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Understanding the socio-economic factors that influence usage of prescribed and non-prescribed medicine using a large population cohort

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Abstract

Objectives: Prescribed and non-prescribed medicine usage has increased in recent years, however there has been less investigation of the socio-economic predictors of use. This has been due to a lack of data at the population level, especially for non-prescribed medicines. Our study explores the social, demographic and health factors that influence individual behaviour regarding medicine usage.

Design: Cross-sectional data analysis. Negative binomial regression models were used to analyse the count of medicine usage.

Setting: South Yorkshire, UK.

Participants: 27,806 individuals from wave one of the Yorkshire Health Study (2010-2012).

Measures: Individuals self-reported each medicine they were taking and whether each was prescribed or not. The medicines were grouped into 14 categories. We also controlled for age, gender, ethnicity, body mass index, educational attainment, smoking, alcohol consumption, physical activity and a series of chronic health conditions.

Results: 49 per cent of males and 62 per cent of females were taking medicine with the majority of this prescribed (88 per cent and 83 per cent respectively). Health conditions were found to be positively associated with prescribed medicine usage, but negatively associated to non-prescribed medicines. Educational attainment was negatively associated with prescribed and positively associated with non-prescribed usage, suggesting the importance of social factors in understanding behaviours.

Conclusions: This study has provided a new understanding of the multiple socio-economic factors that influence medicine usage. The non-prescribed medicine findings are novel and reveal insights about individual behaviours particularly of the highly educated.

MeSH Keywords

Medicine; Socioeconomic Factors; Prescriptions.

Strengths and limitations of this study

- We address a dearth of evidence on socio-economic differences in terms of prescribed and non-prescribed medication usage (disaggregated by medicine type) using a large secondary dataset.
- Our data are self-reported and may be subject to bias suggesting the need for objective data.
- Our analysis is only cross-sectional and extending this investigation longitudinally will be neccessary for assessing the importance of our results.

Introduction

There have been recognised increases in the production and consumption of medicines globally for many years (1), reflecting a market of several hundreds of billions of pounds. In England, for example, the total volume of medicine taken across England has grown with the total number of medicines prescribed by General Practitioners (GPs) tripling in the 15 years up to 2010 (2). This growth has paradoxically occurred during a period of rising life expectancy, quality of life and better health care. Over-the-counter medicines represent the other key supply route, and this also represents a significant market, with over nine hundred million packs being supplied in the UK in 2011 (3). Indeed, the cost of medicines has been the subject of increasing attention, where it represents a key burden in health care systems like the National Health System in the UK; over-the-counter medicine use has been argued to represent a potential saving by reducing NHS spending, as well as empowering individuals (4). Whilst the medical applications of the use and growth of medicines is well established, less is known about the demographic and socioeconomic variations factors that influence medicine usage patterns.

Past research into the demographic and socioeconomic predictors of medicine usage has concentrated on the elderly and children, as these represent two periods of vulnerability across the life course (5–8). Females have been shown to use greater non-prescribed medicine than males (5,8,9), although this difference declines with age as other factors such as health begin to have a stronger influence on behaviours (10). There has been less work surrounding differences by socioeconomic status, with evidence suggesting that more affluent individuals use more medicines despite better health (7,8,11,12). Ethnicity, health and weight status have also been shown to be important (9,13–15).

There has been less investigation of population-level associations within the UK, with most of the evidence base conducted in the US. This has been due to a lack of available data, particularly for non-prescribed medicines which represent important areas due to their potential benefits (saving GP time and NHS costs) and problems (medicine interactions, side effects, misuse and abuse; (16)). Data sources often contain small sample sizes, restricting the generalisability of findings. Whilst the Health Survey of England is the largest national survey on health behaviours in England, it only contains information on prescribed medicines (17). There has also been a concentration of research exploring uptake of cardiovascular medicine (18,19), ignoring potential variations in other types of medicines.

Our study aims to understand how prescribed and over-the-counter medicine patterns and health-related behaviours vary within a large population cohort, particularly in relation to socio-economic factors.

Methods

Data

Data were taken from the first wave (2010-2012) of the Yorkshire Health Study (formerly the South Yorkshire Cohort), a longitudinal observational survey (20). This contained information on 27,806 individuals that consisted of the South Yorkshire region of England. Data were self-reported by individuals.

