

Examining the Effect of Deprivation on Prescribing Behaviours in Northern Ireland

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Abstract— This study uses classifications of Metropolitan and Non-Metropolitan behavioural archetypes of General Practitioner practice in Northern Ireland. Of the 333 practices operating in Northern Ireland at the start of the study period (March 2018), 90 were classified as Metropolitan and 243 as Non-Metropolitan. This paper seeks to examine any associations between deprivation and each archetype and to investigate what their prescription behaviours would be when controlled for deprivation. It was found that for each archetype, as the deprivation level of the area in which a practice was located increased, so too did the prescribing levels associated with that practice. A large proportion of Metropolitan practices (52.2%) were located in high deprivation areas and these practices had prescribing levels that were 40.3% higher in the number of items prescribed per registered patient than practices in low deprivation areas within the same archetype. Only 13.9% of Non-Metropolitan practices were located in high deprivation areas and had levels of prescribing 11.2% greater than practices in areas of low deprivation within the same archetype. A comparison of only practices in low deprivation areas in both archetypes found that higher prescribing levels were seen in Non-Metropolitan practices, the complete opposite of the trend observed when comparing all practices where Metropolitan practices show higher prescribing levels.

Keywords— Health, General Practice, Open Data, Prescriptions, Deprivation

Introduction

A number of studies have shown that levels of prescribing are higher in areas with high deprivation than those in areas with low deprivation. Public Health England has linked these higher levels to five specific classes of medicine [1], these being benzodiazepines (mainly prescribed for anxiety and insomnia), Z-drugs (Insomnia), gabapentinoids (neuropathic pain), opioid pain medications (for chronic non-cancer pain) and antidepressants (depression). Whilst similar correlations between deprivation and antidepressants have been discovered within Northern Ireland [2] and deprivation and antibiotics in Scotland [3] and Wales [4] there also exists a number of studies relating to the effects of deprivation on prescribing of Statins [5], respiratory medications [6] and anti-dementia drugs [7]. Previous work examining the link between geolocation and types of General Practitioner

practice, based on the Prescribing by Contractor [8] and GP Prescribing Data [9] datasets from Open Data NI has been carried out. This study identified six features relating to the geolocation of GP practices and their relationship with associated pharmacies via the prescriptions issued / dispensed by both entities. K-means clustering was then used to identify archetypes of GP practice. It was found that GP practices in Northern Ireland could be classified into two distinct groups (Metropolitan and Non-Metropolitan) with the former group being in and around the city of Belfast and the latter covering the rest of Northern Ireland (Figure 1). It was acknowledged that deprivation was a likely factor in the differences seen in prescribing. The internal report detailing this process can be made available to researchers on request, however this paper deals with the effects of deprivation on prescribing behaviours of all classes of drugs in Metropolitan and Non-Metropolitan practices. General Practitioners provide the front line of primary care in the United Kingdom (of which Northern Ireland is a part of). With the exception of emergencies, patients are generally referred to hospitals for specialist treatment by their GP who manages their patients overall care.

Northern Ireland Practices by Cluster
Green = Cluster A (Metropolitan), Orange = Cluster B (Non-Metropolitan)

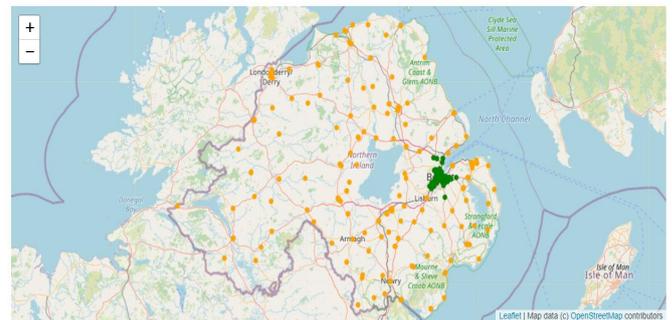


Figure 1: Map of GP practices by Cluster in Northern Ireland (grey line denotes the border of Northern Ireland)

Methods

The Northern Ireland Multiple Deprivation Measure 2017, published by the Northern Ireland Statistics Research Agency, measures seven types of deprivation:

- Income deprivation,

- Employment deprivation,
- Health Deprivation & Disability,
- Education,
- Skills & Training Access to Services,
- Living Environment
- Crime & Disorder

These measures are combined by the Northern Ireland Statistics and Research Agency to provide an index of super Output Areas by deprivation ranking. Using this index, each practice was linked to the level of deprivation recorded in the area in which it was located. By constructing line graphs, prescribing behaviours of practices in different archetypes and deprivation quartile were analysed (Quartile 1 being areas with lowest deprivation and Quartile 4 being those with the highest). Prescription trends for each quartile were compared for each GP type with the average number of items prescribed per registered patient being used to estimate the effect deprivation had on prescribing. T-Tests were performed on each set of adjacent series in both the Metropolitan and Non-Metropolitan graphs in order to ascertain whether the difference was statistically significant or not. Finally, prescribing for each GP type for Quartile 1, the least deprived areas were compared to establish what the trend would be without the effects of deprivation.

