



Public Health
England

Protecting and improving the nation's health

Technical supplement

Severe mental illness and physical health inequalities

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

Public Health England
Wellington House
133-155 Waterloo Road
London SE1 8UG
Tel: 020 7654 8000
www.gov.uk/phe
Twitter: [@PHE_uk](https://twitter.com/PHE_uk)
Facebook: www.facebook.com/PublicHealthEngland

Prepared by: Kate Lachowycz, Sulia Celebi, Gabriele Price, Cam Lugton and Rachel Roche

For queries relating to this document, please contact: mhdnin@phe.gov.uk



© Crown copyright 2018

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v3.0. To view this licence, visit [OGL](https://www.ogilicence.gov.uk). Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

Published September 2018

PHE publications

gateway number: 2018395

PHE supports the UN

Sustainable Development Goals



Contents

About Public Health England	2
Summary	4
Introduction	5
Methods	6
Statistical analysis	11
Strengths and limitations	12
Appendix 1	15
Appendix 2	16
Appendix 3	18
References	26

Summary

This supplement provides technical information on the methods used to examine inequalities in physical health between people with a diagnosis of severe mental illness (SMI) and all patients in GP care. It should be used together with Public Health England's (PHE's) research report [Severe mental illness \(SMI\) and physical health inequalities](#) which provides details on:

- background to this work
- key results from the analysis
- discussion of the findings
- summary of interventions and guidance to improve physical health that the findings support
- conclusions

This analysis uses The Health Improvement Network (THIN) database. THIN is a large general practice database covering about 6% of the UK population. The records in THIN are anonymised, and longitudinal data is available. Using quality and outcomes framework (QOF) rules allow a comparison between the prevalence reported by GP practices and the prevalence derived from THIN. Therefore, the purpose of this technical supplement is to provide:

- detail on how SMI patients are identified in THIN
- detail on how all patients (as a comparison group) are identified in THIN
- detail on how the examined physical health conditions (including asthma, atrial fibrillation, cancer, coronary heart disease, chronic obstructive pulmonary disease, diabetes, heart failure, hypertension, obesity and stroke) are identified in THIN
- a full list of Read of codes used in the analysis
- detail on the statistical analysis applied
- comprehensive tables of results from the statistical analysis
- strengths and limitation of THIN, and the methodology used in the analysis
- a basis for a similar sub-national analysis for local areas where access to general practice data is available

Introduction

People with SMI, such as schizophrenia and bipolar disorder, are at a greater risk of poor physical health and have a higher premature mortality than the general population¹. People with SMI in England:

- die on average 15 to 20 years earlier than the general population²
- have 3.7 times a higher death rate for ages under 75²
- experience a widening gap in death rates over time³

It is estimated that 2 in 3 deaths in people with SMI are from physical illnesses that can be prevented⁴. Major causes of death in people with SMI include chronic physical medical conditions such as cardiovascular, respiratory, diabetes and hypertension⁵. In addition to chronic physical medical conditions, suicide is also an important cause of death in the SMI population. Suicide risk in people with SMI is high following acute psychotic episodes and psychiatric hospitalisation. It peaks during psychiatric hospital admission and shortly after discharge⁶. Other causes of death include substance abuse, Parkinson's disease, accidents, dementia (including Alzheimer's disease) and infections and respiratory acute conditions (particularly pneumonia)⁵.

In England, there have been few large-scale studies in primary care that look at the nature and extent of physical health and health inequality in people with SMI⁷:

- experiencing both a mental illness and a physical illness at the same time (known as co-morbidity)
- experiencing a mental illness and more than one physical condition at once (known as multi-morbidity)

Previous studies in England focused on specific conditions, geographical regions or looked at overall patterns of inequality (with deprivation largely only considered).⁷

General practice data is a rich source of longitudinal data on patients. There are a number of sources of general practice data and research databases, including:

- Clinical Practice Research Datalink (CPRD)⁸
- The Health Improvement Network (THIN) database⁹
- bespoke extracts of data using the General Practice Extraction Service (GPES)¹⁰

Public Health England (PHE) currently (May 2018) holds the THIN database. Therefore, use of THIN is preferable to obtaining other similar datasets that are available for such research. THIN offers an opportunity to investigate which physical health conditions

have a high prevalence among those with SMI known to primary care in England and how this compares with the general population. Data access to THIN allows analysis at England-level only. Consequently, the PHE's **Severe mental illness (SMI) and physical health inequalities** report does not provide sub-national findings. However, where local agreements for access to primary-care data exist the methodology and list of codes below will allow similar analysis to be carried out.