Individuals were asked to record any medicines they were currently taking, including whether it was prescribed or not. The data were then grouped into 14 categories (linked to the British National Formulary (BNF)), loosely based upon the area and organ system of the body being targeted by the medicine (see Table 1). This grouping system was selected to minimise overlap between categories and follows previous research (13). In the BNF chapter

categorisation system female oral contraceptives are categorised as a separate group. By separating oral contraceptives from other endocrine agents, gender variation in endocrine medicine use can be compared (10).

Age, gender and ethnicity were included as independent predictors of medicine since variations in medicine use with respect to these factors have been previously demonstrated (5,9,15,21). Body mass index (BMI) was also included since it has been shown to be positively associated with medicine usage (14).

Education was included as a measure of socio-economic status. Education has been used as a proxy for socio-economic status in previous research since a higher level of education allows individuals to access better employment opportunities and therefore maximise their socio-economic status (22,23). Education was defined using the following groups; 'no formal education', 'secondary level of education' (GCSE level or equivalent), 'post-secondary level' (A-level or equivalent), and 'degree level or higher'.

Individuals reported in the Yorkshire Health Study whether they had any of the following long-standing conditions or disabilities; fatigue, pain, insomnia, anxiety, depression, diabetes, breathing problems (e.g. chronic bronchitis), high blood pressure, heart disease, osteoarthritis, stroke or cancer. These were each included as explanatory variables.

Smoking status and number of units of alcohol consumed in the past week were included, since these variables have been shown to be important predictors of health (24–27). A measure of physical activity was included (total number of hours in the previous week for both walking and physical exercise separately), since this has been shown to be important for health (28–30). Physical activity per week was categorised as; 'none', 'less than 1 hour', '1 to 3 hours', or 'more than 3 hours'.

Each GP (General Practitioner) practice was included as a separate variable in the analysis in order to account for differences in prescribing patterns between surgeries (results not reported due to the large number of surgeries).

Statistical Analysis

Prevalence of each medicine category was reported. These prevalences were weighted using sample weights such that weighted prevalences are comparable to England. This weighting was necessary because the South Yorkshire Cohort is not representative of the population of England, with respect to age, gender and socio-economic deprivation (20). Analysis of medicine usage was conducted using total medicines split by prescription status. Medicine data were considered to have a Poisson distribution, however variances were greater than mean values. To account for the over dispersion, negative binomial regression models were used to analyse medicine usage. Incidence rate ratios (IRR) were reported. GP practice could not be included as a random effect in the model since it resulted in the model becoming unstable and unable to converge. The analysis was also repeated for the individual medicine categories.

Results

Table 1 presents a summary of self-reported medicines taken split by category and gender. A greater proportion of females were found to be taking any category of medicine in comparison to males (with a similar finding for prescribed medicines). However, there were no difference in the mean number of any medicine category taken. Cardiovascular medicines were the most common medicine taken, with gastrointestinal, CNS, CNS Pain and dietary supplements also commonly used. There was little difference in the mean number of

medicines taken split by category or gender. The majority of medicines taken were prescribed, however the proportion prescribed varied by category. Dietary supplements were the only category with greater non-prescribed medicines than prescribed medicines.

Table 2 presents the results from the regression models exploring the association between the number of medicines taken (prescribed or non-prescribed). Age was associated with greater medicine use both for prescribed and non-prescribed medicine. Females were more likely to take both prescribed and non-prescribed medicines. Although individuals from ethnic minority groups were less likely to use prescribed medicine than White individuals, there were no differences for non-prescribed medicine. BMI was positive associated with the number of prescribed medicines but unrelated to non-prescribed medicine.

The chronic illness and health conditions variables were consistently positively associated with greater prescribed medicines taken, with only insomnia having no significant relationship. Diabetes, breathing problems, high blood pressure and heart disease had greater associations than compared to anxiety, stroke or fatigue. Negative associations were found for the relationships between non-prescribed medicine use and diabetes, high blood pressure and heart disease. Pain and osteoarthritis were significantly and positively associated with both prescribed and non-prescribed medicine use.

