Prevalence and variation in antidepressant prescribing across Northern Ireland: a longitudinal administrative data linkage study for targeted support.

Project Reference:
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Final Report

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Executive Summary

Anti-depressant prescription rates in the United Kingdom (UK) are among the highest in Western Europe and prescription rates in Northern Ireland (NI) are significantly higher than the rest of the UK. Moreover, while prescription rates are climbing annually, rates of depression are not changing, and evidence suggests that a range of socio-economic and geographical factors may be responsible. The primary aim of this project was to use data-linkage techniques trough the Administrative Data Research Centre (Northern Ireland) to link returns from the 2011 NI Census and data on anti-depressant prescribing from the Enhanced Prescribing Database to help inform the work of our non-academic partner Aware Defeat Depression (AWARE NI). Project outcomes include

- Successful linkage of 92.58% of the 2011 NI Census cases with the Enhanced Prescribing Database was achieved, resulting in a sample of 1,588,491 individuals.
- For years 2011 to 2015 the prevalence of anti-depressant prescribing was 12.45%, 13.08%, 13.67%, 14.23%, 14.93%, and over the 5-year period the prevalence was 24.12%.
- Self-reported mental health condition (OR=3.37), poor physical health (OR=3.22), female gender (OR=2.08), disability (OR=1.34), lower rateable property value (ORs = 1.11 – 1.63) and lone parent family (OR=1.17) were all significant risk factors for anti-depressant prescribing.
- Some variables were found to be protective; age 40-54 years (OR=.94), not being in a family (OR=0.95), being Catholic (OR=0.91) or No faith (OR=.95), and being a full-time (OR=0.53) or part-time student (OR=0.59).
- In collaboration with AWARE NI, The project findings were presented at an *End of Project Briefing Conference* with representatives from the Royal College of Psychiatrists, the Public Health Agency, the Belfast Health and Social Care Trust, and academics from Ulster University and Queens University Belfast in attendance.
- AWARE has used the project findings to tailor delivery of training and services.

Background

Rates of antidepressant medication (ADM) use in the United Kingdom (U.K.) are among the highest in Europe (McClure, 2013). In 2009, the daily dosage of antidepressants per 1000 people in the U.K. population was 6th highest of 29 European countries at 61.93. Use of ADM here has continually increased over the last few years; recent health statistics from the Organisation for Economic Co-operation and Development (2016) indicated that the estimated daily dosage of antidepressants per 1000 people in the UK population was 87.1 in 2015, 1.84 times higher than the estimated daily dosage per 1000 people in 2005 (47.3).

Whilst ADM use has climbed, rates of depression have remained more or less constant at approximately 10% for any 12-month mood disorder (Kessler et al., 1993; Kessler et al., 2005), and approximately 5-6% for 12-month Major Depressive Disorder (MDD: Hasin, Goodwin, Stinson & Grant, 2005; Kessler et al., 2005). In an epidemiological review addressing the worldwide prevalence of MDD, Baxter et al. (2014) reported that the point-prevalence of MDD in Western Europe was 5.6% for females, and 3.4% for males in 1991. In 2010, these figures increased slightly to 5.8% for females and 3.5% for males. Subsequently, Baxter et al. (2014) concluded that there was no evidence of significant change in the prevalence of MDD during that 10-year period. Whilst the authors concede that there was an increase in the crude number of cases of MDD (38% worldwide), they contend that this increase is explained by population growth and changing age structures (Baxter et al., 2014).

If ADM use is increasing and the prevalence of depression is not changing significantly, what is contributing to the increase in ADM use? Reasons behind the disparity remain unclear (Munoz-Arroyo, Sutton & Morrison, 2006). Depression irrefutably remains a strong predictor of ADM use; results from the European study of the epidemiology of mental disorders indicated that a diagnosis of depression increased the probability of ADM use by 5 times (Demyttenaere et al., 2008). Yet, the prevalence of depression cannot fully account for all current ADM use (Munoz-Arroyo et al., 2006). This has resulted in current research addressing the contributions of a range of personal, social and economic factors to explaining ADM

use, such as physical health (Demyttenaere et al., 2008), deprivation (Morrison et al., 2009) and unemployment (Spence, Roberts, Ariti & Bardsley, 2014).

There have been relatively few studies that have investigated the social, economic and psychological predictors of ADM use, and fewer still have addressed a broad constellation of predictors in population-based studies. The small number of studies which have addressed ADM use in the general population have found that age and gender are strong predictors of ADM use (Demyttenaere et al., 2008; Lewer, O'Reilly, Mojtabai & Evans-Lacko, 2015). The risk for ADM use generally increases from young adulthood to middle adulthood (OR =1.69), and declines in older adulthood (OR = .1.45) (Lewer et al., 2015). This is unsurprising, given that the prevalence of 12-month and lifetime MDD drops significantly in older adulthood, and that the lifetime risk of MDD in middle-aged adults is double that of older adults (OR = 2.10) (Hasin et al., 2005). Additionally, epidemiological evidence has shown that being female is associated with an increase of about 40% in risk of ADM use (Benson, O'Neill, Murphy, Ferry & Bunting, 2015). This is expected given that patterns of ADM use tend to follow those for diagnosis of MDD, and epidemiological research has reported that being female is a significant risk factor for MDD (Kessler et al., 2003; Seedat et al., 2009).

Social isolation is another factor that has been linked with ADM use. Previous research has shown that loneliness increased the risk of using any psychotropic medication (including ADMs) in older adults by about 50% (Boehlen et al., 2015). Moreover, research has suggested that increased rates of ADM use may be a consequence of living alone. The number of one-person households in the U.K. increased sharply between 1971 and 1998 and has remained relatively stable since 1998 at approximately 29% (Office for National Statistics [ONS], 2015). In their analysis of the Health 2000 study, Pulkki-Raback et al. (2012) reported that those of working age who lived alone had an 80% higher risk of ADM use during the 7-year follow-up period compared with participants who lived with others. However, this study and others of its kind have focused on specific populations only. Further analysis is required to assess whether social isolation is an independent predictor of ADM use in the general population.

There is relatively little research on ADM use by migrants. In the U.K., ADMs can only be prescribed via the National Health Service, and research suggests that only a small proportion (32%) of new migrants to the U.K. register with a GP (Stagg, Jones, Bickler, Abubakar, 2017). Explanations for this include issues related to access, such as the practice lacking interpretation services, or lack of transparency regarding entitlement (Stagg et al., 2017). Another explanation is that ADM use in migrants compared to natural-born citizens differs due to varying cultural perceptions of mental health and its care (Furnham & Malik, 1994). The Office for National Statistics reported that the top-10 countries of birth for non-U.K. migrants in 2015 included India (#2) and Pakistan (#3), in addition to Bangladesh, South Africa, Nigeria and China (#7 - #10 respectively) (ONS, 2016). In countries such as these, there can be great stigma and shame associated with mental illness (Health and Social Care in Northern Ireland [HSCNI], 2014). Mental illness is likely ignored or concealed in Asian cultures in particular, as mental illness can have serious negative consequences for the reputation of the family (Ng, 1997). Moreover, analyses of the perceptions of mental illness in India have shown that depression is less often perceived as a mental or physical disorder than other psychoses. As such, the medical approach to treatment is less popular than social or more traditional healing methods (Wig et al., 1980). Comparatively, westernized concepts of depression, such as depressive symptoms being a result of chemical imbalance in the brain, are significantly associated with increases in ADM use (Aikens, Neese & Klinkman, 2008). Thus, it appears that migrants may be less likely to use ADM as they are (1) less likely to register with a GP, and as a result are (2) less likely to be diagnosed with depression, and (3) they have varying cultural beliefs about mental health and mental health care which may not align with ADM use (Furnham & Malik, 1994; HSCNI, 2014; Stagg, et al., 2017).

Prescriptions of ADM with or without diagnosis of depression are increasingly common for people managing chronic physical health conditions such as fibromyalgia, heart disease and diabetes (Mercier et al., 2013; Mojtabai & Olfson, 2011). Persistent pain conditions are especially strongly associated with ADM use; endorsement of persistent pain in the previous year has been reported to almost

double risk of using any ADM (OR = 1.99) (Demyttenaere et al., 2008). Whilst there is evidence that the prevalence of ADM use is higher in those who have chronic physical conditions, there is little significant evidence for chronic physical conditions as predictors of ADM use (Demyttenaere et al., 2008). This is in part due to research predicting ADM use being scarce. It may also be due in part to there being little in the way of a theoretical framework for understanding the association between physical health and ADM use. If we look to the relationship between depression and physical health for more information, research points to the role of the functional impairment as a result of poor physical health (Zeiss, Lewinsohn, Rohde & Seeley, 1996). According to the Integrative Model of Depression, poor physical health (without functional impairment) is not a significant predictor of depression (Lewinsohn, Hoberman, Teri & Hautzinger, 1985). This suggests that evaluating physical health-related functional impairment (PHFI) as a predictor of ADM use, rather than the presence of any one chronic physical condition, would be prudent.

Socioeconomic disadvantage has long been recognized as a risk factor for depression (Lorant et al., 2002), and more recently recognized as a risk factor for ADM use (Butterworth, Olesen & Leach, 2013). In a study investigating the contributions of a range of socioeconomic disadvantage factors to ADM use, factors such as unemployment (OR =2.67) and financial hardship (OR = 2.87) increased likelihood of ADM use. Indeed, all social disadvantage factors investigated in the study were reported to increase odds of ADM use, although two factors (rental housing tenure and not finishing high school) failed to reach statistical significance (Butterworth et al., 2013). These findings suggest that socioeconomic disadvantage is a reasonably good predictor of ADM use. However, further evidence is required to assess the unique contributions of socioeconomic disadvantage factors to ADM use in a multivariate context, as only financial hardship remained an independent predictor of ADM use when depression was controlled for (OR = 1.43).

Northern Ireland Context

The high rates of mental health problems in Northern Ireland 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% (Bunting, Murphy, O'Neill & Ferry, 2012). The life-time estimates of prevalence do not appear to be legacy of the history of 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% (Bunting, Murphy, O'Neill & Ferry, 2013). In an international comparison Northern Ireland had the second highest rates of mental health disorders globally (Kessler, et al., 2008).

The high rates of mental health problems in Northern Ireland appear to be associated with high, and increasing, levels of psychopharmacological treatment, in particular the use of antidepressants. For example, Kelly, Ansari, Rafferty and Stevenson (2003) used administrative data from the Regional Prescribing Information Unit (Northern Ireland) to get details of all antidepressants prescribed annually from 1989 to 1999 using the Defined Daily Dose (DDD) System. The reported an increase in antidepressant DDD from 4,962 in 1989 to 28,182 in 1999. More recently the use of antidepressant medication was studied in the entire Northern Irish population of women of childbearing age (15–45 years) in 2009 using administrative data from the Enhanced Prescribing Database. It was reported that 66.5% of the prescriptions prescribed to women were for antidepressants and 43,770 redeemed at least one prescription for an antidepressant giving an antidepressant prescription prevalence of 16.3% (Wemakor, Casson, & Dolk, 2014). The 'Script Report' (2014) was based on a freedom of information request on U.K. prescribing practices. Access was gained to 36 million prescription records from

across the UK, including 3.5 million prescriptions from GPs in Northern Ireland for the period April 2013 to September 2013. The findings showed that Northern Ireland (1) prescribed proportionately more antidepressants than the 23 countries that were examined in a major international study, (2) consumed more than two-and-a-half times the antidepressants per head than in similarly wealthy economic areas in England, (3) antidepressant use is higher among women than men and highest for 35-64 year olds. Overall, GPs in Northern Ireland prescribed enough antidepressant to give every member of the population a 27-day supply at the DDD limits; the same statistics for England and Wales was 10 and 19 respectively.

