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**Title:** Development and Implementation of a ‘Mental Health Finder’ software tool within an Electronic Medical Record System

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**Authors' contributions:** Walter Cullen and David Meagher conceived the study. Walter Cullen and Sean Higgins, in collaboration with the other authors, designed the 'mental health finder.' Davina Swan collected the data. Davina Swan, Ailish Hannigan, David Meagher and Walter Cullen analysed and interpreted the data. Davina Swan led the write-up of the manuscript in collaboration with the other authors.

**Conflict of Interest:** The authors have no conflict of interest to disclose.

## **Abstract**

**Background:** In Ireland, as in many other healthcare systems, mental health service provision is being reconfigured with a move towards more care in the community, and particularly primary care. Recording and surveillance systems for mental health information and activities in primary care are needed for service-planning and quality improvement.

**Aims:** We describe the development and initial implementation of a software tool ('mental health finder') within a widely-used primary care electronic medical record system (EMR) in Ireland to enable large-scale data collection on the epidemiology and management of mental health and substance use problems among patients attending general practice.

**Methods:** In collaboration with the Irish Primary Care Research Network (IPCRN), we developed the 'Mental Health Finder' as a software plug-in to a commonly used primary care EMR system to facilitate data collection on mental health diagnoses and pharmacological treatments among patients. The finder searches for and identifies patients based on diagnostic coding and/or prescribed medicines. It was initially implemented among a convenience sample of six GP practices.

**Results:** Prevalence of mental health and substance use problems across the six practices, as identified by the finder, was 9.4% (range 6.9-12.7%). 61.9% of identified patients were female; 25.8% were private patients. One-third (33.4%) of identified patients were prescribed more than one class of psychotropic medication. Of the patients identified by the finder, 89.9% were identifiable via prescribing data, 23.7% via diagnostic coding.

**Conclusions:** The finder is a feasible and promising methodology for large-scale data collection on mental health problems in primary care.

**Keywords:** software plug-in, electronic medical record, mental health, substance use, primary care

## **Introduction**

A recent meta-analysis examining the global prevalence of common mental disorders found that 17.6% of people met the criteria for a common mental disorder in the 12 months preceding assessment and 29.2% met the criteria for lifetime prevalence [1]. In its 2004 update on the global burden of disease, the World Health Organization (WHO) estimated that mental disorders were the most important cause of disability in adults aged 15 years and over, accounting for up to one-third of years of life lost due to disability [2]. The burden associated with mental disorders is growing due to their high prevalence, their delayed diagnosis and treatment, and the associated high prevalence of chronic illnesses [3].

It is widely recognised that primary care, and general practice in particular, is well-placed to optimise the detection and treatment of mental disorders. For a person at risk of or experiencing a mental health problem, GPs are typically the first point of contact with the healthcare system and a conduit to specialist mental health services. Because of its longitudinal nature, general practice can offer ongoing support and mental health promotion [4], and is arguably more accessible and less stigmatising than specialist mental health services. A recent review of the prevalence of mental disorders among patients attending general practice in the EU highlighted the high prevalence (point, period and lifetime) of these conditions and suggested a greater understanding of their prevalence, profile, associated co-morbidity and treatment is needed to enhance the capacity of primary care to effectively help those at risk of mental and substance use disorders [5].

Integrating mental health services into primary care is a global priority and “one of the World Health Organization’s most fundamental health care recommendations” [6]. To achieve this

goal, mental health information needs to be routinely recorded in patients' files and integrated in the general health information system at primary health care level. In addition, recording systems need to be established which allow for continuous monitoring, evaluation and updating of mental health activities and which facilitate service planning and quality improvement [7].

However, the introduction of such recording systems into routine clinical practice is a challenge. In Ireland as in other healthcare systems, utilising routinely collected administrative and clinical data from electronic medical records (EMR) in primary care to inform service development remains a challenge. To do so, would require an approach that addresses not only technological and scientific challenges, but also legal and ethical considerations around data protection, patient privacy and informed consent [8].

In Ireland, mental health policy has articulated an intent to deliver “more care in the community” [9], and use of electronic medical records in Irish primary care is now widespread [10], thus the establishment of a recording and surveillance system for mental health data, e.g., diagnoses and treatments, within primary care is feasible and important.