Consumption of alcohol was negatively associated with number of prescribed medicines taken, but smoking was associated with increased number of prescribed medicines. For non-prescribed medicine, there was no significant association for alcohol whereas the relationship for smoking was reversed. Walking was not associated with prescribed medicine, but positively associated to non-prescribed medicine. Physical exercise followed a similar pattern to walking for non-prescribed medicines, but the relationship reversed for prescribed medicine. Education level was negatively associated with total prescribed medicine,

although the strength of this association was weak. This contrasted with non-prescribed medicine, where education was positively associated with use of non-prescribed medicines.

The analysis was then repeated for the individual medicine types to explore differences between them. Only the most prevalent medicine types (a sample size greater than 10%; Table 1) were selected to avoid small sample size issues. Tables 3 and 4 present the results from these analyses. There were fewer significant associations, however the results mostly followed the findings from Table 2. Health conditions related to the prescribed medicine type showed increased strength in their associations, but this was not replicated with non-prescribed medicine (some conditions produced reversed patterns). Pain was associated with multiple medication types, both for prescribed and non-prescribed (as was osteoarthritis but to a lesser extent). The results for education still showed higher non-prescribed usage in the more educated groups.

Discussion

This study has demonstrated the important social and demographic variations in medicine usage at the population-level. There were clear differences in individual behaviour between prescribed and non-prescribed medicine. Prescribed medicine usage was associated with the presence of chronic health conditions and poor health-related behaviours. Taking non-prescribed medicine was associated with higher levels of education, and positive health behaviours. The patterns were fairly consistent when analysing by medicine type. Our findings for prescribed medicines follow those in a recent nationally representative survey (17).

The main strength of the study is it addresses the dearth of evidence of social and demographic patterns in medicine usage at the population level particularly for non-

prescribed medicines. Such comprehensive information on associations are typically not available for large surveys outside of the US. Our findings are therefore novel and important for policy officials to consider. There are several limitations to our study. The analysis is cross-sectional and therefore cannot demonstrate causality. Future waves of the Yorkshire Health Study will allow the findings to be tested longitudinally, helping to strengthen conclusions and recommendations (20). Data collected in the Yorkshire Health Study were self-reported and this may lead to bias in estimates. For example, recall bias may lead to under-reporting of medications particularly for over-the-counter medications which are taken sporadically or not always thought of as medicines (e.g. vitamins). Medicine dosage was not measured in the data limiting our comparison of medicines. The categories used to group together medicines may also hide variations in patterns, particularly where medications may be used for different purposes despite operating at the same organ system/area of the body.

While individuals of high education took fewer medications compared to individuals with no qualifications (Table 2), the effect size was only small and medicine usage was influenced more strongly by health status. In contrast, a distinct social gradient in non-prescribed medicine usage was observed. At first instance this may appear unintuitive, since individuals of high socio-economic status tend to have better health. A possible explanation for this finding follows Link and Phelan's fundamental causation hypothesis (23). Link and Phelan argue that social inequalities in health are the result of individuals of high socio-economic status utilising their greater supply of resources to maximise their health. One opportunity is through purchasing additional medicines (for example, dietary supplements to improve nutritional intake). Individuals of higher education will also have greater understanding of the potential benefits of non-prescribed medicines and have a greater ability to act upon this as well (31). Educational attainment was also an important in using pain relief medicine to

supplement treatment. Health did not confound this relationship either, with our results suggesting that it is not necessarily the unhealthy who purchase non-prescribed medicines.

The relationships for physical exercise, walking and smoking may also be explained similarly to that for education. Individuals who exercise regularly or do not smoke have been shown to have greater health consciousness (32,33) and look to maximise their health using non-prescribed medicines. This is contrary to the relationships with prescribed medicine where physical exercise is protective to health (28–30) and smoking damaging (24,26,27), independently influencing the need for prescribed medicine. However, alcohol consumption only followed this pattern for prescribed medicine.

Individuals who were non-White were found to be less likely to take prescribed medicines, supporting evidence from the US (9,34). This finding was independent of socioeconomic status. However, there is little understanding of why this this association exists and therefore further research is required. Addressing inequalities in health care usage by ethnicity will be important given that most medicines are only available through prescriptions in the UK.

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Competing Interests No conflicts of interest are declared.

Data Sharing Statement Data from the YHS can be applied for access through www.yorkshirehealthstudy.org. MG is happy to share the statistical code for the analyses and should be contacted using mark.green@liverpool.ac.uk.

