Rates and predictors of anti-depressant prescribing in Northern Ireland 2011 – 2015: A data linkage study using the Administrative Data Research Centre (NI).

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Objectives: Research indicates that anti-depressant prescribing is higher in Northern Ireland (NI) than in the rest of the United Kingdom, and that socioeconomic and area-level factors may contribute to this. The current study provides comprehensive population-based estimates of the prevalence of anti-depressant prescription prescribing in NI from 2011-2015, and examined the associations between sociodemographic, socioeconomic, self-reported health and area-level factors and anti-depressant prescription.

Methods: Data were derived from the 2011 NI Census (N = 1,588,355) and the Enhanced Prescribing Database. Data linkage techniques were utilized through the Administrative Data Research Centre in NI. Prevalence rates were calculated and binary logistic analysis assessed the associations between contextual factors and anti-depressant prescription.

Results: From 2011-2015 the percentage of the population in Northern Ireland aged sixteen or more receiving anti-depressant prescriptions was 12.3%, 12.9%, 13.4%, 13.9% and 14.3% respectively, and over the 5-year period was 24.3%. The strongest predictors of anti-depressant prescription in the multivariate model specified were 'very bad' (OR=4.02) or 'Bad' general health (OR=3.98), and self-reported mental health problems (OR=3.57). Other significant predictors included social renting (OR=1.67) and unemployment (OR= 1.25). Protective factors included Catholic religious beliefs, other faith/philosophic beliefs and no faith/philosophic beliefs in comparison to reporting Protestant/other Christian religious beliefs (ORs=0.78-0.91).

Conclusion: The prevalence of anti-depressant prescription in NI appears to be higher than the prevalence of depressive disorders, although this may not necessarily be attributable to over-prescribing as anti-depressants are also prescribed for conditions other than depression. Anti-depressant prescription was linked to several factors that represent socioeconomic disadvantage.

Keywords: Antidepressant(s); Prevalence; Northern Ireland; Administrative data.

Rates and predictors of anti-depressant prescribing in Northern Ireland 2011 – 2015: A data linkage study using the Administrative Data Research Centre (NI).

The high rates of mental health problems in Northern Ireland (NI) have been well documented. O'Reilly and Stevenson (2003) analysed data from the Northern Ireland Health and Wellbeing Survey, which was based on a random sample of households and stratified by health board, and reported that 27.6% of the 1,694 participants met the criteria for "significant psychological morbidity" based on the General Health Questionnaire. Results from the Northern Ireland Study of Health and Stress, a nationally representative face-to-face household survey of 4,340 participants aged 18 years and older conducted from 2004 to 2008, indicated that the lifetime prevalence of any DSM-IV anxiety, mood, impulse-control or substance disorder was 39.1% and the prevalence of any mood disorder was 18.8%, and major depressive disorder 16.3% (Bunting, Murphy, O'Neill & Ferry, 2012). Life-time prevalence estimates do not appear to be a legacy of the recent political violence (the Troubles) as the estimate of the prevalence of any 12-month DSM-IV anxiety, mood, impulse-control and substance disorders was 23.1 % and the 12-month prevalence of any mood disorder was 9.6%, and major depressive disorder 7.9% (Bunting, Murphy, O'Neill & Ferry, 2013). In an international comparison NI had the second highest rates of mental health disorders globally (Kessler *et al*, 2009).