In this paper, we describe the development and implementation of a software plug-in within a commonly used primary care EMR system, which can facilitate data collection on the epidemiology and management of common mental disorders in Irish primary care.

## **Methods**

### *Development of the software*

The Irish Primary Care Research Network (IPCRN) was established in 2012 and its mission is to facilitate and promote the involvement of general practice in research and audit. As part of its work, the IPCRN facilitates the development of software tools within GP EMR systems, including ‘finders’ to help GPs identify patients with certain conditions or who are taking certain medications, and ‘registers’ to bring together all the patients coded with a particular condition. The IPCRN also gathers anonymized data from GP practices to create practice level and national reports. In collaboration with the IPCRN and a widely used GP EMR system (‘Socrates’<sup>TM</sup>), we created a software plug-in (‘mental health finder’) to facilitate data collection on mental health conditions and pharmacological treatments in general practice.

In developing the ‘mental health finder’, we decided to focus on those mental health problems most commonly encountered in primary care as defined by the PRIME-MD [11], i.e. Depression, Panic/Anxiety, Somatoform Disorders, Eating Disorders and Alcohol Disorders. In addition, we included the following mental health problems which are also commonly encountered in primary care: Substance Use Disorders, Cognitive Disorders, and Other (Unspecified) Psychological Disorders.

When using administrative and clinical information from EMRs for mental health research, researchers should first assess the accuracy of their chosen fields as proxies for a clinical diagnosis [12]. To this end, members of our research team conducted a cross-sectional study,



involving manual clinical records review, in seven general practices, to determine how GPs record mental health information in the EMR. Mental health problems were most commonly identified from free text in consultation notes and prescriptions [13]. Since development of a software plug-in which would reliably and validly identify patients with mental health problems from the unstructured and unstandardized free text in consultation notes posed significant technological and scientific challenges, as an initial step and ‘proof of concept’ in the development of the finder, we decided to use prescription data and diagnostic coding as the bases on which the software would search for and identify the relevant patients.

Available disease and symptom/complaint codes within Socrates for coding conditions/problems, i.e., International Classification of Primary Care, Second Edition (ICPC2) codes [14] and International Classification of Diseases, 10<sup>th</sup> Revision (ICD-10) codes [15], were reviewed and those relating to the diagnosis or classification of the mental health conditions listed above were included in the finder (see Table 1). Regarding prescriptions, medications within the following Anatomical and Therapeutic Chemical (ATC) classes were incorporated in the finder: antipsychotics (N05A), anxiolytics (N05B), hypnotics and sedatives (N05C), antidepressants (N06A), psychostimulants, agents used for ADHD and nootropics (N06B), psycholeptics and psychoanaleptics in combination (N06C), anti-dementia drugs (N06D), and methadone (N02AC52 ) (see Table 2). The mental health finder was to search a practice’s EMRs to find those patients within the practice who had been assigned any of the mental health related codes and/or prescribed any of the medications at any point in time.

< INSERT TABLE 1 HERE >

< INSERT TABLE 2 HERE >

The finder generates a report for the practice which collates and synthesizes demographic, diagnostic and pharmacological information on the identified patients (see Figure 1). For convenient collation and analysis of data, it was decided the report should present patient information in the form of a single row of data for each patient, with the mental health information in the form of Boolean yes/no's under each diagnostic and medication class. In addition to the patient's name and date of birth, the report includes the patient's age, gender, and whether they are 'private' fee-paying patients or are eligible for state-funded assistance with health care. The latter includes patients who have a doctor's visit card (DVC) which entitles them to free GP visits and patients who have a 'medical card' (i.e., are GMS - 'general medical services' - eligible) which entitles them to a minimum fee for prescription medicines in addition to free GP visits. Patients usually receive a doctor's visit card or a medical card for reasons of financial or medical hardship. Reports generated can be exported to Microsoft Excel as worksheets for further analysis.

< INSERT FIGURE 1 HERE >

To optimize the clinical and research utility of the mental health finder, it was developed to allow searches to be varied according to a number of different parameters, thus a GP or researcher using the finder can search patients EMRs by age, gender, patient type (i.e.,

private/GMS/DVC), primary care provider, the date the patient registered with the practice, and/or whether the condition is categorised as an ‘active condition.’

