Public Health England

CPRD

Prescribing of psychotropic drugs to people with learning disabilities and/or autism by general practitioners in England

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Executive summary

Background

Transforming Care, the Government report into the events at Winterbourne View, noted ‘deep concerns’ about the over-use of antipsychotic and antidepressant medicines in people with learning disabilities and/or autism.[1] These concerns related to the extent to which these drugs are used outside licensed indications with the aim of managing problem behaviour. This study was designed to identify how many people in these groups are treated with these types of drugs, how the drugs are used and how much of this use is for licensed clinical indications.

The scope was widened to include anxiolytics, hypnotics, anticonvulsants and, to some extent, mood stabilisers as studies indicate that these have all been considered relevant to management of behaviour.[2] The study aimed to provide information about people with learning disabilities or autism generally, not just those in touch with specialist mental health services. As such, we utilised general practice records from the Clinical Practice Research Datalink primary care database (CPRD GOLD). This is a well-established system that collects comprehensive anonymised clinical data from a large number of general practices throughout the UK for research studies.

Methods

Using the anonymised database, we searched for clinical records of patients living in England and registered with GPs between April 2009 and March 2012 who were identified as having either learning disabilities or autism. Excluding periods when this group were hospitalised we noted periods during which they were exposed to any drugs in the British National Formulary (BNF) sections 4.1 (hypnotics and anxiolytics), 4.2 (drugs used in psychoses and related disorders), 4.3 (antidepressant drugs) and 4.8 (antiepileptic drugs). We recorded duration of exposure, combinations of drugs within and between BNF sections, dosages and the recording of Read coded diagnoses which are recognised indications for the medications. Our analysis focussed mainly on hypnotics (4.1.1), anxiolytics (4.1.2), antipsychotic drugs (4.2.1) antidepressants (4.3) and antiepileptics (4.8).

Findings

The numbers of relevant patients identified (17,887 people with learning disabilities and an additional 11,136 with autism) suggested that the database covers about 7.8% of the English population. A substantial number of people with learning disabilities was identified in each of the predefined age categories, whilst those identified as having autism alone were predominantly (76.5%) aged under 18. The proportion of those identified as having learning disabilities who were also identified as having autism was much smaller than expected.

People with learning disabilities:

Patients were exposed to one or more of the drugs we studied on 41.3% of person days for adults and 14.7% for children and young people. Excluding antiepileptics, the figures were 29.5% of adult- and 6.8% of children and young people's person-time. Antipsychotic drugs were being prescribed on 17.0% of adult and 2.4% of children and young people's person-days, drugs used in mania and hypomania on 7.1% and 0.3% respectively, antidepressants on 16.9% and 1.2%, anxiolytics on 4.2% and 0.6% and antiepileptic drugs on 22.9% and 10.2%. Hypnotics were the only group of drugs we studied for which a higher proportion of children and young people's time was exposed (children and young people 4.1% of person-days vs adults 2.7%). For most groups of drugs, exposure rates rose through adult life. The rate of prescribing antipsychotics in people aged 65 and over was 3.3 times the rate in those aged 18 to 24; corresponding multiples were 1.8 for hypnotics, 2.9 for anxiolytics, 2.5 for drugs used in mania and hypomania and 2.7 for antidepressants. The multiple was much less (1.3) for antiepileptics.

People with autism:

For people with autism but not learning disabilities, the rates we can report for children were based on large numbers and therefore probably reflect the experience of people with autism in the population reasonably well. Adult rates were based on much smaller numbers of individuals. Interpretting adult rates therefore requires some allowance for the issue of the effective selection critieria leading to those individuals having their autism identified and recorded by their GP. It is likely that this would be a particularly disabled group, not representative of the generality of adults with autism in the population. Among those aged under 18, 1.5% of person days were exposed to prescribing of antipsychotics, 0.2% drugs for the management of mania and hypomania, 1.1% antidepressants, 3.2% hypnotics, 0.1% anxiolytics and 2.0% anti-epileptics. Corresponding rates for adults with autism were: antipsychotics 8.2%, drugs

for the management of mania and hypomania 3.5%, antidepressants 17.0%, hypnotics 2.1%, anxiolytics 1.8% and anti-epileptics 6.9%.

Patterns of prescribing:

A large proportion (90% or more) of the prescribing of drugs in most of the BNF sections and sub-sections we studied was not short term, in the sense that prescriptions were followed by at least one repeat prescription. The only exceptions to this appeared to be anxiolytics, for acults with autism, hypnotics. However even for these groups the majority of periods of prescribing involved more than a single prescription.

Prescribing of more than one drug within BNF a sub-section was seen for adults with learning disabilities in 22.5% of prescriptions for antipsychotic drugs, 10.8% for antidepressants and 43.3% for antiepileptics. Simultaneous prescribing of drugs from more than one of the five BNF (sub)-sections we studied in more detail was also common. Two in five adults (39.9%) and 17.6% of all children and young people with learning disabilities who were receiving any of the drugs were receiving drugs from two or more groups. Corresponding proportions for people with autism but not learning disabilities were 30.3% for adults and 13.6% for children and young people.

Relatively little prescribing was reported to be at doses above BNF recommended limits. For antipsychotics this applied to 5.5% of prescriptions for adults with learning disabilities and 5.6% for adults with autism, and for both hypnotics and anxiolytics to 2.4% of prescriptions for adults with learning disabilities. High dose rates were seen for roughly double these proportions in the youngest adult age group. In all other cases high doses were recorded in fewer than 2% of prescriptions. However in 27.1% of prescriptions overall, the recording of the dose did not allow this analysis.

The proportions of patients for whom Read codes for licensed indications were recorded for the drugs prescribed varied and was difficult to interpret. Amongst adults with learning disabilities, potentially relevant indications were recorded in the notes of 41.9% of those prescribed antipsychotics, 68.2% prescribed antidepressants, 44.1% prescribed hypnotics and 53.6% prescribed anxiolytics. A much higher proportion of those receiving anti-epileptics (90.7%) had records of relevant indications. These patterns were broadly reflected for other groups except that relevant indications were less often recorded for children and young people in relation to hypnotics, anxiolytics and antipsychotics.

Comparison with epidemiological studies of mental illness in adults with learning disabilities suggests that 13% of the population (roughly 23,800 people) are being prescribed antipsychotics in the absence of a psychotic illness, and 10%

antidepressants in the absence of an affective illness (roughly 19,500 people). Allowing for overlap, which is common, we estimate that between 30,000 and 35,000 adults with a learning disability in England are taking one or both of these types of drug in the absence of the conditions for which they are indicated. Prescribing of antipsychotics and antidepressants to children and young people is much less common. It is less clear that rates for this group are disproportionate to the same extent.

Discussion

The data source we used is well established and widely studied. There is no reason to doubt that the pattern of prescribing recorded is a good reflection of prescribing by GPs for the patients concerned. However, drugs prescribed by secondary care staff, or in in-patient settings were excluded from this study and we have no way of telling to what extent the patients took the drugs prescribed.

Analysing the extent to which people prescribed medications had records of relevant conditions proved difficult. In our judgement we are likely to have over-estimated the proportions of people prescribed drugs who actually had relevant indications.

The study shows antipsychotic and antidepressant drugs are being prescribed for people with learning disabilities in England in the absence of recording of the conditions for which they are known to be effective. This is in line with the results of previous studies. The two contributions this study makes are first that it establishes the scale and patterns of prescribing and second that it demonstrates that the database we used documents it well. The approach used in this paper, with reasonably straightforward enhancements, would thus provide a useful method of monitoring the progress of attempts to tackle this problem.

Introduction

This study examined the prescribing of drugs acting on the central nervous system to people with learning disabilities or autism by general practitioners (GPs) in England. It forms part of the wider review of the prescribing of antipsychotic and antidepressant medicines for people with challenging behaviour undertaken as a result of the investigations into care for this group following the exposure of the events at Winterbourne View hospital

The authors of the government's final report into Winterbourne View noted that they had heard 'deep concerns about over-use of antipsychotic and antidepressant medicines'.[1 - paragraph 7.31] The action arising from this observation was that a review would be commissioned of the prescribing of antipsychotic and antidepressant medications. It is not practical to encompass all prescribing for people with learning disabilities or autism in a single study design. This study was designed to look at the experience of the largest natural sub-group – those people who are currently not in hospital and who, for the most part, may be assumed to be receiving most or all of the drugs they take on the basis of prescriptions issued by their GP.

The study focussed on the use of drugs in four of the sections of chapter 4 of the British National Formulary (BNF). Antipsychotic drugs (BNF section 4.2.1 and 4.2.2) and antidepressant drugs (4.3) were naturally included. However, published literature indicates a wider range of drugs is used for behaviour management in this group of people.[3,4] Accordingly we widened the range of drugs studied to include hypnotics (4.1.1), anxiolytics (section 4.1.2), the rest of the section covering drugs used in psychoses and related disorders (4.2) and antiepileptic drugs (4.8). The aim was to document the extent and patterns of prescribing of these drugs for people with learning disabilities and/or autism and to explore how much of this related to recorded diagnoses of licenced indications for the drugs.

The study was descriptive, using data from a major UK general practice research dataset, the Clinical Practice Research Datalink primary care database (CPRD GOLD). This is a large anonymised data source which draws from clinical case notes made by GPs in participating practices throughout the UK.

Background

i. Use of medication in the management of behaviour in people with learning disabilities and/or autism

Drugs in the categories studied (anxiolytics, hypnotics, drugs used in the management of psychosis and related disorders, antidepressants and antiepileptics) all have appropriate and licensed uses in the treatment of the conditions for which their category names indicate they are primarily intended. Some people with learning disabilities and/or autism suffer these conditions; in the cases of psychotic disorders and epilepsy, larger proportions than the general population.[5] However, these drugs are also widely used in people with learning disabilities, and also at least in young people with autism, . in the hope that they will assist in the management of behaviour carers find problematic.[6] This usage is mostly unlicensed and in most cases substantial evidence of its efficacy is largely lacking.[3,7,8]

The specific exception to this is in children with autism. Two well-designed randomised trials have recently demonstrated that risperidone can be effective in treating behaviour disorders not responsive to non-pharmacological treatment approaches in this group.[9,10] The group of drugs most strongly associated with longer term use for behaviour management is the antipsychotics. Many of these have sedative properties, at least initially. Some are licensed for rapid tranquilisation to manage acute violent disturbance, some for management of severe anxiety as well as psychosis and two, in limited situations, for management of behaviour. The evidence that these two, (haloperidol and risperidone) are effective beyond immediate sedation in the management of aggressive behaviour, one of the most commonly reported purposes for their use in people with intellectual disability, has been called into question by a major study by Tyrer et al.[11] In a randomised controlled trial, these authors failed to find any significant benefit of either for this purpose greater than placebo. Studies of progressive withdrawal of antipsychotic medication in people with learning disability where this had been prescribed for management of behavioural problems for a year or more have shown that in half or more cases, full or partial withdrawn of the drugs can be achieved with no deterioration in behaviour and improvements in general activity levels.[12,13]

Assessing the appropriateness of using psychotropic medications in people with learning disabilities is often far from easy. In some cases difficult behaviours can arise as a symptom of underlying psychiatric illness, or some types of epilepsy. In these circumstances the use of appropriate drugs to treat the underlying condition may well be beneficial. However, in the absence of mental illness or epilepsy, they have little relevant effect beyond, in some cases, sedation and carry well known risks of side effects. But establishing clearly whether a person has a major psychiatric illness is

particularly difficult when their capacity to communicate is limited. This means that treatment plans are often initiated in a situation of some diagnostic uncertainty. The approach recommended by a consensus group of the Royal College of Psychiatrists and the British Psychological Society is a detailed functional analysis of the behaviour followed by a variety of mainly behavioural interventions. If psychotropic medication forms part of the plan, it should be targeted at a specific psychiatric illness or symptom. Frequent review with fine tailoring of doses and withdrawal of drugs where they are ineffective or no longer needed is an important component.[14]

Deb and his colleagues proposed guidelines for prescribing of psychotropic medications for the management of problem behaviours.[15,16] Noting the limited evidence of their effectiveness and the potential for adverse effects, they recognised nevertheless that these drugs were widely used. In this context they set out to establish which drugs psychiatrists considered most appropriate and to propose principles for good practice. In addition to the questions prior to prescribing, they considered issues of duration, review and withdrawal of medication, use of high drug dosages and multiple drugs. They advised that dosages should be as low as possible consistent with response and that with the exception of anti-epileptics, use of multiple drugs, particularly from the same class of psycho-active medication should be avoided.

Paton and her colleagues at the Prescribing Observatory for Mental Health in the Research Unit of the Royal College of Psychiatrists undertook a large scale national audit of the use of antipsychotic medication for people with learning disabilities under the care of UK mental health services.[17] Their study was intended to explore the clinical rationale for prescribing and to see how far it was consistent with current good practice guidelines including those described above.[14] The study only explored the use of antipsychotics and the sampling approach used could not be relied on to produce a representative picture of current practice. Respondents reported on the clinical indications for which 2319 patients with learning disabilities were being prescribed antipsychotics and some associated clinical aspects of their care. Eighty-eight percent had a diagnosable mental illness of some type, 42% a psychosis. Amongst both these, and the 12% who did not, a range of behavioural issues including (most prominently) overt aggression, threatening behaviour and self-harm were given as clinical indications for the use of these drugs. Eighty-five percent of patients had been receiving treatment for more than a year. Monitoring of important side effects was seriously deficient. However the design of the study did not allow conclusions about the overall prevalence of use of antipsychotics (in the presence or absence of evidence of psychotic illness), or the extent to which this varied around the country.

There has not previously been a large scale population-based study of the extent of use of psychotropics in people with learning disabilities in England. Several authors have studied the scale of off-label prescribing in local services. [18–20] Cooper recorded the prevalence of use of psychotropic medication in her 2007 population based study of all

adults with intellectual disabilities in Glasgow.[21] She found that 49.5% were taking some form of psychotropic drug, with 23.2% taking an antipsychotic (compared with 4.4% who had psychotic illnesses). She also reported that high proportions were taking antidepressants, anxiolytics and mood stabilisers, although in this secondary report, these rates were not detailed numerically. Murray and her colleagues recently reported a population level study of psychotropic medication prescribed to children and young people (aged under 25) with autism in the UK, using a different general practice research database.[6] They reported a large rise in the identified prevalence of autism between 1992 and 2008 (from 0.01% to 0.50%, with psychotropic drugs being prescribed to 29% of these. The most widely prescribed drugs in the groups they studied were sleep medication (9.7%), psychostimulants (7.9%) and antipsychotics (7.3%). The rate of use of sleep medication and psychostimulants amongst those identified as having autism showed a three to four fold rise in the decade from 1999 to 2008, use of antipsychotics remained steady.

ii Locations of clinical care

The overall scope for consideration adopted by the Transforming Care programme was care for people who show challenging behaviour associated with learning disability or autism (para 1.1). Whilst the events at Winterbourne View occurred in a hospital, the concerns that fall within this scope cover a much wider range of care settings. Psychotropic drugs are used as part of management programmes for individuals across the full range of types of residential accommodation. There is currently little evidence about whether drugs are used more or less sparingly in different types of setting. One study identified more extensive use of medication as an approach to the management of challenging behaviour in registered residential care homes than in larger, campus-based units.[22] Thus an appropriate scope for a review would be to identify patterns of care as far as possible, in all types of residential setting.

For this reason, whilst hospital prescribing is important (and the subject of an accompanying piece of work[1]) it was also important for the Transforming Care programme to study care provided outside hospital. The most practical approach to this was to study GP prescribing. For most people who are not in hospital, the GP has a central role in co-ordinating medical aspects of care including the prescribing of medication. GPs commonly refer patients to specialists for assessments and recommendations about treatment plans, but generally they oversee the week-to-week management of long term conditions and undertake any long term prescribing themselves. This applies to patients living in private households, supported living environments and residential care homes.

[1] www.nhsiq.nhs.uk/winterbourne

iii The Clinical Practice Research Datalink

The study was based entirely on analysis of operational clinical notes made by GPs in the course of their work. These were available to us in the Clinical Practice Research Datalink primary care database (CPRD GOLD). CPRD is a UK NHS observational data and interventional research service, jointly funded by the NHS National Institute for Health Research (NIHR) and the Medicines and Healthcare Products Regulatory Agency (MHRA). It developed from work drawing anonymised data from general practice information systems for the purpose of studying the occurrence of rare but important drug side-effects. Comprehensive data about the transactions between patients and GPs are collected. The nature of the role of the GP in the English health service means that this gives a near comprehensive overview of the healthcare received by a definable population, albeit with uneven levels of detail.

The database holds comprehensive data about primary care interactions from selected GP practices.[23] Participating practices have staff training in data recording. Data quality and completeness are routinely monitored. Practices have to reach a recording quality threshold to be included in an analysis dataset. In the UK, patients are affiliated to a practice on a semi-permanent basis. It is relatively uncommon for them to switch practices other than as a result of substantial residential moves. Practice data, therefore, give a fairly comprehensive view of medical aspects of individuals' lives over a substantial period of time. The CPRD primary care database includes records of demographic information, prescription details, clinical events, preventive care provided, and specialist referrals. Recent changes have enabled the development of the system to allow data derived from general practice records to be linked directly to records relating to secondary care from a wide range of healthcare and mortality data sources. For this study the most important such linkage was to hospital statistics which show periods when patients are in hospital. The system currently collects information on approximately 5 million GP patients, although not all of these live in England. We estimate the effective population coverage below.

The system is well suited to this study in several ways. Within the population covered, individuals with a learning disability are relatively easy to identify. This is because GPs maintain registers of them as a requirement under a national quality programme (the quality and outcomes framework - QOF) for which they receive incentive payments.[24] As well as providing an incentive, this programme also provides mandatory coding details. Further QOF registers cover many of the other diagnoses for which the drugs in this study are licensed (depression, psychotic illness and epilepsy), also providing effective definitional frameworks for these. As a result of its original purpose, the system is designed to give optimal coverage of drug prescribing. It covers GP prescribing of all types. Where individuals are hospitalised (and thus the task of prescribing drugs

switches temporarily to hospital doctors) this should usually be apparent from linked hospital data.2

[2]The exception to this is when people are in NHS funded care in private hospitals. At the time to which the data studied relate, private mental hospitals did not report on these in the standard NHS statistical datasets.

Aims and objectives

The study set out to explore four aspects of the use of the four classes of drugs of interest (anxiolytics and hypnotics, drugs used in the management of psychosis and related disorders, antidepressants and antiepileptics) in patients with learning disabilities or autism.

These were:
1. The overall extent of their use,
2. Prescribing patterns; specifically the extent to which use was short term or ongoing, the extent to which people were being prescribed more than one compound in each of the four BNF sections, and whether dosages were within the range recommended by the BNF,
3. The extent to which use of these drugs was associated with recording of recognised indications, and
4. Variations in these patterns between subgroups of patients
Sources, methods, analysis and presentation

Methods

i. Data sources

GP prescribing and diagnostic data were obtained from the Clinical Practice Research Datalink (CPRD) primary care database. We identified patients with learning disabilities using the codes listed in the technical specification of the Quality and Outcomes Framework indicator LD01. An NHS Information Centre study showed that a number of people who are clearly known to have learning disabilities may not be included in these registers.[25] Accordingly we supplemented this code list with codes for diagnoses reliably associated with learning disabilities listed in the Learning Disabilities Observatory study of mortality.[24,26] We identified people with autism from Read codes related to the ICD10 diagnoses F840 (childood autism), F841 (atypical autism) and F845 (Asperger syndrome). We used GP practice and patient registration data to identify the periods for which they were potentially visible for analysis and data on hospital episodes to identify periods for which GP prescribing would not have occurred.

ii. Patient group

The study used a cohort design. A single cohort of patients defined by having a recorded diagnosis of learning disability or autism was identified. Learning disability or autism were considered to be persistent conditions, so a diagnosis at any time was considered to be relevant to the whole study period.