Findings from the analysis, together with discussion and conclusions, are available in PHE's **Severe mental illness (SMI) and physical health inequalities** report.

Methods

Using THIN data (May 2018, Version: 1705) for GP practices in England, the aim of the analysis is to examine:

- the recorded prevalence of SMI in England by age, sex and deprivation
- the proportion of people with recorded SMI in England experiencing co-morbidities and multi-morbidities
- inequalities in the co-morbidities and multi-morbidities between SMI and all patients in England by age, sex and deprivation

Analysis by age group and sex in people with SMI can help to identify further inequalities in physical health within patients with SMI. It is also important to consider the role of socio-economic factors. People experiencing mental health problems together with long-term physical conditions disproportionately live in deprived areas.¹¹ Deprivation is therefore an important factor in understanding differences in the prevalence of physical health conditions among those with and without SMI. It is potentially both a confounder (an explanation for the observed differences between SMI and all patients) and a moderator (it affects the strength of the relationship for example between SMI and physical health conditions).

This analysis was approved by the THIN scientific review committee (4 June 2018, SRC Reference Number 18THIN021).

Description of THIN

THIN⁹ is a UK primary care database of anonymised electronic medical records collected in a sample of general medical practices throughout the UK. Extracts are taken from GP systems every four months. THIN data collection began in 2002 and by July 2017 over 780 practices had contributed data¹². Across the UK there are around 375 GP practices active in THIN and just under 3 million active patients (around 6% of the general population).

THIN data includes non-identified data about:

- demographics, such as gender, year of birth and registration dates
- consultations, diagnoses and symptoms entered by GPs
- prescribed medication
- lab tests and results ordered by GP
- vaccinations
- additional health data such as blood pressure, height and weight

The THIN sample is broadly representative of the UK general population.¹³ It has similar demographics, although the THIN sample contains fewer people aged under 25 and is slightly less deprived. The prevalence of major conditions is comparable to that recorded by the Quality and Outcomes Framework (QOF) and death rates are close to national death rates after adjusting for demographics and deprivation¹³. The GP recorded SMI prevalence in THIN is broadly comparable with that in other studies and shows similar patterns by socio-demographic characteristics.¹⁴

Patient inclusion criteria

The analysis uses data extracted from THIN in May 2018. The analysis looks at permanently registered active patients aged 15 to 74 across 154 GP practices in England. Active patients are patients who are alive and contribute data to THIN.

Patients are only included if they have a complete registration date recorded in THIN and:

- patient flag is either 'A' or 'C' indicating that the patient record passed the internal THIN validation process and is an 'acceptable record' or is an 'acceptable record and transferred out of data due to patient being dead'
- registration flag is either '01', '02', '05' or '99' indicating that a patient has 'Applied' or is 'Permanent' residence or patient has 'transferred out' of the practice or patient has died'

The criteria and definitions to identify patients for the analysis:

- only active patients in the age group 15 to 74 are included. Few people aged less than 15 years have a diagnosis of SMI and focussing on those aged less than 75 years is consistent with the measures of excess mortality in this group⁵
- excluding older age groups also helps avoid mortality attrition bias (earlier deaths for people with SMI who have physical health conditions)
- the analysis looks at cross-sectional point prevalence on the census date (May 2018), with 'current' prevalence defined as an unresolved diagnosis. Any historic diagnosis is included as long as it is not subsequently coded as resolved

- there is no minimum period of record history for inclusion in the analysis and all active permanent patients in THIN are included
- ‘SMI patients’ are defined as having schizophrenia, affective disorder (bipolar or unspecified affective disorder) or other types of psychoses using **Quality and Outcomes Framework** (QOF) business rules¹⁵ using Read codes. Patients who have had a lithium prescription in the preceding six months are not included although they are included in QOF. Lithium is a medication used to treat SMI and most commonly bipolar disorder. Full list of Read codes used in the analysis are available in Appendix 1
- in line with QOF business rules for prevalence, counts with a SMI diagnosis ‘In remission’ are included. ‘In remission’ coding is used by GPs for patients where there is no record of anti-psychotic medication, mental health in-patient episodes or secondary care mental health follow-up for at least five years. These patients remain on the QOF register but are excluded from the quality indicators
- similarly to ‘In remissions’ codes, ‘Exception codes’ can be used by GPs to exclude patients on a QOF register from quality indicators where appropriate. ‘Exception codes’ are not considered in this analysis
- ‘all patients’ are defined as all active patients aged 15 to 74 and include the SMI population within it
- the Townsend quintiles are allocated to patients based on the Townsend score of the small geographic area of their home postcode¹²
- deprivation quintiles are available for 78.5% of SMI patients and 75.3% for all THIN patients. The remaining patients have no allocated score as their postcode cannot be linked to Townsend score or a score is not available due to data quality reasons