In June 2014, the finder was available to all general practices in Ireland which use Socrates as their EMR system, i.e., approximately 600 sites (Higgins, Personal Communication, 2014).

### *Application of the tool in practice*

We recruited six practices from the professional networks of the research team. At invitation, GPs were invited via a single email to participate in the initial implementation of the software plug-in – which entailed installing the plug-in available as an update within Socrates, running the finder, and providing the study team with the anonymized practice report. The invite contained study information and an expression of interest form to be completed and returned by interested GPs.

A link to a youtube video ([https://www.youtube.com/watch?v=\\_pDSP8vlbvs](https://www.youtube.com/watch?v=_pDSP8vlbvs)) showing how to install updates within Socrates, and an instruction sheet on how to run the mental health finder, was emailed or posted to participating GPs. Following the instruction sheet and/or the verbal instructions of the researcher over the phone, GPs ran the finder using the following parameters to include all relevant ‘active’ patients within their practice: ‘active’ patients, of any age, gender, patient type, or primary care provider, currently registered with the practice. For the purpose of this study, we considered a ‘practice’ to be where one or more doctors shared a common database of patients. GPs anonymised (i.e. deleted patient names and dates

of birth) and password protected / encrypted the report before emailing it to the researcher. Passwords were sent in a separate email.

Aggregate data on the overall 'active' patient population within each practice was collected from each GP using a standard report writing tool in Socrates – 'Practice Distribution Breakdown.' This report gives the total number of 'active' patients within the practice and summarises their characteristics, including age, gender and GMS-status. Data extraction / report preparation by the GP was facilitated by the lead researcher and took approximately 15 minutes of the GP's time.

GPs were provided with a waiting room notice, approved by the IPCRN, to inform patients their anonymised data may be used for research purposes and their right to withhold such data. The study was approved by the ethics committee of the Irish College of General Practitioners.

Data were collated, cleaned and checked in Microsoft Excel and analysed using Statistical Packages for the Social Sciences Version 22.

## **Results**

### *Characteristics of participating practices*

Of the six participating practices, four described themselves as 'mostly urban' and two as 'mostly rural'. Three had 1-2 doctors in the practice and three had three or more doctors in

the practice. Five had been using Socrates for two years or more. Two practices indicated they used diagnostic codes ‘most of the time’ and four used them ‘some of the time.’

### ***Characteristics of ‘active’ patient population***

The total population of patients registered with the six practices (and who were labelled as ‘active’ within the database) was 44,756 patients: 53.6% (N=23988) of patients were female and 45.6% (N=20406) male, 31.4% (N=14037) of patients were GMS or DVC eligible and 67.6% (N=30247) were private patients. In terms of age, 37.3% (N=16666) of patients were aged 0-29 years, 51.9% (N=23243) were aged 30-64 years, and 10.5% (N=4860) were aged 65 years and over. The median number of patients per practice was 6710 (range 3071-13929).

### ***Prevalence of mental health and substance use problems***

The overall prevalence of mental health and substance use problems known to GPs across all six practices, as identified by the finder, was 9.4% (N=4222). The prevalence across practices ranged from 6.9% to 12.7% (see Table 3). Of the patients identified by the finder, 89.9% (N=3796) were identifiable via prescribing data, while 23.7% (N=1000) were identifiable via diagnostic coding. Just 13.6% (N=574) of patients identified by the finder had both been prescribed medication and assigned a diagnostic code.

Among patients identified by the finder, 38.0% (N=1606) were male and 61.9% (N=2615) female, 73.8% (N=3114) of patients were GMS/DVC eligible (i.e. Ireland’s free GP care system, which at the time of the study was determined by income and medical need) and

25.8% (N=1090) were 'private' patients. The mean age of patients identified by the finder was 50.8 years (SD=19.5 years).

< INSERT TABLE 3 HERE >

### ***Prevalence of mental health and substance use problems across age groups***

The prevalence of mental health problems known to the GP as identified by the finder increased from 0.4% in patients aged under five years to greater than 30% in the 75-79 year-old age group (see Figure 2).