Patients were available for selection if they met three inclusion criteria. They needed a qualifying diagnosis, at least one day of permanent registration with a qualifying practice between 1st April 2009 and 31st March 2012, and they needed to be eligible for linkage to the inpatient Hospital Episode Statistics (HES) data. ‘Eligibility’ for linkage required them to be registered with a practice, in England, that had consented to take part in the scheme linking GP to hospital data, and they had to have a valid NHS number recorded in their primary care records thereby making linkage possible. Approximately 75% of English practices that contribute to CPRD also participate in this scheme.

A study window for each patient was defined as starting at the latest of the study start date (1st April 2009), the patient’s current registration date and the up-to-standard date of the practice, and finishing with the earliest of the end of the study period (31st March 2012), end of patient’s registration (if applicable), or the last collection date of the practice. Periods when patients were in hospital were excluded from their study window. The April 2014 version of the CPRD GOLD database was used.

Patients were characterised, by their age at study entry point, gender and diagnosis (learning disability (with or without autism), and autism without recorded learning disability). These categories were used to stratify most analyses.

iii. Drugs and prescribing

Psychotropic prescribing was defined as at least one GP prescription recorded in the CPRD GOLD therapy file for a drug in one of the four selected sections of the BNF chapter on drugs affecting the central nervous system. The sections were hypnotics and anxiolytics (BNF section 4.1), drugs used in psychosis or related disorders (4.2), antidepressant drugs (4.3) and antiepileptic drugs (4.8). For reporting purposes we have generally divided drugs in section 4.1 into those considered as hypnotics (4.1.1) and as anxiolytics (4.1.2). In section 4.2 we have focussed more on antipsychotic drugs (4.2.1) than on drugs used in the control of mania and hypomania (4.2.3). We have mainly reported on sections 4.3 and 4.8 as whole groups. There was too little use of barbiturates (4.1.3), monoamine oxidase inhibitors (4.3.2) or depot antipsychotics (4.2.2) for extensive reporting, although the small number of prescriptions for these identified were included in section totals. Appendix tables show figures for all the sub-sections.

Periods of use of drugs for patients were calculated from the total quantity prescribed and available daily dosage information. Durations were rounded up to a minimum of 1 day, or down to a maximum of 365 days where relevant. Where quantity or dosage information was missing a standard prescription length of 28 days was used. A subsequent prescription that occurred within the estimated duration of the original prescription plus a 56 day “grace period” was considered to be part of the same treatment episode. If there was any overlap, treatment episodes were censored at a patient’s study start and end dates. Treatment episodes were calculated for each group of drugs (based on BNF sections and sub-sections) and the dosage for each treatment episode was classified as within or above the maximum BNF-recommended daily dosage or missing. These are standard approaches for analysis of prescribing using this data source.

iv. Indications for Prescribing

For each drug compound (and, where appropriate, dose range) a list of approved indications was constructed, including, for example, psychotic illness, bipolar depression, unipolar depression, anxiety, ADHD and epilepsy. Read code lists for each indication were constructed by RW and ambiguous elements of these were reviewed by GG, UC and MH. UC and MH are both experienced GPs with special expertise in the care of people with learning disabilities. Most relevant indications could reasonably be

considered as chronic or likely recurrent conditions. As such, CPRD GOLD clinical and referral records were searched for Read codes for recognised indications both before and after prescribing events. We did not search text fields. On this basis records of indications were categorised as “contemporary” (within 28 days of the start of the treatment episode), “prior” (more than 28 days before the start of the treatment episode), and “following” (more than 28 days after the start of the treatment episode). Where more than one record of an indication was entered, contemporary records were chosen in preference to prior records, which were chosen in preference to following records.

v. Statistical analysis

Following an initial description of the patient group involved, the analysis was conducted in five main sections:

Exposure

The extent of prescribing of drugs from each of the BNF sections is reported as the proportion of observed person days in which patients were exposed to the drugs. Exposure periods were calculated from reported treatment episodes, plus intervening ‘grace periods’ if applicable (see above). The denominator (observed patient days) was the whole of each patient’s registration period omitting hospitalised days. Periods of hospitalisation were also excluded from the exposed days even if a prescribing episode was unfinished at the time of admission. Confidence intervals for rates were calculated using the Wilson method for standard errors of proportions using our own visual basic routines for Microsoft Access.[27]

Variations

We explored variations between the three study years and between geographic regions in England.

Treatment patterns

For exploration of treatment patterns, each episode of prescribing (essentially each prescription) of a drug for a patient was categorised in three ways. It was labelled as “acute” or “on-going” on the basis of whether it was directly followed by a subsequent

prescription for a drug from the same BNF section or sub-section, as “multiple” or not on the basis of whether two or more drug compounds from the BNF section / sub-section were prescribed at the same time, and as high-dose or not according to whether the prescribed dose exceeded BNF recommended limits. Dose limits for normal use were taken from the BNF April 2014 edition. The analysis of prescribing episodes was based on prescriptions not people as clearly a patient’s status in respect of these categories can change.

Combinations of drugs

In addition to identifying multiple prescribing within BNF sections we also conducted a cross-sectional analysis to identify the proportion of prescribing episodes where a patient was simultaneously given drugs from more than one of the sections studied. We report on the combinations.

Indications

The presence of recognised indications for prescribing is also reported for prescribing episodes. The counts and proportions of treatment episodes with an approved indication, and approved dosage, are presented overall, and to show the timing of recording of the indication in relation to the prescription. Each of the BNF drug sections considered had a range of recognised indications. We explored all of these notwithstanding the fact that some would normally be considered relatively unusual reasons for use of the drugs. This rather problematic analysis is described in more detail along with the results.

Data management and analysis at the CPRD level was undertaken using Stata version 13.[28] Subsequent analysis was undertaken using Microsoft Access and Excel. Unless otherwise stated, tests of statistical significance were also undertaken using Stata 13.

Results

i. The population covered

The data available from practices with adequate data quality and linkage to Hospital Episode Statistics included a total of 29,023 people meeting the diagnostic criteria for learning disability or autism. Over half (53.7%) were recorded as having a learning disability alone, 38.4% autism without a learning disability and 7.9% both. Between them they were followed for 67,799 person-years, an average of 2.34 years each. Table 1 shows their age gender and disability profiles.

Age and gender profiles for the two disability groups were very different. Figure 1 shows a population pyramid for the two groups. This is drawn as a histogram with bars representing numbers per year of age in the age band and width reflecting the number of years in the band. The youngest age group is arbitrarily drawn starting at 5 on the basis that diagnosis at younger ages is much less complete and in school data does not plateau until age 7. Similarly the oldest age group is arbitrarily truncated at 80 in recognition of reduced life expectancy. Just over half (57.4%) of those with learning disabilities were male, 17.2% aged under 18 and 34.2% aged 45 or older. Corresponding figures for the group with autism were 81.6% male, 76.5% under 18 and 2.6% aged 45 or older.

These population profiles show the patients identified as having these conditions by their GPs. In the case of learning disabilities the total number of adults in England registered by their GPs as having this condition is published annually. The average number in the three years covered by the study was 188,920. Our study found 14,802 people with learning disabilities aged 18 and over. The effective coverage of the data source can therefore be estimated at 7.8% of the people in England known to their GP as having a learning disability. It may be slightly smaller if a substantial number of people with learning disability were identified only through diagnoses not in the QOF data definition. Working from this figure it is possible to estimate the identified prevalence of learning disabilities in children as 0.35%. This is a prevalence similar to, though slightly lower that identified by GPs in adulthood, but much smaller than the figure identified in schools or in the national child psychiatric morbidity survey (discussed below).[29,30]

Figure 1. Population pyramids for patients identified as having learning disability (with or without autism) and autism but not learning disabilities.

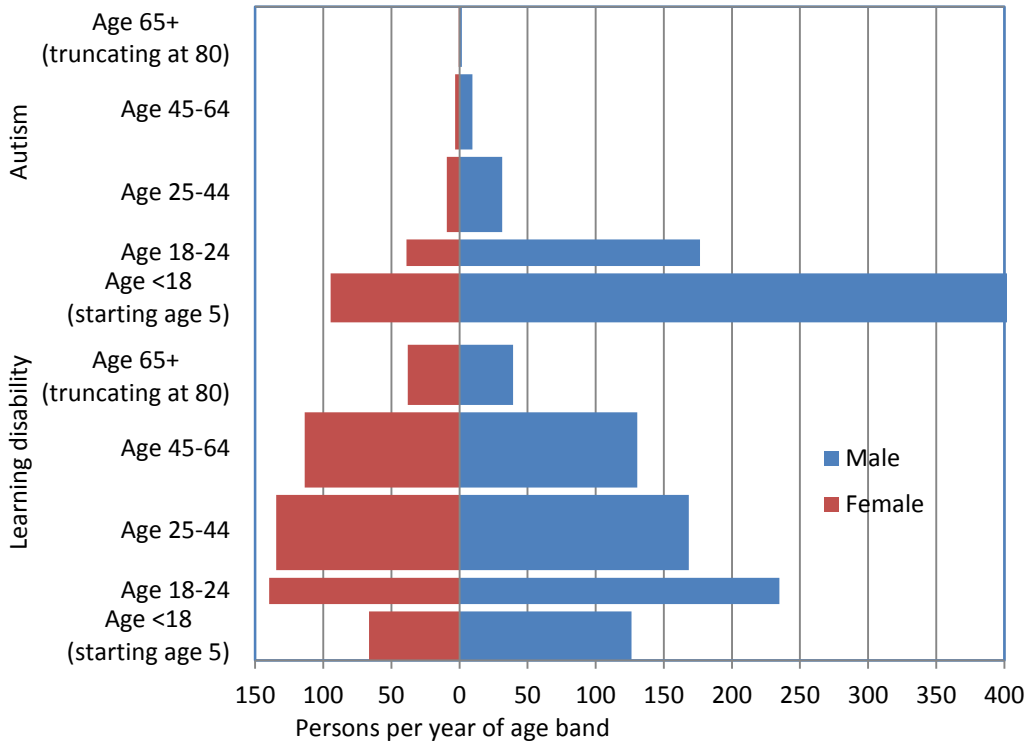


Table 1. Age, gender and diagnosis profile of people in the study group.

Age Group	Learning disabilities			Autism without learning disabilities			Proportion with LD also recorded as having Autism		
	Female	Male	Persons	Female	Male	Persons	Female	Male	Persons
Age <18	1064	2021	3085	1513	7008	8521	12%	31%	25%
Age 18-24	979	1644	2623	273	1236	1509	14%	27%	22%
Age 25-44	2693	3366	6059	188	628	816	7%	14%	11%
Age 45-64	2272	2611	4883	63	191	254	4%	8%	6%
Age 65+	609	628	1237	9	27	36	2%	3%	2%
Total	7617	10270	17887	2046	9090	11136	7%	17%	13%

There is no corresponding published total for the number of people known by their GP to have autism. However, epidemiological studies of the prevalence of autism suggest that contrary to the numbers identified by GP's, it varies relatively little with age. The 2004 UK survey of the mental health of children and young people in Great Britain found a prevalence in children of 0.8%, whilst the 2007 UK adult psychiatric morbidity survey reported the prevalence to be 1.1% of the population at age 16-44 falling to 0.8% in those aged 75 and older.[31,32] These reports do not publish confidence intervals, but in view of the sample size the rates for younger and older adults may well not differ to a statistically significantly extent. The numbers of children with autism seen in our data, assuming they represent 7.8% of the children in England, imply a prevalence of 1.4% - a slightly high figure. However, the numbers of adults at all subsequent ages was far below what would be expected and suggests GPs only record autism in a small fraction of adults with the condition. It seems likely that the ones that are identified are amongst the most disabled.

We considered reporting separately on the experience of people recorded as having both learning disabilities and autism. However from the numbers recorded as having both conditions it looked as if the recording of autism in the context of learning disabilities was too incomplete for this to be done reliably. Emerson and Baines, on the basis of a literature review, concluded that a reasonable working estimate of the prevalence of autism in adults with learning disabilities would be 20% to 33%.[33] Table 1 shows that the youngest two age groups show roughly this proportion. However at older ages the level of recognition of autism falls sharply. Emerson and Baines also estimated that the prevalence of learning disabilities in children with autism could reasonably be taken as between 40% and 67%. This suggests that LD is under recorded in children by GPs even in situations where, because of the presence of identified autism it might be supposed that their intellectual capacity would have been carefully assessed. Our figures show 17% of children and young people identified as having autism were also identified as having a learning disability, a proportion that rose with age to 44% at age 25 to 44 and 54% in those aged 45 to 64.

Whilst we have not systematically reported the experience of people identified by their GPs as having both conditions as we do not consider they are identified sufficiently systematically we do comment on how these differ.

ii Exposure to the drugs studied

Table 2 shows the pattern of exposure to the main groups of drugs. In the commentary that follows, age patterns are not described in depth for people with autism as rates at ages above 24 were based on relatively small numbers. Annex table 1 provides a full breakdown of the rates of exposure to drugs of all of the sub-sections of these four BNF sections by gender, disability and age group. An important general point to make about the observations reported in this section is that the data told us the proportion of patient days in each group exposed to each type of drug. This is like having an average census view. However it does not tell us how many of the individuals studied were exposed (perhaps for short periods) to each at any time in the overall study period.

Hypnotics

Hypnotics were being prescribed on 3.0% of person days observed in the period for people with learning disabilities and the same proportion for people with autism. They were prescribed across the age spectrum. Rates were slightly higher for males up to the age of 25 and for females at older ages. Hypnotics were prescribed in learning disabilities more for children and people in middle age with rates lower in young adulthood. In future work it would be useful to explore how much of the hypnotic prescribing is of melatonin. Although not a licensed indication, the BNF for children reports that some clinicians believe this is useful in treating initial insomnia in children with autism, cerebral palsy and learning disabilities. Murray and her colleagues draw attention to the parallel rise in prescribing of sleep medication and psycho-stimulants (which we did not study) for children and young people with autism who are also diagnosed as having attention deficit hyperactivity disorder.[6] For children and young people diagnosed as having both learning disabilities and autism, hypnotics were being prescribed on 7.2% of person days, twice the rate for those identified as having only one of the conditions.

Anxiolytics

Overall, anxiolytics were being prescribed to 3.6% of people with learning disabilities at any point in time. Rates of prescribing rose with age from 0.6% of person days in people aged under 18 rising to 5% in middle age. For people with autism the rate in those under 18 was 0.1%; this rose to around 3% in adulthood. There was no substantial gender difference in either case. For adults identified as having both learning disabilities and autism, the rate was roughly double the rate for people only identified as having learning disabilities.

Table 2. Rates of exposure, as percentage of person years exposed, to drugs of each BNF section by age, gender and disability group.

BNF Group / sub group and Age group	Learning disabilities Female	Male	Autism without learning disabilities Female	Male
4.1.1. Hypnotics				
Age <18	3.6 (2.9 to 4.3)	4.4 (3.9 to 5.1)	3.9 (3.4 to 4.6)	3.1 (2.8 to 3.4)
Age 18-24	1.6 (1.1 to 2.2)	2.2 (1.7 to 2.7)	2.5 (1.5 to 4.3)	1.3 (0.9 to 1.9)
Age 25-44	2.2 (1.8 to 2.6)	2.2 (1.9 to 2.6)	2.4 (1.3 to 4.4)	2.4 (1.7 to 3.4)
Age 45-64	4.1 (3.6 to 4.7)	3.1 (2.7 to 3.6)	5.4 (2.9 to 10.0)	2.9 (1.7 to 4.8)
Age 65+	3.9 (3.0 to 5.1)	3.2 (2.4 to 4.3)	4.5 (0.8 to 21.8)	6.8 (2.7 to 16.2)
All ages	3.0 (2.8 to 3.3)	3.0 (2.7 to 3.2)	3.7 (3.2 to 4.3)	2.9 (2.6 to 3.1)
4.1.2. Anxiolytics				
Age <18	0.5 (0.3 to 0.8)	0.7 (0.5 to 1.0)	0.3 (0.1 to 0.5)	0.0 (0.0 to 0.1)
Age 18-24	1.7 (1.2 to 2.3)	1.9 (1.5 to 2.4)	1.0 (0.4 to 2.3)	0.7 (0.4 to 1.1)
Age 25-44	3.4 (3.0 to 3.9)	4.4 (3.9 to 4.8)	3.9 (2.4 to 6.2)	2.8 (2.0 to 3.8)
Age 45-64	5.5 (5.0 to 6.2)	5.4 (4.9 to 6.0)	2.4 (0.9 to 6.0)	3.3 (2.0 to 5.4)
Age 65+	6.1 (5.0 to 7.5)	4.5 (3.6 to 5.8)	0.0 (0.0 to 14.9)	3.4 (0.9 to 11.5)
All ages	3.6 (3.4 to 3.9)	3.5 (3.3 to 3.8)	0.7 (0.5 to 1.0)	0.4 (0.3 to 0.5)
4.2.1. Antipsychotic drugs				
Age <18	1.4 (1.0 to 1.9)	2.9 (2.4 to 3.4)	1.6 (1.2 to 2.0)	1.4 (1.3 to 1.6)
Age 18-24	7.0 (6.0 to 8.2)	8.7 (7.8 to 9.7)	6.4 (4.6 to 8.9)	5.1 (4.3 to 6.1)
Age 25-44	11.5 (10.7 to 12.3)	16.7 (15.9 to 17.5)	13.6 (10.6 to 17.2)	10.6 (9.0 to 12.3)
Age 45-64	21.0 (19.9 to 22.1)	23.2 (22.2 to 24.3)	6.6 (3.7 to 11.5)	14.5 (11.5 to 18.0)
Age 65+	27.1 (24.8 to 29.6)	26.4 (24.1 to 28.7)	0.0 (0.0 to 14.9)	11.9 (5.9 to 22.5)
All ages	13.6 (13.1 to 14.1)	15.0 (14.5 to 15.4)	3.3 (2.8 to 3.8)	2.7 (2.5 to 2.9)
4.3. All Antidepressants				
Age <18	1.2 (0.8 to 1.7)	1.2 (0.9 to 1.6)	1.8 (1.4 to 2.3)	1.0 (0.9 to 1.2)
Age 18-24	9.9 (8.7 to 11.2)	6.9 (6.1 to 7.8)	16.6 (13.6 to 20.0)	8.0 (7.0 to 9.2)
Age 25-44	18.0 (17.1 to 19.0)	14.2 (13.4 to 15.0)	31.6 (27.3 to 36.2)	22.5 (20.4 to 24.8)
Age 45-64	25.0 (23.9 to 26.2)	18.2 (17.2 to 19.2)	32.5 (25.9 to 40.0)	28.7 (24.8 to 33.0)
Age 65+	24.0 (21.8 to 26.4)	18.6 (16.7 to 20.7)	31.8 (16.4 to 52.7)	22.0 (13.4 to 34.1)
All ages	17.2 (16.7 to 17.8)	11.8 (11.4 to 12.2)	7.0 (6.3 to 7.7)	3.8 (3.5 to 4.0)
4.8 All Antiepileptic drugs				
Age <18	11.5 (10.3 to 12.8)	9.5 (8.7 to 10.4)	3.4 (2.9 to 4.0)	1.7 (1.5 to 1.9)
Age 18-24	20.4 (18.7 to 22.2)	16.1 (14.9 to 17.4)	8.8 (6.6 to 11.5)	4.3 (3.6 to 5.2)
Age 25-44	21.6 (20.6 to 22.7)	23.3 (22.4 to 24.3)	12.6 (9.8 to 16.2)	6.2 (5.0 to 7.6)
Age 45-64	25.8 (24.6 to 27.0)	25.9 (24.8 to 27.0)	12.0 (7.9 to 17.9)	11.2 (8.6 to 14.4)
Age 65+	24.5 (22.3 to 26.8)	21.2 (19.1 to 23.4)	0.0 (0.0 to 14.9)	23.7 (14.7 to 36.0)
All ages	21.5 (20.9 to 22.1)	20.0 (19.5 to 20.5)	5.0 (4.4 to 5.7)	2.6 (2.3 to 2.8)

Figures in parentheses are 95% confidence intervals. See methods section for details

Antipsychotics

Overall, 16.6% of people with learning disabilities were being prescribed some drug from the class ‘drugs used in psychoses and related disorders’ (BNF 4.2). The most widely used sub-group of these (antipsychotic drugs - sub-section 4.2.1) were being given to 14.4% of people with learning disabilities. There were major age and gender differences. Among those aged under 18, 2.4% of those with learning disabilities and

1.5% with autism alone were being prescribed antipsychotics; corresponding figures for adults were 17.0% and 8.2%. In those with learning disabilities the proportion rose fairly steadily with age: 8.1% at age 18 to 24, 14.3% at 25-44, 22.2% at 45 to 64, and 26.7% at ages over 65. The gradation was less marked in adults with autism and we cannot be so confident about it as the observations were based on much smaller numbers of patients. Very few patients with either learning disabilities or autism were receiving depot antipsychotic agents (BNF section 4.2.2). Across the age spectrum the proportion of people identified as having both learning disabilities and autism being prescribed antipsychotics was substantially higher than in those identified as having learning disabilities alone. The difference was sixfold in those aged under 18, falling to roughly threefold in most of the adult years; in those aged over 65 the difference fell to two and a half times.