The 10 physical health conditions for SMI and all patients in THIN identified using QOF business rules¹⁵ are:

- asthma – patients with a history of asthma^a
- atrial fibrillation (AF) – patients with an atrial fibrillation event, including paroxysmal, persistent and permanent
- cancer – patients with a diagnosis of cancer excluding non-melanoma skin cancers
- coronary heart disease (CHD) – patients who have had coronary artery revascularisation procedures, such as coronary artery bypass grafting (CABG)
- chronic obstructive pulmonary disease (COPD) – patients with symptoms of a persistent cough, sputum production, or dyspnoea and/or a history of exposure to

^a QOF excludes patients without any prescription of asthma medication in the previous 12 months

risk factors for the disease, and diagnosis confirmed by post bronchodilator spirometry

- diabetes – all patients with diabetes mellitus (type 1 and type 2)
- heart failure (HF) – all patients with a diagnosis of HF
- hypertension – patients with established hypertension, for example, elevated blood pressure readings of greater than 140/90 mmHg on three separate occasions
- obesity – patients with a BMI ≥ 30 in the preceding 12 months
- stroke – patients with a diagnosis of stroke or transient ischaemic attack (TIA)

As the 10 conditions included are a subject of QOF registers:

- diagnosis recording is likely to be good
- the results can be checked against the QOF figures
- the analysis can easily be reproduced

The analysis uses full patient history to define co-morbidities and multi-morbidities. Given the low prevalence of SMI in primary care, this maximises the sample size available for the analysis. Consistent with QOF, patients have a specific physical condition if they have a Read-code diagnosis that is not subsequently coded as 'resolved'. Full list of Read codes used in the analysis is available in Appendix 1.

Details of variables included in the data extraction and a summary of inclusion criteria are available in Appendix 2.

Validation of prevalence

To assess the accuracy of SMI and physical conditions prevalence from THIN, this analysis compares the prevalence recorded in THIN with the prevalence recorded in QOF for the period April 2016 to March 2017¹⁶. This is currently the latest available data for QOF.

The SMI prevalence in THIN is lower than recorded in QOF (Table 1). This is partially due to lithium prescribing being not included in THIN analysis. For the majority of the ten examined physical health conditions, the prevalence compares well with the England QOF prevalence. The prevalence figures in THIN are within 0.5 percentage points of the QOF value with greater differences recorded for asthma, hypertension and obesity (Table 1).

Table 1 Condition prevalence (%) in THIN (May 2018) and QOF 2016 to 2017

Condition (ages* included)	THIN prevalence % (95% CI)	England QOF Prevalence %
Asthma (all ages)	9.00 (8.95-9.05)	5.94
Atrial Fibrillation (all ages)	1.64 (1.62-1.66)	1.84
Cancer (all ages)	2.99 (2.96-3.02)	2.58
CHD (all ages)	2.70 (2.68-2.73)	3.15
COPD (all ages)	1.59 (1.57-1.61)	1.87
Diabetes (over 17 years)	6.22 (6.18-6.27)	6.67
Heart Failure (all ages)	0.86 (0.85-0.88)	0.79
Hypertension (all ages)	12.40 (12.34-12.45)	13.83
Obesity (over 18 years)	7.40 (7.35-7.45)	9.65
SMI (all ages)	0.73 (0.71-0.74)	0.92
Stroke & TIA (all ages)	1.47 (1.45-1.49)	1.75

Note the percentages are not age and sex standardised.

* age groups used to match prevalence in each specific QOF register

Source: The Health Improvement Network (THIN). Data extracted May 2018; NHS Digital; Quality and Outcomes Framework – Prevalence, Achievements and Exceptions Report. England, 2016-17¹⁷

For asthma, QOF excludes patients without any prescription for asthma medication in the previous 12 months. This analysis captures all people with an unresolved diagnosis of asthma and possibly resulting in a higher prevalence of asthma. Obesity and hypertension shows a large variation in QOF prevalence between sub-regions across England¹⁸. Therefore, the location of GP practices in THIN sample can affect the recorded prevalence for both conditions. Demographic and deprivation profiles between the QOF and the THIN population may also play a role. This analysis does not account for the differences.