Results

From our previous study it was found that overall prescribing levels were higher for Metropolitan practices than those in Non-Metropolitan practices (Figure 2).

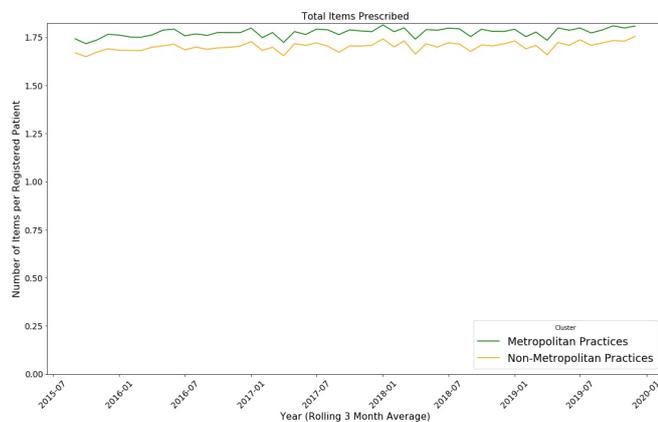


Figure 2: Prescribing levels in Northern Ireland by GP Practice type

By assigning each practice to the corresponding deprivation level assigned to the area in which it was located, it was found that 52.2% of practices in the Metropolitan area were in the highest quartile for deprivation compared to only 13.9% of Non-Metropolitan practices (Figure 3).

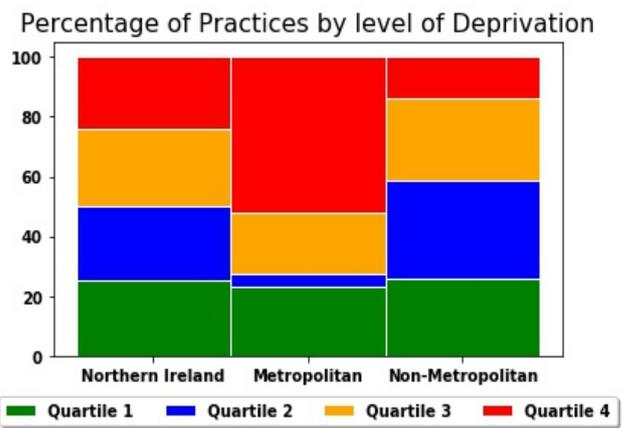


Figure 3: Percentage of Practices by level of Deprivation

Examining prescription levels for Metropolitan practices for each deprivation quartile (Figure 4) clearly showed that higher deprivation resulted in higher prescribing levels with an average of 1.44 items prescribed per registered patient in quartile 1, 1.62 in quartile 2, 1.70 in quartile 3 and 2.02 in quartile 4 making prescribing over 40% higher in the most deprived Metropolitan areas than those in the least deprived areas.

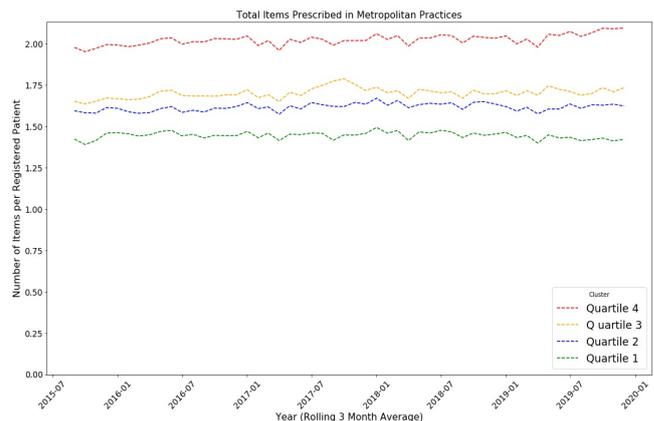


Figure 4: Prescribing levels for Metropolitan practices by Deprivation Quartile

Similarly, examining prescription levels for Non-Metropolitan practices for each deprivation quartile (Figure 5) also showed that higher deprivation levels resulted in higher prescribing levels with an average of 1.60 items prescribed per registered patient in quartile 1, 1.71 in quartile 2, 1.74 in quartile 3 and 1.78 in quartile 4 making prescribing more than 11% higher in the most deprived Non-Metropolitan areas than those in the least deprived areas.