Drugs for the treatment of mania and hypomania (BNF sub-section 4.2.3) were being prescribed for 5.9% of patients with learning disabilities. Prescribing was rare for patients under age 18 but rose steadily through the adult age groups steadying after the age of 65. There was no obvious gender difference. Anti-manic drugs were being prescribed for fewer people identified as having autism alone. As with learning disabilities, this was very rare under the age of 18 (0.2%), rising again in the adult age groups to a peak of 7.6% in the 45 to 64 year old band.

Antidepressants

Antidepressants were being prescribed overall to 14.1% of people with learning disabilities. From little more than 1% in both groups at ages under 18, prescribing rates rose sharply through adult age bands to peaks in the 45 to 64 age band of 21.4% for adults with learning disabilities and 29.7% for those with autism but not learning disabilities. Women with learning disabilities were about 45% more likely to be receiving antidepressants at any time than men, There was a similar gender difference for people with autism. Children and young people identified as having both autism and learning disabilities were six times as likely to be being prescribed antidepressants as those identified as having only learning disabilities and three times as likely as those only identified as having autism.

The most commonly used sub-class of antidepressants was selective serotonin re-uptake inhibitors (SSRIs). These accounted for 70% of the person years exposure to antidepressants for people with learning disabilities and 75% for people with autism but not learning disabilities. Tricyclics (BNF 4.3.1) and ‘other’ antidepressants (BNF 4.3.4)3 accounted for the rest in almost equal shares. The higher rates of prescribing in

[3] BNF sub-section 4.3.4 includes agomelatine, duloxetine, flupentixol, mirtazapine, nefazodone, reboxetine, tryptophan and venlafaxine.

children and adolescents with both learning disabilities and autism noted above were almost entirely attributable to use of SSRIs.

Antiepileptics

Overall, 20.6% of people with learning disabilities were being prescribed anti-epileptic drugs (BNF 4.8). In people with learning disabilities, the rate in those aged under 18 was 10.2% but this rose to 17.7% at ages 18 to 24 and more than 20% in older ages. There was no consistent gender difference. In people with autism but not learning disabilities, 2.0% of those aged under 18 were being prescribed drugs in this class. This rose to 5.1% at age 18 to 24 and higher rates at older ages. In younger people with autism, drugs for control of epilepsies were being prescribed twice as commonly for females as for males at any time. Drugs used to control status epilepticus were being prescribed for 4.4% of people with learning disabilities and 0.5% of those with autism alone.

iii. Variation

We undertook a number of stratified analyses of the exposure data. There were substantial differences between geographic regions in rates of exposure to all four groups of drugs. In all but anti-epileptics, the highest regional exposure rate was double the lowest. For anti-epileptics the highest regional rate was 1.7 times the lowest. We explored whether regional prescribing rates for drugs from the various BNF sections we studied were correlated. For the most part they were not. However regional rates of prescribing of anti-epileptic drugs were significantly correlated with rates of prescribing of anxiolytics and antipsychotics (antiepileptics with anxiolytics, Spearman's rho=0.8788, p=0.0008, antiepileptics with antipsychotics, rho=0.867, p=0.0012). Rates of prescribing anxiolytics and antipsychotics were also significantly, though less strongly, correlated with each other (rho=0.661, p=0.0376).
There was little evidence of changes over the three years studied, the only exception to this being that for selective serotonin re-uptake inhibitors the rate of exposure in the first year was significantly lower than the overall rate, and the rate in the third significantly higher.

It is difficult to interpret these patterns as we do not know how uniform they were across the age, gender and disability sub-groups for which we have reported other findings.

iv. Patterns of prescribing

Duration of prescribing

Figure 2 illustrates two aspects of the pattern of prescribing; the detailed numbers for these charts are shown in Annex table 2 (page 60). The upper two charts show the proportion of time for which patients were exposed to the drugs in which the prescribing episode was not confined to a single prescription - in other words where the prescription involved was followed by another prescription for the same patient for a drug from the same BNF section / sub-section. The charts show that for both people with learning disabilities and people with autism but not learning disabilities, most prescribing of all of the drugs studied was longer term. The slight exceptions to this were anxiolytics, where for adults with learning disabilities 11.1% of prescriptions and for children and young people 19.6% involved single prescriptions and 13.5% for people with autism but not learning disabilities involved single prescriptions. This also applied to 9.6% of prescriptions for hypnotics to people with autism. In all other cases 95% or more of exposure was in treatment episodes involving two or more prescriptions. In all cases, single prescription treatment episodes were more common in those aged under 18 than in older people.

Use of multiple drugs

The lower two charts in Figure 2 show the proportion of prescribing exposure where more than one drug in the BNF section / sub-section was prescribed simultaneously. This was relatively unusual. However, for patients with learning disabilities, within-section/sub-section multiple drug prescribing was seen for antipsychotics in 22.5% of prescriptions for adults and 7% for children and young people, and for antidepressants 10.8% (adults) and 5.7% (children and young people). In the case of antipsychotics this may be a slight underestimate because depot injectable preparations of antipsychotics are grouped in a separate sub-section from other preparations. Thus a patient recorded as having been prescribed a single depot injectable antipsychotic and a single oral antipsychotic would not have been classified as receiving multiple prescribing for either sub-group. As prescribing of depot injectable antipsychotics was rare, this is not likely to have had a major effect. For patients with autism but not learning disabilities, corresponding figures were: antipsychotics 16.1% and 8.3%, antidepressants:1.03% and 3.7%. Multi-drug use was seen for higher proportions of treatment episodes with anti-epileptics (for people with learning disabilities 43.3% for adults and 27.9% cor children and young people, for people with autism 31.4% and 27.3%). This is less surprising since multiple-drug strategies have recognised purposes in the treatment of epilepsies.[34] In most cases multi-drug prescribing was less common in those aged under 18 than in older people. An exception was for hypnotics.

In addition to use of multiple drug compounds within BNF sections/sub-sections, we looked at the extent to which people being treated with drugs in each section were also receiving drugs from other sections. We did this by using a single randomly chosen sample day for each included patient. The results are in Table 3. A small number of patients were excluded from this analysis because they were in hospital on the selected day (2.0% of patients with learning disabilities (358/17,887) and 0.5% (54/11,136) with autism but not learning disabilities).

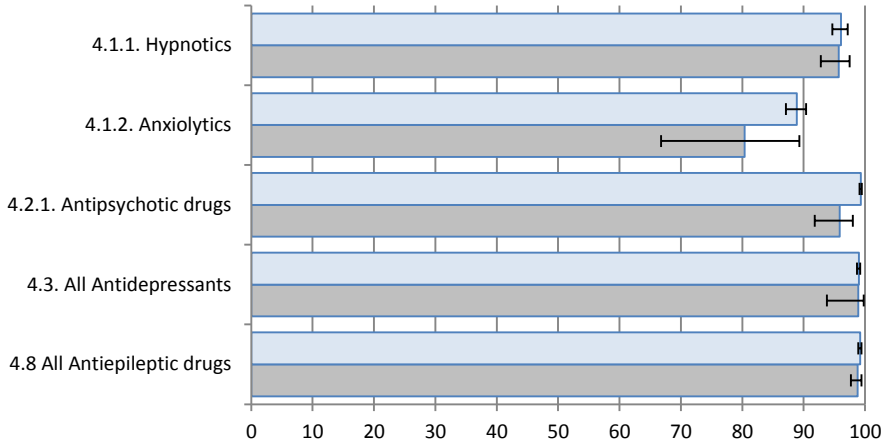
On the randomly selected day, 63.4% of people with learning disabilities and 88.9% with autism were not being prescribed drugs in any of the sections studied. These figures are not directly comparable because they varied substantially with age and the patients with autism were a much younger group. Table 4 shows that under age 18, 85.3% of people with learning disability and 93.1% with autism were not being prescribed any of the drugs studied. The proportions not prescribed drugs fell and the average number of drugs prescribed rose with age.

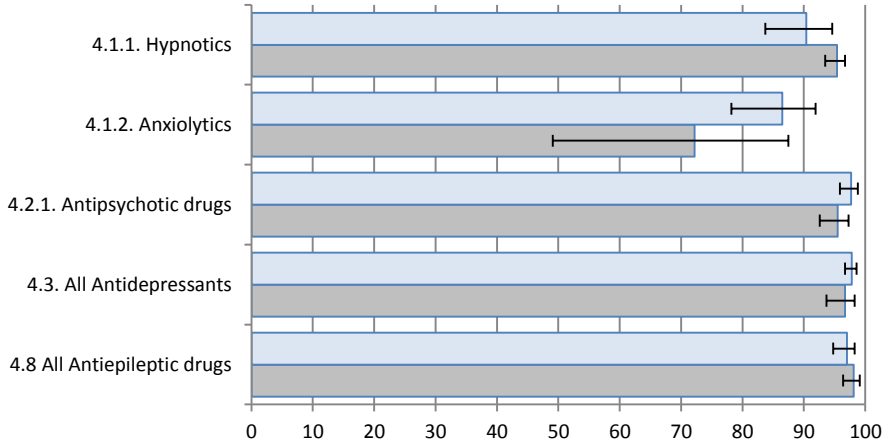
The pattern of prescribing of drugs of multiple BNF sections differed between patients with learning disabilities and those with autism but not learning disabilities. Considering adults with learning disabilities, of those prescribed antipsychotics, overall 67.2% were prescribed drugs in at least one other class, most commonly anti-depressants (40.0%) and anticonvulsants (38.0%). Of those prescribed antidepressants, 59.3% were also prescribed at least one other class of drug, most commonly antipsychotics (40.4%). Of those prescribed anxiolytics, 96.2% were prescribed at least one other drug class with 49.2% prescribed an antipsychotic, 40.6% an antidepressant and 75.5% an anticonvulsant. Of those prescribed hypnotics, 85.6% were prescribed another drug class, 48.4% an antipsychotic, 42.4% an antidepressant and 41.9% an anticonvulsant. Anticonvulsants were the group most commonly prescribed without drugs from other sections (52.2%). Of those prescribed an anticonvulsant, 28.8% were also prescribed an antipsychotic, 22.4% an antidepressant, 14.8% an anxiolytic and 5.2% a hypnotic. Corresponding figures for children and young people with learning disabilities and for people with autism can be seen in Table 3.

Compared to those under to those aged over 18, children and young people with autism alone prescribed hypnotics, antipsychotics or antidepressants were less likely than those with learning disabilities to be prescribed drugs of another class as well.
As people got older, the chance that they were not prescribed any of the five classes of drugs considered in this section fell. This was the case for both those with learning disabilities (chi square for trend = 1152.7, df=1, $p<0.0001$) and autism (chi square for trend = 865.3, df=1, $p<0.0001$). For those prescribed at least one type, the average number of types used rose with age. This was also true for both those with learning disabilities (adjusted R-squared = 0.017, $F(1,6422)=113.3$, $P<0.0001$) and autism (adjusted R-squared = 0.055, $F(1,1230)=72.0$, $P<0.0001$).

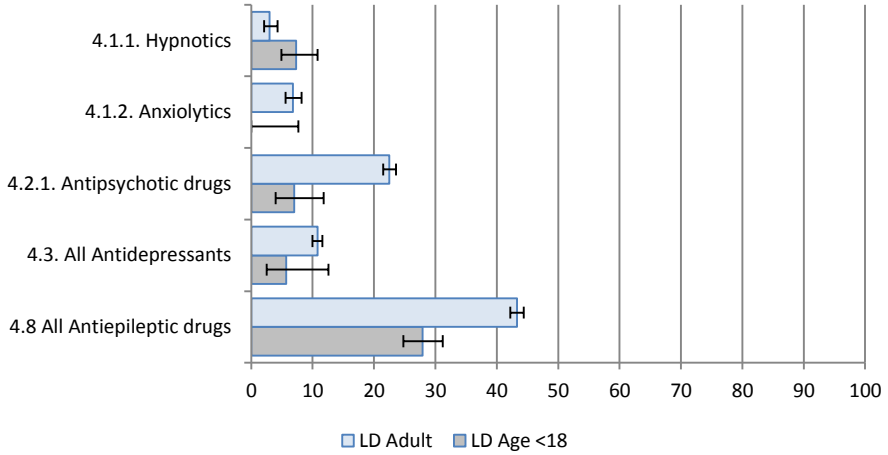
Figure 2. Patterns of prescribing. Upper two charts show proportion of exposure in 'ongoing' treatment episodes, lower two show proportion in episodes involving more than one drug compound in the BNF section / sub-section

Proportion (percentage) of treatment in 'on-going' episodes

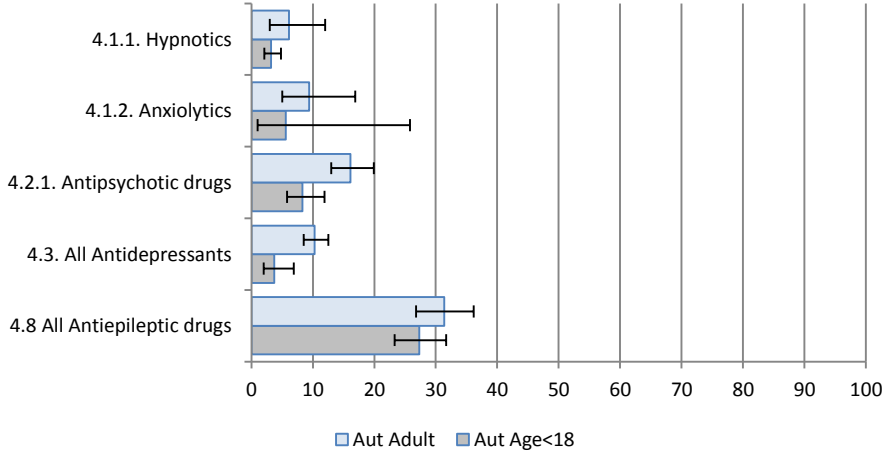




Proportion (percentage) of treatment involving more than one compound in class



People with learning disabilities



People with autism but not learning disabilities

Table 3. Cross-sectional analysis of combinations of drugs from different BNF sections.

	Learning disabilities		Autism without learning disabilities	
	Aged under 18	Aged 18 and older	Aged under 18	Aged 18 and older
Anxiolytics (BNF 4.1.1)				
Number (%) exposed on random day	17 (0.6%)	640 (4.4%)	9 (0.1%)	54 (2.1%)
Taking just Anxiolytics	5.9%	3.8%	11.1%	3.7%
Also taking: Hypnotics	23.5%	10.3%	22.2%	24.1%
Antipsychotics	5.9%	49.2%	22.2%	31.5%
Antidepressants	11.8%	40.6%	11.1%	55.6%
Anticonvulsants	94.1%	75.5%	88.9%	88.9%
Average number of the 5 drug classes	2.4	2.8	2.4	3.0
Hypnotics (BNF 4.1.2)				
Number (%) exposed on random day	118 (3.9%)	403 (2.8%)	265 (3.1%)	50 (1.9%)
Taking just Hypnotics	62.7%	14.4%	80.8%	30.0%
Also taking: Anxiolytics	3.4%	16.4%	0.8%	26.0%
Antipsychotics	9.3%	48.4%	10.6%	26.0%
Antidepressants	3.4%	42.4%	4.5%	44.0%
Anticonvulsants	28.8%	41.9%	8.3%	36.0%
Average number of the 5 drug classes	1.4	2.5	1.2	2.3
Antipsychotics (BNF 4.2.1 and 4.2.2)				
Number (%) exposed on random day	70 (2.3%)	2,476 (17.1%)	135 (1.6%)	208 (8.1%)
Taking just Antipsychotics	50.0%	32.8%	65.9%	38.5%
Also taking: Anxiolytics	1.4%	12.7%	1.5%	8.2%
Hypnotics	15.7%	7.9%	20.7%	6.3%
Antidepressants	18.6%	40.0%	13.3%	47.1%
Anticonvulsants	25.7%	38.0%	6.7%	24.5%
Average number of the 5 drug classes	1.6	2.0	1.4	1.9
Antidepressants (BNF 4.3)				
Number (%) exposed on random day	34 (1.1%)	2,450 (16.9%)	96 (1.1%)	418 (16.2%)
Taking just Antidepressants	52.9%	40.7%	69.8%	64.4%
Also taking: Anxiolytics	5.9%	10.6%	1.0%	7.2%
Hypnotics	11.8%	7.0%	12.5%	5.3%
Antipsychotics	38.2%	40.4%	18.8%	23.4%
Anticonvulsants	14.7%	29.9%	9.4%	15.3%
Average number of the 5 drug classes	1.7	1.9	1.4	1.5
Anticonvulsants (BNF 4.8)				
Number (%) exposed on random day	302 (9.9%)	3,266 (22.6%)	178 (2.1%)	187 (7.3%)
Taking just Anticonvulsants	79.8%	52.2%	77.5%	43.9%
Also taking: Anxiolytics	5.3%	14.8%	4.5%	25.7%
Hypnotics	11.3%	5.2%	12.4%	9.6%
Antipsychotics	6.0%	28.8%	5.1%	27.3%
Antidepressants	1.7%	22.4%	5.1%	34.2%
Average number of the 5 drug classes	1.2	1.7	1.3	2.0
n (People in group *not* in hospital on the random selected day)	3,052	14,477	8,504	2,578

The table shows data relating to a single randomly chosen sample day for each individual in the study. A number of individuals were excluded from this analysis because they were in hospital on the selected day.

Table 4 Proportion of people prescribed none of the drugs and average of groups prescribed by those prescribed at least one by age and diagnostic group

Diagnostic and age group	% prescribed none of the drugs studied	Average drug groups among those prescribed at least one	n
Learning disabilities			
Age <18	85.3%	1.2	3052
Age 18-24	72.8%	1.3	2573
Age 25-44	61.1%	1.5	5951
Age 45-64	50.9%	1.6	4767
Age 65+	48.0%	1.5	1186
Autism			
Age <18	93.1%	1.2	8504
Age 18-24	82.2%	1.3	1491
Age 25-44	68.5%	1.5	807
Age 45-64	56.3%	1.5	247
Age 65+	51.5%	1.6	33

Drugs given in high doses

There was limited data available for this aspect of the study due to the nature of GP recording of dosage information. Doses were not clearly identifiable in 28.6% of prescriptions for hypnotics, 55.3% for anxiolytics, 25.9% for antipsychotics, 16.7% for antidepressants and 31.2% for anti-epileptics. This was due to a large number of prescriptions having non-informative dosage information recorded, such as “as directed” or “as required”. Annex table 5 shows the frequency of this uncertainty for all drug and patient groups.