The high rates of mental ill-health in NI appear to be associated with high, and increasing, levels of psychopharmacological treatment, in particular the use of anti-depressants. For example, Kelly, Ansari, Rafferty & Stevenson (2003) used administrative data from the Regional Prescribing Information Unit (NI) to get details of all antidepressants prescribed annually from 1989 to 1999 using the Defined Daily Dose (DDD) System. They reported an increase in anti-depressant DDD from 4,962 in 1989 to 28,182 in 1999. More recently anti-depressant medication use was studied over the entire NI population of women of childbearing age (15–45 years) in 2009 using administrative data from the Enhanced Prescribing Database (Wemakor, Casson, & Dolk, 2014): they reported that 66.5% of the prescriptions prescribed were for anti-depressants and 43,770 women redeemed at least one prescription for an anti-depressant, giving an anti-depressant prescription prevalence of

16.3%. The 'Script Report' (2014) – an analysis of 36 million prescription records from GP practices across the UK, including 3.5 million from NI for the period April to September 2013 - showed that NI (1) prescribed proportionately more anti-depressants than twenty-three countries examined in a major international study, (2) consumed more than 2.5 times the anti-depressants as similarly defined socio-economic areas in England, and (3) anti-depressant use is higher among women than men and highest for 35-64 year olds. The high rates of anti-depressant prescribing may be explained by the relatively poor physical heath in NI (Newton et al., 2015), the high rates of posttraumatic stress disorder, most likely associated with decades of political violence (Koenen, et al, 2017), and NI having the highest levels of social and economic deprivation in the UK (Abel, Barclay, & Payne, 2016).

The extant evidence indicates that NI has high levels of depression and the primary treatment is anti-depressant medication. The study uses data-linkage techniques to derive: (i) comprehensive population-based estimates of anti-depressant prescribing in NI; and (ii) an examination of the personal, socio-demographic and socio-economic factors associated with anti-depressant prescribing.

Method

Data for this study was provided through the Administrative Data Research Centre – Northern Ireland (ADRC-NI) (https://adrn.ac.uk/about/network/n-ireland/), part of a recent UK-wide initiative funded by the Economic and Social Research Council (ESRC) to increase use of administrative data sources and linkages for research purposes. The main data sources linked for analysis comprised the 2011 NI Census returns and the Enhanced Prescribing Database, an electronic database of all primary care prescriptions dispensed in NI and submitted to the Business Services Organisation for payment. Deaths occurring subsequent to the Census (until the end of 2015; data provided by Business Services Organisation) and data on rateable values of households (from the Land and Property Services) (REF) were also included and linked through the Census record. Much of the detailed architecture of the data and linkage processes are based on the Northern Ireland Longitudinal Study (NILS), a precursor to ADRC-NI that is representative of 28% of the

population, and are described in detail elsewhere (O'Reilly, Rosato, Catney, Johnston & Brolly, 2011). The final dataset was linked at NISRA (using a one-way encryption methodology), tested for potential disclosure problems, de-identified and, lastly, made available to the research team in a secure setting at NISRA headquarters in Belfast. Ethical approval for this study was obtained from the Ulster University Research Ethics Committee and the Office for Research Ethics Committee Northern Ireland.   Successful linkage of 92.58% of the 2011 NI Census cases with the Enhanced Prescribing Database (EPD) was achieved, resulting in a sample of 1,588,355 individuals with 4,065,959 EPD file records. No unlinked data were provided for analysis.

Study Measures

The population for analysis comprises the whole enumerated NI 2011 Census population, normally resident in NI and living in private households. All indicators were derived from the Census returns, and were selected for analysis because of their utility in the extant literature on antidepressant use.

Demographic characteristics

Age was classified in five broad bands reflecting life-stage and antidepressant use (0-15, 16-34, 35-54, 55-74 and 75+ years). Gender was coded as male/female (0/1). Family structure was derived from household data and summarized as: a couple-based household; lone parent-based household; living alone. Because religious denomination was derived from two Census questions which records either current religious denomination or, for those who did not answer the question, the denomination they were brought up in. It is essentially a specification of identity rather than religiosity and for this analysis was summarised as four categories: Catholic; Protestant/other Christian; Other Faith/Philosophy; and none reported.