< INSERT FIGURE 2 HERE >

### ***Profile of mental health and substance use problems identified by the finder***

Among patients identified by the finder (N=4222), the conditions most commonly coded were: depression (11.5%), panic/anxiety (5.7%), substance use disorders (4.6%) and alcohol disorders (3.1%). The conditions least commonly coded were somatoform disorders (0%) and eating disorders (0.1%). However, within each diagnostic class, the proportion of patients coded varied across the six practices (see Table 4). The most common ATC class of medicine prescribed to patients identified by the finder was antidepressants (48.3%). This was followed by hypnotics and sedatives (33.6%), anxiolytics (33.4%), and antipsychotics (15.9%). No patients were identified as having been prescribed psycholeptics and psychoanaleptics in combination, or methadone. Although this pattern of prescribing was consistent across

practices, within each ATC class practices varied in the proportion of patients prescribed any medication (see Table 5).

< INSERT TABLE 4 HERE >

< INSERT TABLE 5 HERE >

### ***Multi-morbidity***

56.6% of patients (N=2388) identified by the finder had been prescribed just one ATC class of medication. 22.9% of patients (N=968) identified had been prescribed two ATC classes of medication and 10.4% (N=440) had been prescribed three or more ATC classes of medication. 10.1% of patients identified (N=426) had not been prescribed any of the classes of medication.

## **Discussion**

### ***Key findings***

In this paper we described the development of a software plug-in ('mental health finder') within a widely-used primary care EMR system in Ireland to enable data collection on mental health diagnoses and pharmacological treatments among patients attending general practice. Initial implementation of the finder in six practices found 9.4% of 'active' patients were identified as ever having a mental health or substance use problem known to their GP.

Prevalence was highest (at 30.6%) in patients aged 75-79 years. The mean age of patients identified by the finder was 50.8 years. Patients identified by the finder were more likely to be female (61.9% vs 53.6%) and GMS/DVC eligible (73.8% vs 31.4%) than the overall patient population within participating practices. Among patients identified by the finder, the most commonly coded conditions were depression, panic/anxiety, and alcohol and substance use disorders. The most commonly prescribed medications were antidepressants, anxiolytics, hypnotics / sedatives, and antipsychotics. Considerable psychological multi-morbidity was evident with one-third of patients ever prescribed two or more ATC classes of psychotropic medication. Practices varied in the overall prevalence rate of mental health and substance use issues known to the GP, and in the proportion of patients within each diagnostic and medication class.

#### *How our work relates to the existing literature*

Internationally, mental health services researchers have looked to the EMR to answer questions regarding diagnostic and prescribing patterns [16, 17], although the importance of determining the accuracy of such information for research purposes has been highlighted [12]. We used prescription data and diagnostic coding as the bases on which the finder would search for and identify patients with mental health and substance use problems known to their GP. Almost one-quarter (23.7%) of patients identified by the finder were identifiable via diagnostic coding, while 89.9% were identifiable via prescriptions. This is consistent with research conducted in the Netherlands which found that prescription data was the single best indicator of GP recognition of depression but that labelling with specific diagnostic codes was weak [18].



We found considerable variation between practices in their use of mental health related coding. The reasons for GPs' reluctance to code mental health problems warrants further exploration. Some qualitative research conducted with primary care practitioners suggests that practitioners may sometimes view mental health problems in social, contextual and existential terms, as understandable and justifiable responses to life circumstances rather than pathological reactions or clinical disorders [19, 20]. Such understandings of mental ill-health may encourage non-use of biomedically oriented ICD-10 diagnoses.

A study of Dutch GP trainers' and trainees' general use of ICPC coding found that agreement with the statement 'ICPC coding is unpleasant to use' predicted trainers' and trainee's actual use of coding; while for trainers, 'no personal gain from ICPC' and 'coding is difficult' were additional predictors of coding performance [21]. In addition, almost half of the trainees and one-third of the trainers agreed that 'insufficient refinement of the ICPC coding system' was a barrier to coding [21]. The authors suggest that increasing GPs' motivation to code and making coding systems more user-friendly would help to improve GPs' coding performance and therefore the value of EMR data for research and educational purposes. We found that somatoform disorders and eating disorders were the least commonly coded conditions and this may partly reflect the complexity involved in making such diagnoses.

Practices varied in the proportion of patients prescribed various ATC classes of psychotropic medications. Such differences may be reflective of varying needs among populations served by participating GPs or of differences in GPs' detection rates of mental health problems and/or preferred therapeutic approaches. Further research is needed to determine the factors

of influence. There were no prescriptions for methadone identified by the finder as in Ireland prescriptions for controlled drugs must be handwritten.