To the extent that it was informatively recorded, prescribing of most drugs in most groups was within BNF recommended dosage limits. Table 5 shows the extent to which this was not the case for the most important BNF sections / sub-sections. A fuller version of this table giving details for BNF sub-sections is at Annex table 6. Our identification of high doses here relates only to individual agents. We did not estimate the cumulative effect of use of more than one drug from the same BNF section / sub-section.

The drug groups for which high-dose prescribing was most common were hypnotics and anxiolytics for adults with learning disabilities (2.4% of prescriptions were for high doses) and antipsychotics for adults with either learning disabilities (5.5%) or autism (5.6%). High dose prescribing was significantly more common in the youngest adult age group both for people with learning disabilities and for those with autism but not learning disabilities (18-24: learning disabilities - 10.4%, autism 8.4%). Whilst overall high dose prescribing of antidepressants was rare, high doses of tricyclic antidepressants were seen in people with autism aged both under 18 (8.7% of prescriptions) and in adulthood (4.6%), particularly at ages 18-24 (20.6%).

Table 5. Proportion (percentage) of prescriptions for drugs where dose specified exceeded BNF recommended maximum

	People with learning disabilities		People with autism but not learning disabilities	
BNF Sub group	Under 18	18 and older	Under 18	18 and older
4.1.1. Hypnotics	0.2 (0.1 to 0.4)	2.4 (2.2 to 2.7)	0.4 (0.3 to 0.5)	1.7 (1.2 to 2.4)
4.1.2. Anxiolytics	0.7 (0.3 to 1.7)	2.4 (2.2 to 2.6)	1.0 (0.3 to 2.8)	1.0 (0.6 to 1.7)
4.2.1. Antipsychotic drugs	1.5 (1.0 to 2.1)	5.5 (5.4 to 5.7)	1.3 (1.0 to 1.7)	5.6 (5.1 to 6.2)
4.3. All Antidepressants	0.0 (0.0 to 0.3)	0.6 (0.5 to 0.6)	0.7 (0.4 to 1.0)	1.1 (0.9 to 1.3)
4.8 All Antiepileptic drugs	0.8 (0.6 to 0.9)	0.8 (0.8 to 0.9)	0.4 (0.3 to 0.5)	0.2 (0.1 to 0.3)

Drugs and indications

As described in the methods section, we explored the association between prescribing of drugs and recording of recognised indications for their use by deriving lists of indications and searching patients' notes for records of these conditions in relation to the drugs they were prescribed. This proved to be a complex task and the answers we were able to derive should not be considered precise.

Some indications could be described by symptom terms with much wider applicability than that was relevant to the drug of interest. The most obvious example is the recognised, though rare, use of many phenothiazines, categorised as antipsychotic drugs (BNF sub-section 4.2.1), for the control of persistent nausea or vomiting in terminal care. Our code list included a range of terms for nausea as indications for this group of drugs. It seems likely that only a small proportion of cases where a person receiving a drug of this type and also recorded as suffering with nausea or vomiting would have fallen into the category where the drug was an appropriate treatment for this symptom. The tendency arising from this would have been for us to err in the direction of rating prescriptions as indicated when the record on which this was based may not have provided an adequate basis. The following results should be considered in this light.

It is also important to remember that we do not know whether appropriate clinical indications for the drugs were present, only whether they were recorded as being present. So absence of indications could be a sign or either poor practice or poor notekeeping.

We show the findings from this part of the study in three tables. The first (Table 6) shows the proportion of prescriptions from each BNF section or sub-section for which a recognised indication was recorded. The second (Figure 3) shows the timing of recorded indications in relation to prescriptions. The third (

Table 7) shows the proportion of prescriptions from each BNF section for which each of the various possible iindications was recorded.

Table 6 shows the proportions of prescriptions where the case notes also included a report of a recognised indication. These varied considerably between drug groups. High proportions of prescriptions for drugs used in the control of the epilepsies had records of relevant indications. The overall prevalence of exposure to antiepileptics in people with learning disabilities was similar to estimates of epilepsy prevalence for this group so for this is not surprising. For adults with autism but not learning disabilities, the prescribing rate climbs strikingly and surprisingly with age (Table 2). The high proportion of prescriptions for which there is an appropriate indication (80.6%) seems surprising.

Prescriptions for drugs in the BNF section for drugs used in psychoses and related disorders had an appropriate accompanying diagnosis in 16.4% of cases for children and young people and 49.6% for adults. Within this overall section prescriptions for drugs in the sub-section for drugs used for mania and hypomania were most commonly accompanied by a record of a recognised indication (94.8% prescriptions for children and young people and 68.0% for adults with learning disabilities, and 68.4% and 73.5% of prescriptions for people with autism in the corresponding age groups). Prescriptions for compounds in the sub-section covering anti-psychotic drugs were less likely to be associated with records of recognised indications.

For antidepressants, 46% of prescriptions for children and young people in both diagnostic groups had a relevant indication recorded as did 68.2% of adults with learning disabilities and 83.2 prescriptions for adults with autism but not learning disabilities.

Hypnotics had relevant indications reported in 22.2% of prescriptions for children and young people with learning disabilities and 24.2% for those with autism. For adults, hypnotic prescribing was associated with relevant indications in 44.1% of cases for individuals with learning disabilities and 34.4 of those with autism. Anxiolytic prescribing was associated with relevant indications in 18.3% of cases for children and young people with learning disabilities and 21.7% with autism, 53.6% of those for adults with learning disabilities and 81.8% for adults with autism.

Figure 3 shows the timing of records of indications for prescribing where these were found. In the great majority of cases records of the indication were contemporary with prescriptions (recorded within 28 days). In adults with learning disabilities, in about 10% of cases the record of the indication preceded the prescription. In children and in adults with autism this was more common. There were some exceptions where indications were commonly only recorded after the prescription. These included prescribing of anxiolytics and drugs for febrile convulsions in children with learning disabilities and antipsychotics in children with autism. After-prescription recording of indications was

also relatively common in prescribing of antipsychotics, hypnotics and antidepressants to children and young people with autism. Table 7 shows the frequency with which each type of indication identified as being potentially relevant to each category of drugs was recorded. The table only includes drug indications for which examples appeared in the data. In many cases patients were noted as having more than one possible indication. However, this table suggests that the extent to which usage of drugs was associated with recording of the normal primary indications may be a little overstated by Table 6. The table shows the full list of indications that we considered were recognised for each group of drugs. Some members of groups of drugs had additional indications. Table 7 shows the drugs concerned. Alongside each type of indication, the second column records either 'Core' if the indication represented a primary purpose for the group, or, where it was an additional indication for some members of the group, the names of the drugs concerned. This analysis was undertaken as a late addition to the project to clarify the emerging findings. We did not have the resources to undertake it for all drug groups; it is confined to the groups of drugs in BNF sub-sections for hypnotics (4.1.1), anxiolytics (4.1.2), antipsychotics (4.2.1) and the sections for antidepressant and anti-epileptic drugs.

Anxiolytics are recorded as indicated in 53.6% of prescriptions for adults with learning disabilities (Table 6), however only 29.7% had records of anxiety states. In this case several others were recorded as having other types of anxiety disorder (5.4% phobias and 6.2% panic symptoms or disorder, although we do not know how much these overlap), so it is possible that the proportion with some type of anxiety disorder reached 40% of those prescribed the drugs. However an alternative possibility is that in many cases our approach was reading a diagnosis of epilepsy as a relevant indication. The position is similar for antipsychotic drugs – this part of the table relates to just drugs in BNF section 4.2.1 and 4.2.2. Table 6 shows 41.9% of prescriptions for adults with learning disabilities as being associated with a recognised indication. However the proportion having a diagnosis falling into our categories of either psychosis or bipolar disorder could only just have exceeded 30%, and assuming some overlap of the categories was probably less. In this case the vestibular symptoms (the most commonly recorded indication for these drugs in all four age / diagnosis groups) relate to persistent nausea and vomiting or travel sickness.

Table 7 is more reassuring in relation to antidepressants and anti-epileptic drugs. In these cases the most commonly recorded type of indication is the corresponding primary one – depression or epilepsy. For adults with autism the rate of prescriptions of anti-epileptics rises with age and as noted above, the proportion reported as having relevant indications is high. Table 7 shows that in more than half of the cases this was due to records of anxiety, insomnia and bipolar disorders.

Table 6. Proportions (percent) of prescriptions with recognised indications recorded in casenotes.

	% of Prescriptions for people with learning disabilities		% of Prescriptions for people with autism but not learning disabilities	
BNF Sub group	Under 18	18 and older	Under 18	18 and older
4.1. All Hypnotics and anxiolytics	21.6 (20.4 to 22.9)	49.6 (49.1 to 50.1)	24.2 (23.2 to 25.1)	56.4 (54.7 to 58.1)
4.1.1. Hypnotics	22.2 (20.9 to 23.5)	44.1 (43.3 to 44.8)	24.3 (23.3 to 25.3)	34.4 (32.2 to 36.6)
4.1.2. Anxiolytics	18.3 (15.4 to 21.5)	53.6 (53.0 to 54.2)	21.7 (17.5 to 26.5)	81.8 (79.9 to 83.7)
4.2. All Drugs used in psychoses and related disorders	16.4 (15.0 to 18.0)	49.6 (49.3 to 49.8)	19.2 (18.1 to 20.4)	54.1 (53.0 to 55.1)
4.2.1. Antipsychotic drugs	6.8 (5.8 to 7.9)	41.9 (41.6 to 42.1)	11.4 (10.5 to 12.5)	47.2 (46.0 to 48.4)
4.2.2. Antipsychotic depot injections	-	88.8 (86.9 to 90.4)	-	100.0 (80.6 to 100.0)
4.2.3. Drugs used for mania and hypomania	94.8 (91.5 to 96.9)	68.0 (67.6 to 68.4)	68.4 (64.9 to 71.8)	73.5 (72.0 to 75.0)
4.3. All Antidepressants	46.0 (43.2 to 48.9)	68.2 (68.0 to 68.5)	46.1 (44.3 to 47.9)	83.2 (82.5 to 83.8)
4.3.1. Tricyclic and related antidepressant drugs	38.2 (28.1 to 49.4)	54.1 (53.4 to 54.8)	21.8 (17.0 to 27.6)	72.4 (70.3 to 74.5)
4.3.3. Selective serotonin re-uptake inhibitors	43.6 (40.6 to 46.7)	69.7 (69.4 to 70.1)	48.6 (46.7 to 50.6)	86.0 (85.2 to 86.7)
4.3.4. Other antidepressant drugs	100.0 (78.5 to 100.0)	75.2 (74.5 to 75.9)	64.0 (54.2 to 72.7)	82.3 (80.7 to 83.9)
4.8 All Antiepileptic drugs	94.2 (93.8 to 94.6)	90.7 (90.6 to 90.8)	92.0 (91.4 to 92.6)	80.6 (79.7 to 81.4)
4.8.1 Control of the epilepsies	96.6 (96.2 to 96.9)	93.5 (93.4 to 93.6)	93.8 (93.2 to 94.3)	80.1 (79.1 to 81.0)
4.8.2 Drugs used in status epilepticus	70.4 (67.8 to 72.8)	74.6 (74.1 to 75.1)	67.7 (63.6 to 71.5)	84.4 (82.4 to 86.3)
4.8.3 Febrile convulsions	41.7 (32.8 to 51.1)	55.0 (54.2 to 55.9)	41.3 (32.5 to 50.7)	85.1 (82.9 to 87.1)

Figure 3. Timing of indications in relation to prescriptions. Charts show the proportion of prescriptions for which some recognised indication was identified where this was recorded within 28 days of the prescription or before or after this. Numbers after drug section labels are counts of prescriptions

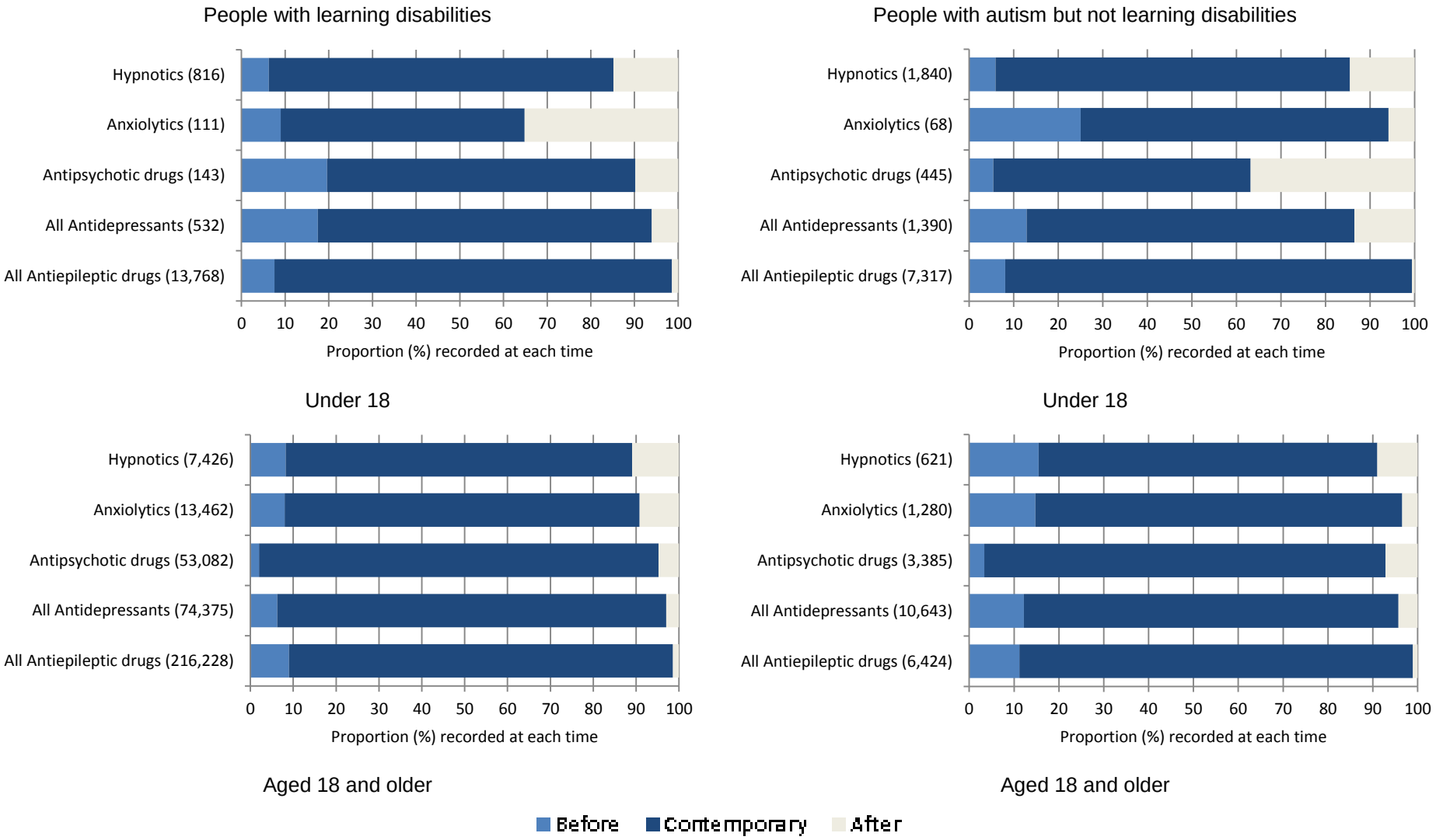


Table 7. Specific indications recorded in notes in association with drugs from BNF sections / sub-sections. The table shows number exposed to relevant drugs followed by the proportion (with 95% C.I.) in whose notes each potential clinical reason is recorded.

Type of indication	Specific drugs in the groups concerned where not general	Learning disabilities		Autism without learning disabilities	
		Under 18	18 and older	Under 18	18 and older
Hypnotics (4.1.1)					
Patients exposed		275	1168	737	227
Nausea and vomiting	Promethazine	34.9 (29.5 to 40.7)	32.7 (30.1 to 35.4)	30.4 (27.2 to 33.8)	20.7 (15.9 to 26.4)
Insomnia	(Core)	20.4 (16.0 to 25.5)	42.6 (39.8 to 45.5)	21.8 (19.0 to 25.0)	44.5 (38.2 to 51.0)
Anxiety	Chlormethiazole (restlessness and agitation in the elderly)	7.3 (4.8 to 11.0)	35.1 (32.4 to 37.9)	8.7 (6.9 to 10.9)	55.9 (49.4 to 62.3)
Alcohol withdrawal	Chlormethiazole		0.4 (0.2 to 1.0)		1.3 (0.5 to 3.8)
Anxiolytics (4.1.2)					
Patients exposed		109	2259	76	219
Epilepsy	Diazepam, Lorazepam	61.5 (52.1 to 70.1)	46.2 (44.2 to 48.3)	30.3 (21.1 to 41.3)	17.4 (12.9 to 22.9)
Insomnia	Diazepam, Lorazepam, Oxazepam	7.3 (3.8 to 13.8)	17.4 (15.9 to 19.1)	10.5 (5.4 to 19.4)	30.1 (24.4 to 36.5)
Anxiety	(Core)	6.4 (3.1 to 12.7)	29.7 (27.8 to 31.6)	28.9 (20.0 to 40.0)	62.6 (56.0 to 68.7)
Phobias	(Core)	5.5 (2.5 to 11.5)	5.4 (4.5 to 6.4)	7.9 (3.7 to 16.2)	16.4 (12.1 to 21.9)
Panic	(Core)	3.7 (1.4 to 9.1)	6.2 (5.3 to 7.3)	6.6 (2.8 to 14.5)	22.8 (17.8 to 28.8)
Alcohol withdrawal	Diazepam, Chlordiazepoxide		0.2 (0.1 to 0.5)		1.4 (0.5 to 3.9)
Dystonia	Diazepam		0.1 (0.0 to 0.4)		
For sedation	Lorazepam		0.8 (0.5 to 1.2)		0.5 (0.1 to 2.5)
Social anxiety	(Core)		0.2 (0.1 to 0.5)		4.1 (2.2 to 7.6)
Antipsychotic drugs (4.2.1)					
Patients exposed		182	3470	325	378
Nausea, vomiting and allergic indications specific to	Perphenazine[4],	42.3 (35.4 to 49.6)	34.9 (33.3 to 36.5)	36.9 (31.9 to 42.3)	30.4 (26.0 to 35.2)
Persistent nausea and vomiting	Prochlorperazine,	34.1 (27.6 to 41.2)	28.4 (26.9 to 29.9)	29.2 (24.6 to 34.4)	21.7 (17.8 to 26.1)
Anxiety	Chlorpromazine, Pericyazine, Perphenazine, Trifluoperazine,	12.6 (8.6 to 18.2)	26.1 (24.6 to 27.5)	13.2 (10.0 to 17.3)	47.1 (42.1 to 52.1)
Depression	Flupentixol, Quetiapine	9.9 (6.3 to 15.1)	35.8 (34.2 to 37.4)	12.3 (9.2 to 16.3)	54.5 (49.5 to 59.4)
Psychosis	(Core)	3.3 (1.5 to 7.0)	22.5 (21.2 to 24.0)	3.1 (1.7 to 5.6)	25.7 (21.5 to 30.3)
Bipolar disorder	(Core)	2.2 (0.9 to 5.5)	9.2 (8.2 to 10.2)	2.8 (1.5 to 5.2)	10.3 (7.6 to 13.8)
Antipsychotic drugs cont.					
Antisocial sexual behaviour	Benperidol		0.3 (0.2 to 0.6)		

[4] The list of allergic indications for perphenazine was so wide and so potentially common that we used a separate list of physical indications for this drug.