Health characteristics

General health in the twelve months prior to Census was taken directly from the Census question (a 5-point Likert type scale ranging from *very good* health to *very bad*). Respondents were also asked a series of questions ascertaining more specific health

information: this had the form *Do you have any of the following conditions which have lasted, or are expected to last, at least 12 months?*' and included a category for "*Emotional, psychological or mental health conditions*" with responses as no/yes (0/1). This was also included for analysis.

Socioeconomic characteristics

The economic activity of respondents aged 16+ was summarised as seven categories: *employed full-time*; *employed part-time*; *unemployed*; *retired*; *homemaker*; *permanently sick*; and *other*. Housing tenure and rateable property value were summarised as one indicator: tenure was derived from the Census record (and coded as *owner occupied*, *private renting*, *social renting*); rateable value of property was derived from data derived initially for local taxation purposes in 2005 and provided by Land and Property Services (Department of Finance and Personnel for NI); this latter was summarised and combined with tenure – producing eight categories, five defining owner-occupation (owner-occupied houses valued for local taxation purposes as £160,000+, £115,000-<£160,000, £90,000-<£115,000, £70,000-<£90,000, and <£70,000 and one for owner-occupied properties with no assigned rateable value), and two renting categories (*private renting* and *social renting*).

Area-level characteristics

Area-level deprivation was measured using Northern Ireland Multiple Deprivation Measure (NIMDM, 2010) – a ranked index of deprivation of 890 relatively homogeneous Super-Output Areas (Northern Ireland Statistics and Research Agency, 2010). Deprivation is measured on seven domains (health; income; employment; education skills and training; proximity to services; living environment; and crime and disorder; with an additional summary ranking of the seven). For this analysis the summary ranking was specified as deciles, from most to least deprived.

Settlement band is a measure of locale that places all settlements in NI on an urban-rural spectrum according to population size, population density and service provision (NISRA, 2005). NISRA defines eight settlement bands: (A) Belfast metropolitan urban area; (B) Derry

urban area; (C) large towns; (D) medium-sized towns; (E) small towns; (F) intermediate settlements; (G) village; and lastly (H) small villages, hamlets or open countryside. For analysis purposes these were summarised as three categories: *urban* (Bands A-B), *intermediate* (C-G) and *rural* (H).

Antidepressant prescribing measures

The analysis utilised records of prescriptions for anti-depressant medications in each quarter from 2011 to 2015. Antidepressant medications were identified using three British National Formulary (BNF) codes: BNF 4.3.1 (Tricyclics); 4.3.2 (MAOIs); and 4.3.3 (SSRIs). There were approximately 3.62 million prescriptions in the specified period, of which 3.55 million were viable for linkage. The data were (a) coded (0/1) to indicate prescription of one or more anti-depressants for each calendar year (2011-2015), and (b) aggregated over the whole five-years indicating a prescription issued at any time during the five-year study period.

Analysis Strategy

First, deaths were considered. Death at any point during year (2011-2014) resulted in removal from calculations for subsequent years. Death accounted for 3% of sample attrition over the five-year study period (Effective sample sizes 2011 *N* = 1,588,355; 2012 *N* = 1,579,424; 2013 *N* = 1,566,525; 2014 *N* = 1,553,402; 2015 *N* =1,540,475;   All Years *N* = 1,540,475). Next, the percentages of individuals redeeming one or more prescription during the given time-periods (individually for each year between 2011-2015, and all years combined). Logistic regression analyses were conducted using Stata 15 to assess the impact of predictor variables on the likelihood that respondents prescribed an anti-depressant, firstly in univariate analyses and then in a model fully-adjusted for all included variables.

Results

For each year from 2011 to 2015 the proportions of the population in Northern Ireland aged sixteen or more receiving anti-depressant prescriptions was 12.3%, 12.9%, 13.4%, 13.9% and 14.3% respectively, and over the whole 5-year period was 24.3%. From the 2011 NI

Census, 5.9% endorsed the item relating to experiencing "Emotional, psychological or mental health conditions", and of these 71.2% had a record of an antidepressant prescription anytime between 2011 and 2015. Counts and percentages of anti-depressant prescribing for each year, stratified by all predictor variables, and chi-squared tests are available at https://tinyurl.com/ADRCreport.