Prevalence rates for mental health and substance use problems in practices in this study (ranging from 6.9-12.7%) are lower than estimates in population-based surveys [1] and studies using screening instruments in primary care [5]. A review by Klimas et al. of studies examining prevalence of mental and substance use disorders among patients attending primary care in the EU and which used screening instruments, identified three studies looking at lifetime prevalence, with estimates ranging from 37.8% to 65% [5]. While the mental health finder will have missed cases identified by GPs through the free text in consultation notes, the large disparity may nonetheless reflect the under-identification of mental health issues in primary care. The potential under-identification of mental health problems by GPs in this study is more evident for children and adolescents. The mental health finder identified less than 2% of patients under the age of 20 years as ever having a mental health problem known to their GP, compared to a recent meta-analysis of community samples which found 13.4% of children and adolescents had a mental disorder [22]. Prevalence rates for older adults in our study however, approximate to lifetime prevalence rates in other studies. For example, a large-scale study by Baladon et al. in Catalonia, Spain assessed patients over 65 years of age attending primary care and found 29.7% had experienced a mental disorder in their lifetime [23]. This would suggest that GPs in our study are recognising mental health problems more frequently in their older patients, perhaps partly through greater familiarity with the patient over time. Incorporating validated mental health and substance use screening tools (e.g. PRIME-MD [11], AUDIT [24]) within EMR software packages would likely enhance the detection of mental health issues and the accuracy of GP diagnoses.

### *Utility of the mental health finder and future directions*

Researchers are increasingly looking to utilize patient EMRs to create time and cost-efficiencies in the conduct of research. Seyfried et al. developed an EMR search engine to enhance EMR review and described its utility in screening charts for patient eligibility for a depression study [17]. They found that use of the search engine provided significant time savings in comparison to manual EMR review, while preserving clinical accuracy when compared to a gold standard rater. The mental health finder can enable large-scale data collection on the epidemiology of mental health problems in primary care. Our finding that trends (if not frequency) in prescribing were consistent across practices (depression, anxiety, and psychosis are commonly managed by GPs) suggests it is a good indicator of the profile of mental health problems encountered in primary care. The mental health finder can also potentially facilitate easier and quicker identification of patient samples for mental health research in primary care.

The mental health finder adds functionality to Socrates. Although Socrates already has the facility to search for patients according to diagnostic codes and prescriptions, in order to identify the range of patients identified by the mental health finder GPs/researchers would have to select all of the diagnostic codes and prescription classes above (see Tables 1 and 2), which would entail a more time-consuming search process and a greater risk of human error. The finder thus provides an efficient and standardized way to conduct a comprehensive search of EMRs for patients with common mental health and substance use problems. While the development of plug-ins such as the mental health finder adds functionality to Socrates, incorporation of multiple plug-ins over time can pose challenges to software systems.

Initial implementation showed the finder was easy for GPs to use and quickly generated reports. The protocol developed by the research team enabled secure and anonymous transfer of reports to the research team for analysis. As participating GPs were involved in the training of medical students at the host institutions, it is likely they may be more IT 'savvy' than non-training practices [10]. Although further examination of the usability of the tool in a larger and more representative sample is warranted, some researchers have pointed to the value of initial roll-out of interventions among innovators and early adopters [16].

This study was a proof of concept study to demonstrate the feasibility and practical potential of the mental health finder as a data collection tool within one widely-used primary care EMR system. For improved monitoring and service planning at the national level, similar developments within the other widely-used primary care EMR systems would need to take place. The facility to gather large-scale data on mental health and substance use problems known to and managed by GPs in primary care nationally would complement population level data on mental health issues gathered via surveys such as TILDA (which reported period prevalence of mental disorders among a nationally representative sample of adults  $\geq$  50 years of age), the My World Survey (which reported point prevalence of symptoms of depression and anxiety in a national sample of adolescents and young people aged 12-25 years) and the Healthy Ireland Survey (which reported point prevalence of psychological distress in a nationally representative sample over 15 years of age) [25-27]. Gathering large-scale data from practices at multiple time points could facilitate monitoring of the impact of public health and policy interventions in primary care.