Type of indication	Specific drugs in the groups concerned where not general	Learning disabilities		Autism without learning disabilities	
		Under 18	18 and older	Under 18	18 and older
Monosymptomatic hypochondriacal psychosis	(Core, but specifically Pimozide)		0.2 (0.1 to 0.5)	0.3 (0.1 to 1.7)	0.8 (0.3 to 2.3)
Hiccup	Chlorpromazine, Haloperidol		0.3 (0.2 to 0.5)		
Antidepressants (4.3)					
Patients exposed		102	3712	292	755
Depression	(Core)	33.3 (24.9 to 42.9)	61.5 (59.9 to 63.0)	37.0 (31.7 to 42.7)	76.3 (73.1 to 79.2)
Anxiety	Trazodone, Paroxetine, Escitalopram, Duloxetine, Venlafaxine	24.5 (17.2 to 33.7)	39.3 (37.7 to 40.9)	33.9 (28.7 to 39.5)	54.8 (51.3 to 58.4)
Epilepsy	Pregablin	16.7 (10.7 to 25.1)	26.1 (24.7 to 27.5)	10.3 (7.3 to 14.3)	8.9 (7.0 to 11.1)
Enuresis	Imipramine	9.8 (5.4 to 17.1)	4.9 (4.2 to 5.6)	9.6 (6.7 to 13.5)	5.6 (4.1 to 7.4)
Obsessive compulsive disorder	Clomipramine, Escitalopram, Fluoxetine, Fluvoxamine, Paroxetine, Sertraline	8.8 (4.7 to 15.9)	4.7 (4.1 to 5.4)	10.3 (7.3 to 14.3)	12.6 (10.4 to 15.1)
Panic	Citalopram, Escitalopram, Paroxetine, Sertraline	7.8 (4.0 to 14.7)	9.3 (8.5 to 10.3)	4.8 (2.9 to 7.9)	12.2 (10.0 to 14.7)
Phobia	Clomipramine	5.9 (2.7 to 12.2)	5.9 (5.2 to 6.7)	3.4 (1.9 to 6.2)	11.7 (9.6 to 14.1)
Psychosis	(Core)	2.9 (1.0 to 8.3)	11.5 (10.5 to 12.6)	1.7 (0.7 to 3.9)	9.5 (7.6 to 11.8)
Bipolar disorder	(Core)	2.0 (0.5 to 6.9)	4.0 (3.5 to 4.7)	1.7 (0.7 to 3.9)	4.8 (3.5 to 6.5)
Bulimia	Fluoxetine	1.0 (0.2 to 5.3)	0.3 (0.1 to 0.5)	0.7 (0.2 to 2.5)	0.8 (0.4 to 1.7)
Cataplexy	Clomipramine				0.5 (0.2 to 1.4)
Social anxiety	Escitalopram, Paroxetine, Sertraline		0.2 (0.1 to 0.4)		2.1 (1.3 to 3.4)
Chronic pain	Amitryptaline, Nortryptaline		1.7 (1.3 to 2.2)		1.6 (0.9 to 2.8)

Type of indication	Specific drugs in the groups concerned where not general	Learning disabilities Under 18	Learning disabilities 18 and older	Autism without learning disabilities Under 18	Autism without learning disabilities 18 and older
Anti-epileptic drugs (4.8)					
Patients exposed		429	4295	301	353
Epilepsy	(Core)	85.3 (81.7 to 88.4)	70.9 (69.5 to 72.3)	74.8 (69.6 to 79.3)	39.4 (34.4 to 44.6)
Insomnia	Clormethiazole	8.4 (6.1 to 11.4)	13.0 (12.0 to 14.0)	9.6 (6.8 to 13.5)	22.7 (18.6 to 27.3)
Anxiety	Pregablin, Clobazam	4.2 (2.7 to 6.5)	20.2 (19.0 to 21.4)	11.6 (8.5 to 15.7)	46.7 (41.6 to 52.0)
Chronic pain including Trigeminal Neuralgia	Carbamazepine, Gabapentin, Pregablin, Phenytoin	0.7 (0.2 to 2.0)	0.9 (0.7 to 1.2)		2.3 (1.2 to 4.4)
Bipolar disorder	Carbamazepine, Sodium Valproate,	0.5 (0.1 to 1.7)	5.2 (4.6 to 5.9)	1.3 (0.5 to 3.4)	8.2 (5.8 to 11.5)
Tremor	Primidone		0.3 (0.1 to 0.5)	0.3 (0.1 to 1.9)	0.3 (0.1 to 1.6)
Alcohol withdrawal	Carbamazepine		0.2 (0.1 to 0.3)		0.6 (0.2 to 2.0)

Exposure rates and prevalence of mental illness

The group of people covered by the study was intended to be as close as we could get to a general population group. This means we would expect that the rates of use of drugs intended for the treatment of mental illness would be lower than those reported in groups of people with learning disability under treatment by mental health services. The group would be expected to have an overall pattern of mental health problems more similar to that found in the general population in population-based studies of psychiatric morbidity.[35] However inevitably the group will not be a true reflection of all people with learning disability or autism in the population since we had no way of identifying those not already identified as such by their GP.

The research study likely to give the closest approximation of the expected patterns of psychiatric morbidity for adults with learning disabilities in our study sample is by Cooper and her colleagues.[36] Cooper studied as far as possible all adults with a learning disability living in a part of Scotland. She used a multiple key informant strategy (including the local authority, social care providers, GPs and secondary health care services) to identify all people aged 16 and older with learning disabilities in the Greater Glasgow Health Board area in 2002-4. She used four different sets of diagnostic protocols for mental illness to clarify the effect of using different definitional protocols on the number of individuals identified as having diagnosable problems. The approach most appropriate for comparison with the present prescribing data would be the clinical diagnosis made by the psychiatrist who, in Cooper's study, had undertaken a comprehensive standardised assessment. This gave substantially higher rates of mental illness than major diagnostic classifications applied algorithmically to responses to standardised interview schedules. Cooper included both problem behaviour and autism in the broad range of what she termed 'mental ill health'. On this basis, in her initial prevalence survey, 40.9% of people with learning disabilities had some type of mental ill health. The prevalence of psychotic disorder was 4.4%, affective disorder 6.6%, anxiety disorder 3.8% and sleep disorder 0.6%. Additionally, 7.5% had an autistic spectrum disorder and 22.5% were considered to show some type of problem behaviour. Overall, 22.4% had some type of mental ill health not including problem behaviour and autistic spectrum conditions, and 37% had some type of mental ill health including problem behaviour but not including autism alone. It is worth noting that these observed rates are likely to have been higher than would have been known to GPs before the study since the screening process itself may have identified problems not previously reported to them.

It is also likely that these rates would be higher than the rates in the population we studied for three reasons. First Greater Glasgow is an area of high overall deprivation, whereas England as a whole should be average in this respect; high rates of deprivation are usually associated with higher rates of mental illnesses of most types. Second the key informant strategy used for Cooper's study identified a population prevalence of

learning disability of only 0.33%. This suggests it was less effective at identifying this than current English GP registers which, at the time to which our data relate, identified 0.46% of people as having learning disabilities. Generally those with more severe disabilities or more associated problems would be more visible. Third, Coopers study included people currently in psychiatric hospitals. In England, at any point in time, about 1.5% of adults with learning disabilities are in psychiatric hospitals.[37] At the census of 2014, 1,365 of these people were considered to need hospitalisation primarily because of a mental illness, not a behaviour disorder or other perceived risk. This suggests that if Cooper's overall prevalence of psychotic illness (4.4%) had applied exactly in England at the time to which our data relate, the prevalence outside hospital would have been 3.8%.

On this basis, the numbers prescribed psychotropic medication in the data we looked at substantially exceeded the numbers likely to have the types of mental illness for which these drugs are primarily indicated. A rough estimate would be that the prescribing rate for antipsychotics to adults with learning disabilities is almost four times the probable rate of psychosis, for hypnotics more than four times the rate of sleep disorders, but for anxiolytics reasonably close to the rate of anxiety states. We cannot make such a neat comparison for antidepressants and for drugs used for mania and hypomania as Cooper provides a single rate for affective disorders and we did not include drugs used for mania and hypomania in our analysis of people receiving drugs from multiple BNF sections. However at 6.6%, the likely rate of all affective disorders is only two fifths of the rate of antidepressant prescribing and similar to the rate of prescribing of drugs in the category of those used for mania and hypomania. This comparison suggests that most of the prescribing, at least of antipsychotics and antidepressants, is for reasons other than current psychosis or affective disorders. Some, of course may be to prevent relapses in people who have had prior episodes of depression or psychosis.

The population based nature of our study, taken with Coopers estimates of the prevalence of mental illness allows some estimation of the scale of this usage nationally. The population of adults with learning disabilities known to their GP in England, of whom our study was representative, in the three years of the study averaged 188,920. The figures above suggest that 23,800 (13%) of these would have been being treated with antipsychotics in the absence of psychosis, 19,500 (10%) with antidepressants in the absence of a relevant affective disorder and 4,000 (2%) with a hypnotic in the absence of a sleep disorder. These numbers would have overlapped substantially. Our overlap analysis showed that in adults with learning disabilities roughly 40% of those prescribed antipsychotics were also prescribed antidepressants, and the proportion of those prescribed antidepressants also prescribed antipsychotics was similar. On this basis it seems reasonable to estimate that between 30,000 and 35,000 adults with learning disabilities nationally are likely to be being prescribed an antidepressant or an antipsychotic without the key indications for doing so.

Rates of mental illness in the population of children with intellectual disabilities have been reported by Emerson and Hatton using data from the first two British child psychiatric morbidity surveys.[38] They noted 36% had some type of psychiatric disorder (4.5 times the rate in children without intellectual disabilities), 11.4% (3.6 times) an anxiety disorder including 1.6% (2.7 times) generalised anxiety disorder, 1.4% (1.6 times) depression, 8.3% (9.2 times) hyperkinesis (ADHD), 20.5% (4.8 times) a conduct disorder and 8% (26.7 times) an autistic spectrum condition. 4.4% (5.5 times) had both and emotional disorder and a conduct disorder. However their analysis was based on identifying 3.5% of children as having learning disabilities, a prevalence similar to that found in schools but substantially more inclusive than our effective operational criterion of being recognised as having a learning disability by the GP. As noted above, in our data, GPs appear to have identified 0.35% of children and young people as having learning disabilities. This is close to but slightly lower than the prevalence identified by GPs in adults. Hence prevalence figures for mental illness within the group identified by Emerson and Hatton are not directly comparable with what might be expected in the much narrower group identified by their GP. It seems likely that those identified by their GP will be those with more physical problems. But whether this means they would have more mental health problems is not clear.

In comparison to these rates of likely illness, and in light of the clearer evidence in relation to use of risperidone in behavioural disturbance in children with autism cited in the introduction, it is harder to be clear that the much smaller rates of prescribing seen for children and adolescents were substantially disproportionate.

Discussion

The study arose from the concerns, reported in Transforming Care, that antipsychotic and antidepressant medicines were being overused in the care of people with learning disabilities and autism. The study described the use of four classes of psychotropic drugs among people with learning disabilities or autism who are not currently in hospital.

Key findings

The numbers of relevant patients identified (17,887 people with learning disabilities and an additional 11,136 with autism) suggested that the database covers about 7.8% of the relevant English population. People with learning disabilities covered the age spectrum, those identified as having autism alone were predominantly (77%) aged under 18.

People with learning disabilities:

Patients were exposed to one or more of the drugs we studied on 41.3% of person days for adults and 14.7% for children and young people. Excluding antiepileptics, the figures were 29.5% of adult- and 6.8% of children and young people's person-time. Antipsychotic drugs were being prescribed on 17.0% of adult and 2.4% of children and young people's person-days, drugs used in mania and hypomania on 7.1% and 0.3% respectively, antidepressants on 16.9% and 1.2%, anxiolytics on 4.2% and 0.6% and antiepileptic drugs on 22.9% and 10.2%. Hypnotics were the only group of drugs we studied for which a higher proportion of children and young people's time was exposed (children and young people 4.1% of person-days; adults 2.7%). For most groups of drugs, exposure rates rose through adult life. The rate of prescribing antipsychotics in people aged 65 and over was 2.9 times the rate in those aged 18 to 24; corresponding multiples were 1.8 for hypnotics, 2.9 for anxiolytics, 2.5 for drugs used in mania and hypomania and 2.7 for antidepressants. The multiple for antiepileptics, 1.2, was much lower.

People with autism:

For people with autism but not learning disabilities, the rates we can report for children were based on large numbers and therefore probably reflect the experience of people with autism in the population reasonably well. Adult rates were based on much smaller numbers of individuals. Interpretting adult rates therefore requires some allowance for

the question which individuals had their autism identified and recorded by their GP. It is likely that this would be a particularly disabled group, not representative of adults with autism in the population generally. Among those aged under 18, 1.5% of person days were exposed to prescribing of antipsychotics, 0.2% drugs for the management of mania and hypomania, 1.1% antidepressants, 3.2% hypnotics, 0.1% anxiolytics and 2.0% anti-epileptics. Corresponding rates for adults with autism were: antipsychotics 8.2%, drugs for the management of mania and hypomania 3.5%, antidepressants 17.0%, hypnotics 2.1%, anxiolytics 1.8% and anti-epileptics 6.9%.

Patterns of prescribing:

A large proportion (90% or more) of the prescribing of drugs in most of the BNF sections and sub-sections we studied was not short term: the first visible prescription was followed by at least one repeat prescription. The only exceptions to this appeared to be anxiolytics, and, for acults with autism, hypnotics. However even for these groups the majority of periods of prescribing involved more than a single prescription. Strikingly, hypnotic prescribing involved at least one repeat prescription in 96.0% of cases despite the BNF guidance that chronic insomnia is rarely benefitted by hypnotics and may be a consequence of long term hypnotic use.

Prescribing of more than one drug within BNF a sub-section was seen for adults with learning disabilities in 22.5% of prescriptions for antipsychotic drugs, 10.8% for antidepressants and 43.3% for antiepileptics, though in the latter case there may be good therapeutic reasons. As explained in the previous section, in the case of antipsychotics this may be a slight underestimate as a consequence of depot injectable preparations of antipsychotics being grouped in a separate BNF sub-section from other preparations. Simultaneous prescribing of drugs from more than one of the five BNF (sub)-sections we studied in more detail was also common. Two in five adults (39.9%) and 17.6% of all children and young people with learning disabilities who were receiving any of the drugs were receiving drugs from two or more groups. Corresponding proportions for people with autism but not learning disabilities were 30.3% for adults and 13.6% for children and young people.

Relatively little prescribing was reported to be at doses above BNF recommended limits. For antipsychotics, 5.5% of prescriptions for adults with learning disabilities and 5.6% for adults with autism were for doses above recommended limits, The corresponding proportion for prescriptions of hypnotics and anxiolytics for adults with learning disabilities was 2.4%. High dose rates were seen for roughly double these proportions in the youngest adult age group. In all other cases high doses were recorded in fewer than 2% of prescriptions. However in 27.1% of prescriptions overall, the dose was not sufficiently clearly recorded for analysis. Our analysis also did not consider additive dose effects in patients prescribed more than one drug in a BNF section or sub-section.

The proportions of patients for whom licensed indications were recorded for the drugs received varied and was difficult to interpret. Amongst adults with learning disabilities, 41.9% of those prescribed antipsychotics, 68.2% prescribed antidepressants, 44.1% prescribed hypnotics and 53.6% prescribed anxiolytics had relevant indications recorded in their notes. A much higher proportion of those receiving anti-epileptics (90.7%) had records of relevant indications. These patterns were broadly reflected for other groups except that relevant indications were less often recorded for children and young people in relation to hypnotics, anxiolytics and antipsychotics.

Comparison with epidemiological studies of mental illness in adults with learning disabilities suggests that 13% of the population (roughly 23,800 people) are being prescribed antipsychotics in the absence of a psychotic illness, and 10% antidepressants in the absence of an affective illness (roughly 19,500 people). Allowing for overlap, which is common, we estimate that between 30,000 and 35,000 adults with a learning disability in England are taking one or both of these types of drug in the absence of the conditions for which they are indicated. Perhaps the single clearest impression given by the data is the way that the load of medication given to adults with learning disabilities appears to accumulate through their adult life. It seems that new drugs are added to address newly emerging problems, but they are seldom removed when the problem changes or the likely efficacy of the drug wanes.

Reliability and limitations

The Clinical Practice Research Datalink is a well-established research service. There is no good reason to doubt that the primary care data it holds provides a reasonable representation of the state of care provided in general practice across England. Identification of patients with learning disabilities is likely to have been more reliable than that of patients with autism, though both are clearly far from complete. The introduction of learning disabilities registers in 2006 under the Quality and Outcomes Framework has provided a clear set of codes by which this group of patients should be identifiable in GP note systems. Registration of patients with learning disabilities has been required under this programme since then. The reason for believing that registration is incomplete is that the overall prevalence figures (0.45% of adults at the time to which the study data relate) is substantially lower than the prevalence found in school age populations.[39] However it is similar to prevalence figures found in areas of the country where there have been case registers for research and planning purposes for many years.[40] Whilst this is likely to be only about a quarter of the people who have a learning disability it probably represents all or most of those whose make use of statutory services for this type of disability or whose disability has been recognised by their GP. It probably includes almost all with severe or profound learning disability as well as those with the most obvious causes such as Down's syndrome. Autism, like

learning disability is a persistent condition in the sense that whilst some people with autism develop ways of accommodating to the extent that the consequent disability is reduced, it does not remit. For people with autism the extent of under-diagnosis in adults was evident from the very sharp fall in identified prevalence with increasing age. We have noted the likely effect of this in identifying adults, particularly older adults with autism who were a more narrowly selected group, probably on average much more disabled than the much larger group of people with autism identified in our sample in childhood. In both cases, our view is that we have identified most of those in the practices covered by CPRD GOLD whose GPs were aware of their learning disability or autism.

The data on which we are reporting cover patients permanently registered with a GP. We have excluded individuals only temporarily registered. The scope of the data we used should have included all of those not currently in hospital. By linkage to NHS Hospital Episode Statistics we attempted to exclude periods for individuals when they were in hospital and consequently when prescribing would not have been undertaken or recorded by their GP. However this would not have identified periods when individuals were in private mental hospitals. For these periods we would not have seen any prescribing. This should not have had an important effect as the numbers involved would probably have been less than 1% of the person years we were studying.
The patients in the study would have included all patients living independently, and also those living in residential care homes, group homes, or other supported or congregate setting as long as they was not classified as hospitals. GPs generally do not prescribe drugs for people in hospitals, whether these are run by the NHS or independent sector organisations. We are aware that there may be a small number of exceptions to this in some private hospitals, however we think this is unlikely to have produced substantial distortion.

The study should have covered all GP prescriptions for included patients. However it would not have captured prescriptions given by secondary care-based specialists for patients living in the community. Generally specialists do not do this. They determine the most appropriate medication and then ask patients' GPs to prescribe this for them. The most obvious gap in our data which would have arisen from this would be the period after patients leave hospital when they are given a supply of drugs for a few days to take home with them. These supplies last only a few days so this should not be important. However it could also explain the very low apparent rate of use of depot antipsychotics if these are prescribed, dispensed and administered by community-based secondary care staff. In 2006, Bramble reported unwillingness on the part of GPs at that time to prescribe expensive medications (notably risperidone and melatonin) in the long term. This could still be an issue for prescribing of melatonin, but the antipsychotic drugs which were expensive at that time have all subsequently come out of patient so non-proprietary makes should be available at modest prices.

It is less clear how completely GP's record other information such as diagnoses or symptoms. It is possible that busy GP's could record a prescription, for example for an antidepressant, as shorthand covering both the symptoms presented and the management chosen. This would be poor note keeping but it would have appeared to our analysis as a prescription without a clinical indication.

We have no way of telling to what extent patients actually took the prescribed medication. It is likely that most of the patients identified in the study would have had a substantial amount of support either from family members or paid carers. Probably relatively few of the patients would have taken the initiative themselves to seek initial or continuing treatment. It is likely that carers would have been influential both in arranging consultations and in procuring and administering medication. So the compliance question would have related to carers at least as much as to the patients.