Contributorship Statement MG, MS and CR designed the study. MG, EL and RC prepared the data. MG and EL conducted the analysis. All authors were involved in the writing of the manuscript.

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Table 1: Summary statistics on medicine usage including the percentage of each category taken, the mean number taken and the percentage of each prescribed.

Category	Individuals taking each medicine (%)		Mean number of medicines taken[+]		Percentage of medicines prescribed (%)	
	Male	Female	Male	Female	Male	Female
Cardiovascular	24.3	21.3	2.7	2.4	97.7	97.0
Gastrointestinal	12.1	14.6	1.2	1.3	94.9	92.4
CNS	9.6	16.0	1.3	1.3	92.5	90.4
CNS Pain	15.5	21.4	1.5	1.5	83.6	79.4
Respiratory	8.1	8.4	1.8	1.9	99.1	99.3
Anti-infection	2.9	2.7	1.6	1.1	94.7	96.7
Endocrine	3.4	9.3	1.2	1.2	99.6	98.5
Contraception	0.0	7.5	0.0	1.0	100	97.3
Chemotherapy / Immunosuppressant	0.2	0.3	1.3	1.2	100	100
Musculoskeletal	4.5	9.8	1.2	1.3	63.1	74.6
Eye	1.8	2.5	1.3	1.3	96.5	91.6
Anti-allergic	4.2	4.6	1.2	1.1	78.3	79.4
Weight Loss	0.4	0.5	1.0	1.0	71.4	83.6
Smoking Cessation	0.1	0.1	1.1	1.0	100	91.9
Dietary Supplements	9.3	17.3	1.5	1.5	27.7	25.5
Skin	3.1	4.1	1.5	1.4	92.2	85.1
Diabetes	4.1	2.6	1.5	1.4	99.3	99.8
Urinary	3.3	1.4	1.1	1.0	94.4	99.0
Gout	1.6	0.3	1.2	1.2	96.8	98.6
Other	2.6	3.5	1.1	1.1	72.5	47.1
Any Category	49.3	62.2	3.7	3.6	88.1	82.5

[+] Individuals not taking each medicine excluded

N.B.: Estimates weighted by age, gender, deprivation

Table 2: Results from negative binomial regression models analysing the associated factors of medicine usage, split by prescription status.

Variable	Total Prescribed			Total Non-Prescribed		
	IRR		95% CI	IRR		95% CI
Age	1.025	***	(1.024-1.027)	1.027	***	(1.024-1.030)
Gender	0.894	***	(0.863-0.925)	0.600	***	(0.553-0.651)
Non-White	0.756	***	(0.670-0.853)	0.805		(0.628-1.033)
BMI	1.011	***	(1.007-1.014)	1.001		(0.993-1.009)
Fatigue	1.208	***	(1.154-1.265)	1.052		(0.933-1.185)
Pain	1.528	***	(1.467-1.593)	1.563	***	(1.412-1.730)
Insomnia	1.007		(0.947-1.070)	1.116		(0.957-1.302)
Anxiety	1.155	***	(1.093-1.221)	1.064		(0.925-1.224)
Depression	1.449	***	(1.365-1.537)	1.141		(0.978-1.331)
Diabetes	1.807	***	(1.708-1.912)	0.747	**	(0.628-0.888)
Breathing Problems	1.949	***	(1.861-2.041)	0.972		(0.858-1.101)
High Blood Pressure	1.907	***	(1.835-1.983)	0.863	**	(0.776-0.959)
Heart Disease	1.824	***	(1.723-1.931)	0.771	**	(0.647-0.920)
Osteoarthritis	1.143	***	(1.086-1.203)	1.280	***	(1.127-1.453)
Stroke	1.259	***	(1.146-1.384)	0.600	**	(0.438-0.824)
Cancer	1.276	***	(1.174-1.387)	0.850		(0.676-1.069)
Units of Alcohol	0.995	***	(0.993-0.996)	1.000		(0.996-1.004)
Smoke	1.065	*	(1.013-1.120)	0.786	***	(0.695-0.888)
Walking:						
None	Reference			Reference		
<1 Hour	1.001		(0.933-1.074)	1.165		(0.957-1.418)
1-3 Hours	0.976		(0.914-1.042)	1.355	**	(1.131-1.624)
3+ Hours	0.938		(0.879-1.001)	1.500	***	(1.253-1.795)
Physical Exercise:						
None	Reference			Reference		
<1 Hour	0.947		(0.891-1.006)	1.156	*	(1.011-1.323)
1-3 Hours	0.926	**	(0.884-0.971)	1.188	**	(1.074-1.313)
3+ Hours	0.854	***	(0.811-0.898)	1.231	***	(1.106-1.370)
Education:						
None	Reference			Reference		
Secondary	0.943	**	(0.904-0.985)	1.665	***	(1.495-1.856)
Post-Secondary	1.013		(0.951-1.080)	1.817	***	(1.573-2.099)
Degree or higher	0.950	*	(0.906-0.997)	1.967	***	(1.754-2.206)
Constant	0.220	***	(0.188-0.257)	0.054	***	(0.037-0.078)
/lnalpha	-0.761			1.178		
alpha	0.467			3.249		
Pseudo r-squared	0.154			0.039		