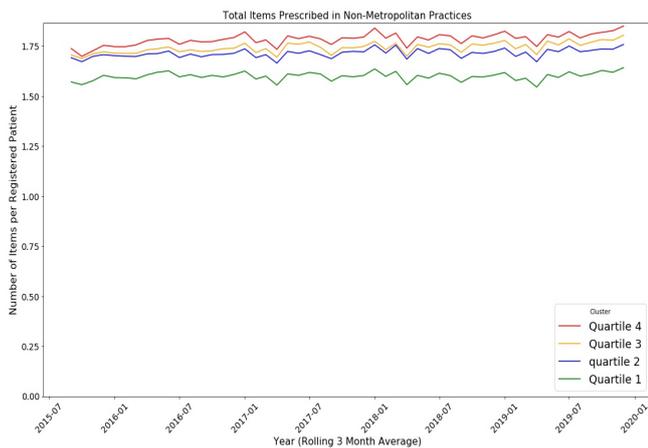


Figure 5: Prescribing levels for Non-Metropolitan practices by Deprivation Quartile

T-Tests were performed on adjacent series for both Metropolitan and Non-Metropolitan practices (Table 1) showing that the only statistically significant difference in prescribing levels was found between Quartile 1 and Quartile 2 (The lower two quartiles) in Non-Metropolitan practices. Practices in Metropolitan areas saw a statistically significant difference between each quartile.

| Deprivation Quartiles compared | Non-Metropolitan | Metropolitan |
|--------------------------------|------------------|--------------|
| Quartile 4 / Quartile 3 | 0.0023 | 2.49e-43 |
| Quartile 3 / Quartile 2 | 0.0265 | 7.07e-11 |
| Quartile 2 / Quartile 1 | 1.51e-16 | 8.89e-30 |

Table 1: P values resulting from T-Tests performed on Deprivation Quartile graphs

Comparing the practices in the least deprived areas (quartile 1) of both GP practice types showed that without the effects of deprivation, prescribing levels in Non-Metropolitan practices are actually 11% higher than those in Metropolitan practices (Figure 6).

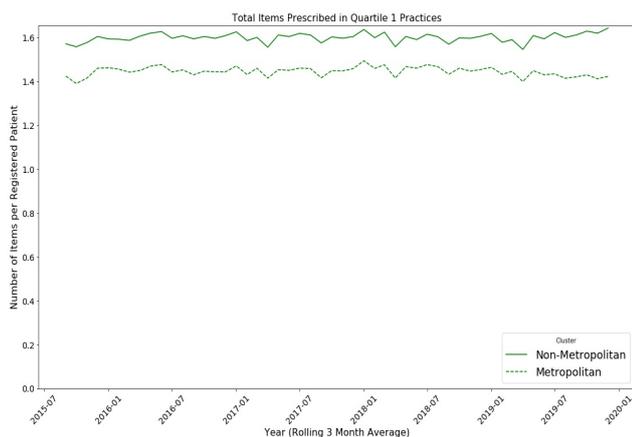


Figure 6: Prescribing levels for GP practice types - Quartile 1

Discussion

Comparing prescription levels of the two archetypes it can be seen that the higher the deprivation of the area in which the practice is located, the higher the prescribing levels are. It is

interesting to note that prescribing levels in Non-Metropolitan practices do not vary as much between low and high deprivation areas (11.2%) as in Metropolitan practices (40.3%) and it is unclear whether this can be attributed to the higher proportion of Metropolitan practices being located in high deprivation areas. Deprivation is definitely a major factor when examining the differences in prescribing levels as the overall prescribing levels are reversed when deprivation is taken out of the mix. Initial results showed Metropolitan practices having higher prescribing levels but comparing quartile 1 (practices in the least deprived areas) for each archetype shows Non-Metropolitan to have the higher prescribing levels.

Conclusion

Comparing the prescribing levels of the two previously identified archetypes of GP practice in Northern Ireland shows that higher prescribing levels can be associated with practices located in areas with higher deprivation levels. It was also found that the increase in prescribing was greater for practices in the Metropolitan areas than in the Non-Metropolitan areas and whilst there was a larger proportion of Metropolitan practices in high deprivation areas it was unclear whether this could account for the larger increase observed in prescribing levels. Analysis of practices within the two archetypes in areas with low deprivation levels show a completely different picture to those with all practices across all levels of deprivation. Prescribing levels for Non-Metropolitan practices are higher than Metropolitan practices where deprivation is not a factor while the opposite is true when examining all practices for both archetypes. This leads to the conclusion that deprivation is a major factor affecting prescribing levels and that it has a greater effect on Metropolitan practices than on Non-Metropolitan ones. Further investigation at British National Formulary (BNF) chapter level will provide insight into the types of medications affected by the level of deprivation.

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