We noted the limitations of the data in the analysis of the frequency of use of high doses; data were missing or uninterpretable in more than a quarter of cases. We also did not estimate cumulative high doses where individuals were prescribed more than one compound in a BNF section or sub-section.

Finally, there were limitations to the extent we could explore variation around the country. The source we used can be reported at regional level, but the differences of interest would be more between local services than overall regions.

Usage of drugs

In addition to overall prescribing in relation to diagnoses, we were able to report on three aspects of drug usage: dosage, chronicity and poly-pharmacy. Our findings about the use of antipsychotics can be compared to those of the Royal College of Psychiatrists' Prescribing Observatory for Mental Health study described above, although it should be noted that they were describing patients receiving secondary care who might be expected to have more severe problems, and thus be receiving more medication than the overall population of people with learning disabilities. This group only considered adults with learning disabilities, so our comparisons are with that group in our data.

Paton's reported that the proportion of patients on antipsychotic medication where doses exceeded recommended limits ranged from 4% to 17% between participating centres. However she did not report findings for specific age groups. Overall we found that 4.5% of antipsychotic prescriptions for adults with learning disabilities were definitely at doses above BNF recommended limits. It was also notable that the figure for the youngest group of adults was twice as high. However our findings on this were incomplete (as described above) because of the high proportion of prescriptions for

which we did not have usable data and the fact that we were not able to calculate total dose equivalents where multiple compounds were used.

Paton reported that 73% of adults with learning disabilities currently prescribed antipsychotics were also taking other classes of medication for mental illness, behavioural problems or epilepsy. The corresponding proportion in our study was 67.3%. She reported that 33% were also taking antidepressants. We found this in 40.0% of adults with learning disabilities and 47.1% with autism but not a learning disability. It is not easy to compare other drug categories since Paton grouped them differently, but she reported that 15% were also taking a benzodiazepine. In our figures, 18.9% of adults with learning disabilities who were taking antipsychotics were also taking either a hypnotic or an anxiolytic.

Use of more than one antipsychotic is less easy to compare. Paton gave an overall figure of 15% for the proportion of sample patients (selected for receiving an antipsychotic) who were prescribed more than one. The corresponding figure for adults with learning disabilities in our data was 22.5%.
Compared to rates of use in the general population, the rate of prescribing of antipsychotics in people with learning disabilities is very high. Marston and her colleagues reported this in a comparable study using a similar general practice database (THIN).[41] They found the rate for people aged under 18 to be 63 per 100,000.

The reported prescribing rates we found for children and young people were 38 times that figure for those with learning disabilities and 24 times for people with autism. A rough estimation suggests that patients with learning disabilities and/or autism could account for about 40% of antipsychotics prescribed by GPs to children and young people. Unfortunately, the age banding Marston used for adults was different to the one we adopted. So precise comparisons are not possible. However antipsychotic prescribing for people with learning disabilities was roughly 18 times as common as for the general population up to age 45 and in excess of 30 times as common for older people. For adults with autism the prescribing rate was roughly 10 times that in the general population.

Further refinements, future work

This was an initial study. The study demonstrated that the Clinical Practice Research Datalink primary care database is effective for monitoring use of psychotropic drugs in people with learning disabilities. It is effective also in children with autism, although the numbers suggest it may be over-inclusive in this group. Adults with autism are clearly very much less fully identified, making interpretation of the data about them harder. This source would be an effective tool for monitoring national trends. CPRD itself currently monitors only about 8% of the UK population, but has plans to double this proportion by

April 2016 by including data from a range of GP software systems. Increased coverage would increase confidence in the results of research and monitoring conducted. Other research databases are available which bring the total covered up to about 20%. Coverage of the different monitoring systems varies regionally around England. Hence ideally a monitoring system should use all of them.

If a monitoring programme were to be established, the queries we used could be enhanced in a number of ways. The coverage of high dose prescribing could be improved at least to the extent of calculating combined dose equivalents where multiple agents have been used. The monitoring of clinical indications could be sharpened by exploring the plausibility of possible indications such as persistent vomiting or allergic phenomena for the use of specific phenothiazines in more detail for individuals where the question was relevant. We accepted a single reference to these symptoms as sufficient to qualify as an indication. In practice this type of medication is not a first line treatment for either indication and would only be likely to be prescribed for this reason if the symptoms were persistent, failed to respond to simpler approaches and probably in the context of other major illness. Algorithms to assess these could be developed. Side effects are a major concern in prescribing many psychotropics. In monitoring their use through data abstracted through GP record systems it should be possible to check the extent of coverage of recommended monitoring procedures and also the patterns of response to emerging adverse trends in weight, plasma cholesterol and triglyceride levels or neurological extrapyramidal side effects.

Duration of treatment is important in the use of hypnotics and anxiolytics where habituation means that long term treatment is likely to be ineffective and may even be counterproductive. The two recognised uses of risperidone in relation to behaviour (persistent aggression in conduct disorder and in moderate to severe Alzheimer's disease) are also specifically recognised as being appropriate only in the short term (up to six weeks). A continuing programme of monitoring drug use through extracts from GP record systems could usefully examine durations of treatment in more detail and over longer time frames for these and other drugs.

Conclusion

The study shows antipsychotic and antidepressant drugs are being prescribed for people with learning disabilities in England in the absence of the conditions for which they are known to be effective. This is in line with the findings from previous studies. The two contributions this study makes are first that it establishes the scale and patterns of prescribing and second that it demonstrates that the CPRD primary care database documents it well. The approach used in this paper, with reasonably straightforward enhancements would thus provide a useful method of monitoring the progress of attempts to tackle this problem.

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Annexes

Annex table 1. Proportion (percentages) of person years exposed to one or more drugs in the group by age sex and disability category. (95% confidence intervals in parantheses)

BNF Group / sub group and Age group	Learning disabilities			Autism without learning disabilities		
	Female	Male	Persons	Female	Male	Persons
4.1. All Hypnotics and anxiolytics						
Age <18	4.0 (3.3 to 4.9)	4.9 (4.3 to 5.6)	4.6 (4.2 to 5.1)	4.2 (3.6 to 4.9)	3.1 (2.9 to 3.4)	3.3 (3.1 to 3.6)
Age 18-24	3.2 (2.5 to 4.0)	3.8 (3.3 to 4.5)	3.6 (3.1 to 4.1)	3.5 (2.2 to 5.5)	1.9 (1.4 to 2.5)	2.2 (1.7 to 2.7)
Age 25-44	5.3 (4.8 to 5.9)	6.3 (5.8 to 6.9)	5.9 (5.5 to 6.3)	6.1 (4.1 to 8.8)	4.4 (3.5 to 5.7)	4.8 (3.9 to 5.9)
Age 45-64	8.9 (8.2 to 9.7)	7.9 (7.3 to 8.6)	8.4 (7.9 to 8.9)	6.6 (3.7 to 11.5)	5.9 (4.1 to 8.5)	6.1 (4.5 to 8.3)
Age 65+	9.8 (8.3 to 11.5)	7.5 (6.3 to 9.0)	8.7 (7.7 to 9.8)	4.5 (0.8 to 21.8)	8.5 (3.7 to 18.4)	7.4 (3.4 to 15.2)
All ages	6.3 (6.0 to 6.7)	6.1 (5.8 to 6.5)	6.2 (6.0 to 6.5)	4.4 (3.8 to 5.0)	3.1 (2.9 to 3.4)	3.4 (3.2 to 3.6)
4.1.1. Hypnotics						
Age <18	3.6 (2.9 to 4.3)	4.4 (3.9 to 5.1)	4.1 (3.7 to 4.6)	3.9 (3.4 to 4.6)	3.1 (2.8 to 3.4)	3.2 (3.0 to 3.5)
Age 18-24	1.6 (1.1 to 2.2)	2.2 (1.7 to 2.7)	2.0 (1.6 to 2.4)	2.5 (1.5 to 4.3)	1.3 (0.9 to 1.9)	1.5 (1.2 to 2.1)
Age 25-44	2.2 (1.8 to 2.6)	2.2 (1.9 to 2.6)	2.2 (2.0 to 2.5)	2.4 (1.3 to 4.4)	2.4 (1.7 to 3.4)	2.4 (1.8 to 3.3)
Age 45-64	4.1 (3.6 to 4.7)	3.1 (2.7 to 3.6)	3.6 (3.2 to 3.9)	5.4 (2.9 to 10.0)	2.9 (1.7 to 4.8)	3.5 (2.3 to 5.3)
Age 65+	3.9 (3.0 to 5.1)	3.2 (2.4 to 4.3)	3.5 (2.9 to 4.3)	4.5 (0.8 to 21.8)	6.8 (2.7 to 16.2)	6.2 (2.7 to 13.6)
All ages	3.0 (2.8 to 3.3)	3.0 (2.7 to 3.2)	3.0 (2.8 to 3.1)	3.7 (3.2 to 4.3)	2.9 (2.6 to 3.1)	3.0 (2.8 to 3.2)
4.1.2. Anxiolytics						
Age <18	0.5 (0.3 to 0.8)	0.7 (0.5 to 1.0)	0.6 (0.5 to 0.8)	0.3 (0.1 to 0.5)	0.0 (0.0 to 0.1)	0.1 (0.1 to 0.1)
Age 18-24	1.7 (1.2 to 2.3)	1.9 (1.5 to 2.4)	1.8 (1.5 to 2.2)	1.0 (0.4 to 2.3)	0.7 (0.4 to 1.1)	0.7 (0.5 to 1.1)
Age 25-44	3.4 (3.0 to 3.9)	4.4 (3.9 to 4.8)	3.9 (3.6 to 4.3)	3.9 (2.4 to 6.2)	2.8 (2.0 to 3.8)	3.1 (2.3 to 4.0)
Age 45-64	5.5 (5.0 to 6.2)	5.4 (4.9 to 6.0)	5.5 (5.1 to 5.9)	2.4 (0.9 to 6.0)	3.3 (2.0 to 5.4)	3.1 (2.0 to 4.7)
Age 65+	6.1 (5.0 to 7.5)	4.5 (3.6 to 5.8)	5.3 (4.5 to 6.2)	0.0 (0.0 to 14.9)	3.4 (0.9 to 11.5)	2.5 (0.7 to 8.6)
All ages	3.6 (3.4 to 3.9)	3.5 (3.3 to 3.8)	3.6 (3.4 to 3.8)	0.7 (0.5 to 1.0)	0.4 (0.3 to 0.5)	0.4 (0.4 to 0.5)

BNF Group / sub group and Age group	Learning disabilities Female	Male	Persons	Autism without learning disabilities Female	Male	Persons
4.2. All Antipsychotics						
Age <18	1.8 (1.4 to 2.4)	3.1 (2.6 to 3.6)	2.6 (2.3 to 3.0)	1.7 (1.3 to 2.2)	1.6 (1.4 to 1.7)	1.6 (1.4 to 1.8)
Age 18-24	9.0 (7.9 to 10.3)	10.3 (9.4 to 11.4)	9.8 (9.1 to 10.6)	7.8 (5.8 to 10.4)	6.1 (5.2 to 7.1)	6.4 (5.6 to 7.3)
Age 25-44	14.2 (13.3 to 15.1)	20.0 (19.1 to 20.9)	17.4 (16.7 to 18.0)	15.5 (12.4 to 19.3)	10.8 (9.2 to 12.5)	11.9 (10.5 to 13.5)
Age 45-64	24.2 (23.0 to 25.3)	25.9 (24.8 to 27.0)	25.1 (24.3 to 25.9)	8.4 (5.1 to 13.7)	16.4 (13.3 to 20.1)	14.3 (11.8 to 17.3)
Age 65+	29.4 (27.0 to 31.8)	28.2 (25.9 to 30.6)	28.8 (27.1 to 30.5)	0.0 (0.0 to 14.9)	11.9 (5.9 to 22.5)	8.6 (4.2 to 16.8)
All ages	16.0 (15.5 to 16.5)	17.1 (16.7 to 17.6)	16.6 (16.3 to 17.0)	3.7 (3.2 to 4.3)	3.0 (2.8 to 3.2)	3.1 (2.9 to 3.3)
4.2.1. Antipsychotic drugs						
Age <18	1.4 (1.0 to 1.9)	2.9 (2.4 to 3.4)	2.4 (2.0 to 2.7)	1.6 (1.2 to 2.0)	1.4 (1.3 to 1.6)	1.5 (1.3 to 1.6)
Age 18-24	7.0 (6.0 to 8.2)	8.7 (7.8 to 9.7)	8.1 (7.4 to 8.8)	6.4 (4.6 to 8.9)	5.1 (4.3 to 6.1)	5.4 (4.6 to 6.2)
Age 25-44	11.5 (10.7 to 12.3)	16.7 (15.9 to 17.5)	14.3 (13.8 to 14.9)	13.6 (10.6 to 17.2)	10.6 (9.0 to 12.3)	11.3 (9.9 to 12.8)
Age 45-64	21.0 (19.9 to 22.1)	23.2 (22.2 to 24.3)	22.2 (21.4 to 23.0)	6.6 (3.7 to 11.5)	14.5 (11.5 to 18.0)	12.4 (10.0 to 15.2)
Age 65+	27.1 (24.8 to 29.6)	26.4 (24.1 to 28.7)	26.7 (25.1 to 28.4)	0.0 (0.0 to 14.9)	11.9 (5.9 to 22.5)	8.6 (4.2 to 16.8)
All ages	13.6 (13.1 to 14.1)	15.0 (14.5 to 15.4)	14.4 (14.0 to 14.7)	3.3 (2.8 to 3.8)	2.7 (2.5 to 2.9)	2.8 (2.6 to 3.0)
4.2.2. Antipsychotic depot injections						
Age <18	0.0 (0.0 to 0.2)	0.0 (0.0 to 0.1)	0.0 (0.0 to 0.1)	0.0 (0.0 to 0.1)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)
Age 18-24	0.0 (0.0 to 0.2)	0.0 (0.0 to 0.1)	0.0 (0.0 to 0.1)	0.0 (0.0 to 0.7)	0.0 (0.0 to 0.2)	0.0 (0.0 to 0.1)
Age 25-44	0.1 (0.0 to 0.2)	0.2 (0.1 to 0.3)	0.1 (0.1 to 0.2)	0.0 (0.0 to 0.9)	0.1 (0.0 to 0.5)	0.1 (0.0 to 0.4)
Age 45-64	0.5 (0.4 to 0.8)	0.2 (0.1 to 0.3)	0.4 (0.3 to 0.5)	0.0 (0.0 to 2.3)	0.0 (0.0 to 0.8)	0.0 (0.0 to 0.6)
Age 65+	1.3 (0.8 to 2.0)	0.6 (0.3 to 1.1)	0.9 (0.6 to 1.3)	0.0 (0.0 to 14.9)	0.0 (0.0 to 6.1)	0.0 (0.0 to 4.5)
All ages	0.3 (0.2 to 0.4)	0.2 (0.1 to 0.2)	0.2 (0.2 to 0.3)	0.0 (0.0 to 0.1)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)
4.2.3. Drugs used for mania and hypomania						
Age <18	0.4 (0.2 to 0.7)	0.2 (0.1 to 0.4)	0.3 (0.2 to 0.4)	0.2 (0.1 to 0.4)	0.2 (0.1 to 0.2)	0.2 (0.1 to 0.2)
Age 18-24	3.2 (2.5 to 4.1)	3.1 (2.5 to 3.7)	3.1 (2.7 to 3.6)	2.7 (1.6 to 4.5)	2.0 (1.5 to 2.7)	2.2 (1.7 to 2.7)
Age 25-44	5.9 (5.4 to 6.5)	7.7 (7.1 to 8.3)	6.9 (6.5 to 7.3)	5.8 (3.9 to 8.5)	4.0 (3.1 to 5.2)	4.4 (3.6 to 5.5)
Age 45-64	8.3 (7.5 to 9.0)	9.9 (9.2 to 10.7)	9.1 (8.6 to 9.7)	7.8 (4.6 to 12.9)	7.5 (5.4 to 10.2)	7.6 (5.7 to 9.9)
Age 65+	8.8 (7.4 to 10.4)	7.0 (5.7 to 8.4)	7.9 (6.9 to 8.9)	0.0 (0.0 to 14.9)	0.0 (0.0 to 6.1)	0.0 (0.0 to 4.5)
All ages	5.7 (5.4 to 6.1)	6.0 (5.7 to 6.3)	5.9 (5.7 to 6.1)	1.2 (0.9 to 1.5)	0.8 (0.7 to 0.9)	0.8 (0.7 to 1.0)

BNF Group / sub group and Age group	Learning disabilities Female	Male	Persons	Autism without learning disabilities Female	Male	Persons
4.3. All Antidepressants						
Age <18	1.2 (0.8 to 1.7)	1.2 (0.9 to 1.6)	1.2 (1.0 to 1.5)	1.8 (1.4 to 2.3)	1.0 (0.9 to 1.2)	1.1 (1.0 to 1.3)
Age 18-24	9.9 (8.7 to 11.2)	6.9 (6.1 to 7.8)	8.0 (7.3 to 8.7)	16.6 (13.6 to 20.0)	8.0 (7.0 to 9.2)	9.5 (8.5 to 10.6)
Age 25-44	18.0 (17.1 to 19.0)	14.2 (13.4 to 15.0)	15.9 (15.3 to 16.5)	31.6 (27.3 to 36.2)	22.5 (20.4 to 24.8)	24.6 (22.7 to 26.7)
Age 45-64	25.0 (23.9 to 26.2)	18.2 (17.2 to 19.2)	21.4 (20.6 to 22.1)	32.5 (25.9 to 40.0)	28.7 (24.8 to 33.0)	29.7 (26.3 to 33.5)
Age 65+	24.0 (21.8 to 26.4)	18.6 (16.7 to 20.7)	21.3 (19.8 to 22.8)	31.8 (16.4 to 52.7)	22.0 (13.4 to 34.1)	24.7 (16.6 to 35.1)
All ages	17.2 (16.7 to 17.8)	11.8 (11.4 to 12.2)	14.1 (13.8 to 14.5)	7.0 (6.3 to 7.7)	3.8 (3.5 to 4.0)	4.4 (4.1 to 4.6)
4.3.1. Tricyclic and related antidepressant drugs						
Age <18	0.0 (0.0 to 0.2)	0.1 (0.1 to 0.3)	0.1 (0.0 to 0.2)	0.1 (0.0 to 0.3)	0.1 (0.1 to 0.2)	0.1 (0.1 to 0.2)
Age 18-24	1.4 (1.0 to 2.0)	0.6 (0.4 to 0.9)	0.9 (0.7 to 1.2)	1.9 (1.1 to 3.6)	0.7 (0.4 to 1.1)	0.9 (0.6 to 1.3)
Age 25-44	3.0 (2.6 to 3.5)	2.1 (1.8 to 2.5)	2.5 (2.3 to 2.8)	5.3 (3.6 to 8.0)	2.9 (2.1 to 3.9)	3.5 (2.7 to 4.4)
Age 45-64	5.8 (5.2 to 6.5)	3.3 (2.9 to 3.8)	4.5 (4.1 to 4.9)	10.8 (7.0 to 16.5)	5.0 (3.4 to 7.5)	6.6 (4.9 to 8.8)
Age 65+	7.4 (6.2 to 9.0)	5.8 (4.7 to 7.2)	6.6 (5.8 to 7.6)	0.0 (0.0 to 14.9)	1.7 (0.3 to 9.0)	1.2 (0.2 to 6.7)
All ages	3.6 (3.3 to 3.9)	2.0 (1.8 to 2.2)	2.7 (2.5 to 2.9)	1.1 (0.8 to 1.4)	0.5 (0.4 to 0.5)	0.6 (0.5 to 0.7)
4.3.3. Selective serotonin re-uptake inhibitors						
Age <18	1.2 (0.8 to 1.7)	1.1 (0.8 to 1.4)	1.1 (0.9 to 1.4)	1.7 (1.3 to 2.1)	0.9 (0.8 to 1.1)	1.0 (0.9 to 1.2)
Age 18-24	8.1 (7.0 to 9.3)	5.4 (4.7 to 6.2)	6.4 (5.8 to 7.1)	12.9 (10.2 to 16.0)	6.1 (5.2 to 7.2)	7.3 (6.4 to 8.3)
Age 25-44	13.6 (12.8 to 14.5)	9.7 (9.1 to 10.4)	11.5 (11.0 to 12.0)	22.1 (18.3 to 26.3)	16.1 (14.2 to 18.1)	17.5 (15.8 to 19.3)
Age 45-64	16.6 (15.6 to 17.6)	12.6 (11.8 to 13.4)	14.5 (13.8 to 15.1)	22.3 (16.6 to 29.2)	20.2 (16.7 to 24.1)	20.7 (17.7 to 24.1)
Age 65+	13.1 (11.4 to 15.0)	10.9 (9.4 to 12.6)	11.9 (10.8 to 13.2)	18.2 (7.3 to 38.5)	20.3 (12.0 to 32.3)	19.8 (12.5 to 29.7)
All ages	12.1 (11.6 to 12.5)	8.1 (7.8 to 8.5)	9.8 (9.5 to 10.1)	5.3 (4.7 to 6.0)	2.9 (2.7 to 3.1)	3.3 (3.1 to 3.6)
4.3.4. Other antidepressant drugs						
Age <18	0.0 (0.0 to 0.2)	0.0 (0.0 to 0.1)	0.0 (0.0 to 0.1)	0.1 (0.0 to 0.2)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)
Age 18-24	0.2 (0.1 to 0.6)	0.7 (0.5 to 1.1)	0.5 (0.4 to 0.8)	1.2 (0.5 to 2.5)	1.4 (1.0 to 1.9)	1.3 (1.0 to 1.8)
Age 25-44	1.8 (1.5 to 2.1)	2.1 (1.8 to 2.5)	2.0 (1.7 to 2.2)	5.6 (3.7 to 8.2)	3.7 (2.8 to 4.8)	4.1 (3.3 to 5.2)
Age 45-64	3.6 (3.1 to 4.1)	2.2 (1.9 to 2.6)	2.8 (2.6 to 3.2)	4.2 (2.1 to 8.4)	5.3 (3.6 to 7.7)	5.0 (3.5 to 7.0)
Age 65+	5.2 (4.1 to 6.5)	3.2 (2.4 to 4.3)	4.2 (3.5 to 5.0)	13.6 (4.7 to 33.3)	5.1 (1.7 to 13.9)	7.4 (3.4 to 15.2)
All ages	2.1 (1.9 to 2.4)	1.6 (1.4 to 1.7)	1.8 (1.7 to 2.0)	0.9 (0.6 to 1.2)	0.5 (0.4 to 0.6)	0.6 (0.5 to 0.7)