NB 1: GP Surgery was also adjusted for, including each surgery in the model as binary variables but not included in the table

NB 2: Significance Levels: * = <0.05, ** = <0.01, *** = <0.001

Table 3: Results of negative binomial regressions analysing prescribed medicine usage.

Variable	Cardiovascular			Gastrointestinal			CNS			CNS Pain			Musculoskeletal			Dietary Supplements		
	IRR		95% CI	IRR		95% CI	IRR		95% CI	IRR		95% CI	IRR		95% CI	IRR		95% CI
Age	1.054	***	(1.052-1.056)	1.031	***	(1.028-1.035)	1.013	***	(1.009-1.016)	1.017	***	(1.014-1.020)	1.056	***	(1.049-1.062)	1.024	***	(1.018-1.030)
Gender	1.298	***	(1.233-1.365)	0.897	**	(0.830-0.970)	0.694	***	(0.632-0.763)	0.872	***	(0.812-0.936)	0.440	***	(0.381-0.509)	0.704	***	(0.599-0.827)
Non-White	0.723	**	(0.583-0.895)	0.523	***	(0.369-0.742)	0.770		(0.570-1.041)	0.713	*	(0.546-0.931)	0.768		(0.445-1.325)	0.869		(0.507-1.489)
BMI	1.032	***	(1.027-1.037)	1.012	**	(1.005-1.019)	1.004		(0.996-1.012)	1.019	***	(1.013-1.025)	0.962	***	(0.949-0.975)	0.980	**	(0.965-0.994)
Fatigue	1.017		(0.953-1.085)	1.503	***	(1.369-1.649)	1.213	**	(1.084-1.357)	1.099	*	(1.012-1.193)	1.646	***	(1.393-1.943)	2.273	***	(1.877-2.752)
Pain	1.047		(0.986-1.112)	1.833	***	(1.678-2.003)	1.534	***	(1.378-1.708)	5.088	***	(4.695-5.514)	1.952	***	(1.671-2.280)	1.232	*	(1.021-1.487)
Insomnia	0.954		(0.873-1.042)	1.017		(0.907-1.141)	0.926		(0.812-1.056)	1.060		(0.961-1.170)	1.069		(0.868-1.317)	0.949		(0.739-1.220)
Anxiety	1.109	*	(1.021-1.204)	1.178	**	(1.056-1.314)	2.138	***	(1.912-2.390)	0.936		(0.850-1.032)	0.867		(0.704-1.066)	1.169		(0.925-1.478)
Depression	1.048		(0.957-1.147)	1.215	**	(1.081-1.366)	4.210	***	(3.770-4.700)	1.312	***	(1.186-1.451)	1.170		(0.933-1.467)	1.237		(0.964-1.587)
Diabetes	1.675	***	(1.563-1.795)	0.895		(0.791-1.013)	0.965		(0.823-1.132)	0.878	*	(0.783-0.985)	0.955		(0.754-1.208)	1.613	***	(1.258-2.068)
Breathing Problems	0.983		(0.917-1.054)	1.237	***	(1.123-1.362)	0.929		(0.821-1.052)	1.029		(0.941-1.124)	1.314	**	(1.103-1.566)	1.186		(0.962-1.461)
High Blood Pressure	4.205	***	(3.995-4.425)	1.076		(0.989-1.172)	0.970		(0.868-1.085)	1.013		(0.937-1.096)	0.876		(0.750-1.022)	1.154		(0.962-1.384)
Heart Disease	3.330	***	(3.115-3.560)	1.377	***	(1.236-1.535)	1.099		(0.940-1.284)	1.087		(0.977-1.210)	1.105		(0.893-1.367	1.232		(0.957-1.588)
Osteoarthritis	0.973		(0.909-1.042)	1.216	***	(1.105-1.339)	0.978		(0.858-1.114)	1.720	***	(1.587-1.866)	1.653	***	(1.402-1.949)	1.099		(0.883-1.368)
Stroke	1.631	***	(1.463-1.818)	1.097		(0.921-1.308)	1.238		(0.994-1.543)	1.002		(0.846-1.186)	1.012		(0.722-1.418)	0.912		(0.603-1.380)
Cancer	0.964		(0.862-1.078)	1.386	***	(1.194-1.609)	0.959		(0.766-1.120)	1.127		(0.969-1.311)	1.290		(0.977-1.702)	1.325		(0.943-1.860)
Units of Alcohol	0.999		(0.997-1.002)	0.998		(0.994-1.002)	0.987	***	(0.982-0.991)	0.991	***	(0.988-0.995)	0.982	***	(0.973-0.990)	0.985	**	(0.977-0.994)
Smoke	1.167	***	(1.079-1.261)	0.934		(0.832-1.049)	1.200	**	(1.066-1.350)	1.303	***	(1.187-1.430)	1.113		(0.907-1.365)	1.320	*	(1.067-1.633)