Aims and Objectives

The extant evidence indicates that Northern Ireland has high levels of depression and the primary 'supply side' treatment is antidepressant medication. This project used data-linkage techniques to develop the most comprehensive population-based estimates of the prevalence of antidepressant prescribing in Northern Ireland. Furthermore the association of personal, social, and economic, factors with antidepressant prescribing were examined by linking prescribing records with data from the Census 2011.

Method

Data for this study was provided through the Administrative Data Research Centre – Northern Ireland (ADRC-NI), 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) and data on rateable values of households (from the Land and Property Services) 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, 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, the Administrative Data Research Network, 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 was achieved, resulting in a sample of 1,588,491 individuals. The RSU Statistical Disclosure Control Report is in Appendix 1.

Demographic characteristics

Respondents to the 2011 NI Census were aged 0-95. In this analysis, age was represented in five year bands (0-4, 5-9, 10-14, etc.). Age was also represented in four bands that broadly reflect life stages and antidepressant use (0-15, 16-29, 30-44, 55+). Gender was categorised as male or female. Marital status was assessed for those aged 16 years and older, and was represented in three categories: (1) married or in a civil partnership, (2) widowed/separated/divorced from a marriage or civil partnership, and (3) never married or in a civil partnership. Family structure was derived from the household questionnaire within the Census, which records which residents usually live in each household. In this analysis, family structure was summarized as those in with family structure based on (1) a couple, (2) a lone parent, (3) not in a family, or (4) other. For example, the child of a couple who is recorded as usually living in the same household, would be categorized as a member of a couple family. Ethnicity was summarized as non-white/white. This was a precautionary disclosure control measure as the populations of non-white groups in N.I. (Chinese or other Asian, Black and mixed ethnicity), are relatively small.

Socioeconomic characteristics

Educational qualifications were assessed for all respondents aged 16 years and older. Responses were categorised as: (1) no qualifications, (2) intermediate qualifications (GCSEs, A-Levels and equivalents), and (3) Degree level qualifications and above. Current student status was also restricted to respondents aged 16 years and older, and was categorised as (1) not a student, (2) part-time student, and (3) full-time student. The economic activity of respondents aged 16+ was represented as an eight category variable: (1) employed full-time, (2) employed part-time, (3) unemployed, (4) retired, (5) homemaker, (6) permanently sick, and (7) other. Hours worked for those employed were recorded in four bands (15 or less, 16-30, 31-48, and 49+ hours). The occupations of those in employment were derived from the National Statistics Socio-economic Classification [3], and were summarised as (1) professional, (2) intermediate, (3) routine or (4) other.

Furthermore, unpaid caring responsibilities were recorded. Respondents were asked whether they currently provided unpaid support to any person because of long-term health condition or disability, or problems related to old age. Unpaid caring responsibility was then recorded as a dichotomous no (0) and yes (1) variable, and also according to the weekly total of unpaid caring hours each respondent reported ((1) no unpaid caring hours, (2) 1-19, (3) 20-49, and (4) 50+ caring hours).

Housing tenure and rateable property value were summarised as one indicator. Housing values were derived by Land and Property Services (NI Department of Finance) from capital values not exempt from local taxation in 2005. Residences classified as second homes, student housing or empty were exempt. Rented homes were categorised as those rented with or without housing benefit. The resulting indicator was comprised of eight categories. Five categories relating to owner-occupied properties with an assigned value (£160,000+, £115,000-160,000, £90,000-£115,000, £70,000-£90,000, and <£70,000), one category relating to owner-occupied properties with no assigned value in 2005, and two categories relating to rented properties (private rent and social rent). Car access was also recorded, and

summarised as (1) no car access, (2) access to one car, and (3) access to two or more cars.

Household characteristics

Household size was recorded. This variable is derived from the household questionnaire in the Census. It is a count of the number of people usually living in each domestic residence. There are eight categories, which range from one person to seven people (1-7), and 8 or more people (8+). The next household characteristic recorded and utilised in this analysis was settlement band. Settlement band is a measure that places all settlements in NI on an urban-rural spectrum according to population size, population density and service provision [4]. There are currently eight settlement bands (A-H) on this spectrum: (1) Belfast metropolitan urban area, (2) Derry urban area, (3) large town, (4) medium town, (5) small town, (6) intermediate settlement, (7) village, (8) small village, hamlet or open countryside. In addition to being utilised in its original classification, this variable was collapsed to a three category variable: urban (Bands A-B), intermediate (Bands C-G) and rural (Band H).

Health characteristics

General health was assessed using a 5-point likert type scale that ranged from very good to very bad. Higher scores indicated worse general health for that Census respondent. Impairments in daily functioning were also recorded. Respondents were asked 'Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months?' Responses were categorised as: no limitations; yes, limited a little; and yes, limited a lot. The presence of long-term conditions was assessed similarly. Respondents were asked 'Do you have any of the following conditions which have lasted, or are expected to last, at least 12 months?'. The following categories of long-term condition were listed:

1. Deafness or partial hearing loss
2. Blindness or partial sight loss
3. Communication difficulty
4. Mobility or dexterity difficulty
5. Learning difficulty, an intellectual difficulty, or a social or behavioural difficulty
6. Emotional, psychological or mental health condition
7. Long-term pain or discomfort
8. Shortness of breath or difficulty breathing
9. Frequent periods of confusion or memory loss.

Each category of long-term condition represented a single dichotomous variable in which responses were categorised as no/yes (0/1) for not present or present.

Deprivation measures

Deprivation was measured using NI Multiple Deprivation Measure 2010 (NIMDM) scores [5]. The NIMDM measures deprivation on seven domains: health; income; employment; education skills and training; proximity to services; living environment; and crime and disorder. Weighted scores are derived by calculating the number of people experiencing each type of deprivation in a Super Output Area (SOA; *M* = 2035 residents). For example, the number of General Practitioners in an SOA would contribute to the Health Deprivation score. Scores range from most deprived (1) to least deprived (10). In this analysis, we utilised Income, Health and Multiple (summary) Deprivation indicators.

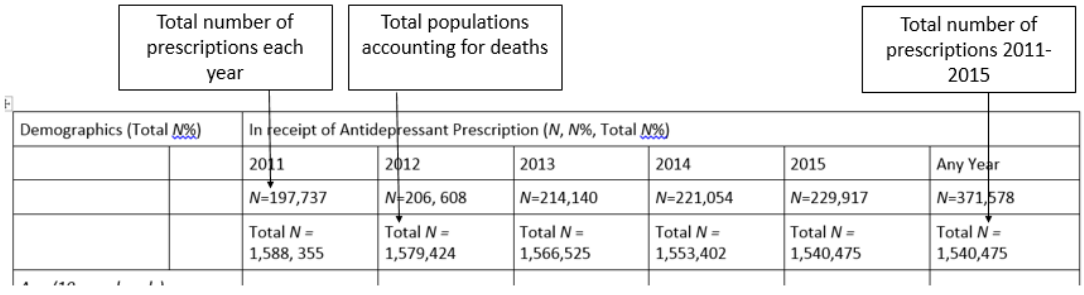
Antidepressant prescribing measures

Prescription data was obtained from the Enhanced Prescribing Database. The EPD is a secure electronic database that holds information on all primary care prescriptions

in N.I., which have been dispensed and submitted to the BSO for payment. This analysis utilised records of prescriptions for antidepressant medications in each quarter from March 2011 to December 2015. Antidepressant medications were identified using three British National Formulatory (BNF) codes: BNF 4.3.1 (Tricyclics); BNF 4.3.2 (MAOIs); and BNF 4.3.3 (SSRIs) [6]. In addition to the prescribing quarter and BNF code, the generic medication name, quantity, strength and form were obtained. There were approx. 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

The data was analysed in 3 linked phases. In Phase 1 annual entire population prescribing rates were calculated for years 2010 to 2015, and also the rate across this five year period. In Phase 2, the prescribing rates were cross-tabulated with a large range of demographic, social, economic and health-related variables. The tables of cross-tabulations can be interpreted using the guide below-



Demographics (Total *N*%)		In receipt of Antidepressant Prescription (*N*, *N*%, Total *N*%)					
		2011	2012	2013	2014	2015	Any Year
		N=197,737	*N*=206, 608	*N*=214,140	*N*=221,054	*N*=229,917	*N*=371,578
		Total *N* = 1,588, 355	Total *N* = 1,579,424	Total *N* = 1,566,525	Total *N* = 1,553,402	Total *N* = 1,540,475	Total *N* = 1,540,475

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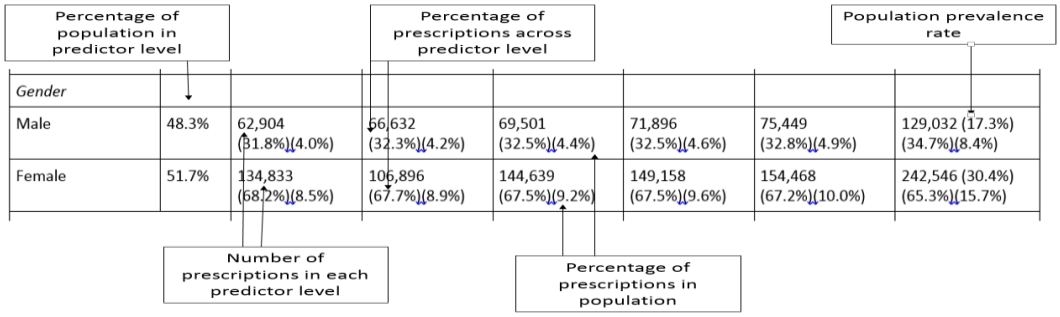

Gender							
Male	48.3%	62,904 (31.8%)(4.0%)	66,632 (32.3%)(4.2%)	69,501 (32.5%)(4.4%)	71,896 (32.5%)(4.6%)	75,449 (32.8%)(4.9%)	129,032 (17.3%) (34.7%)(8.4%)
Female	51.7%	134,833 (68.2%)(8.5%)	106,896 (67.7%)(8.9%)	144,639 (67.5%)(9.2%)	149,158 (67.5%)(9.6%)	154,468 (67.2%)(10.0%)	242,546 (30.4%) (65.3%)(15.7%)

Bivariate statistical measures of association were calculated. Chi-square tests of independence were conducted to determine of there was a significant association between the demographic, social, economic and health-related variables and prescribing rates for each year and combined 5-year data. Post-hoc analysis using Cramer's v (φ) were also conducted to assess the strength of the association. Values of φ can range from 0 to 1, with values closer to 1 indicting a stronger level of association. The magnitude of φ can be interpreted on the basis of 0 - .1 very low association, .1 - .3 low association, .3 - .5 moderate association, and > .5 high association. In Phase 3 a multivariate binary logistic regression model was specified and tested. In this model all the the demographic, social, economic and health-related variables were entered as predictor variables and the binary variable representing the 5-year prescribing rate was used as the dependent variable. The associations between the predictor variables was reported as odds ratios (OR). An OR is a measure of association between each level of a predictor variable (using a reference category if the predictor has more than 2 levels) and the dependent variable and indicates the increased likelihood (OR>1) or decreased likelihood (OR<1) of membership of the predicted level of the dependent variable (in this case having been prescribed an anti-depressant). The statistical significance of an OR is determined based on the 95% confidence intervals. If the value of 1 is below the lower confidence interval or above the upper confidence interval the effect is considered to be statistically significant.