While the finder was developed primarily as a research tool, it may also assist GPs in applying diagnostic codes to patients' charts as the finder collates patients who were ever prescribed psychotropic medicines and GPs can thus consider the relevance of specific diagnostic codes for them. It would be useful however if the finder was developed further to run in the background and suggest potential diagnostic codes to GPs when they are prescribing certain medications. Also, if implementation of the finder was scaled-up with central processing of reports from GP practices, practices could perhaps compare their prescribing patterns to national norms or to other GP practices, similar to the openprescribing.net tool in the UK (<https://openprescribing.net/>) [28]. Such developments would give added value to the tool and might prevent user fatigue in the event that the tool was used at a national level to collect epidemiological data on a number of occasions from GPs.

### *Conclusions*

In conclusion, the mental health finder is a feasible methodology for data collection on mental health and substance use problems in general practice. However, considerable variability between practices in prevalence rates, diagnostic coding and pharmacological treatments warrants further investigation. A study with a larger and more representative sample of practices would allow an analysis of practice and patient factors which might be predictors of prevalence. Developing the mental health finder to search consultation notes and/or referral letters for key words would enhance its capacity to identify patients with mental health and substance use problems known to the GP. To improve data recording and service development at the national level, it would be highly beneficial if the finder was incorporated within other EMR systems that are widely used in primary care in Ireland.

**Ethical approval:** The study was approved by the ethics committee of the Irish College of General Practitioners. Formal patient consent was not required as all data was extracted and anonymized by the GP prior to forwarding to the research team.

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**Table 1** Mental health conditions and respective ICPC2/ICD10 codes included in the ‘Mental Health Finder’

<b>Mental Health Condition</b>	<b>ICD 10 codes</b>	<b>ICPC2 codes</b>
Depression	F30 – Manic episode F31 – Bipolar Disorder F32 – Major depressive disorder, single episode F33 – Major depressive disorder, recurrent F34 – Persistent mood [affective] disorders F38, Other mood [affective] disorders F39 – Unspecified mood [affective] disorder	P03 – Feeling depressed P04 – Feeling/behaving irritable/angry P76 – Depressive disorder P77 – Suicide/suicide attempt
Panic/Other Anxiety Disorders	F40 – Phobic anxiety disorders F41 – Other anxiety disorders F42 – Obsessive-compulsive disorder F43 – Reaction to severe stress, and adjustment disorders F48 – Other nonpsychotic mental disorders	P01 – Feeling anxious/nervous/tense P02 – Acute stress reaction P74 – Anxiety disorder/anxiety state P78 – Neuraesthesia/surmenage P79 – Phobia/compulsive disorder
Somatoform Disorders	F44 – Dissociative and conversion disorders F45 – Somatoform disorders	P75 – Somatization disorder
Alcohol Use Disorder	F10 – Alcohol related disorders	P15 – Chronic alcohol abuse P16 – Acute alcohol abuse

Substance Use Disorder	<p>F11 – Opioid related disorders</p> <p>F12 – Cannabis related disorders</p> <p>F13 – Sedative, hypnotic, or anxiolytic related disorders</p> <p>F14 – Cocaine related disorders</p> <p>F15 – Other stimulant related disorders</p> <p>F16 – Hallucinogen related disorders</p> <p>F17 – Nicotine dependence</p> <p>F18 – Inhalant related disorders</p> <p>F19 – Other psychoactive substance related disorders</p>	<p>P17 – Tobacco abuse</p> <p>P18 – Medication abuse</p> <p>P19 – Drug abuse</p>
Eating Disorders	F50 - Eating disorders	<p>P11 – Eating problem in child</p> <p>P86 – Anorexia nervosa/bulimia</p>
Cognitive Disorders		<p>P70 – Dementia</p> <p>P20 – Memory disturbance</p>
Other Disorders		<p>P99 – Psychological disorders, other</p> <p>P29 – Psychological symptom/complmt other</p>