BNF Group / sub group and Age group	Learning disabilities Female	Male	Persons	Autism without learning disabilities Female	Male	Persons
4.8 All Antiepileptic drugs						
Age <18	11.5 (10.3 to 12.8)	9.5 (8.7 to 10.4)	10.2 (9.5 to 10.9)	3.4 (2.9 to 4.0)	1.7 (1.5 to 1.9)	2.0 (1.8 to 2.2)
Age 18-24	20.4 (18.7 to 22.2)	16.1 (14.9 to 17.4)	17.7 (16.7 to 18.8)	8.8 (6.6 to 11.5)	4.3 (3.6 to 5.2)	5.1 (4.4 to 6.0)
Age 25-44	21.6 (20.6 to 22.7)	23.3 (22.4 to 24.3)	22.6 (21.9 to 23.3)	12.6 (9.8 to 16.2)	6.2 (5.0 to 7.6)	7.7 (6.5 to 9.0)
Age 45-64	25.8 (24.6 to 27.0)	25.9 (24.8 to 27.0)	25.9 (25.1 to 26.7)	12.0 (7.9 to 17.9)	11.2 (8.6 to 14.4)	11.4 (9.1 to 14.2)
Age 65+	24.5 (22.3 to 26.8)	21.2 (19.1 to 23.4)	22.8 (21.3 to 24.4)	0.0 (0.0 to 14.9)	23.7 (14.7 to 36.0)	17.3 (10.6 to 26.9)
All ages	21.5 (20.9 to 22.1)	20.0 (19.5 to 20.5)	20.6 (20.3 to 21.0)	5.0 (4.4 to 5.7)	2.6 (2.3 to 2.8)	3.0 (2.8 to 3.2)
4.8.1 Control of the epilepsies						
Age <18	11.2 (10.1 to 12.5)	9.1 (8.3 to 10.0)	9.9 (9.2 to 10.6)	3.3 (2.7 to 3.9)	1.7 (1.5 to 1.9)	2.0 (1.8 to 2.2)
Age 18-24	19.8 (18.1 to 21.6)	15.5 (14.4 to 16.8)	17.1 (16.2 to 18.1)	8.4 (6.3 to 11.1)	4.1 (3.4 to 5.0)	4.9 (4.1 to 5.7)
Age 25-44	20.2 (19.3 to 21.2)	22.1 (21.2 to 23.0)	21.3 (20.6 to 21.9)	10.0 (7.4 to 13.2)	4.6 (3.6 to 5.8)	5.8 (4.8 to 7.0)
Age 45-64	24.0 (22.9 to 25.2)	24.7 (23.6 to 25.8)	24.4 (23.6 to 25.2)	11.4 (7.5 to 17.2)	9.2 (6.9 to 12.2)	9.8 (7.7 to 12.4)
Age 65+	22.6 (20.5 to 24.9)	18.8 (16.9 to 21.0)	20.7 (19.2 to 22.3)	0.0 (0.0 to 14.9)	22.0 (13.4 to 34.1)	16.0 (9.6 to 25.5)
All ages	20.2 (19.6 to 20.8)	19.0 (18.5 to 19.5)	19.5 (19.1 to 19.9)	4.6 (4.1 to 5.2)	2.3 (2.1 to 2.5)	2.8 (2.6 to 3.0)
4.8.2 Drugs used in status epilepticus						
Age <18	1.7 (1.2 to 2.3)	1.4 (1.1 to 1.8)	1.5 (1.3 to 1.8)	0.4 (0.2 to 0.6)	0.1 (0.1 to 0.2)	0.2 (0.1 to 0.3)
Age 18-24	2.9 (2.3 to 3.8)	2.3 (1.8 to 2.8)	2.5 (2.1 to 3.0)	1.0 (0.4 to 2.3)	0.5 (0.3 to 0.8)	0.5 (0.3 to 0.9)
Age 25-44	4.4 (3.9 to 4.9)	4.0 (3.6 to 4.4)	4.2 (3.9 to 4.5)	3.9 (2.4 to 6.2)	2.5 (1.8 to 3.5)	2.8 (2.2 to 3.7)
Age 45-64	6.5 (5.9 to 7.2)	7.1 (6.5 to 7.8)	6.8 (6.4 to 7.3)	4.2 (2.1 to 8.4)	3.5 (2.2 to 5.6)	3.7 (2.5 to 5.5)
Age 65+	8.7 (7.3 to 10.3)	6.9 (5.7 to 8.3)	7.8 (6.8 to 8.8)	0.0 (0.0 to 14.9)	1.7 (0.3 to 9.0)	1.2 (0.2 to 6.7)
All ages	4.8 (4.5 to 5.1)	4.2 (3.9 to 4.4)	4.4 (4.3 to 4.7)	0.9 (0.6 to 1.2)	0.4 (0.3 to 0.5)	0.5 (0.4 to 0.6)
4.8.3 Febrile convulsions						
Age <18	0.1 (0.0 to 0.3)	0.1 (0.1 to 0.3)	0.1 (0.1 to 0.2)	0.1 (0.0 to 0.2)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.1)
Age 18-24	0.9 (0.5 to 1.4)	0.9 (0.6 to 1.3)	0.9 (0.7 to 1.2)	0.8 (0.3 to 2.0)	0.4 (0.2 to 0.7)	0.4 (0.3 to 0.8)
Age 25-44	1.5 (1.2 to 1.8)	1.8 (1.6 to 2.2)	1.7 (1.5 to 1.9)	2.9 (1.7 to 5.0)	2.4 (1.7 to 3.4)	2.5 (1.9 to 3.4)
Age 45-64	3.1 (2.7 to 3.7)	2.2 (1.8 to 2.6)	2.6 (2.3 to 2.9)	2.4 (0.9 to 6.0)	1.5 (0.7 to 3.1)	1.8 (1.0 to 3.1)
Age 65+	3.2 (2.4 to 4.3)	3.0 (2.2 to 4.0)	3.1 (2.5 to 3.8)	0.0 (0.0 to 14.9)	1.7 (0.3 to 9.0)	1.2 (0.2 to 6.7)
All ages	1.9 (1.7 to 2.1)	1.5 (1.4 to 1.7)	1.7 (1.5 to 1.8)	0.5 (0.3 to 0.7)	0.2 (0.2 to 0.3)	0.3 (0.2 to 0.4)

Annex table 2. Prescribing patterns for groups and sub-groups of drugs

BNF section and age group	Ongoing prescribing Learning disabilities	Autism	Multiple drugs in group All LD	autism
4.1. All Hypnotics and anxiolytics				
Age <18	94.0 (91.0 to 96.1)	94.8 (92.8 to 96.2)	8.0 (5.6 to 11.4)	3.5 (2.4 to 5.2)
Age 18-24	90.5 (85.6 to 93.8)	84.1 (73.2 to 91.1)	11.6 (7.8 to 16.7)	11.1 (5.5 to 21.2)
Age 25-44	90.2 (88.0 to 92.1)	88.2 (79.7 to 93.5)	8.4 (6.7 to 10.5)	15.3 (9.2 to 24.4)
Age 45-64	93.1 (91.3 to 94.5)	92.1 (79.2 to 97.3)	11.8 (9.9 to 14.0)	23.7 (13.0 to 39.2)
Age 65+	94.6 (90.9 to 96.8)	100.0 (61.0 to 100.0)	2.9 (1.4 to 5.9)	0.0 (0.0 to 39.0)
All ages	92.2 (91.1 to 93.2)	93.3 (91.5 to 94.8)	9.3 (8.3 to 10.5)	6.0 (4.6 to 7.8)
4.1.1. Hypnotics				
Age <18	95.7 (92.8 to 97.5)	95.4 (93.5 to 96.7)	7.3 (4.9 to 10.8)	3.2 (2.1 to 4.8)
Age 18-24	96.3 (90.9 to 98.6)	88.9 (76.5 to 95.2)	5.6 (2.6 to 11.6)	6.7 (2.3 to 17.9)
Age 25-44	94.9 (91.9 to 96.8)	90.7 (78.4 to 96.3)	4.2 (2.4 to 7.0)	0.0 (0.0 to 8.2)
Age 45-64	96.8 (94.6 to 98.1)	95.5 (78.2 to 99.2)	2.2 (1.2 to 4.2)	18.2 (7.3 to 38.5)
Age 65+	96.9 (91.4 to 99.0)	80.0 (37.6 to 96.4)	0.0 (0.0 to 3.8)	0.0 (0.0 to 43.4)
All ages	96.0 (94.8 to 97.0)	94.7 (92.9 to 96.0)	4.1 (3.1 to 5.3)	3.6 (2.5 to 5.1)
4.1.2. Anxiolytics				
Age <18	80.4 (66.8 to 89.3)	72.2 (49.1 to 87.5)	0.0 (0.0 to 7.7)	5.6 (1.0 to 25.8)
Age 18-24	85.0 (76.7 to 90.7)	76.2 (54.9 to 89.4)	13.0 (7.8 to 21.0)	0.0 (0.0 to 15.5)
Age 25-44	87.1 (84.0 to 89.6)	88.9 (77.8 to 94.8)	5.6 (3.9 to 7.8)	13.0 (6.4 to 24.4)
Age 45-64	90.2 (87.6 to 92.3)	89.5 (68.6 to 97.1)	8.2 (6.3 to 10.6)	10.5 (2.9 to 31.4)
Age 65+	92.5 (87.1 to 95.8)	100.0 (34.2 to 100.0)	1.4 (0.4 to 4.8)	0.0 (0.0 to 65.8)
All ages	88.6 (86.9 to 90.1)	84.2 (76.4 to 89.8)	6.6 (5.4 to 8.0)	8.8 (4.8 to 15.4)

BNF section and age group	Ongoing prescribing Learning disabilities	Autism	Multiple drugs in group All LD	autism
4.2. All Antipsychotics				
Age <18	94.3 (90.1 to 96.8)	95.5 (92.8 to 97.3)	9.8 (6.4 to 14.9)	8.0 (5.6 to 11.4)
Age 18-24	99.1 (97.9 to 99.6)	98.4 (95.4 to 99.5)	21.3 (18.1 to 25.0)	20.9 (15.6 to 27.2)
Age 25-44	99.3 (98.8 to 99.5)	97.6 (94.5 to 99.0)	28.2 (26.5 to 30.0)	18.6 (13.9 to 24.4)
Age 45-64	99.5 (99.2 to 99.7)	98.9 (93.9 to 99.8)	28.6 (27.0 to 30.3)	24.7 (16.9 to 34.6)
Age 65+	99.5 (98.7 to 99.8)	100.0 (64.6 to 100.0)	21.1 (18.4 to 24.1)	14.3 (2.6 to 51.3)
All ages	99.3 (99.0 to 99.4)	97.1 (95.7 to 98.0)	26.5 (25.5 to 27.6)	15.4 (13.1 to 18.1)
4.2.1. Antipsychotic drugs				
Age <18	95.9 (91.8 to 98.0)	95.5 (92.6 to 97.3)	7.0 (4.0 to 11.8)	8.3 (5.8 to 11.9)
Age 18-24	98.4 (96.8 to 99.2)	97.5 (93.6 to 99.0)	15.7 (12.6 to 19.4)	17.2 (12.1 to 23.9)
Age 25-44	99.2 (98.7 to 99.5)	98.0 (94.9 to 99.2)	24.3 (22.5 to 26.2)	13.6 (9.5 to 19.0)
Age 45-64	99.5 (99.2 to 99.7)	97.4 (91.0 to 99.3)	24.0 (22.3 to 25.7)	20.8 (13.2 to 31.1)
Age 65+	99.5 (98.6 to 99.8)	100.0 (64.6 to 100.0)	16.8 (14.3 to 19.6)	14.3 (2.6 to 51.3)
All ages	99.2 (99.0 to 99.4)	96.8 (95.3 to 97.8)	22.1 (21.0 to 23.1)	12.9 (10.7 to 15.5)
4.2.2. Antipsychotic depot injections				
Age <18	-	-	-	-
Age 18-24	-	-	-	-
Age 25-44	90.5 (71.1 to 97.3)	100.0 (34.2 to 100.0)	0.0 (0.0 to 15.5)	0.0 (0.0 to 65.8)
Age 45-64	95.0 (83.5 to 98.6)	-	7.5 (2.6 to 19.9)	-
Age 65+	100.0 (86.7 to 100.0)	-	12.0 (4.2 to 30.0)	-
All ages	95.3 (88.6 to 98.2)	100.0 (34.2 to 100.0)	7.0 (3.2 to 14.4)	0.0 (0.0 to 65.8)
4.2.3. Drugs used for mania and hypomania				
Age <18	100.0 (83.9 to 100.0)	97.2 (85.8 to 99.5)	35.0 (18.1 to 56.7)	8.3 (2.9 to 21.8)
Age 18-24	99.4 (96.8 to 99.9)	98.4 (91.5 to 99.7)	26.6 (20.6 to 33.6)	19.0 (11.2 to 30.4)
Age 25-44	99.7 (99.1 to 99.9)	98.7 (93.1 to 99.8)	23.4 (20.9 to 26.2)	12.8 (7.1 to 22.0)
Age 45-64	99.7 (99.2 to 99.9)	97.9 (88.9 to 99.6)	24.6 (22.1 to 27.3)	23.4 (13.6 to 37.2)
Age 65+	99.5 (97.4 to 99.9)	-	20.3 (15.5 to 26.1)	-
All ages	99.7 (99.3 to 99.8)	98.2 (95.5 to 99.3)	24.0 (22.3 to 25.7)	16.1 (11.8 to 21.4)

BNF section and age group	Ongoing prescribing Learning disabilities	Autism	Multiple drugs in group All LD	autism
4.3. All Antidepressants				
Age <18	98.9 (93.8 to 99.8)	96.7 (93.7 to 98.3)	5.7 (2.5 to 12.6)	3.7 (2.0 to 6.9)
Age 18-24	98.0 (96.2 to 98.9)	96.4 (93.5 to 98.0)	9.3 (6.9 to 12.3)	8.6 (5.9 to 12.5)
Age 25-44	98.7 (98.2 to 99.1)	98.2 (96.4 to 99.1)	10.3 (9.1 to 11.6)	9.4 (7.0 to 12.5)
Age 45-64	99.3 (98.9 to 99.6)	98.9 (96.1 to 99.7)	11.7 (10.5 to 13.1)	14.6 (10.2 to 20.4)
Age 65+	99.7 (98.8 to 99.9)	100.0 (83.9 to 100.0)	9.7 (7.6 to 12.4)	15.0 (5.2 to 36.0)
All ages	99.0 (98.7 to 99.2)	97.6 (96.5 to 98.3)	10.7 (9.9 to 11.5)	9.0 (7.4 to 10.7)
4.3.1. Tricyclic and related antidepressant drugs				
Age <18	100.0 (61.0 to 100.0)	90.9 (72.2 to 97.5)	33.3 (9.7 to 70.0)	0.0 (0.0 to 14.9)
Age 18-24	95.9 (86.3 to 98.9)	96.3 (81.7 to 99.3)	2.0 (0.4 to 10.7)	11.1 (3.9 to 28.1)
Age 25-44	96.9 (94.6 to 98.3)	95.1 (86.5 to 98.3)	8.7 (6.2 to 12.0)	1.6 (0.3 to 8.7)
Age 45-64	98.0 (96.4 to 98.9)	97.6 (87.4 to 99.6)	9.6 (7.3 to 12.5)	7.3 (2.5 to 19.4)
Age 65+	100.0 (97.9 to 100.0)	100.0 (20.7 to 100.0)	4.4 (2.2 to 8.4)	0.0 (0.0 to 79.3)
All ages	97.9 (96.9 to 98.6)	95.4 (90.8 to 97.8)	8.2 (6.7 to 10.0)	4.6 (2.2 to 9.2)
4.3.3. Selective serotonin re-uptake inhibitors				
Age <18	97.5 (91.3 to 99.3)	97.3 (94.2 to 98.8)	3.8 (1.3 to 10.5)	3.6 (1.8 to 6.9)
Age 18-24	98.0 (96.0 to 99.0)	96.7 (93.4 to 98.4)	7.9 (5.5 to 11.1)	5.1 (2.9 to 9.0)
Age 25-44	98.7 (98.0 to 99.2)	98.1 (95.8 to 99.1)	6.4 (5.3 to 7.7)	7.8 (5.3 to 11.3)
Age 45-64	99.5 (99.0 to 99.7)	99.2 (95.7 to 99.9)	7.8 (6.6 to 9.2)	11.6 (7.2 to 18.3)
Age 65+	99.7 (98.3 to 99.9)	93.8 (71.7 to 98.9)	6.4 (4.2 to 9.5)	18.8 (6.6 to 43.0)
All ages	99.0 (98.7 to 99.3)	97.6 (96.4 to 98.5)	7.0 (6.3 to 7.9)	6.9 (5.4 to 8.7)
4.3.4. Other antidepressant drugs				
Age <18	100.0 (20.7 to 100.0)	100.0 (51.0 to 100.0)	0.0 (0.0 to 79.3)	0.0 (0.0 to 49.0)
Age 18-24	96.7 (83.3 to 99.4)	94.9 (83.1 to 98.6)	0.0 (0.0 to 11.4)	15.4 (7.2 to 29.7)
Age 25-44	98.2 (95.9 to 99.2)	98.6 (92.6 to 99.8)	11.9 (8.6 to 16.2)	16.4 (9.7 to 26.6)
Age 45-64	99.4 (97.8 to 99.8)	96.8 (83.8 to 99.4)	13.9 (10.5 to 18.1)	9.7 (3.3 to 24.9)
Age 65+	100.0 (96.8 to 100.0)	100.0 (61.0 to 100.0)	4.3 (1.9 to 9.8)	0.0 (0.0 to 39.0)
All ages	98.9 (97.9 to 99.5)	97.4 (93.5 to 99.0)	11.1 (9.0 to 13.5)	13.7 (9.2 to 20.1)