Tables 1 (demographic variables), 2 (health-related variables), 3 (housing related), 4 (economic variables), and 5 (deprivation variables) show the overall rates of anti-depressant prescribing and the distribution of prescribing rates stratified across the

levels of the independent variables . Tables 6 through 10 show the associated chi-square statistics and estimates of φ (see Appendix 1).

Results

For each year from 2011 to 2015 the proportions of the population in receipt of anti-depressant prescriptions was 12.45% (95%CI=12.40-12.50), 13.08% (95%CI=13.03-13.13), 13.67% (95%CI=13.62-13.72), 14.23% (95%CI=14.18-14.29), 14.93% (95%CI=14.87-14.98), and over the 5-year period the prevalence was 24.12% (95%CI=24.05-24.19).

Table 1. Counts, percentages, and crosstabulations of demographic variables and antidepressant prescribing rates.

Demographics (Total *N*%)		In receipt of Antidepressant Prescription (*N*, *N*%, Total *N*%)					
		2011	2012	2013	2014	2015	Any Year
		N=197,737	*N*=206,608	*N*=214,140	*N*=221,054	*N*=229,917	*N*=371,578
		Total *N* = 1,588, 355	Total *N* = 1,579,424	Total *N* = 1,566,525	Total *N* = 1,553,402	Total *N* = 1,540,475	Total *N* = 1,540,475
Population prescribing rate		12.45%	13.08%	13.67%	14.23%	14.93%	24.12%
Age (10-year bands)							
0-9	12.9%	15 (0.0%)(0.0%)	41 (0.0%)(0.0%)	53 (0.0%)(0.0%)	104 (0.0%)(0.0%)	201 (0.1%)(0.0%)	283 (0.1%) (0.1%)(0.0%)
10-19	13.5%	3713 (1.9%)(0.2%)	5473 (2.6%)(0.3%)	7446 (3.5%)(0.5%)	9911 (4.5%)(0.6%)	13,286 (5.8%)(0.9%)	21,935 (10.2%) (5.9%)(1.4%)
20-29	12.7%	19,041 (9.6%)(1.2%)	20,515 (9.9%)(1.3%)	21,560 (10.1%)(1.4%)	22,737 (10.3%)(1.5%)	24,999 (10.9%)(1.6%)	47,906 (23.7%) (12.9%)(3.1%)
30-39	13.1%	29,706 (15.0%)(1.9%)	31,489 (15.2%)(2.0%)	32,964 (15.4%)(2.1%)	34,698 (15.7%)(2.2%)	36,496 (15.9%)(2.4%)	61,738 (29.8%) (16.6%)(4.0%)
40-49	14.8%	43,787 (22.1%)(2.8%)	45,680 (22.1%)(2.9%)	47,762 (22.3%)(3.0%)	49,424 (22.4%)(3.2%)	51,685 (22.5%)(3.4%)	80,391 (34.4%) (21.6%)(5.2%)

50-59	12.4%	40,569 (20.5%)(2.6%)	42,345 (20.5%)(2.7%)	43,614 (20.4%)(2.8%)	44,450 (20.1%)(2.9%)	45,102 (19.6%)(2.9%)	68,356 (35.3%) (18.4%)(4.4%)
60-69	10.2%	31,411 (15.9%)(2.0%)	31,946 (15.5%)(2.0%)	32,504 (15.2%)(2.1%)	32,687 (14.8%)(2.1%)	32,517 (14.1%)(2.1%)	50,132 (32.4%) (13.5%)(3.3%)
70-79	6.5%	18,133 (9.2%)(1.1%)	18,432 (8.9%)(1.2%)	18,558 (8.7%)(1.2%)	18,417 (8.3%)(1.2%)	18,067 (7.9%)(1.2%)	28,831 (31.6%) (7.8%)(1.9%)
80+	3.8%	11,362 (5.7%)(0.7%)	10,687 (5.2%)(0.7%)	9679 (4.5%)(0.6%)	8626 (3.9%)(0.6%)	7564 (3.3%)(0.5%)	12,006 (31.0%) (3.2%)(0.8%)
Gender							
Male	48.3%	62,904 (31.8%)(4.0%)	66,632 (32.3%)(4.2%)	69,501 (32.5%)(4.4%)	71,896 (32.5%)(4.6%)	75,449 (32.8%)(4.9%)	129,032 (17.3%) (34.7%)(8.4%)
Female	51.7%	134,833 (68.2%)(8.5%)	139,976 (67.7%)(8.9%)	144,639 (67.5%)(9.2%)	149,158 (67.5%)(9.6%)	154,468 (67.2%)(10.0%)	242,546 (30.4%) (65.3%)(15.7%)
Marital status							
Married	39.0%	94,623 (47.9%)(6.0%)	100,034 (48.4%)(6.3%)	104,347 (48.7%)(6.7%)	107,504 (48.6%)(6.9%)	110,215 (47.9%)(7.2%)	177,586 (15.2%) (47.8%)(11.5%)
Never married	48.1%	49,847 (25.2%)(3.1%)	53,501 (25.9%)(3.4%)	57,162 (26.7%)(3.6%)	61,454 (27.8%)(4.0%)	67,967 (29.6%)(4.4%)	115,281 (29.6%) (31.0%)(7.5%)
Widow/ Separated/ Divorced	12.9%	53,267 (26.9%)(3.4%)	53,073 (25.7%)(3.4%)	52,631 (24.6%)(3.4%)	52,096 (23.6%)(3.4%)	51,735 (22.5%)(3.4%)	78,711 (47.8%) (21.2%)(5.1%)

Family structure							
Not in family	14.5%	46,429 (23.5%)(2.9%)	46,903 (22.7%)(3.0%)	46,959 (21.9%)(3.0%)	46,771 (21.2%)(3.0%)	46,893 (20.4%)(3.0%)	73,476 (34.5%) (19.8%)(4.8%)
In couple family	67.7%	111,030 (56.2%)(7.0%)	118,920 (57.6%)(7.5%)	125,525 (58.6%)(8.0%)	131,428 (59.5%)(8.5%)	137,785 (59.9%)(8.9%)	226,033 (21.4%) (60.8%)(14.7%)
Lone parent family	16.8%	35,945 (18.2%)(2.3%)	37,127 (18.0%)(2.4%)	38,667 (18.1%)(2.5%)	40,476 (18.3%)(2.6%)	43,266 (18.8%)(2.8%)	69,203 (26.4%) (18.6%)(4.5%)
Other	1.0%	4333 (2.2%)(0.3%)	3658 (1.8%)(0.2%)	2989 (1.4%)(0.2%)	2379 (1.1%)(0.2%)	1973 (0.9%)(0.1%)	2866 (33.5%) (0.8%)(0.2%)
Ethnicity							
White	98.5%	196,745 (99.5%)(12.4%)	205,619 (99.5%)(13.0%)	213,088 (99.5%)(13.6%)	219,933 (99.5%)(14.2%)	228,771 (99.5%)(14.9%)	369,114 (24.3%) (99.3%)(24.0%)
Chinese/ Other Asian	0.9%	477 (0.2%)(0.0%)	500 (0.2%)(0.0%)	543 (0.3%)(0.0%)	605 (0.3%)(0.0%)	594 (0.3%)(0.0%)	1370 (9.4%) (0.4%)(0.1%)
Black	0.1%	140 (0.1%)(0.0%)	122 (0.1%)(0.0%)	136 (0.1%)(0.0%)	130 (0.1%)(0.0%)	136 (0.1%)(0.0%)	303 (13.3%) (0.1%)(0.0%)
Mixed ethnicity	0.3%	231 (0.1%)(0.0%)	229 (0.1%)(0.0%)	226 (0.1%)(0.0%)	238 (0.1%)(0.0%)	267 (0.1%)(0.0%)	508 (10.6%) (0.1%)(0.0%)
Other ethnicity	0.1%	144 (0.1%)(0.0%)	138 (0.1%)(0.0%)	147 (0.1%)(0.0%)	148 (0.1%)(0.0%)	149 (0.1%)(0.0%)	283 (16.5%) (0.1%)(0.0%)
Religion							

Catholic	44.5%	84,267 (42.6%)(5.3%)	88,410 (42.8%)(5.6%)	91,544 (42.7%)(5.8%)	94,900 (42.9%)(6.1%)	99,494 (43.3%)(6.5%)	159,585 (23.1%) (42.9%)(10.4%)
Protestant/ Other Christian	49.5%	105,740 (53.5%)(6.7%)	110,194 (53.3%)(7.0%)	114,078 (53.3%)(7.3%)	117,297 (53.1%)(7.6%)	120,868 (52.6%)(7.8%)	195,347 (25.8%) (52.6%)(12.7%)
Other religion/ Philosophy	0.8%	1444 (0.7%)(0.1%)	1465 (0.7%)(0.1%)	1523 (0.7%)(0.1%)	1575 (0.7%)(0.1%)	1568 (0.7%)(0.5%)	2804 (21.5%) (0.8%)(0.2%)
None	5.1%	6286 (3.2%)(0.4%)	6539 (3.2%)(0.4%)	6995 (3.3%)(0.4%)	7282 (3.3%)(0.5%)	7987 (3.5%)(0.5%)	13,842 (17.4%) (3.7%)(0.9%)

Table 2. Counts, percentages, and crosstabulations of health related variables and antidepressant prescribing rates.