**Table 2** ATC classes of medications included in the ‘Mental Health Finder’

ATC Code Class	
N05A Antipsychotics	N05AB Phenothiazines with piperazine structure N05AC Phenothiazines with piperidine structure N05AD Butyrophenone derivatives N05AE Indole derivatives N05AF Thioxanthene derivative N05AG Diphenylbutylpiperidine derivatives N05AH Diazepines, oxazepines, thiazepines and oxepines N05AL Benzamides N05AN Lithium N05AX Other antipsychotics
N05B Anxiolytics	N05BA Benzodiazepine derivatives N05BB Diphenylmethane derivatives N05BC Carbamates N05BD Dibenzo-bicyclo-octadiene derivatives N05BE Azaspirodecanedione derivatives N05BX Other anxiolytics
N05C Hypnotics and sedatives	N05CA Barbiturates, plain N05CB Barbiturates, combinations N05CC Aldehydes and derivatives N05CD Benzodiazepine derivatives N05CE Piperidinedione derivatives N05CF Benzodiazepine related drugs N05CM Other hypnotics and sedatives

	N05CX Hypnotics and sedatives in combination, excluding barbiturates
N06A Antidepressants	N06AA Non-selective monoamine reuptake inhibitors N06AB Selective serotonin reuptake inhibitors N06AF Monoamine oxidase inhibitors, non-selective N06AG Monoamine oxidase A inhibitors N06AX Other antidepressants
N06B Psychostimulants, Agents used for ADHD and Nootropics	N06BA Centrally acting sympathomimetics N06BC Xanthine derivatives N06BX Other psychostimulants and nootropics
N06C Psycholeptics and Psychoanaleptics in combination	N06CA Antidepressants in combination with psycholeptics N06CB Psychostimulants in combination with psycholeptics
N06D Anti-Dementia Drugs	N06DA Anticholinesterases N06DX Other anti-dementia drugs
N02A Opioids	N02AC52 Methadone

**Fig. 1** Excel report/dataset generated by ‘Mental Health Finder’

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
	Age	Gender	Status	Depression	Panic/Other Anxiety Disorders	Somatoform Disorders	Alcohol Disorders	Substance Use Disorders	Eating Disorders	Cognitive disorders	Other Disorders	N05A Antipsychotics	N05B Anxiolytics	N05C Hypnotics and Sedatives	N06A Antidepressants	N06B Psychostimulants, agents used for ADHD and nootropics	N06C Psycholeptics and psychoanaleptics in combination	N06D Antidementia drugs	N02AC52 Methadone	
1																				
2	44	Male	GMS	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No
3	42	Female	GMS	Yes	No	No	No	Yes	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No
4	33	Female	GMS	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No
5	36	Female	GMS	Yes	No	No	Yes	No	No	No	No	No	No	No	Yes	No	No	No	No	No
6	54	Female	GMS	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
7	38	Female	PRV	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	No
8	74	Female	GMS	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
9	35	Male	GMS	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No
10	24	Female	GMS	Yes	No	No	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No
11	21	Female	GMS	No	Yes	No	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No
12	26	Female	GMS	No	No	No	No	Yes	No	No	No	No	Yes	No	Yes	No	No	No	No	No
13	39	Female	GMS	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
14	39	Female	GMS	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No

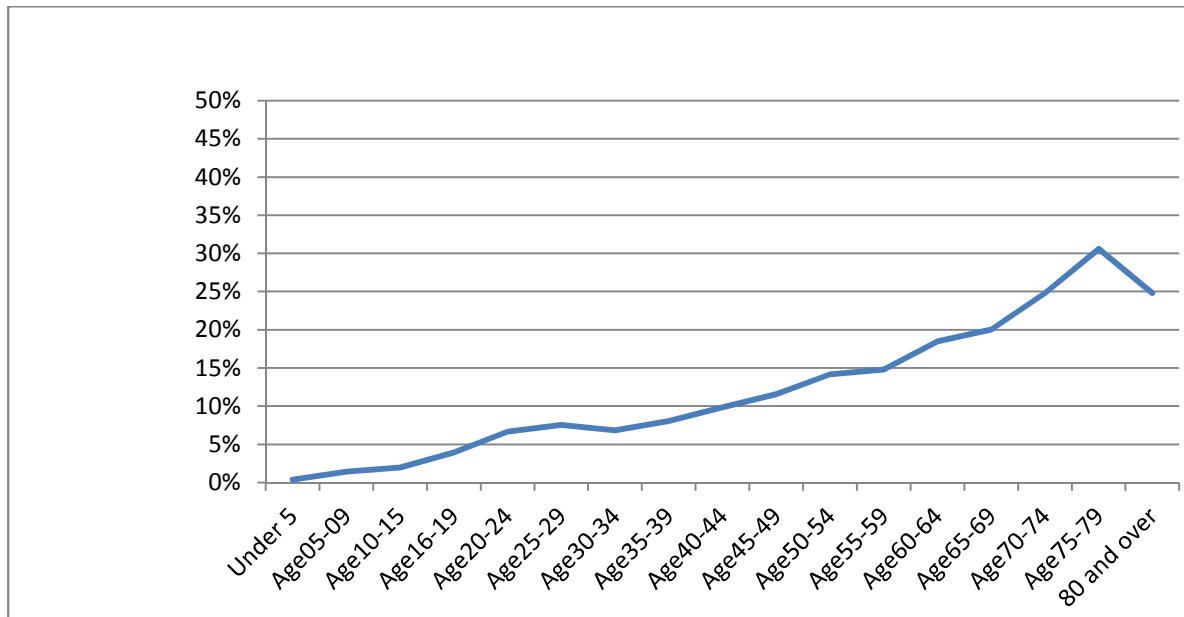
\*Note: Names and date of birth columns removed by GP.