Statistical analysis

To account for demographic differences between SMI patients and all patients, this analysis applies standardisation for age and sex using the direct method¹⁹ to the prevalence of physical health conditions in SMI patients. This analysis applies the age and sex specific prevalence observed in the SMI patients to the age structure of the general THIN population. In other words, the age and sex specific prevalence observed in SMI patients were applied to the age structure of all patients in THIN. This analysis also uses direct standardisation to adjust for deprivation. To allow for easy replicability of the analysis, 95% confidence intervals (CIs) are used to determine statistical significance. However, this approach is more conservative than formal testing and the use of p-values²⁰. The use of CIs to assess statistical significance rather than p-value is widely accepted and currently used across PHE's intelligence products. Both are not contradictory statistical concepts and can be complementary. The 95% CIs calculated in this analysis use Wilson Score and Dobson's methods as recommended by PHE²¹ for proportions and directly standardised rates respectively. Differences in the prevalence are considered as statistically significant if the 95% CIs do not overlap. All patient prevalence is used as a reference (point) value and therefore does not include CIs. All comparisons were at an England level. The rate ratio of prevalence is calculated by dividing SMI patient prevalence by all patient prevalence. A rate ratio higher than 1 indicates higher prevalence in SMI patients.

This analysis compares SMI patients to all patients aged 15 to 74 in THIN to examine if:

- the prevalence of each of the 10 physical health conditions differs between both patient groups
- the prevalence of co-morbidities and multi-morbidities differs between both patient groups
- there are further differences by sex and age group in 20-year bands (15 to 34, 35 to 54, 55 to 74), and socio-economic deprivation

Analysis by sub-group is only carried out where there is sufficient sample size to allow a robust comparison.

Strengths and limitations

This analysis has a number of strengths and limitations that relate to the THIN database itself and this methodological approach. Those should be kept in mind when interpreting the results from the analysis and repeating the analysis at local level.

THIN data

THIN data has a number of strengths around its use in population level and epidemiological studies [^22] such as:

- it is a very large data set containing records of approximately 6% of UK population
- it is broadly representative of the UK population
- it allows patients with particular conditions to be identified and an analysis in relation to the conditions to be carried out
- it can be used to select control subjects from the same source population
- data is collected in a non-interventional way and therefore reflects 'real life'
- information is continually updated, permitting investigation of the effects of new interventions and treatments
- data does not have to be collected which may reduce time and costs
- it can be used in most epidemiological study designs (that is cohort, case-control, case-series).
- it can be used to study relatively rare exposures or outcomes
- a number of practices have been linked to hospital episode statistics (HES) data allowing the analysis of both primary and secondary care data

There are some limitations around THIN data because [^22]:

- the primary use of Vision software that is used for THIN is patient management and not medical research, and data will reflect only those events that are deemed to be relevant to the patient's care
- despite being a large data set THIN may still have power problems when exposure and outcomes are both rare
- as THIN is a sample of the GP practice population, when no-one is identified as having a specific condition, it cannot be assumed that the count is actually zero
- it may be inappropriate for use in studies where individual ethnicity, occupation, employment, and/or socio-economic status are important variables (not available at patient-level data)
- it may be inappropriate for use in studies on drug-related exposures as non-compliance to medication prescriptions may be an issue

- it may be inappropriate for use in studies where data are primarily related to secondary care (cancer-care studies)
- it may be inappropriate for use in studies examining over-the-counter drugs as these will not usually be recorded
- it may be inappropriate for use in studies looking at lab test results before computerisation as only abnormal values may have been entered
- the number of GP practices subscribing to THIN is showing a downward trend

Few of the above limitations apply to this analysis.