Table 1 records the associations between the socio-demographic, socio-economic and health indicators and five-year antidepressant prescribing uptake for those aged fifteen or more at the 2011 Census, firstly in minimally-adjusted then in fully-adjusted models.

Table 1 here

Socio-demographic characteristics: females were twice as likely than males to receive a prescription (at a level remaining stable from the minimally-adjusted to the fully-adjusted models); those aged 35-54 were more likely than other age-groups and those aged seventy-five or more were less likely (OR=1.29: 95%CI=1.28, 1.31 and OR=0.82: 0.80, 0.84 respectively); those living as part of a one-parent households were more likely than persons living a couple-based households to receive prescriptions (OR=1.18: 1.16, 1.19); Protestants were more likely than Catholics to be in receipt of anti-depressants (OR=1.10: 1.09, 1.11); and finally, those from rural areas were less likely to receive prescription than other locale types (OR=1.06: 1.04, 1.07 and 1.15: 1.14, 1.16 for urban and intermediate locales respectively) .

Socio-economic characteristics: housing tenure/rateable property value shows an increasing gradient in relation to housing status – for example, compared to those living in the most expensive housing those in social rented housing recorded an excess likelihood (OR=1.68: 95%CI=1.62, 1.74); area-level deprivation recorded a 0.05% decline (by decile) in receipt of prescriptions (dropping from a 0.6% decline in the minimally-adjusted model; and finally, when compared with those in employment, those unemployed were more likely (OR=1.24: 1.22, 1.27).

Self-reported Health: those in poorer health were also more likely to be in receipt of antidepressants - compared to the very healthy those in poor or very poor health were more likely (OR=3.95: 95%CI=3.86, 4.04 and OR=4.02: 3.86, 4.19 respectively); and those

reporting mental ill-health, when compared to persons not reporting such conditions (OR=3.57: 3.50, 3.64).

Discussion

The primary aim of this study was to use data linkage techniques to develop the most comprehensive population-based estimates of the prevalence of anti-depressant prescribing in NI. Based on the population from the 2011 NI Census, rates of prescribing were 12.449% in 2011 and 14.925% in 2015 and over the 5-year period the prevalence was 24.121%. Direct comparison with other countries is difficult as this is the first full population based assessment of anti-depressant prescribing. However, evidence points to the prescribing rates in NI being higher than other parts of the UK. For example, nationally representative survey data from England, the Adult Psychiatric Morbidity Survey (APMS), estimated the annual 2007 prevalence of anti-depressant prescribing to be 6.6% (Spiers, et al., 2016), and NI has recorded the highest anti-depressant prescribing costs per capita compared to other parts of the UK (Donnelly, 2014).

The most recent estimate of 12-month prevalence of major depressive disorder in NI was 7.9% (Bunting, Murphy, O'Neill & Ferry, 2013) and this is lower than any of the annual rates of anti-depressant prescribing from 2011 to 2015. It may be the case that some people are prescribed an anti-depressant when their symptoms do not meet the full diagnostic criteria for depression; this has previously been observed by Spiers, et al., (2016) who reported 45.4% of the APMS participants who reported currently using anti-depressants did not meet the diagnostic criteria for depression. It may also be the case that anti-depressants have been prescribed for problems other than depression, such as anxiety, insomnia, and pain (Wong et al., 2016). Also, the comparison between 12-month prevalence rates of depression and rates of anti-depressant prescribing are not directly comparable as treatment for depression may continue for more than one year after diagnosis. There is also evidence that anti-depressants may be prescribed due to the lack of alternative treatment options. The Mental Health Foundation (2005) surveyed 200 UK general practitioners and found that 78% had prescribed an antidepressant in the previous three years, despite believing that an alternative treatment might have been more appropriate. It also found that 66% had done so because a suitable

alternative was not available, 62% because there was a waiting list for the suitable alternative, and 33% because the patient requested anti-depressants. Of the GPs surveyed, 60% said they would prescribe anti-depressants less frequently if other options were available to them.

