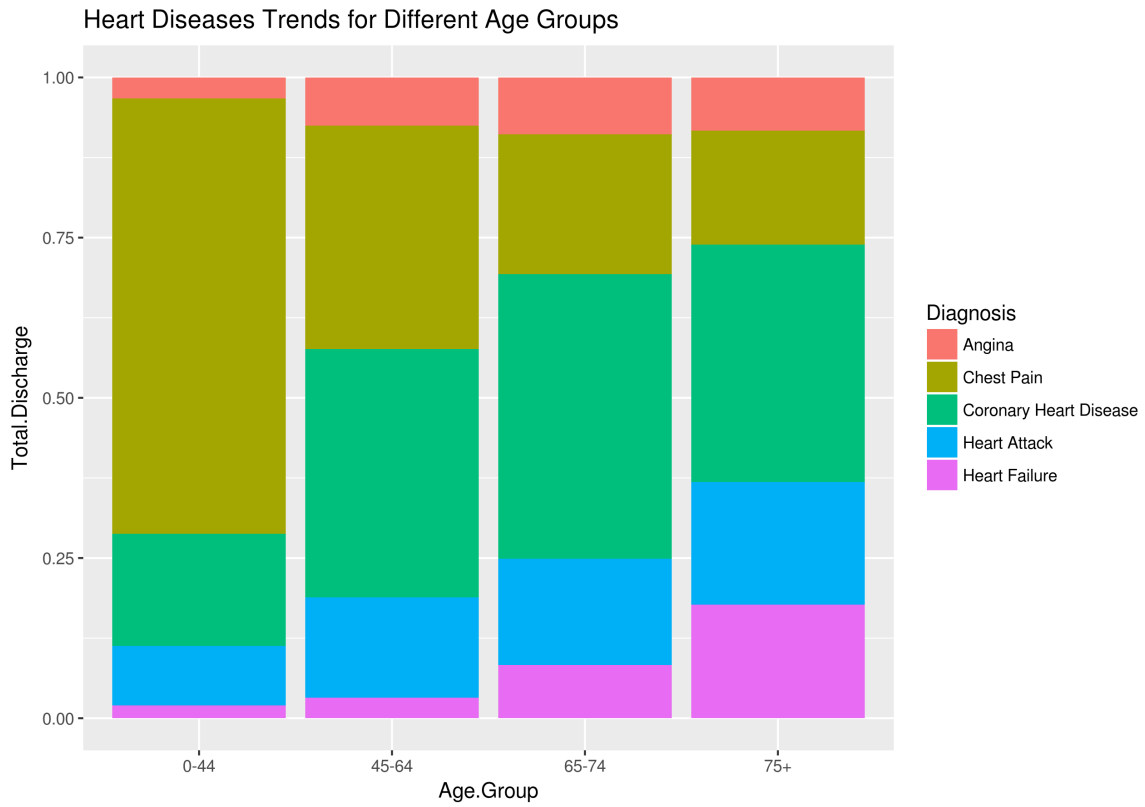

Figure 3: Trends in the repartition of diagnosis by age

Figure 3, reveals that the chest pain ratios were prevalent for patients under 44 and decreased for older generations, to be replaced with coronary heart diseases, heart attack and heart failure. These are problems can be far more lethal than chest pain. Since we know from figure 2 that most emergency admissions are diagnosed as chest pain, it will be interesting to see if the ones overwhelming the emergency departments are the ones under 44.

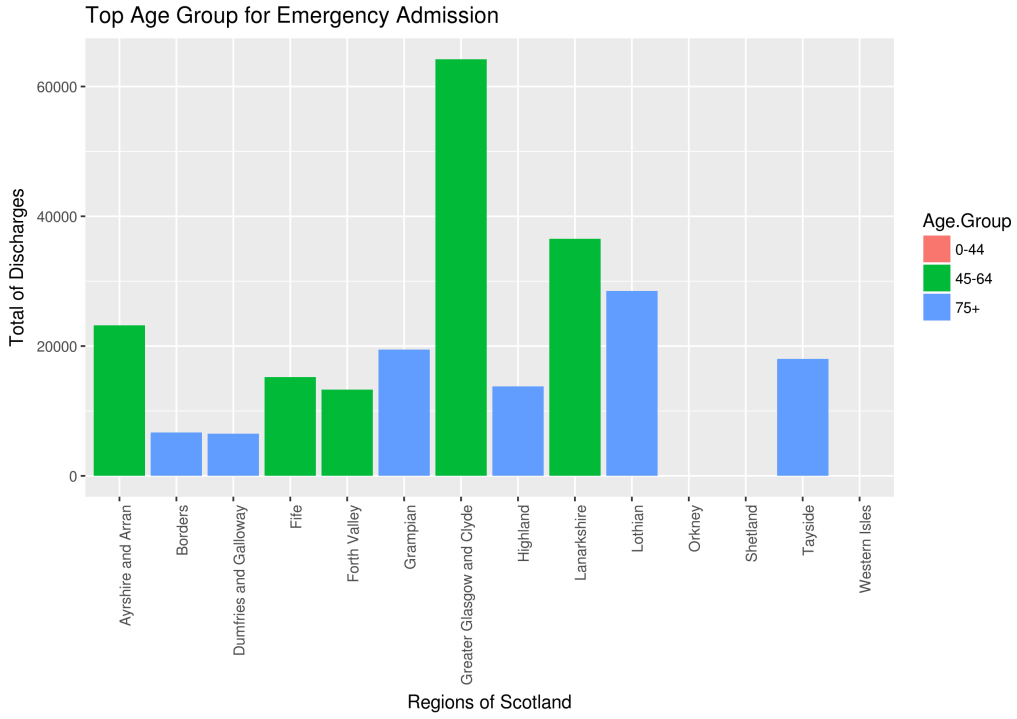

Figure 4: Top age group admitted for emergency treatment

As illustrated in figure 4, the age group most frequently admitted for emergency treatment are the elderly. With DomoPrev, we would be able to detect beforehand that the problem striking a patient is a chest pain, thus decrease the number of people in emergencies. Contrary to what we thought in the previous part, the most present people in emergencies were people aged between 45 and 64 years.

Conclusion

This analysis strengthens our stance in offering the DomoPrev system to elderly people as we have demonstrated that they are most prone to heart problems in a world with increasing heart attacks.

The DomoPrev projects aims to better the accuracy of hospital admission conditions relative to heart problems by providing a prognosis. This prognosis will help determine the most probable heart disease in case of an anomaly in the user's vital signs, and thus deduce the most appropriate admission condition. This could help save lives and alleviate hospitals' workload. The studies conducted on the open dataset retrieved showed that our system's objectives match Scotland's current healthcare needs.