Health (Total *N*%)		Antidepressant Prescription (*N*, *N*%, Total *N*%)					
		2011	2012	2013	2014	2015	Any Year
		N=197,737	*N*=206,608	*N*=214,140	*N*=221,054	*N*=229,917	*N*=371,578
		Total *N* = 1,588,355	Total *N* = 1,579,424	Total *N* = 1,566,525	Total *N* = 1,553,402	Total *N* = 1,540,475	Total *N* = 1,540,475
GHQ Health							
Very good	47.1%	33,751 (17.1%)(2.1%)	39,523 (19.1%)(2.5%)	44,094 (20.6%)(2.8%)	48,876 (22.1%)(3.1%)	54,837 (23.9%)(3.6%)	97,290 (13.1%) (26.2%)(6.3%)
Good	32.0%	61,782 (31.2%)(3.9%)	65,610 (31.8%)(4.2%)	69,309 (32.4%)(4.4%)	73,022 (33.0%)(4.7%)	77,222 (33.6%)(5.0%)	130,476 (26.2%) (35.1%)(8.5%)
Fair	15.2%	63,845 (32.3%)(4.0%)	64,212 (31.1%)(4.1%)	64,445 (30.1%)(4.1%)	64,096 (29.0%)(4.1%)	63,962 (27.8%)(4.2%)	97,060 (44.2%) (26.1%)(6.3%)
Bad	4.6%	29,827 (15.1%)(1.9%)	29,163 (14.1%)(1.8%)	28,567 (13.3%)(1.8%)	27,684 (12.5%)(1.8%)	26,855 (11.7%)(1.7%)	37,254 (59.8%) (10.0%)(2.4%)
Very bad	1.2%	8532 (4.3%)(0.5%)	8100 (3.9%)(0.5%)	7725 (3.6%)(0.5%)	7376 (3.3%)(0.5%)	7041 (3.1%)(0.5%)	9498 (63.2%) (2.6%)(0.6%)
Impairment (daily activity)							

Yes, a lot	12.1%	66,192 (33.5%)(4.2%)	64,978 (31.4%)(4.1%)	63,593 (29.7%)(4.1%)	61,656 (27.9%)(4.0%)	59,938 (26.1%)(3.9%)	84,235 (51.4%) (22.7%)(5.5%)
Yes, a little	9.0%	33,642 (17.0%)(2.1%)	34,201 (16.6%)(2.2%)	34,738 (16.2%)(2.2%)	34,803 (15.7%)(2.2%)	34,836 (15.2%)(2.3%)	53,774 (40.2%) (14.5%)(3.5%)
No	78.0%	97,903 (49.5%)(6.2%)	107,429 (52.0%)(6.8%)	115,809 (54.1%)(7.4%)	124,595 (56.4%)(8.0%)	135,143 (58.8%)(8.8%)	233,569 (80.8%) (62.9%)(15.2%)
Long-term condition							
Deafness	5.3%	17,043 (8.6%)(1.1%)	17,173 (8.3%)(1.1%)	17,063 (8.0%)(1.1%)	16,667 (7.5%)(1.1%)	16,184 (7.0%)(1.1%)	25,108 (34.9%) (6.8%)(1.6%)
Blindness	1.7%	6349 (3.2%)(0.4%)	6173 (3.0%)(0.4%)	5880 (2.7%)(0.4%)	5613 (2.5%)(0.4%)	5370 (2.3%)(0.3%)	8060 (37.1%) (2.2%)(0.5%)
Communication difficulty	1.6%	6038 (3.1%)(0.4%)	5647 (2.7%)(0.4%)	5335 (2.5%)(0.3%)	5051 (2.3%)(0.3%)	4916 (2.1%)(0.3%)	6732 (32.1%) (1.8%)(0.4%)
Mobility difficulty	11.8%	59,923 (30.3%)(3.8%)	59,489 (28.8%)(3.8%)	58,714 (27.4%)(3.7%)	57,154 (25.9%)(3.7%)	55,639 (24.2%)(3.6%)	79,495 (49.7%) (21.4%)(5.2%)
Learning difficulty	2.1%	5186 (2.6%)(0.3%)	5270 (2.6%)(0.3%)	5363 (2.5%)(0.3%)	5554 (2.5%)(0.4%)	5904 (2.6%)(0.4%)	8225 (25.2%) (2.2%)(0.5%)
Mental health condition	5.9%	53,643 (27.1%)(3.4%)	50,310 (24.4%)(3.2%)	48,474 (22.6%)(3.1%)	46,924 (21.2%)(3.0%)	46,160 (20.1%)(3.0%)	63,326 (71.2%) (17.0%)(4.1%)
Pain condition	10.4%	56,816 (28.7%)(3.6%)	56,830 (27.5%)(3.6%)	56,859 (26.6%)(3.6%)	56,088 (25.4%)(3.6%)	55,032 (23.9%)(3.6%)	80,060 (53.4%) (21.5%)(5.2%)

Breathing difficulty	8.9%	32,157 (16.3%)(2.0%)	32,555 (15.8%)(2.1%)	32,861 (15.3%)(2.1%)	32,780 (14.8%)(2.1%)	32,658 (14.2%)(2.1%)	48,343 (37.5%) (13.0%)(3.1%)
Memory loss	2.0%	12,358 (6.2%)(0.8%)	11,478 (5.6%)(0.7%)	10,621 (5.0%)(0.7%)	9852 (4.5%)(0.6%)	9142 (4.0%)(0.6%)	12,635 (56.4%) (3.4%)(0.8%)

Table 3. Counts, percentages, and crosstabulations of housing related variables and antidepressant prescribing rates.

Housing (Total *N*%)		Antidepressant Prescription (*N*, *N*%, Total *N*%)					
		2011	2012	2013	2014	2015	Any Year
		N=197,737	*N*=206,608	*N*=214,140	*N*=221,054	*N*=229,917	*N*=371,578
		Total *N* = 1,588,355	Total *N* = 1,579,424	Total *N* = 1,566,525	Total *N* = 1,553,402	Total *N* = 1,540,475	Total *N* = 1,540,475
# Household							
1	11.2%	39,532 (20.4%)(2.5%)	39,771 (19.6%)(2.5%)	39,622 (18.8%)(2.5%)	39,424 (18.0%)(2.6%)	39,242 (17.2%)(2.6%)	60,885 (37.6%) (16.5%)(4.0%)
2	23.5%	59,951 (31.0%)(3.8%)	62,449 (30.8%)(4.0%)	64,587 (30.6%)(4.2%)	66,002 (30.2%)(4.3%)	67,325 (29.5%)(4.4%)	108,047 (30.3%) (29.3%)(7.1%)
3	19.4%	37,814 (19.6%)(2.4%)	40,135 (19.8%)(2.6%)	42,083 (19.9%)(2.7%)	43,982 (20.1%)(2.8%)	46,448 (20.4%)(3.0%)	75,254 (24.8%) (20.4%)(4.9%)
4	23.0%	31,817 (16.5%)(2.0%)	34,257 (16.9%)(2.2%)	36,771 (17.4%)(2.4%)	39,031 (17.8%)(2.5%)	41,976 (18.4%)(2.7%)	69,166 (19.1%) (18.8%)(4.5%)
5	13.7%	15,837 (8.2%)(1.0%)	17,113 (8.4%)(1.1%)	18,202 (8.6%)(1.2%)	19,511 (8.9%)(1.3%)	21,271 (9.3%)(1.4%)	35,649 (16.5%) (9.7%)(2.3%)
6	6.0%	6164 (3.2%)(0.4%)	6746 (3.3%)(0.4%)	7247 (3.4%)(0.5%)	7837 (3.6%)(0.5%)	8565 (3.8%)(0.6%)	14,336 (15.2%) (3.9%)(0.9%)

7	1.5%	1454 (0.8%)(0.1%)	1583 (0.8%)(0.1%)	1679 (0.8%)(0.1%)	1830 (0.8%)(0.1%)	1963 (0.9%)(0.1%)	3417 (14.8%) (0.9%)(0.2%)
8+	0.9%	835 (0.4%)(0.1%)	886 (0.4%)(0.1%)	960 (0.5%)(0.1%)	1058 (0.5%)(0.1%)	1154 (0.5%)(0.1%)	1958 (14.2%) (0.5%)(0.1%)
Settlement band							
Belfast Met. Urban Area	15.0%	33,782 (17.1%)(2.1%)	34,803 (16.8%)(2.2%)	35,598 (16.6%)(2.3%)	36,437 (16.5%)(2.3%)	37,731 (16.4%)(2.4%)	60,516 (26.4%) (16.3%)(3.9%)
Derry Urban Area	4.5%	10,136 (5.1%)(0.6%)	10,668 (5.2%)(0.7%)	11,018 (5.1%)(0.7%)	11,424 (5.2%)(0.7%)	11,797 (5.1%)(0.8%)	18,334 (26.3%) (4.9%)(1.2%)
Large Town	29.4%	61,324 (31.0%)(3.9%)	64,123 (31.0%)(4.1%)	67,149 (31.4%)(4.3%)	69,471 (31.4%)(4.5%)	72,161 (31.4%)(4.7%)	116,250 (25.7%) (31.1%)(7.5%)
Medium Town	7.1%	15,561 (7.9%)(1.0%)	16,153 (7.8%)(1.0%)	16,393 (7.7%)(1.0%)	16,848 (7.6%)(1.1%)	17,431 (7.6%)(1.1%)	28,056 (25.6%) (7.6%)(1.8%)
Small Town	6.6%	13,404 (6.8%)(0.8%)	14,038 (6.8%)(0.9%)	14,486 (6.8%)(0.9%)	14,961 (6.8%)(1.0%)	15,437 (6.7%)(1.0%)	25,153 (24.9%) (6.8%)(1.6%)
Intermediate settlement	4.3%	8581 (4.3%)(0.5%)	8,887 (4.3%)(0.6%)	9,148 (4.3%)(0.6%)	9,528 (4.3%)(0.6%)	10,103 (4.4%)(0.7%)	16,123 (24.1%) (4.3%)(1.0%)
Village	5.7%	11,273 (5.7%)(0.7%)	11,892 (5.8%)(0.8%)	12,424 (5.8%)(0.8%)	12,834 (5.8%)(0.8%)	13,505 (5.9%)(0.9%)	21,498 (24.3%) (5.8%)(1.4%)

Small village/hamlet /countryside	27.3%	43,676 (22.1%)(2.7%)	46,044 (22.3%)(2.9%)	47,924 (22.4%)(3.1%)	49,551 (22.4%)(3.2%)	51,752 (22.5%)(3.4%)	85,648 (20.2%) (23.0%)(5.6%)
Urbanicity							
Urban	19.5%	43,918 (22.2%)(2.8%)	45,471 (22.0%)(2.9%)	46,616 (21.8%)(3.0%)	47,861 (21.7%)(3.1%)	49,528 (21.5%)(3.2%)	78,850 (26.4%) (21.2%)(5.1%)
Intermediate	53.1%	110,143 (55.7%)(6.9%)	115,093 (55.7%)(7.3%)	119,600 (55.9%)(7.6%)	123,642 (55.9%)(8.0%)	128,637 (55.9%)(8.4%)	207,080 (25.3%) (55.7%)(13.4%)
Rural	27.3%	43,676 (22.1%)(2.7%)	46,044 (22.3%)(2.9%)	47,924 (22.4%)(3.1%)	49,551 (22.4%)(3.2%)	51,752 (22.5%)(3.4%)	85,648 (20.2%) (23.0%)(5.6%)

Table 4. Counts, percentages, and crosstabulations of socioeconomic variables and antidepressant prescribing rates.