It is likely that factors other than depression are associated with anti-depressant prescribing as the results of the multivariate regression analysis that showed that all the demographic, health, socio-economic and area-level variables remained significantly associated with anti-depressant prescribing after controlling for self-reported emotional, psychological or mental health condition. The findings are consistent with the extant research that has shown that socioeconomic disadvantage is associated with increased anti-depressant use (Butterworth, et al, 2013): all forms of economic activity compared to full-time employment were associated with an increased risk, as were lower levels of rateable property value and area-level deprivation. Other risk factors were associated with anti-depression prescribing in line with existing epidemiological evidence. Increased risk of antidepressant prescribing in middle and late adulthood reflects the pattern of the lifetime prevalence of depression (Kessler et al. 2003) and the increased risk for being female (OR=2.07) was within the range of ORs reported in an analysis of data from 10 countries (ORs 1.9–2.5: Andrade et al., 2003). The results showed an increased risk of antidepressant prescribing in urban (OR=1.06) and intermediate (OR=1.15) areas compared to rural areas. These effects are similar to those reported by Weich, Twigg, and Lewis (2006) who found increased rates of common mental disorders in non-rural areas of the UK. The increased rates of anti-depressant prescribing may reflect the availability and easier access to general practitioners in non-rural areas. Compared to the Protestant/other Christian group the Catholic (OR=0.91), Other Faith/Philosophy (OR=0.78), and No Faith/Philosophy (OR=0.90) groups had significantly lower risk of antidepressant prescribing. This is in contrast to the findings of O'Reilly and Stevenson (2003) who reported no significant difference between Catholics and Protestants on scores on the General Health Questionnaire, and Bosqui et al (2017) who found that self-reported poor mental health was higher for Catholics (8.69%) than Protestants (7.06%), although the effect was moderated by the own-group religious neighbourhood density. It would appear, even if there are no differences in prevalence of depression, that the Protestant/other Christian group are more likely to be in receipt of anti-depressants.

There are some limitations of this study. First, not all antidepressants were included in the analysis; the antidepressants from the 'Other Antidepressant Drugs' (BNF section 4.3.4) were not included in the analysis. This is problematic as the research evidence shows that this category has seen significant increases in prescribing rates in England 1993–2004, and more recently NHS data from Scotland showed that this category accounted for 16.71% of the total number of dispensed antidepressants in 2011 (isdscotland, 2018). This means that the rates reported in this study will be underestimated. Second, the percentage of successful data linkage was high but a small percentage (7.42%) were not successfully linked. Third, anti-depressant use was coded as 'any use' in each calendar year. Further research will analyze the dosage and frequency of prescribing, and the type of anti-depressant. Fourth, we did not have an assessment of depression so the rates of anti-depressant prescribing were compared to independent prevalence estimates.

In conclusion, this study found that rates of anti-depressant prescribing were 12.449% in 2011 and 14.925% in 2015 and over the 5-year period the prevalence was 24.121%. These rates are likely to be higher than the prevalence of depressive disorders, and this suggests that alternative non-pharmacological forms of help and support for people with problems associated with low mood are needed.

Ethical standards:

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committee on human experimentation with the Helsinki Declaration of 1975, as revised in 2008.

The study protocol was approved by the Ulster University Research Ethics Committee and the Office for Research Ethics Committee Northern Ireland.

Conflict of Interest statement

Mark Shevlin has no conflicts of interest to disclose.

Michael Rosato has no conflicts of interest to disclose.

Stephanie Boyle has no conflicts of interest to disclose.

Daniel Boduszek has no conflicts of interest to disclose.

Jamie Murphy has no conflicts of interest to disclose.