Methods

The strengths of the method for this analysis are:

- QOF business rules are used and therefore coding is likely to be good
- use of QOF allows validation of findings against other published data
- confirmed diagnoses were used for physical health conditions therefore reducing the effect of misdiagnosis
- use of 'in remission' code as this allows inclusion of patients with SMI who are not included in QOF quality indicators but are still likely to experience poor physical health
- use of ages 15 to 74 to account for the effect of premature mortality in patients with SMI especially in relation to standardisation of the data
- inclusion of a range of physical health conditions
- examination of overall inequalities between SMI and all patients together with the effects of age, sex and deprivation

The methodology used in this analysis has a number of limitations as:

- it is based on diagnosed conditions only and therefore cannot account for levels of undiagnosed physical health conditions in SMI or all patients that could potentially increase the actual health inequality reported in this analysis
- it relies entirely on accurate diagnostic coding although coding across GP practices contributing to THIN is likely to be good
- GP practices contributing to the THIN database might not be fully representative of all GP practices in England in their coding behaviour
- it does not include antipsychotic medication prescribing in addition to SMI diagnosis to determine prevalence
- only individuals who are registered with GPs can be included in the analysis and mental health problems are likely to be an issue in parts of the population with no GP registration such as homeless individuals

- there are some difference in QOF and Read codes used in this analysis
- looking at diagnosis of a condition does not tell us anything about subsequent treatments and interventions that the patient received
- it does not look at differences in physical health conditions by type of SMI diagnosis, for example schizophrenia and affective disorder
- the analysis is cross-sectional, and it is not possible to look at the temporal association (the order in which conditions were diagnosed) of SMI and physical health conditions or consider if there is a 'healthy survivor' bias, where people with the poorest health die early
- using currently active patients results in a small sample of people with both SMI and less common physical health conditions such as cancer, atrial fibrillation, stroke and heart failure

Appendix 1

Table 2 Read codes for types of physical health conditions and SMI

Condition	Condition group	Diagnosis codes	Resolved codes
Asthma	Respiratory	H33.% (excluding H333), H3120, H3B, 173A	21262, 212G
Atrial fibrillation	Cardiovascular	G573.%	212R
Cancer	Cancer	B0-B32z, B34-B6z0 (excluding B677), Byu-Byu41, Byu5-ByuE0, K1323, K01w1, 68W24, C184	
Coronary heart disease (CHD)	Cardiovascular	G3-G309, G30B-G330z (excluding G310), G33z-G3401, G342-G35X, G38-G3z, Gyu3.% (excluding Gyu31)	
Chronic obstructive pulmonary disease (COPD)	Respiratory	H3, H31.% (excluding H3101, H31y0, H3122), H32.%, H36-H3z (excluding H3y0, H3y1), H5832, H4640, H4641, Hyu30, Hyu31	2126F
Diabetes	Long-term conditions	C10, C109J, C109K, C10C, C10D, C10E.%, C10F % (excluding C10F8), C10G.%, C10H.%, C10M.%, C10N.%, PKyP, C10P.%, C10Q	21263, 212H
Heart failure	Cardiovascular	G58.%, G1yz1, 662f.-662i	
Hypertension	Cardiovascular	G2, G20.%, G24-G2z (excluding G24z1, G2400, G2410, G27), Gyu2, Gyu20	21261, 212K
Obesity	Lifestyle	22K5, 22K7, 22KC, 22KD, 22KE 22K (with BMI 30+)	
Serious mental illness (SMI)	Mental health	E10.%, E110.%, E111.%, E1124, E1134, E114-E117z, E11y.% (excluding E11y2), E11z, E11z0, E11zz, E12.%, E13.% (excluding E135), E212, Eu2.%, Eu30.%, Eu31.%, Eu323, Eu328, Eu333, Eu32A, Eu329	
Stroke	Cardiovascular	G61.% (excluding G617), G63y0-G63y1, G64.%, G66.% (excluding G669), G6760, G6W., G6X., Gyu62-Gyu66, Gyu6F, Gyu6G, G65-G654, G656-G65zz, ZV12D, Fyu55, G63y0-G63y1, G64.%, G665, G666, G6760, G6W, G6X, Gyu63-Gyu66, Gyu6G	

Appendix 2

Table 3 Variables and inclusion criteria for THIN data extraction

	Variables	Criteria
Selecting active patients	<ul style="list-style-type: none"> • Unique combined patient identifier • Sex • Age • Unique patient identifier within GP practice • Townsend score (most recently recorded score) 	<ul style="list-style-type: none"> • Valid demography record • Permanent patient registration • Active practice in England • Aged 15-74
Co-morbidities master – a complete diagnosis (all conditions)	<ul style="list-style-type: none"> • Unique combined patient identifier • Sex • Age • Townsend score (most recently recorded score) • Read code • Event date • Condition • Condition category • Read code type (diagnosis/resolved) • QOF age for condition • BMI • Condition number (distinct conditions numbered by event date with the most recent event recorded as 1) 	<ul style="list-style-type: none"> • Medical record integrity is acceptable • Non-missing event date • Condition presence based on eligible read code and age restrictions as defined by QOF Business Rules
Co-morbidities	<ul style="list-style-type: none"> • Unique combined patient identifier 	<ul style="list-style-type: none"> • Most recently recorded diagnosis of