Socioeconomic (Total *N*%)		Antidepressant Prescription (*N*, *N*%, Total *N*%)					
		2011	2012	2013	2014	2015	Any Year
		N=197,737	*N*=206,608	*N*=214,140	*N*=221,054	*N*=229,917	*N*=371,578
		Total *N* = 1,588,355	Total *N* = 1,579,424	Total *N* = 1,566,525	Total *N* = 1,553,402	Total *N* = 1,540,475	Total *N* = 1,540,475
Education							
Degree+	27.7%	40,337 (20.5%)(3.2%)	42,626 (20.7%)(3.4%)	44,410 (20.9%)(3.6%)	45,605 (20.9%)(3.7%)	47,514 (21.2%)(3.9%)	81,615 (24.0%) (22.4%)(6.8%)
Intermediate	42.9%	75,492 (38.3%)(6.0%)	80,108 (39.0%)(6.4%)	84,124 (39.6%)(6.8%)	87,854 (40.3%)(7.2%)	92,197 (41.1%)(7.6%)	154,844(29.2%) (42.5%)(12.8%)
No qualifications	29.5%	81,401 (41.3%)(6.5%)	82,896 (40.3%)(6.7%)	83,788 (39.5%)(6.8%)	84,325 (38.7%)(6.9%)	84,763 (37.8%)(7.0%)	127,757 (37.9%) (35.1%)(10.6%)
Employment							
Employed FT	39.4%	47,926 (24.3%)(3.8%)	52,397 (25.5%)(4.2%)	55,870 (26.3%)(4.5%)	59,110 (27.1%)(4.8%)	63,020 (28.1%)(5.2%)	111,745 (22.8%) (30.7%)(9.3%)
Employed PT	16.5%	31,061 (15.7%)(2.5%)	33,217 (16.2%)(2.7%)	35,360 (16.7%)(2.9%)	37,310 (17.1%)(3.1%)	39,229 (17.5%)(3.2%)	65,312 (31.8%) (17.9%)(5.4%)
Unemployed	5.0%	8018 (4.1%)(0.6%)	8571 (4.2%)(0.7%)	9013 (4.2%)(0.7%)	9657 (4.4%)(0.8%)	10,632 (4.7%)(0.9%)	18,900 (30.2%) (5.2%)(1.6%)
Retired	20.0%	49,020 (24.9%)(3.9%)	49,156 (23.9%)(3.9%)	48,806 (23.0%)(4.0%)	47,878 (22.0%)(3.9%)	46,563 (20.7%)(3.9%)	72,188 (33.3%) (19.8%)(6.0%)
Homemaker	4.2%	11,957 (6.1%)(1.0%)	12,383 (6.0%)(1.0%)	12,703 (6.0%)(1.0%)	13,311 (6.1%)(1.1%)	13,927 (6.2%)(1.2%)	22,122 (42.0%) (6.1%)(1.8%)

Permanently sick	7.0%	37,648 (19.1%)(3.0%)	37,546 (18.3%)(3.0%)	37,500 (17.7%)(3.0%)	36,757 (16.9%)(3.0%)	36,233 (16.1%)(3.0%)	49,515 (60.0% (13.6%)(4.1%)
Other	7.9%	11,600 (5.9%)(0.9%)	12,360 (6.0%)(1.0%)	13,070 (6.2%)(1.1%)	13,761 (6.3%)(1.1%)	14,882 (6.6%)(1.2%)	24,444 (25.3%) (6.7%)(2.0%)
Hours Worked							
15 or less	8.8%	16,143 (9.1%)(1.4%)	16,796 (9.1%)(1.5%)	17,636 (9.2%)(1.6%)	18,133 (9.3%)(1.6%)	18,788 (9.3%)(1.7%)	30,323 (31.3%) (9.2%)(2.8%)
16-30	20.6%	46,476 (26.2%)(4.1%)	48,380 (26.2%)(4.3%)	50,162 (26.3%)(4.5%)	51,693 (26.4%)(4.7%)	53,295 (26.4%)(4.9%)	84,922 (37.3%) (25.8%)(7.8%)
31-48	60.9%	100,995 (57.0%)(8.9%)	105,627 (57.1%)(9.4%)	108,987 (57.0%)(9.8%)	111,475 (56.9%)(10.1%)	114,924 (57.0%)(10.5%)	189,055 (28.5%) (57.5%)(17.3%)
49+	9.7%	13,514 (7.6%)(1.2%)	14,128 (7.6%)(1.3%)	14,262 (7.5%)(1.3%)	14,473 (7.4%)(1.3%)	14,645 (7.3%)(1.3%)	24,755 (23.7%) (7.5%)(2.3%)
Occupation							
Professional	25.7%	39,768 (20.2%)(3.2%)	41,941 (20.4%)(3.4%)	43,524 (20.5%)(3.5%)	44,871 (20.6%)(3.7%)	46,487 (20.7%)(3.9%)	78,786 (25.1%) (21.6%)(6.5%)
Intermediate	44.9%	95,468 (48.4%)(7.6%)	99,605 (48.4%)(8.0%)	102,952 (48.5%)(8.3%)	105,322 (48.4%)(8.6%)	108,101 (48.2%)(9.0%)	175,224 (32.3%) (48.1%)(14.5%)
Routine	13.9%	35,065 (17.8%)(2.8%)	35,882 (17.4%)(2.9%)	36,547 (17.2%)(3.0%)	37,087 (17.0%)(3.0%)	37,502 (16.7%)(3.1%)	58,058 (35.4%) (15.9%)(4.8%)
Other	15.5%	26,929 (13.7%)(2.1%)	28,202 (13.7%)(2.3%)	29,299 (13.8%)(2.4%)	30,504 (14.0%)(2.5%)	32,384 (14.4%)(2.7%)	52,148 (27.9%) (14.3%)(4.3%)
Unpaid Care							
No	87.8%	164,871 (83.4%)(10.4%)	171,579 (83.0%)(10.9%)	177,627 (82.9%)(11.3%)	182,958 (82.8%)(11.8%)	190,430 (82.8%)(12.4%)	164,871 (22.8%) (83.0%)(20.0%)

Yes	12.2%	32,866 (16.6%)(2.1%)	35,029 (17.0%)(2.2%)	36,513 (17.1%)2.3%)	38,096 (17.2%)(2.5%)	39,487 (17.2%)(2.6%)	63,089 (33.2%) (17.0%)(4.1%)
Unpaid Caring (hours)							
No unpaid care	87.8%	164,871 (83.4%)(10.4%)	171,579 (83.0%)(10.9%)	177,627 (82.9%)(11.3%)	182,958 (82.8%)(11.8%)	190,430 (82.8%)(12.4%)	308,489 (22.8%) (83.0%)(20.0%)
1-19	7.0%	15,698 (7.9%)(1.0%)	16,885 (8.2%)(1.1%)	17,665 (8.2%)(1.1%)	18,567 (8.4%)(1.2%)	19,470 (8.5%)(1.3%)	32,045 (29.3%) (8.6%)(2.1%)
20-49	2.0%	5781 (2.9%)(0.4%)	6189 (3.0%)(0.4%)	6538 (3.1%)(0.4%)	6768 (3.1%)(0.4%)	6994 (3.0%)(0.5%)	11,035 (35.6%) (3.0%)(0.7%)
50+	3.2%	11,387 (5.8%)(0.7%)	11,955 (5.8%)(0.8%)	12,310 (5.7%)(0.8%)	12,761 (5.8%)(0.8%)	13,023 (5.7%)(0.8%)	11,035 (40.2%) (3.0%)(1.3%)
Student Status							
Not a student	91.8%	192,478 (97.6%)(15.3%)	199,680 (97.1%)(16.0%)	205,249 (96.7%)(16.6%)	209,685 (96.3%)(17.25)	215,019 (95.8%)(17.8%)	347,042 (31.4%) (95.3%)(28.7%)
Student PT	3.1%	1924 (1.0%)(0.2%)	2387 (1.2%)(0.2%)	2743 (1.3%)(0.2%)	3100 (1.4%)(0.3%)	3569 (1.6%)(0.3%)	6798 (17.3%) (1.9%)(0.6%)
Student FT	5.0%	2828 (1.4%)(0.2%)	3563 (1.7%)(0.3%)	4330 (2.0%)(0.4%)	4999 (2.3%)(0.4%)	5886 (2.6%)(0.5%)	10,376 (16.5%) (2.8%)(0.9%)
Ratable Property Value							
OO: >£160,000	2.7%	2900 (1.5%)(0.2%)	3003 (1.5%)(0.2%)	3190 (1.5%)(0.2%)	3386 (1.5%)(0.2%)	3508 (1.5%)(0.2%)	6264 (15.0%) (1.7%)(0.4%)
OO: £115,000-£160,000	8.7%	10,696 (5.4%)(0.7%)	11,423 (5.5%)(0.7%)	12,073 (5.6%)(0.8%)	12,591 (5.7%)(0.8%)	13,314 (5.8%)(0.9%)	22,992 (16.8%) (6.2%)(1.5%)
OO: £90,000-£115,000	12.9%	18,778 (9.5%)(1.2%)	19,897 (9.6%)(1.3%)	20,967 (9.8%)(1.3%)	22,083 (10.0%)(1.4%)	23,115 (10.1%)(1.5%)	38,691 (19.2%) (10.4%)(2.5%)

OO: £70,000-£90,000	22.1%	38,735 (19.6%)(2.4%)	41,131 (19.9%)(2.6%)	43,119 (20.1%)(2.8%)	44,984 (20.3%)(2.9%)	46,944 (20.4%)(3.0%)	76,556 (22.3%) (20.6%)(5.0%)
OO: <£70,000	23.9%	51,938 (26.3%)(3.3%)	54,843 (26.5%)(3.5%)	57,268 (26.7%)(3.7%)	59,170 (26.8%)(3.8%)	61,569 (26.8%)(4.0%)	98,366 (26.7%) (26.5%)(6.4%)
OO: Value not assigned	3.7%	7948 (4.0%)(0.5%)	7492 (3.6%)(0.5%)	7029 (3.3%)(0.4%)	6593 (3.0%)(0.4%)	6365 (2.8%)(0.4%)	9544 (20.1%) (2.8%)(0.7%)
Private rent	13.9%	29,020 (14.7%)(1.8%)	30,247 (14.6%)(1.9%)	31,046 (14.5%)(2.0%)	31,298 (14.4%)(2.1%)	33,538 (14.6%)(2.2%)	55,429 (25.6%) (14.9%)(3.6%)
Social rent	11.9%	37,677 (19.1%)(2.4%)	38,572 (18.7%)(2.4%)	39,448 (18.4%)(2.5%)	40,319 (18.2%)(2.6%)	41,524 (18.1%)(2.7%)	62,915 (34.7%) (16.9%)(4.1%)
Car Access							
2+ cars	48.6%	68,000 (35.2%)(4.3%)	73,424 (36.2%)(4.7%)	78,166 (37.0%)(5.0%)	82,354 (37.7%)(5.3%)	87,339 (38.3%)(5.7%)	146,615 (19.2%) (39.8%)(9.6%)
1 Car	35.5%	79,782 (41.3%)(5.1%)	83,346 (41.1%)(5.3%)	86,320 (40.9%)(5.6%)	89,197 (40.8%)(5.8%)	92,351 (40.5%)(6.0%)	147,760 (27.1%) (40.1%)(9.6%)
0 Cars	15.0%	45,622 (23.6%)(2.9%)	46,180 (22.8%)(2.9%)	46,665 (22.1%)(3.0%)	47,134 (21.6%)(3.1%)	48,254 (21.2%)(3.1%)	74,337 (33.4%) (20.2%)(4.9%)

Table 5. Counts, percentages, and crosstabulations of deprivation variables and antidepressant prescribing rates.