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Table 1. Socio-demographic, socio-economic and health characteristics for those aged sixteen or more and prescribed anti-depressant medication in Northern Ireland (2011-2015). Data represents Odds Ratios (and 95%CIs) derived from logistic regression model.

Predictor	Categories	Minimally adjusted[&] OR (95% CI)	Fully-adjusted OR (95% CI)
Age group (ref=age 16-34)	35-54	1.60 (1.58, 1.61)	1.29 (1.28, 1.31)
	55-74	1.46 (1.45, 1.48)	1.04 (1.03, 1.06)
	75 plus	1.21 (1.19, 1.23)	0.82 (0.80, 0.84)
Gender (ref=male)	Female	2.15 (2.13, 2.17)	2.10 (2.09, 2.12)
Family structure (ref=couple-based family)	Not in family	1.41 (1.40, 1.43)	0.98 (0.97, 0.99)
	Lone-parent family	1.60 (1.59, 1.61)	1.18 (1.16, 1.19)
Religious denomination (ref=Catholic)	Protestant & other Christian	1.03 (1.02, 1.04)	1.10 (1.09, 1.11)
	Other faith groups	0.88 (0.84, 0.92)	0.87 (0.83, 0.91)
	None stated	1.03 (1.01, 1.06)	0.99 (0.97, 1.01)
Housing tenure – rateable value of property (ref=owner occupied properties valued at £160,000 or more)	OO[$]: £115 - £<160,000	1.20 (1.17, 1.24)	1.11 (1.07, 1.14)
	OO: £90 - £<115,000	1.39 (1.34, 1.43)	1.18 (1.15, 1.22)
	OO: £70 - £<90,000	1.65 (1.60, 1.70)	1.28 (1.24, 1.32)
	OO: <£70,000	2.08 (2.02, 2.14)	1.42 (1.38, 1.47)
	OO: value not assigned	1.34 (1.29, 1.40)	1.15 (1.11, 1.20)
	Private renting	2.47 (2.40, 2.55)	1.47 (1.43, 1.52)
	Social renting	3.60 (3.49, 3.71)	1.68, 1.62, 1.74)

Locale (ref=rural)	Intermediate	1.27 (1.26, 1.28)	1.15 (1.14, 1.16)
	Urban	1.28 (1.27, 1.29)	1.06 (1.04, 1.07)
Economic activity (ref=full-time employed)	Part-time employed	1.24 (1.23, 1.26)	1.15 (1.14, 1.17)
	Unemployed	1.61, 1.58, 1.64)	1.24 (1.22, 1.27)
	Retired	1.51 (1.49, 1.54)	0.99 (0.97, 1.00)
	Homemaker	1.77 (1.74, 1.81)	1.27 (1.25, 1.30)
	Permanently sick	4.08 (4.63, 4.79)	1.27 (1.25, 1.30)
	Other	1.16 (1.14, 1.18)	0.91 (0.90, 0.93)
Area-level deprivation (continuous)	Area-level deprivation$^{\%}$	0.936 (0.935, 0.937)	0.994 (0.993, 0.996)
General health (ref=very good health)	Good health	1.86 (1.85, 1.88)	1.65 (1.64, 1.67)
	Fair health	4.11 (4.06, 4.16)	2.83 (2.79, 2.87)
	Bad health	7.68 (7.54, 7.83)	3.95 (3.86, 4.04)
	Very bad health	9.00 (8.68, 9.34)	4.02 (3.86, 4.19)
Self-reported mental health problems (ref=none stated)	Problem reported=yes	6.95 (6.84, 7.06)	3.57 (3.50, 3.64)

%: age and gender mutually adjusted; the remainder each adjusted for age and gender

$: OO=owner occupation

%: continuous variable – 10 categories from most to least deprived

&: column 3 - (a) age and sex mutually adjusted; (b) all other variables minimally adjusted for age/sex