Walking:																			
None	Reference			Reference			Reference			Reference			Reference			Reference			
<1 Hour	1.153	**	(1.045-1.273)	0.972		(0.849-1.114)	0.734	***	(0.629-0.856)	0.897		(0.799-1.008)	1.049		(0.814-1.352)	0.821		(0.616-1.093)	
1-3 Hours	1.176	**	(1.072-1.289)	0.931		(0.820-1.058)	0.639	***	(0.552-0.738)	0.777	***	(0.696-0.868)	0.871		(0.686-1.106)	0.761	*	(0.583-0.994)	
3+ Hours	1.162	**	(1.059-1.274)	0.867	*	(0.762-0.987)	0.556	***	(0.480-0.644)	0.756	***	(0.676-0.845)	0.836		(0.658-1.062)	0.671	**	(0.513-0.877)	
Physical Exercise:																			
None	Reference			Reference			Reference			Reference			Reference			Reference			
<1 Hour	0.955		(0.869-1.050)	0.884		(0.765-1.022)	0.834	*	(0.707-0.983)	0.972		(0.857-1.102)	0.935		(0.730-1.197)	1.000		(0.761-1.315)	
1-3 Hours	0.919		(0.854-0.989)	0.880	*	(0.787-0.985)	0.764	***	(0.669-0.872)	0.859	**	(0.774-0.953)	1.032		(0.860-1.237)	0.892		(0.715-1.113)	
3+ Hours	0.927		(0.858-1.002)	0.787	***	(0.692-0.896)	0.633	***	(0.538-0.744)	0.720	***	(0.634-0.817)	0.873		(0.703-1.083)	0.881		(0.686-1.130)	
Education:																			
None	Reference			Reference			Reference			Reference									
Secondary	0.955		(0.899-1.015)	0.974		(0.886-1.070)	0.959		(0.856-1.075)	1.099	*	(1.009-1.196)	0.915		(0.775-1.080)	0.954		(0.786-1.159)	
Post-Secondary	0.936		(0.846-1.036)	0.987		(0.851-1.145)	0.943		(0.798-1.115)	1.173	*	(1.032-1.333)	0.927		(0.711-1.209)	1.084		(0.814-1.443)	
Degree or higher	0.856	***	(0.800-0.917)	0.966		(0.867-1.077)	0.893		(0.782-1.020)	0.985		(0.888-1.093)	1.008		(0.837-1.213)	0.847		(0.677-1.061)	
Constant	0.005	***	(0.003-0.006)	0.018	***	(0.013-0.026)	0.085	***	(0.058-0.125)	0.033	***	(0.024-0.044)	0.010	***	(0.005-0.018)	0.028	***	(0.014-0.055)	
/lnalpha	-0.906			-1.327			-0.628			-1.175			0.909			1.344			
alpha	0.404			0.265			0.534			0.309			2.481			3.836			
Pseudo r-squared	0.284			0.142			0.176			0.208			0.144			0.082			

NB 1: GP Surgery was also adjusted for, including each surgery in the model as binary variables but not included in the table

NB 2: Significance Levels: * = <0.05, ** = <0.01, *** = <0.001

Table 4: Results of negative binomial regressions analysing non-prescribed medicine usage.