MDM Deprivation in Deciles (Total *N*%)		Antidepressant Prescription (*N*, *N*%, Total *N*%)					
		2011	2012	2013	2014	2015	Any Year
		N=197,737	*N*=206,608	*N*=214,140	*N*=221,054	*N*=229,917	*N*=371,578
		Total *N* = 1,588,355	Total *N* = 1,579,424	Total *N* = 1,566,525	Total *N* = 1,553,402	Total *N* = 1,540,475	Total *N* = 1,540,475
Income Deprivation							
1	9.0%	24,015 (12.1%)(1.5%)	24,770 (12.0%)(1.6%)	25,293 (11.8%)(1.6%)	26,100 (11.8%)(1.7%)	27,179 (11.8%)(1.8%)	41,936 (30.3%) (11.3%)(2.7%)
2	9.7%	22,378 (11.3%)(1.4%)	23,475 (11.4%)(1.5%)	24,296 (11.3%)(1.6%)	24,980 (11.3%)(1.6%)	25,867 (11.3%)(1.7%)	40,908 (27.4%) (11.0%)(2.7%)
3	9.8%	22,403 (11.3%)(1.4%)	23,258 (11.3%)(1.5%)	23,967 (11.2%)(1.5%)	24,555 (11.1%)(1.6%)	25,434 (11.1%)(1.7%)	40,542 (27.0%) (10.9%)(2.6%)
4	10.3%	21,129 (10.7%)(1.3%)	21,973 (10.6%)(1.4%)	23,038 (10.8%)(1.5%)	23,787 (10.8%)(1.5%)	24,690 (10.7%)(1.6%)	39,540(24.8%) (10.6%)(2.6%)
5	10.0%	19,738 (10.0%)(1.2%)	20,569 (10.0%)(1.3%)	21,192 (9.9%)(1.4%)	21,862 (9.9%)(1.4%)	22,738 (9.9%)(1.5%)	36,688(23.9%) (9.9%)(2.4%)

6	10.8%	19,264 (9.7%)(1.2%)	20,404 (9.9%)(1.3%)	21,164 (9.9%)(1.4%)	21,734 (9.8%)(1.4%)	22,691 (9.9%)(1.5%)	37,178 (22.4%) (10.0%)(2.4%)
7	10.8%	19,058 (9.6%)(1.2%)	20,011 (9.7%)(1.3%)	20,673 (9.7%)(1.3%)	21,317 (9.6%)(1.4%)	22,443 (9.8%)(1.5%)	36,868 (22.1%) (9.9%)(2.4%)
8	10.4%	18,350 (9.3%)(1.2%)	19,143 (9.3%)(1.2%)	19,952 (9.3%)(1.3%)	20,896 (9.5%)(1.3%)	21,744 (9.5%)(1.4%)	35,781 (22.2%) (9.6%)(2.3%)
9	10.1%	17,060 (8.6%)(1.1%)	17,958 (8.7%)(1.1%)	18,778 (8.8%)(1.2%)	19,584 (8.9%)(1.3%)	20,226 (8.8%)(1.3%)	33,775 (21.6%) (9.1%)(2.2%)
10	9.1%	14,342 (7.3%)(0.9%)	15,047 (7.3%)(1.0%)	15,787 (7.4%)(1.0%)	16,239 (7.3%)(1.0%)	16,905 (7.4%)(1.1%)	28,452 (20.3%) (7.7%)(1.8%)
Health Deprivation							
1	9.2%	24,175 (12.2%)(1.5%)	24,904 (12.1%)(1.6%)	25,408 (11.9%)(1.6%)	26,360 (11.9%)(1.7%)	27,353 (11.9%)(1.8%)	42,263 (30.1%) (11.4%)(2.7%)
2	9.7%	23,189 (11.7%)(1.5%)	24,089 (11.7%)(1.5%)	24,930 (11.6%)(1.6%)	25,344 (11.5%)(1.6%)	26,368 (11.5%)(1.7%)	41,446 (27.9%) (11.2%)(2.7%)
3	10.2%	22,458 (11.4%)(1.4%)	23,469 (11.4%)(1.5%)	24,304 (11.3%)(1.6%)	24,985 (11.3%)(1.6%)	25,905 (11.3%)(1.7%)	41,443 (26.5%) (11.2%)(2.7%)
4	10.1%	21,146 (10.7%)(1.3%)	21,954 (10.6%)(1.4%)	22,850 (10.7%)(1.5%)	23,373 (10.6%)(1.5%)	24,184 (10.5%)(1.6%)	39,016 (25.1%)

							10.5%)(2.5%)
5	9.9%	19,216 (9.7%)(1.2%)	20,240 (9.8%)(1.3%)	20,917 (9.8%)(1.3%)	21,569 (9.8%)(1.4%)	22,472 (9.8%)(1.5%)	36,107 (23.6%) (9.7%)(2.3%)
6	10.6%	19,729 (10.0%)(1.2%)	20,700 (10.0%)(1.3%)	21,439 (10.0%)(1.4%)	22,212 (10.0%)(1.4%)	23,216 (10.1%)(1.5%)	37,706 (23.0%) (10.1%)(2.4%)
7	10.6%	18,452 (9.3%)(1.2%)	19,334 (9.4%)(1.2%)	20,072 (9.4%)(1.3%)	20,992 (9.5%)(1.4%)	21,941 (9.5%)(1.4%)	36,061 (22.0%) (9.7%)(2.3%)
8	10.7%	18,204 (9.2%)(1.1%)	19,147 (9.3%)(1.2%)	20,123 (9.4%)(1.3%)	20,861 (9.4%)(1.3%)	21,831 (9.5%)(1.4%)	35,887 (21.8%) (9.7%)(2.3%)
9	9.6%	16,462 (8.3%)(1.0%)	17,245 (8.3%)(1.1%)	17,912 (8.4%)(1.1%)	18,681 (8.5%)(1.2%)	19,195 (8.3%)(1.2%)	32,241 (21.8%) (8.7%)(2.1%)
10	9.4%	14,706 (7.4%)(0.9%)	15,526 (7.5%)(1.0%)	16,185 (7.6%)(1.0%)	16,677 (7.5%)(1.1%)	17,452 (7.6%)(1.1%)	29,408 (20.2%) (7.9%)(1.9%)
Multiple Deprivation							
1	9.0%	24,066 (12.2%)(1.5%)	24,712 (12.0%)(1.6%)	25,224 (11.8%)(1.6%)	26,033 (11.8%)(1.7%)	27,060 (11.8%)(1.8%)	41,766 (30.4%) (11.2%)(2.7%)
2	9.6%	22,687 (11.5%)(1.4%)	23,818 (11.5%)(1.5%)	24,695 (11.5%)(1.6%)	25,294 (11.4%)(1.6%)	26,197 (11.4%)(1.7%)	41,389 (28.1%) (11.1%)(2.7%)
3	9.8%	21,529 (10.9%)(1.4%)	22,448 (10.9%)(1.4%)	23,208 (10.8%)(1.5%)	23,949 (10.8%)(1.5%)	24,784 (10.8%)(1.6%)	39,522 (26.3%) (10.6%)(2.6%)

4	10.6%	21,909 (11.1%)(1.4%)	22,735 (11.0%)(1.4%)	23,543 (11.0%)(1.5%)	24,178 (10.9%)(1.6%)	25,105 (10.9%)(1.6%)	40,144 (24.6%) (10.8%)(2.6%)
5	10.2%	19,507 (9.9%)(1.2%)	20,355 (9.9%)(1.3%)	21,223 (9.9%)(1.4%)	21,727 (9.8%)(1.4%)	22,759 (9.9%)(1.5%)	36,752 (23.5%) (9.9%)(2.4%)
6	10.9%	19,050 (9.6%)(1.2%)	20,138 (9.7%)(1.3%)	20,827 (9.7%)(1.3%)	21,519 (9.7%)(1.4%)	22,360 (9.7%)(1.5%)	37,063 (22.0%) (10.0%)(2.4%)
7	10.1%	18,159 (9.2%)(1.1%)	19,003 (9.2%)(1.2%)	19,742 (9.2%)(1.3%)	20,518 (9.3%)(1.3%)	21,578 (9.4%)(1.4%)	34,998 (22.4%) (9.4%)(2.3%)
8	10.6%	18,614 (9.4%)(1.2%)	19,628 (9.5%)(1.2%)	20,339 (9.5%)(1.3%)	21,213 (9.6%)(1.4%)	22,122 (9.6%)(1.4%)	36,547(22.4%) (9.8%)(2.4%)
9	10.0%	17,112 (8.7%)(1.1%)	17,968 (8.7%)(1.1%)	18,790 (8.8%)(1.2%)	19,529 (8.8%)(1.3%)	20,315 (8.8%)(1.3%)	33,757 (21.9%) (9.1%)(2.2%)
10	9.3%	15,104 (7.6%)(1.0%)	15,803 (7.6%)(1.0%)	16,549 (7.7%)(1.1%)	17,094 (7.7%)(1.1%)	17,637 (7.7%)(1.1%)	29,640 (20.7%) (8.0%)(1.9%)

The results from the binary logistic regression are presented in Table 6.

Table 6. Bivariate and multivariate Odds Ratios from Binary Logistic Regression analyses of 5-year antidepressant prescription (2011-2015) and risk factors.

	Antidepressant Prescription (2011-2015)			
	Bivariate		Multivariate	
	OR	95% CI	*OR*	95%CI
Demographic characteristics				
Age (years) (ref= 15-39)				
0-14	0.067	0.066-0.069		
40-54	1.59	1.57-1.60	1.22	1.20-1.23
55+	1.45	1.43-1.46	0.94	0.93-0.96
Female gender	2.09	2.07-2.10	2.08	2.06-2.10
Family Status (ref= In couple family)				
Not in family	1.94	1.92-1.96	0.95	0.93-0.96
In lone-parent family	1.32	1.31-1.34	1.17	1.12-1.19
Other	1.85	1.77-1.93	0.88	0.83-0.94
White ethnicity	2.73	2.62-2.84	2.14	2.04-2.25
Religion (ref= Protestant/other Christian)				
Catholic	0.86	0.86-0.87	0.91	0.90-0.92
Other Faith/Philosophy	0.79	0.76-0.82	**1.00**	**0.96-1.06**
No Faith/Philosophy	0.61	0.60-0.62	0.95	0.93-0.98
Health characteristics				
General Health (ref= Very good)				
Good	2.36	2.34-2.38	1.60	1.58-1.62
Fair	5.27	5.22-5.33	2.39	2.35-2.43
Bad	9.91	9.74-10.09	3.13	3.05-3.21
Very bad	11.44	11.06-11.84	3.22	3.09-3.36
Disability (ref= no impairment)				
Impaired a little	2.90	2.87-2.94	1.28	1.26-1.30
Impaired a lot	4.57	4.53-4.62	1.34	1.32-1.37
Mental health condition	9.15	9.02-9.29	3.37	3.31-3.42
Socioeconomic characteristics				
Economic activity (ref= Employed full-time)				
Employed part-time	1.58	1.56-1.60	1.21	1.19-1.22
Unemployed	1.47	1.44-1.49	1.31	1.28-1.33
Retired	1.70	1.68-1.72	0.93	0.91-0.94
Homemaker	2.46	2.41-2.51	1.28	1.25-1.30

Permanently sick	5.09	5.01-5.17	1.19	1.17-1.22
Other	1.15	1.13-1.17	1.26	1.23-1.29
Student Status (ref= not student)				
Student part-time	0.46	0.45-0.47	0.59	0.58-0.61
Student full-time	0.43	0.42-0.44	0.53	0.51-0.54
Rateable property value (ref= oo: £160,000+)				
OO: £115,000-£160,000	1.15	1.11-1.18	1.11	1.07-1.14
OO: £90,000-£115,000	1.35	1.31-1.39	1.18	1.14-1.22
OO: £70,000-£90,000	1.63	1.59-1.68	1.27	1.23-1.31
OO: <£70,000	2.07	2.01-2.13	1.39	1.35-1.44
OO: value not assigned	1.43	1.38-1.48	1.14	1.09-1.19
Private rent	1.95	1.90-2.01	1.45	1.41-1.50
Social rent	3.02	2.93-3.10	1.63	1.57-1.68
Household characteristics				
Deprivation	1.054	1.052-1.055	1.005	1.003-1.006
Urbanicity (ref= Rural)				
Urban	1.41	1.40-1.43	1.08	1.07-1.09
Intermediate	1.34	1.32-1.35	1.16	1.15-1.18

OO: owner-occupier
p = <.001, Odds Ratios in bold are non-significant.