	Variables	Criteria
distinct – latest active diagnosis of each condition	<ul style="list-style-type: none"> • Sex • Age • Townsend score (most recently recorded score) • Condition • Condition category • QOF age for condition • Diagnosis date (most recent) • Resolved date (if condition was diagnosed and resolved prior to the latest diagnosis) 	<p>each condition</p> <ul style="list-style-type: none"> • Active diagnosis (diagnosis event date must be more recent than resolved event date)

Appendix 3

The below tables provide full results presented in the research report **Severe mental illness (SMI) and physical health inequalities**.

Table 4 Age and sex distribution of patients with a diagnosis of SMI compared with all THIN patients

Age group (years)	Number of females (%)		Number of males (%)	
	SMI	THIN	SMI	THIN
0-4	*	41675 (5.80)	*	43450 (6.20)
5-9	*	44388 (6.18)	*	46931 (6.70)
10-14	*	43555 (6.06)	*	44903 (6.41)
15-19	56 (1.09)	38711 (5.39)	54 (1.05)	39793 (5.68)
20-24	206 (4.01)	44611 (6.21)	251 (4.86)	42289 (6.04)
25-29	289 (5.62)	50896 (7.08)	364 (7.05)	48289 (6.89)
30-34	361 (7.02)	51788 (7.21)	473 (9.17)	49431 (7.06)
35-39	402 (7.82)	49555 (6.90)	557 (10.79)	49166 (7.02)
40-44	444 (8.63)	46651 (6.49)	524 (10.16)	48224 (6.88)
45-49	534 (10.39)	50580 (7.04)	639 (12.38)	51957 (7.42)
50-54	558 (10.85)	50704 (7.05)	628 (12.17)	51680 (7.38)
55-59	511 (9.94)	42977 (5.98)	512 (9.92)	44259 (6.32)
60-64	377 (7.33)	35733 (4.97)	351 (6.80)	35701 (5.10)
65-69	400 (7.78)	36119 (5.03)	307 (5.95)	33769 (4.82)
70-74	323 (6.28)	30582 (4.26)	236 (4.57)	27662 (3.95)
75-79	271 (5.27)	22620 (3.15)	136 (2.64)	18975 (2.71)
80-84	193 (3.75)	18128 (2.52)	77 (1.49)	13614 (1.94)
85-89	137 (2.66)	11931 (1.66)	32 (0.62)	7339 (1.05)
90+	76 (1.48)	7496 (1.04)	17 (0.33)	3163 (0.45)
Total	5142	718700	5160	700595

Key: * = counts below 6

Table 5 Prevalence of SMI by sex, age group and deprivation patients aged 15 to 74

	Sub-group	Number of people with SMI	Number of people in THIN	Prevalence as % (95% Confidence Intervals - CIs)
Sex	Female	4461	528907	0.84 (0.82-0.87)
	Male	4896	522220	0.94 (0.91-0.96)
Age group (years)	15-34	2054	365808	0.56 (0.54-0.59)
	35-54	4286	398517	1.08 (1.04-1.11)
	55-74	3017	286802	1.05 (1.02-1.09)
Deprivation quintile	Least deprived	1204	221301	0.54 (0.51-0.58)
		1060	160233	0.66 (0.62-0.70)
		1548	169934	0.91 (0.87-0.96)
		1821	144240	1.26 (1.21-1.32)
	Most deprived	1709	95678	1.79 (1.70-1.87)

Table 5 Prevalence (age and sex standardised) of physical health conditions for SMI and all patients aged 15 to 74

Condition	Prevalence (%) in SMI patients (95% CIs)	Prevalence (%) in THIN patients	Rate ratio*
Obesity	12.82 (12.12-13.55)	7.03	1.8
Asthma	12.35 (11.48-13.26)	10.02	1.2
Hypertension	12.05 (11.41-12.72)	11.50	1.0
Diabetes	9.51 (8.92-10.12)	4.94	1.9
COPD	2.90 (2.59-3.24)	1.39	2.1
Cancer	2.42 (2.13-2.73)	2.66	0.9
CHD	2.42 (2.13-2.73)	2.02	1.2
Stroke	1.59 (1.36-1.85)	0.98	1.6
Atrial fibrillation	0.86 (0.70-1.06)	0.95	0.9
Heart failure	0.82 (0.65-1.01)	0.55	1.5