Variable	Cardiovascular			Gastrointestinal			CNS			CNS Pain			Musculoskeletal			Dietary Supplements		
	IRR		95% CI	IRR		95% CI	IRR		95% CI	IRR		95% CI	IRR		95% CI	IRR		95% CI
Age	1.052	***	(1.042-1.063)	1.033	***	(1.023-1.044)	0.995		(0.985-1.004)	1.009	**	(1.003-1.015)	1.057	***	(1.050-1.064)	1.031	***	(1.027-1.034)
Gender	0.963		(0.765-1.212)	0.505	***	(0.377-0.675)	0.493	***	(0.366-0.664)	0.597	***	(0.509-0.701)	0.624	***	(0.530-0.736)	0.573	***	(0.519-0.633)
Non-White	0.769		(0.304-1.947)	1.305		(0.591-2.877)	1.147		(0.569-2.314)	0.720		(0.433-1.196)	0.953		(0.501-1.814)	0.746		(0.542-1.027)
BMI	1.036	**	(1.013-1.059)	0.989		(0.963-1.015)	1.034	**	(1.011-1.058)	1.021	**	(1.006-1.035)	1.004		(0.987-1.021)	0.986	**	(0.976-0.996)
Fatigue	1.027		(0.741-1.425)	1.033		(0.720-1.483)	0.860		(0.592-1.249)	1.076		(0.872-1.327)	0.806		(0.627-1.035)	1.086		(0.940-1.254)
Pain	1.192		(0.896-1.585)	1.938	***	(1.424-2.639)	2.765	***	(2.027-3.772)	3.457	***	(2.908-4.111)	1.449	***	(1.192-1.763)	1.140	*	(1.005-1.293)
Insomnia	1.084		(0.715-1.645)	0.989		(0.642-1.522)	1.554	*	(1.031-2.342)	1.084		(0.834-1.408)	1.135		(0.843-1.528)	1.091		(0.907-1.311)
Anxiety	1.114		(0.756-1.640)	1.505	*	(1.031-2.197)	1.228		(0.830-1.816)	1.009		(0.792-1.286)	0.701	*	(0.509-0.963)	1.079		(0.911-1.277)
Depression	0.940		(0.601-1.471)	1.364		(0.888-2.094)	1.360		(0.902-2.052)	1.131		(0.871-1.469)	0.880		(0.612-1.266)	1.201		(0.996-1.447)
Diabetes	0.840		(0.559-1.263)	0.327	**	(0.142-0.752)	0.456	*	(0.210-0.994)	0.857		(0.616-1.194)	0.597	*	(0.403-0.883)	0.770	*	(0.623-0.952)
Breathing Problems	0.615	*	(0.412-0.917)	1.121		(0.764-1.646)	0.772		(0.496-1.200)	0.991		(0.786-1.249)	0.925		(0.714-1.197)	1.042		(0.897-1.210)
High Blood Pressure	1.189		(0.922-1.533)	0.952		(0.684-1.326)	0.808		(0.548-1.192)	0.653	***	(0.527-0.810)	0.682	***	(0.557-0.834)	0.976		(0.861-1.106)
Heart Disease	1.103		(0.751-1.618)	0.855		(0.491-1.491)	0.850		(0.423-1.709)	0.489	***	(0.329-0.725)	0.599	**	(0.416-0.863)	0.861		(0.698-1.061)
Osteoarthritis	1.015		(0.729-1.412)	1.646	**	(1.165-2.324)	1.359		(0.909-2.031)	1.359	**	(1.088-1.700)	1.720	***	(1.403-2.107)	1.268	**	(1.089-1.477)
Stroke	1.225		(0.664-2.262)	0.545		(0.170-1.749)	0.490		(0.119-2.025)	0.842		(0.471-1.504)	0.337	*	(0.138-0.822)	0.560	**	(0.374-0.840)
Cancer	0.624		(0.322-1.209)	0.421		(0.155-1.148)	1.514		(0.766-2.990)	0.903		(0.584-1.396)	1.134		(0.777-1.655)	0.840		(0.637-1.107)
Units of Alcohol	1.003		(0.992-1.013)	1.004		(0.991-1.018)	1.000		(0.987-1.014)	1.000		(0.992-1.008)	1.007		(0.999-1.014)	0.998		(0.993-1.003)
Smoke	1.412	*	(1.016-1.961)	0.603	*	(0.379-0.962)	1.375		(0.987-1.915)	0.897		(0.717-1.122)	0.669	*	(0.490-0.913)	0.690	***	(0.590-0.808)