The regression models, bivariate and multivariate, show that all variables are significant predictors of 5-year anti-depressant prescribing rates in Northern Ireland. The ORs from the multivariate model indicate that being prescribed an anti-depressant can be described in terms of a risk profile. In order of increasing risk the variables are

1. Self-reported mental health condition (OR=3.37).
2. Self-reported general health described as ‘Fair’ (OR=2.39), ‘Bad’ (OR=3.13), or ‘Very Bad’ (OR=3.22).
3. Ethnicity reported as ‘White’ (OR=2.14).
4. Female gender (OR=2.08).
5. Disability reported as ‘Impaired a little’ (OR=1.28) and ‘Impaired a lot’ (OR=1.34).
6. Lower rateable property value (ORs = 1.11 – 1.63).
7. Lone parent family (OR=1.17).

8. Non full-time or retired economic activity (ORs = 1.19 – 1.31).
9. Non-urban residence (ORs = 1.08 – 1.16).

Some variables were found to be protective; age 40-54 years (OR=.94), not being in a family (OR=0.95), being Catholic (OR=0.91) or No faith (OR=.95), and being a full-time (OR=0.53) or part-time student (OR=0.59).

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). 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, the percentage of successful data linkage was high but a small percentage (7.42%) were not successfully linked. Second, 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. Third, 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. Anti-depressant prescribing was associated with a range of variables that represented social and economic disadvantage.

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Appendix 1.

RSU Statistical Disclosure Control Report
PROJ043: Prevalence and variation in antidepressant prescribing across Northern Ireland: A longitudinal administrative data linkage study for targeted support

1. Overview of the RSU Linkage and Statistical Disclosure Control Process for creation of PROJ043

From a governance perspective, preserving the confidentiality of the de-identified data is of paramount importance. This is considered to be a top priority of the Research Support Unit (RSU) and is managed through the implementation of the RSU Statistical Disclosure Control Policy (ADRCNI045). Statistical Disclosure Control (SDC) is managed at two stages for ADRC-NI research projects: the creation of the database and releasing outputs to researchers. This report relates to the SDC measures that were implemented when the databases were created for PROJ043.

The purpose of the SDC process is to ensure that the privacy and confidentiality of data subjects is preserved throughout the duration of a research project. An important component of this is ensuring that all of the data is managed and processed securely in accordance with agreed protocols. SDC procedures minimise the risk of disclosure and spontaneous recognition at the point of accessing the finalised de-identified data files within the Secure Environment. The SDC process associated with the data creation for PROJ043 comprised of three main strands which are summarised below.

Firstly, as part of the creation of the database, a pre-agreed list of disclosure checks were undertaken by the lead statistician. When completed, these were signed off by the SDC approver who ensured that both the linkage and coding required had been completed satisfactorily. The approach in this initial strand ensured that creation of the database and the implementation of the SDC process was developed using a two tier checking system.

To ensure the SDC process did not rely on the subjective analysis of one person, the second strand of the SDC process involved the preliminary assessment of potential disclosure risks by a wider SDC group who were knowledgeable about the project and had prior experience of SDC matters. The SDC Group considered collectively the sensitivities of the finalised de-identified data files and disclosure controls that were

warranted.

The final strand of the SDC process required final sign off from the Grade 7 (Head of Research Support Unit (RSU)). Table 1 summarises the dates and staff who were involved in each strand of the SDC process for PROJ043.

Table 1: SDC process for PROJ043

SDC role	Name	Date
Lead statistician	Ian Craig	17/11/2017
SDC approver	Chris Snoddy	29/11/2017
SDC working group	Ian Craig, Chris Snoddy, Anne Jordan and Orla Bateson	23/11/2017
RSU Grade 7	Orla Bateson	30/11/2017

2. Creation of de-identified data files

Project details	
Project reference number	PROJ043
Title of research proposal	Prevalence and variation in antidepressant prescribing across Northern Ireland: A longitudinal administrative data linkage study for targeted support
Lead researcher	Dr. Mark Shevlin

Linkage data files

There were six data sets involved in the creation of the finalised de-identified research data files for PROJ043. Table 2 provides a summary of the data sets received by RSU for linkage purposes. A detailed description of the data sets is included in Annex A.

Table 2: List of data sets required for linkage purposes

Data	Linkage method
Population Census 2011 Attribute data	Encrypted person identification
Population Census 2001 Attribute data	Encrypted person identification
Property data added to the Census 2011 Attribute data	UPRN (Not provided to the researcher) Capital data provided as deciles
Three domains as selected by the researcher from the Northern Ireland Multiple Deprivation Measure (NIMDM) added to the Census 2011 Attribute	SOA (Anonymous SOA provided to researcher) NIMDM variables provided in deciles
Business Services Organisation (BSO) Health Card Registration (NHAIS)	Encrypted Health and Care number
Business Services Organisation (BSO) Enhanced Prescribing Dataset (EPD)	Encrypted Health and Care number

Finalised de-identified Research data files

The RSU created two de-identified research files which will be passed to the research team. Figure 1 shows the files which will be passed to the research team. A more detailed description of the linkage process is included in Annex B.

Figure 1: Final output file(s) for Research purposes

The researcher will receive two output files for ADRC-NI project 043.

The first output file will include data from the 2001 and 2011 Censuses of Population Northern Ireland data owned by the NISRA - Census Office matched to the BSO Health Card Registration system (NHAIS) of all individuals as at the 1 April 2011 with a live status.

The second dataset will include data for 1 January 2011 to 31 December 2015 (inclusive) from the Enhanced Prescribing Database (EPD) who were dispensed medications from BNF 4.3.1, 4.3.2 or 4.3.3 and matched to the NHAIS as provided in dataset one.

Population Census 2011 and 2001 data merged with Business Services Organisation (BSO) Health Card Registration of all individuals as at the 1 April 2011 with a live status.
1,588,491 records

BSO Enhanced Prescribing Database (EPD) records of those dispensed medications from BNF 4.3.1, 4.3.2 or 4.3.3 and matched to the NHAIS as provided above
3,621,592 records

3. Statistical Disclosure Control Checks that were conducted

The RSU carried out a series of standard SDC checks as well as project specific checks on the final de-identified data files for PROJ043. This process ensures that spontaneous recognition is minimised in the final dataset within the Secure Environment for this project. The SDC process has been summarised below.

Sensitivities within the datasets
Establishing the sensitivities within the datasets is one of the key requirements of the SDC process. The type and level of checks carried out on the combined de-identified data files were specifically tailored in accordance with the sensitivities associated with the data files that were identified at this stage.

As a result of these checks, a number of variables were banded in order to reduce the risk of disclosure. Details can be found in Annex C.

While the outcome from the SDC process will minimise the risk of spontaneous recognition in the Secure Environment, RSU will continue to monitor disclosure risks while monitoring the Secure Environment and through intermediate and final outputs.

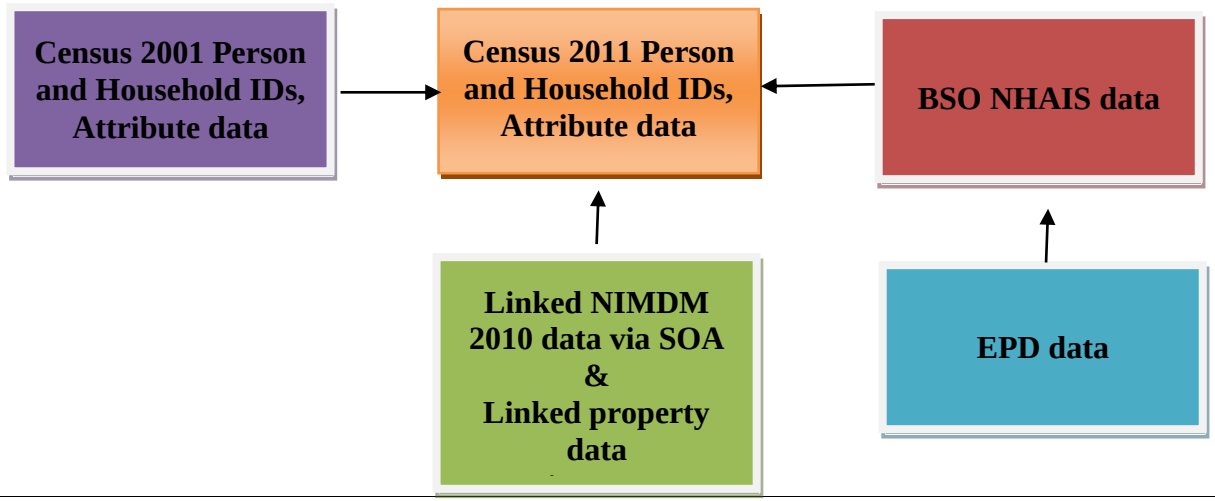
Annex A: Attribute Data Supplied to the Research Support Unit (RSU)

Four data sets were provided to the RSU	
DATA SET 1	
DATA SUPPLIER:	NISRA-Census Office
DESCRIPTION:	Supplied an extract from the Census 2011 and 2001 (separate files) containing all records and including variables as documented within the signed DSA (TRIM Ref: FI1/17/259086). Also includes the rateable value of property variable from the Land Property Services (LPS) and three domains as selected by the researcher of the Northern Ireland Multiple Deprivation Measures (NIMDM) attached to the Census 2011 data set.
NUMBER OF RECORDS:	Census 2001 Attribute file-1,603,457 records
	Census 2011 Attribute file-1,715,796 records
DATA SET 2	
DATA SUPPLIER:	Business Services Organisation (BSO)
DESCRIPTION:	Health Card Registration (NHAIS) and Enhanced Prescribing database (EPD)
NUMBER OF RECORDS:	NHAIS Attribute file – 1,890,788 records
	EPD Attribute file – 4,065,959 records

Annex B: Data Linkage and checks Process

At this stage, the RSU linked the Population Census 2011 attribute data file to the BSO Health Card Registration (NHAIS) data file. The Census 2011 attribute data file was linked to the Population Census 2001 attribute data file. A separate EPD file was made available to the researcher linked through the BSO NHAIS encrypted heath card number. Once the linkage was complete, checks were carried out to ensure that the number of records agreed with the number specified in the Trusted Third Party Matching Report. All original ID numbers were removed and replaced by a random anonymous identification number. No unlinked data

Fig 1. RSU Linkage Process Step



Annex C: Statistical Disclosure Control Process – Variable regroupings and top coding required

Variable	Change	Category/Description	Count
CV_Rateable	Labels	Capital value was provided as 10 categories or deciles. 1) Less than £58,000, 2) Greater than or equal to £58,000 and less than £70,000, 3) Greater than or equal to £70,000 and less than £80,000, 4) Greater than or equal to £80,000 and less than £90,000, 5) Greater than or equal to £90,000 and less than £100,000, 6) Greater than or equal to £100,000 and less than £115,000, 7) Greater than or equal to £115,000 and less than £135,000, 8) Greater than or equal to £135,000 and less than £160,000, 9) Greater than or equal to £160,000 and less than £205,000, 10) Greater than or equal to £205,000.	
AGEP0	Those over 94 Years of age.	Aggregated into a new category ’95 years or older.	
AGEP1	Those over 94 years of age.	Aggregated into a new category ’95 years or older.	