BNF section and age group	Ongoing prescribing Learning disabilities	Autism	Multiple drugs in group All LD	autism
4.8 All Antiepileptic drugs				
Age <18	98.8 (97.7 to 99.4)	98.1 (96.4 to 99.1)	27.9 (24.8 to 31.2)	27.3 (23.3 to 31.7)
Age 18-24	98.9 (98.0 to 99.4)	97.3 (93.3 to 99.0)	38.0 (35.0 to 41.1)	32.2 (25.2 to 40.1)
Age 25-44	99.1 (98.7 to 99.4)	97.1 (92.7 to 98.9)	42.5 (40.8 to 44.3)	33.8 (26.4 to 42.1)
Age 45-64	99.3 (98.9 to 99.5)	97.2 (90.3 to 99.2)	46.8 (45.0 to 48.6)	25.4 (16.7 to 36.6)
Age 65+	99.4 (98.4 to 99.8)	92.9 (68.5 to 98.7)	39.4 (35.6 to 43.2)	28.6 (11.7 to 54.6)
All ages	99.1 (98.9 to 99.3)	97.6 (96.3 to 98.5)	42.0 (40.9 to 43.0)	29.2 (26.1 to 32.4)
4.8.1 Control of the epilepsies				
Age <18	99.4 (98.6 to 99.8)	98.8 (97.2 to 99.5)	25.2 (22.1 to 28.5)	24.5 (20.6 to 28.8)
Age 18-24	99.4 (98.6 to 99.7)	99.3 (96.1 to 99.9)	37.1 (34.1 to 40.3)	32.4 (25.2 to 40.5)
Age 25-44	99.7 (99.5 to 99.9)	99.0 (94.7 to 99.8)	43.8 (42.0 to 45.6)	38.8 (30.0 to 48.5)
Age 45-64	99.8 (99.6 to 99.9)	96.7 (88.8 to 99.1)	46.3 (44.5 to 48.2)	29.5 (19.6 to 41.9)
Age 65+	99.8 (99.0 to 100.0)	100.0 (77.2 to 100.0)	40.4 (36.4 to 44.5)	30.8 (12.7 to 57.6)
All ages	99.7 (99.6 to 99.8)	98.8 (97.7 to 99.4)	42.0 (40.9 to 43.1)	28.5 (25.4 to 31.9)
4.8.2 Drugs used in status epilepticus				
Age <18	77.3 (68.6 to 84.1)	67.5 (52.0 to 79.9)	6.4 (3.1 to 12.6)	5.0 (1.4 to 16.5)
Age 18-24	83.6 (76.6 to 88.8)	75.0 (50.5 to 89.8)	11.4 (7.2 to 17.8)	0.0 (0.0 to 19.4)
Age 25-44	90.0 (87.3 to 92.2)	90.0 (78.6 to 95.7)	10.7 (8.4 to 13.4)	2.0 (0.4 to 10.5)
Age 45-64	94.3 (92.5 to 95.7)	87.0 (67.9 to 95.5)	20.0 (17.4 to 23.0)	13.0 (4.5 to 32.1)
Age 65+	95.8 (92.2 to 97.8)	100.0 (20.7 to 100.0)	17.7 (13.2 to 23.3)	0.0 (0.0 to 79.3)
All ages	91.3 (89.9 to 92.5)	80.8 (73.2 to 86.6)	15.3 (13.7 to 17.0)	4.6 (2.1 to 9.7)
4.8.3 Febrile convulsions				
Age <18	75.0 (40.9 to 92.9)	60.0 (23.1 to 88.2)	0.0 (0.0 to 32.4)	0.0 (0.0 to 43.4)
Age 18-24	87.8 (75.8 to 94.3)	76.9 (49.7 to 91.8)	14.3 (7.1 to 26.7)	0.0 (0.0 to 22.8)
Age 25-44	86.7 (81.8 to 90.4)	88.9 (76.5 to 95.2)	4.6 (2.6 to 8.0)	2.2 (0.4 to 11.6)
Age 45-64	91.0 (87.2 to 93.7)	81.8 (52.3 to 94.9)	8.7 (6.0 to 12.4)	0.0 (0.0 to 25.9)
Age 65+	95.3 (88.6 to 98.2)	100.0 (20.7 to 100.0)	0.0 (0.0 to 4.3)	0.0 (0.0 to 79.3)
All ages	89.6 (87.1 to 91.7)	84.0 (74.1 to 90.6)	6.5 (4.8 to 8.6)	1.3 (0.2 to 7.2)

Annex table 3. Variation in rate of exposure of whole patient group to drugs from BNF sections/sub-sections across the three years studied

Drug group / sub-group	2009/2010	2010/2011	2011/2012
4.1. All Hypnotics and anxiolytics	4.9 (4.7 to 5.2)	5.1 (4.8 to 5.4)	5.3 (5.0 to 5.6)
4.1.1. Hypnotics	2.8 (2.6 to 3.1)	3.0 (2.8 to 3.2)	3.2 (2.9 to 3.4)
4.1.2. Anxiolytics	2.4 (2.2 to 2.6)	2.3 (2.2 to 2.6)	2.3 (2.1 to 2.5)
4.2. All Antipsychotics	11.2 (10.7 to 11.6)	11.3 (10.9 to 11.7)	11.5 (11.1 to 12.0)
4.2.1. Antipsychotic drugs	9.7 (9.3 to 10.1)	9.8 (9.4 to 10.2)	10.0 (9.6 to 10.5)
4.2.2. Antipsychotic depot injections	0.1 (0.1 to 0.2)	0.1 (0.1 to 0.2)	0.1 (0.1 to 0.2)
4.2.3. Drugs used for mania and hypomania	3.8 (3.5 to 4.1)	4.0 (3.7 to 4.2)	4.0 (3.7 to 4.2)
4.3. All Antidepressants	9.6 (9.2 to 10.1)	10.3 (9.9 to 10.7)	10.9 (10.5 to 11.4)
4.3.1. Tricyclic and related antidepressant drugs	1.8 (1.7 to 2.0)	1.8 (1.7 to 2.0)	1.9 (1.7 to 2.1)
4.3.3. Selective serotonin re-uptake inhibitors	6.8 (6.4 to 7.1)	7.3 (6.9 to 7.6)	7.8 (7.4 to 8.1)
4.3.4. Other antidepressant drugs	1.2 (1.0 to 1.3)	1.3 (1.2 to 1.5)	1.5 (1.4 to 1.7)
4.8 All Antiepileptic drugs	12.1 (11.7 to 12.6)	12.1 (11.6 to 12.6)	12.1 (11.6 to 12.5)
4.8.1 Control of the epilepsies	12.9 (12.4 to 13.3)	12.9 (12.5 to 13.4)	13.0 (12.5 to 13.4)
4.8.2 Drugs used in status epilepticus	3.0 (2.8 to 3.2)	2.9 (2.7 to 3.2)	2.7 (2.5 to 3.0)
4.8.3 Febrile convulsions	1.1 (1.0 to 1.3)	1.1 (1.0 to 1.3)	1.1 (0.9 to 1.2)

Annex table 4. Prescribing episode patterns. The table shows the proportions of days in prescribing episodes in which the patient was in an 'ongoing' prescribing episode or receiving more than one agent in the drug class or sub-class concerned

	Proportion ongoing				Proportion Multiple			
	Learning disabilities		Autism without learning disabilities		Learning disabilities		Autism without learning disabilities	
	Under 18	18 and older	Under 18	18 and older	Under 18	18 and older	Under 18	18 and older
4.1. All Hypnotics and anxiolytics	94.0 (91.0 to 96.1)	91.9 (90.7 to 93.0)	94.8 (92.8 to 96.2)	88.0 (82.7 to 91.9)	8.0 (5.6 to 11.4)	9.5 (8.4 to 10.8)	3.5 (2.4 to 5.2)	15.1 (10.7 to 20.9)
4.1.1. Hypnotics	95.7 (92.8 to 97.5)	96.1 (94.7 to 97.2)	95.4 (93.5 to 96.7)	90.4 (83.7 to 94.6)	7.3 (4.9 to 10.8)	3.0 (2.1 to 4.3)	3.2 (2.1 to 4.8)	6.1 (3.0 to 12.0)
4.1.2. Anxiolytics	80.4 (66.8 to 89.3)	88.9 (87.1 to 90.4)	72.2 (49.1 to 87.5)	86.5 (78.2 to 91.9)	0.0 (0.0 to 7.7)	6.8 (5.6 to 8.2)	5.6 (1.0 to 25.8)	9.4 (5.0 to 16.9)
4.2. All Antipsychotics	94.3 (90.1 to 96.8)	99.4 (99.2 to 99.6)	95.5 (92.8 to 97.3)	98.2 (96.6 to 99.0)	9.8 (6.4 to 14.9)	27.0 (25.9 to 28.1)	8.0 (5.6 to 11.4)	20.5 (17.2 to 24.3)
4.2.1. Antipsychotic drugs	95.9 (91.8 to 98.0)	99.3 (99.1 to 99.5)	95.5 (92.6 to 97.3)	97.7 (95.9 to 98.8)	7.0 (4.0 to 11.8)	22.5 (21.5 to 23.6)	8.3 (5.8 to 11.9)	16.1 (13.0 to 19.9)
4.2.2. Antipsychotic depot injections	-	95.3 (88.6 to 98.2)	-	100.0 (34.2 to 100.0)	-	7.0 (3.2 to 14.4)	-	0.0 (0.0 to 65.8)
4.2.3. Drugs used for mania and hypomania	100.0 (83.9 to 100.0)	99.7 (99.3 to 99.8)	97.2 (85.8 to 99.5)	98.4 (95.4 to 99.5)	35.0 (18.1 to 56.7)	23.9 (22.2 to 25.6)	8.3 (2.9 to 21.8)	17.6 (12.8 to 23.6)
4.3. All Antidepressants	98.9 (93.8 to 99.8)	99.0 (98.7 to 99.2)	96.7 (93.7 to 98.3)	97.8 (96.7 to 98.6)	5.7 (2.5 to 12.6)	10.8 (10.0 to 11.6)	3.7 (2.0 to 6.9)	10.3 (8.5 to 12.5)
4.3.1. Tricyclic and related antidepressant drugs	100.0 (61.0 to 100.0)	97.9 (96.9 to 98.6)	90.9 (72.2 to 97.5)	96.2 (91.3 to 98.3)	33.3 (9.7 to 70.0)	8.1 (6.6 to 9.9)	0.0 (0.0 to 14.9)	5.4 (2.6 to 10.7)
4.3.3. Selective serotonin re-uptake inhibitors	97.5 (91.3 to 99.3)	99.0 (98.7 to 99.3)	97.3 (94.2 to 98.8)	97.8 (96.3 to 98.6)	3.8 (1.3 to 10.5)	7.1 (6.3 to 7.9)	3.6 (1.8 to 6.9)	7.9 (6.1 to 10.2)
4.3.4. Other antidepressant drugs	100.0 (20.7 to 100.0)	98.9 (97.9 to 99.5)	100.0 (51.0 to 100.0)	97.3 (93.3 to 99.0)	0.0 (0.0 to 79.3)	11.1 (9.1 to 13.6)	0.0 (0.0 to 49.0)	14.1 (9.4 to 20.6)
4.8 All Antiepileptic drugs	98.8 (97.7 to 99.4)	99.2 (98.9 to 99.4)	98.1 (96.4 to 99.1)	97.0 (94.8 to 98.3)	27.9 (24.8 to 31.2)	43.3 (42.2 to 44.4)	27.3 (23.3 to 31.7)	31.4 (26.8 to 36.2)
4.8.1 Control of the epilepsies	99.4 (98.6 to 99.8)	99.7 (99.6 to 99.8)	98.8 (97.2 to 99.5)	98.7 (96.8 to 99.5)	25.2 (22.1 to 28.5)	43.6 (42.5 to 44.8)	24.5 (20.6 to 28.8)	33.9 (28.9 to 39.2)
4.8.2 Drugs used in status epilepticus	77.3 (68.6 to 84.1)	92.1 (90.8 to 93.3)	67.5 (52.0 to 79.9)	86.7 (78.1 to 92.2)	6.4 (3.1 to 12.6)	15.8 (14.2 to 17.6)	5.0 (1.4 to 16.5)	4.4 (1.7 to 10.9)
4.8.3 Febrile convulsions	75.0 (40.9 to 92.9)	89.8 (87.2 to 91.8)	60.0 (23.1 to 88.2)	85.7 (75.7 to 92.1)	0.0 (0.0 to 32.4)	6.5 (4.9 to 8.7)	0.0 (0.0 to 43.4)	1.4 (0.3 to 7.7)

Annex table 5. Proportion (%) of prescriptions for drugs where dose was not identifiable (20150412)

	People with learning disabilities		People with autism but not learning disabilities	
BNF Sub group	Under 18	18 and older	Under 18	18 and older
4.1. All Hypnotics and anxiolytics	53.0 (51.5 to 54.5)	41.2 (40.7 to 41.6)	39.7 (38.6 to 40.8)	32.8 (31.2 to 34.4)
4.1.1. Hypnotics	50.6 (49.0 to 52.2)	20.8 (20.2 to 21.4)	39.0 (37.9 to 40.1)	12.8 (11.3 to 14.4)
4.1.2. Anxiolytics	67.1 (63.3 to 70.7)	55.0 (54.3 to 55.6)	55.1 (49.6 to 60.5)	55.8 (53.3 to 58.3)
4.2. All Antipsychotics	52.7 (50.7 to 54.7)	25.8 (25.6 to 26.0)	40.3 (38.8 to 41.7)	20.9 (20.1 to 21.8)
4.2.1. Antipsychotic drugs	56.6 (54.5 to 58.7)	25.2 (24.9 to 25.4)	41.5 (40.0 to 43.1)	21.9 (20.9 to 22.9)
4.2.2. Antipsychotic depot injections	-	77.4 (75.0 to 79.7)	-	100.0 (80.6 to 100.0)
4.2.3. Drugs used for mania and hypomania	19.6 (15.3 to 24.8)	22.5 (22.2 to 22.9)	27.0 (23.8 to 30.4)	13.6 (12.5 to 14.8)
4.3. All Antidepressants	33.7 (31.1 to 36.5)	16.5 (16.3 to 16.8)	29.8 (28.2 to 31.4)	13.4 (12.8 to 14.0)
4.3.1. Tricyclic and related antidepressant drugs	31.6 (22.2 to 42.7)	20.3 (19.7 to 20.8)	21.4 (16.6 to 27.2)	25.4 (23.4 to 27.5)
4.3.3. Selective serotonin re-uptake inhibitors	31.0 (28.2 to 33.9)	15.0 (14.7 to 15.3)	29.9 (28.2 to 31.7)	11.1 (10.5 to 11.8)
4.3.4. Other antidepressant drugs	78.6 (52.4 to 92.4)	15.9 (15.3 to 16.4)	15.0 (9.3 to 23.3)	11.8 (10.5 to 13.2)
4.8 All Antiepileptic drugs	51.4 (50.6 to 52.2)	29.4 (29.3 to 29.6)	48.7 (47.6 to 49.8)	30.2 (29.2 to 31.2)
4.8.1 Control of the epilepsies	48.1 (47.3 to 49.0)	27.2 (27.0 to 27.3)	46.2 (45.1 to 47.3)	25.4 (24.4 to 26.4)
4.8.2 Drugs used in status epilepticus	84.2 (82.1 to 86.1)	43.9 (43.4 to 44.5)	83.6 (80.2 to 86.5)	54.4 (51.6 to 57.1)
4.8.3 Febrile convulsions	50.9 (41.6 to 60.2)	46.2 (45.3 to 47.1)	35.8 (27.4 to 45.1)	55.8 (52.9 to 58.7)
All	50.9 (50.2 to 51.5)	26.1 (26.0 to 26.2)	41.5 (40.8 to 42.1)	20.2 (19.8 to 20.7)

Annex table 6. Proportion (%) of prescriptions for drugs where dose specified exceeded BNF recommended maximum for BNF sections and sub-sections. Note this table should be read in conjunction with the preceding table which indicates the proportion of cases were doses were known(20150412)

	People with learning disabilities		People with autism but not learning disabilities	
BNF Sub group	Under 18	18 and older	Under 18	18 and older
4.1. All Hypnotics and anxiolytics	0.3 (0.1 to 0.5)	2.4 (2.3 to 2.6)	0.4 (0.3 to 0.6)	1.4 (1.0 to 1.8)
4.1.1. Hypnotics	0.2 (0.1 to 0.4)	2.4 (2.2 to 2.7)	0.4 (0.3 to 0.5)	1.7 (1.2 to 2.4)
4.1.2. Anxiolytics	0.7 (0.3 to 1.7)	2.4 (2.2 to 2.6)	1.0 (0.3 to 2.8)	1.0 (0.6 to 1.7)
4.2. All Antipsychotics	1.3 (0.9 to 1.9)	4.5 (4.4 to 4.6)	1.2 (0.9 to 1.5)	4.7 (4.3 to 5.2)
4.2.1. Antipsychotic drugs	1.5 (1.0 to 2.1)	5.5 (5.4 to 5.7)	1.3 (1.0 to 1.7)	5.6 (5.1 to 6.2)
4.2.2. Antipsychotic depot injections	-	0.0 (0.0 to 0.3)	-	0.0 (0.0 to 19.4)
4.2.3. Drugs used for mania and hypomania	0.0 (0.0 to 1.4)	0.3 (0.3 to 0.3)	0.0 (0.0 to 0.5)	0.1 (0.0 to 0.2)
4.3. All Antidepressants	0.0 (0.0 to 0.3)	0.6 (0.5 to 0.6)	0.7 (0.4 to 1.0)	1.1 (0.9 to 1.3)
4.3.1. Tricyclic and related antidepressant drugs	0.0 (0.0 to 4.8)	1.9 (1.7 to 2.1)	8.7 (5.7 to 13.1)	4.6 (3.7 to 5.7)
4.3.3. Selective serotonin re-uptake inhibitors	0.0 (0.0 to 0.4)	0.2 (0.2 to 0.2)	0.0 (0.0 to 0.1)	0.8 (0.6 to 1.0)
4.3.4. Other antidepressant drugs	0.0 (0.0 to 21.5)	0.1 (0.0 to 0.1)	0.0 (0.0 to 3.7)	0.0 (0.0 to 0.2)
4.8 All Antiepileptic drugs	0.8 (0.6 to 0.9)	0.8 (0.8 to 0.9)	0.4 (0.3 to 0.5)	0.2 (0.1 to 0.3)
4.8.1 Control of the epilepsies	0.8 (0.7 to 1.0)	0.7 (0.7 to 0.7)	0.4 (0.3 to 0.5)	0.2 (0.1 to 0.4)
4.8.2 Drugs used in status epilepticus	0.2 (0.0 to 0.6)	1.4 (1.3 to 1.5)	0.6 (0.2 to 1.7)	0.0 (0.0 to 0.3)
4.8.3 Febrile convulsions	1.9 (0.5 to 6.5)	2.6 (2.3 to 2.9)	2.8 (0.9 to 7.8)	0.0 (0.0 to 0.3)