**Table 3** Prevalence of mental health and substance use problems (MESUD) in participating practices

<b>Practice</b>	<b>N 'active' patients</b>	<b>N with MESUD</b>	<b>% Patients with MESUD</b>
A	10892	1098	10.1
B	8165	1036	12.7
C	13929	965	6.9
D	5255	474	9.0
E	3444	366	10.6
F	3071	283	9.2
<b>All</b>	<b>44756</b>	<b>4222</b>	<b>9.4</b>



**Fig. 2** Prevalence of mental health and substance use problems across age groups



**Table 4** Mental health and substance use problems by diagnostic code and practice

<b>Practice</b>	<b>Depression</b>	<b>Panic/Other Anxiety Disorders</b>	<b>Somatoform Disorders</b>	<b>Alcohol Disorders</b>	<b>Substance Use Disorders</b>	<b>Eating Disorders</b>	<b>Cognitive disorders</b>	<b>Other Disorders</b>
A (N=1098)	1.3%	0.7%	0%	0.2%	0.6%	0%	0%	0.1%
B (N=1036)	28.8%	13.0%	0%	8.3%	15.7%	0.3%	1.8%	3.2%
C (N=965)	7.1%	3.1%	0%	1.0%	1.9%	0%	0.3%	1.7%
D (N=474)	0.2%	0.6%	0%	0%	0.2%	0%	0.2%	0%
E (N=366)	21.0%	15.0%	0%	8.2%	0.8%	0%	3.8%	2.2%
F (N=283)	9.2%	3.2%	0%	1.1%	0.4%	0%	0.4%	0.4%
<b>Total (N=4222)</b>	<b>11.5%</b>	<b>5.7%</b>	<b>0%</b>	<b>3.1%</b>	<b>4.6%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>1.4%</b>

**Table 5** Mental health and substance use problems by medicines prescribed and practice

<b>Practice</b>	<b>N05A</b> Antipsychotics	<b>N05B</b> Anxiolytics	<b>N05C</b> Hypnotics and Sedatives	<b>N06A</b> Antidepressants	<b>N06B</b> Psychostimulants , agents used for ADHD and nootropics	<b>N06C</b> Psycholeptics and psychoanaleptics in combination	<b>N06D</b> Anti-dementia drugs	<b>N02AC52</b> Methadone
A (N=1098)	12.8%	40.4%	40.1%	53.6%	2.0%	0%	2.1%	0%
B (N=1036)	11.5%	25.8%	27.1%	41.9%	3.1%	0%	1.5%	0%
C (N=965)	17.8%	33.8%	39.0%	50.4%	2.5%	0%	2.9%	0%
D (N=474)	20.0%	37.8%	28.9%	43.9%	0.6%	0%	1.7%	0%
E (N=366)	20.8%	30.3%	27.6%	43.2%	2.2%	0%	3.6%	0%
F (N=282)	24.7%	29.3%	29.0%	57.6%	1.4%	0%	3.2%	0%
<b>Total</b> <b>(N=4222)</b>	<b>15.9%</b>	<b>33.4%</b>	<b>33.6%</b>	<b>48.3%</b>	<b>2.2%</b>	<b>0%</b>	<b>2.3%</b>	<b>0%</b>