Walking:																			
None	Reference			Reference			Reference			Reference			Reference			Reference			
<1 Hour	2.193	*	(1.141-4.214)	0.721		(0.379-1.372)	0.546		(0.267-1.115)	1.268		(0.885-1.816)	0.997		(0.647-1.536)	1.174		(0.916-1.505)
1-3 Hours	2.291	**	(1.228-4.275)	1.250		(0.718-2.177)	1.305		(0.728-2.337)	1.375		(0.985-1.920)	1.218		(0.823-1.801)	1.403	**	(1.116-1.764)
3+ Hours	3.106	***	(1.676-5.758)	1.004		(0.574-1.756)	1.631		(0.918-2.896)	1.422	*	(1.021-1.982)	1.622	*	(1.104-2.384)	1.519	***	(1.211-1.907)
Physical Exercise:																			
None	Reference			Reference			Reference			Reference			Reference			Reference			
<1 Hour	1.308		(0.899-1.903)	1.045		(0.658-1.660)	0.962		(0.620-1.490)	0.963		(0.742-1.251)	1.259		(0.950-1.669)	1.158		(0.983-1.363)
1-3 Hours	0.906		(0.660-1.244)	1.231		(0.894-1.694)	0.910		(0.652-1.271)	0.971		(0.800-1.180)	1.511	***	(1.248-1.829)	1.227	**	(1.089-1.383)
3+ Hours	1.029		(0.746-1.421)	1.190		(0.831-1.702)	0.760		(0.509-1.136)	0.939		(0.757-1.163)	1.645	***	(1.351-2.003)	1.334	***	(1.175-1.514)
Education:																			
None	Reference			Reference			Reference			Reference			Reference			Reference			
Secondary	1.465	**	(1.101-1.949)	3.162	***	(2.155-4.639)	1.665	*	(1.126-2.463)	1.883	***	(1.523-2.328)	1.700	***	(1.380-2.094)	1.659	***	(1.454-1.892)
Post-Secondary	1.342		(0.859-2.095)	3.457	***	(2.113-5.656)	2.346	***	(1.476-3.730)	2.032	***	(1.542-2.676)	1.486	*	(1.082-2.041)	1.806	***	(1.514-2.155)
Degree or higher	1.539	**	(1.130-2.096)	2.862	***	(1.878-4.361)	1.916	**	(1.253-2.928)	1.943	***	(1.541-2.450)	2.051	***	(1.651-2.549)	2.045	***	(1.781-2.348)
Constant	0.000	***	(0.000-0.000)	0.001	***	(0.000-0.004)	0.004	***	(0.001-0.012)	0.011	***	(0.006-0.023)	0.001	***	(0.000-0.002)	0.033	***	(0.021-0.052)
/lnalpha	0.954			-0.118			-35.436			1.382			-1.068			1.164		
alpha	2.595			0.889			0.000			3.981			0.344			3.202		
Pseudo r-squared	0.072			0.087			0.0829			0.062			0.110			0.047		

NB 1: GP Surgery was also adjusted for, including each surgery in the model as binary variables but not included in the table

NB 2: Significance Levels: * = <0.05, ** = <0.01, *** = <0.001

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	2, 5-7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-7
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	7
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5
		(b) Indicate number of participants with missing data for each variable of interest	5
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7-9
		(*b*) Report category boundaries when continuous variables were categorized	5-6
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9-10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-11
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.