CARSNOHP1	Those with more than 9 cars in a household,	Aggregated into a new category ’10 or more cars.	

Appendix 2.

Table 6. Chi-square tests for demographic variables and antidepressant prescribing rates.

Demographic		Antidepressant Prescription					
		2011	2012	2013	2014	2015	Any Year
Age (10-year bands)	Chi Square	86,054.9 (8) .000	85,323.4 (8) .000	84,711.4 (8) .000	82,121.3 (8) .000	77,617.1 (9) .000	126,998.0 (8) .000
	Cramer's V	.233 .000	.232 .000	.233 .000	.230 .000	.224 .000	.287 .000
Gender	Chi Square	24,466.6 (1) .000	24,402.8 (1) .000	24,840.6 (1) .000	25,597.5 (1) .000	25,881.1 (1) .000	36,029.1 (1) .000
	Cramer's V	.124 .000	.124 .000	.126 .000	.128 .000	.130 .000	.153 .000
Marital Status	Chi Square	63,229.2 (2) .000	61,189.9 (2) .000	59,477.7 (2) .000	56,687.4 (2) .000	51,770.8 (2) .000	77,297.4 (2) .000
	Cramer's V	.200 .000	.197 .000	.195 .000	.191 .000	.183 .000	.224 .000
Living Arrangement	Chi Square	61,982.8 (2) .000	60,484.3 (2) .000	59,457.9 (2) .000	56,861.3 (2) .000	52,186.1 (2) .000	80,377.1 (2) .000
	Cramer's V	.199 .000	.197 .000	.196 .000	.192 .000	.185 .000	.229 .000
Family Structure	Chi Square	20,594.6 (3) .000	17,478.4 (3) .000	15,299.1 (3) .000	13,433.6 (3) .000	12,422.0 (3) .000	18,095.7 (3) .000

	Cramer's V	.114 .000	.105 .000	.099 .000	.093 .000	.090 .000	.108 .000
Ethnicity	Chi Square	1531.6 (4) .000	1683.4 (4) .000	1736.1 (4) .000	1762.2 (4) .000	1905.7 (4) .000	2440.1 (4) .000
	Cramer's V	.031 .000	.033 .000	.033 .000	.034 .000	.035 .000	.040 .000
Religion	Chi Square	2547.5 (3). .000	2607.0 (3) .000	2618.1 (3) .000	2654.6 (3) .000	2326.8 (3) .000	3485.0 (3) .000
	Cramer's V	.039 .000	.041 .000	.041 .000	.041 .000	.039 .000	.048 .000

Table 7. Chi-square tests for health variables and antidepressant prescribing rates.

Health		Antidepressant Prescription					
		2011	2012	2013	2014	2015	Any Year
GHQ Health	Chi Square	159,795.4 (4) .000	147,244.5 (4) .000	139,937.7 (4) .000	130,305.2 (4) .000	119,628.1 (4) .000	155,198.5 (4) .000
	Cramer's V	.317 .000	.305 .000	.299 .000	.290 .000	.278 .000	.317 .000
Impairment (daily activity)	Chi Square	125,187.0 (2) .000	114,897.0 (2) .000	108,389.9 (2) .000	99,345.2 (2) .000	89,609.7 (2) .000	104,835.5 (2) .000
	Cramer's V	.281 .000	.270 .000	.263 .000	.253 .000	.241 .000	.261 .000
Deafness	Chi Square	4965.3 (1) .000	4748.7 (1) .000	4594.3 (1) .000	4094.1 (1) .000	3387.9 (1) .000	4761.7 (1) .000
	Cramer's V	.056 .000	.055 .000	.054 .000	.051 .000	.047 .000	.056 .000
Blindness	Chi Square	2908.1 (1) .000	2539.8 (1) .000	2205.3 (1) .000	1956.6 (1) .000	1659.4 (1) .000	2021.1 (1) .000
	Cramer's V	.043 .000	.040 .000	.038 .000	.035 .000	.033 .000	.036 .000
Communication Difficulty	Chi Square	2965.7 (1) .000	2193.6 (1) .000	1775.7 (1) .000	1413.9 (1) .000	1213.8 (1) .000	739.1 (1) .000
	Cramer's V	.043 .000	.037 .000	.034 .000	.030 .000	.028 .000	.022 .000

Mobility Difficulty	Chi Square	1531.6 (4) .000	1683.4 (4) .000	1736.1 (4) .000	1762.2 (4) .000	1905.7 (4) .000	2440.1 (4) .000
	Cramer's V	.216 .000	.210 .000	.206 .000	.199 .000	.190 .000	.203 .000
Learning Difficulty	Chi Square	2547.5 (3). .000	2607.0 (3) .000	2618.1 (3) .000	2654.6 (3) .000	2326.8 (3) .000	3485.0 (3) .000
	Cramer's V	.013 .000	.011 .000	.010 .000	.011 .000	.013 .000	.004 .000
Mental Health Condition	Chi Square	181,774.7 (1) .000	145,719.7 (1) .000	126,790.4 (1) .000	111,764.2 (1) .000	101,544.9 (1) .000	114,199.6 (1) .000
	Cramer's V	.338 .000	.304 .000	.284 .000	.268 .000	.257 .000	.272 .000
Pain Condition	Chi Square	80,752.3 (1) .000	76,108.4 (1) .000	73,786.3 (1) .000	68,896.8 (1) .000	62,050.5 (1) .000	77,783.4 (1) .000
	Cramer's V	.225 .000	.220 .000	.217 .000	.211 .000	.201 .000	.225 .000
Breathing Difficulty	Chi Square	15,131.2 (1) .000	14,397.2 (1) .000	14,100.7 (1) .000	13,244.4 (1) .000	11,985.9 (1) .000	13,736.2 (1) .000
	Cramer's V	.098 .000	.095 .000	.095 .000	.092 .000	.088 .000	.094 .000
Memory Loss	Chi Square	21,396.7 (1) .000	17,832.9 (1) .000	15,721.8 (1) .000	13,902.9 (1) .000	11,988.9 (1) .000	12,934.9 (1) .000
	Cramer's V	.116 .000	.106 .000	.100 .000	.095 .000	.088 .000	.092 .000

Table 8. Chi-square tests for housing variables and antidepressant prescribing rates.

Housing		Antidepressant Prescription					
		2011	2012	2013	2014	2015	Any Year
# Household	Chi Square	34,932 (7) .000	33,061.9 (7) .000	31,476.3 (7) .000	29,544.3 (7) .000	26,854.3 (7) .000	41,429.6 (7) .000
	Cramer's V	.149 .000	.145 .000	.142 .000	.138 .000	.132 .000	.164 .000
Settlement band	Chi Square	3517.8 (7) .000	3419.5 (7) .000	3420.5 (7) .000	3511.2 (7) .000	3546.2 (7) .000	5101.6 (7) .000
	Cramer's V	.047 .000	.047 .000	.047 .000	.048 .000	.048 .000	.058 .000
Urbanicity	Chi Square	2303.5 (2) .000	2463.2 (2) .000	2598.4 (2) .000	2742.7 (2) .000	2814.2 (2) .000	4018.2 (2) .000
	Cramer's V	.045 .000	.047 .000	.049 .000	.050 .000	.051 .000	.061 .000

Table 9. Chi-square tests for socioeconomic variables and antidepressant prescribing rates.

Socioeconomic		Antidepressant Prescription					
		2011	2012	2013	2014	2015	Any Year
Education	Chi Square	16,669.8 (2) .000	15,837.6 (2) .000	15,540.7 (2) .000	15,495.9 (2) .000	14,855.5 (2) .000	15,931.4 (2) .000
	Cramer's V	.115 .000	.113 .000	.112 .000	.113 .000	.111 .000	.115 .000
Employment	Chi Square	68,036.2 (6) .000	62,783.5 (6) .000	59,677.5 (6) .000	54,718.0 (6) .000	49,788.1 (6) .000	53,501.3 (6) .000
	Cramer's V	.233 .000	.224 .000	.220 .000	.212 .000	.203 .000	..211 .000
Hours Worked	Chi Square	4726.0 (3) .000	4763.9 (3) .000	5166.3 (3) .000	5495.5 (3) .000	5750.8 (3) .000	8604.0 (3) .000
	Cramer's V	.065 .000	.065 .000	.068 .000	.071 .000	.073 .000	.089 .000
Occupation	Chi Square	6482.0 (3) .000	6236.0 (3) .000	6235.9 (3) .000	6133.0 (3) .000	5790.1 (3) .000	7591.8 (3) .000
	Cramer's V	.072 .000	.071 .000	.071 .000	.071 .000	.069 .000	.079 .000
Caring Status	Chi Square	4101.4 (1) .000	4905.4 (1) .000	5220.1 (1) .000	5749.8 (1) .000	5803.8 (1) .000	9679.8 (1) .000
	Cramer's V	.051 .000	.056 .000	.058 .000	.061 .000	.061 .000	.079 .000
Unpaid Caring Hours	Chi Square	6187.5 (3) .000	6977.3 (3) .000	7312.7 (3) .000	7875.5 (3) .000	7786.5 (3) .000	12,025.8 (3) .000

	Cramer's V	.062 .000	.066 .000	.068 .00	.071 .000	.071 .000	.088 .000
Tenure	Chi Square	12,284.1 (2) .000	11,506.3 (2) .000	11,075.7 (2) .000	10,922.9 (2) .000	11,061.3 (2) .000	14,001.0 (2) .000
	Cramer's V	.088 .000	.086 .000	.084 .000	.084 .000	.085 .000	.096 .000
Rateable Property Value	Chi Square	17,010.4 (7) .000	16,589.2 (7) .000	16,452.7 (7) .000	16,482.7 (7) .000	16,965.9 (7) .000	24,230.2 (7) .000
	Cramer's V	.103 .000	.102 .000	.102 .000	.103 .000	.105 .000	.125 .000
Car Access	Chi Square	20,904.4 (2) .000	19,111.6 (2) .000	18,012.5 (2) .000	17,406.0 (2) .000	17,136.6 (2) .000	23,308.8 (2) .000
	Cramer's V	.115 .000	.110 .000	.108 .000	.106 .000	.106 .000	.123 .000

Table 10. Chi-square tests for deprivation variables and antidepressant prescribing rates.

Deprivation		Antidepressant Prescription					
		2011	2012	2013	2014	2015	Any Year
Income Deprivation	Chi Square	5699.6 (9) .000	5608.7 (9) .000	5438.7 (9) .000	5521.2 (9) .000	5745.0 (9) .000	7080.6 (9) .000
	Cramer's V	.060 .000	.060 .000	.059 .000	.060 .000	.061 .000	.068 .000
Health Deprivation	Chi Square	5863.9 (9) .000	5694.2 (9) .000	5568.2 (9) .000	5560.1 (9) .000	5758.9 (9) .000	7109.1 (9) .000
	Cramer's V	.061 .000	.060 .000	.060 .000	.060 .000	.061 .000	.068 .000
Multiple Deprivation	Chi Square	5658.6 (9) .000	5523.2 (9) .000	5392.5 (9) .000	5441.8 (9) .000	5666.4 (9) .000	69777.8 (9) .000
	Cramer's V	.060 .000	.059 .000	.059 .000	.059 .000	.061 .000	.067 .000