* Rate ratio = prevalence in SMI/prevalence in all patients. **Bold** indicates if SMI prevalence is significantly higher

Table 6 Age-specific prevalence of physical health conditions by age group for SMI patients and all patients aged 15 to 74

Condition	Age group (years)	Prevalence (%) in SMI patients (95% CIs)	Prevalence (%) in THIN patients	Rate Ratio*
Obesity	15-34	7.01 (5.98-8.20)	2.33	3.0
	35-54	15.10 (14.06-16.20)	8.11	1.9
	55-74	18.66 (17.31-20.09)	11.51	1.6
Asthma	15-34	15.00 (13.52-16.60)	11.85	1.3
	35-54	11.99 (11.05-13.00)	9.23	1.3
	55-74	8.95 (7.98-10.02)	8.77	1.0
Hypertension	15-34	1.36 (0.94-1.96)	0.43	3.2
	35-54	9.75 (8.90-10.68)	7.66	1.3
	55-74	29.40 (27.80-31.05)	30.95	0.9
Diabetes	15-34	2.39 (1.81-3.14)	0.65	3.7
	35-54	9.80 (8.94-10.73)	3.77	2.6
	55-74	18.93 (17.57-20.36)	12.04	1.6

* Rate Ratio = prevalence in SMI/prevalence in all patients. **Bold** indicates if SMI prevalence is significantly higher.

Table 7 Prevalence (age standardised) of physical health conditions by sex for SMI and all patients aged 15 to 74

Sex	Condition	Prevalence (%) in SMI patients (95% CIs)	Prevalence (%) in THIN patients	Rate Ratio*
Female	Obesity	13.94 (12.91-15.03)	7.89	1.8
	Asthma	13.87 (12.53-15.30)	10.36	1.3
	Hypertension	11.34 (10.48-12.26)	10.71	1.1
	Diabetes	8.69 (7.89-9.56)	4.03	2.2
	COPD	2.62 (2.22-3.08)	1.31	2.0
	Cancer	2.94 (2.51-3.43)	3.16	0.9
	CHD	1.36 (1.07-1.70)	1.08	1.3
	Stroke	1.44 (1.14-1.79)	0.81	1.8
	Atrial fibrillation	0.55 (0.37-0.78)	0.60	0.9
	Heart failure	0.67 (0.48-0.92)	0.39	1.7
Male	Obesity	11.68 (10.75-12.67)	6.15	1.9
	Asthma	10.81 (9.71-11.97)	9.66	1.1
	Hypertension	12.77 (11.83-13.77)	12.30	1.0
	Diabetes	10.34 (9.49-11.23)	5.86	1.8
	COPD	3.19 (2.72-3.71)	1.47	2.2
	Cancer	1.89 (1.53-2.31)	2.17	0.9
	CHD	3.49 (3.00-4.05)	2.97	1.2
	Stroke	1.74 (1.40-2.15)	1.15	1.5
	Atrial fibrillation	1.18 (0.90-1.53)	1.31	0.9
	Heart failure	0.96 (0.71-1.27)	0.72	1.3

* Rate Ratio = prevalence in SMI/prevalence in all patients. **Bold** indicates if SMI prevalence is significantly higher.

Table 8 Prevalence (age, sex and deprivation standardised) of physical health conditions for SMI and all patients aged 15 to 74

Condition	Prevalence (%) in SMI patients (95% CIs)	Prevalence (%) in THIN patients	Rate Ratio*
Obesity	12.86 (11.98-13.78)	7.03	1.8
Asthma	12.01 (11.11-12.95)	10.02	1.2
Hypertension	12.02 (11.22-12.85)	11.50	1.0
Diabetes	9.36 (8.65-10.10)	4.94	1.9
COPD	2.58 (2.25-2.95)	1.39	1.9
Cancer	2.85 (2.45-3.28)	2.66	1.1
CHD	2.65 (2.26-3.08)	2.02	1.3
Stroke	1.74 (1.43-2.08)	0.98	1.8

* Rate Ratio = prevalence in SMI/prevalence in all patients. **Bold** indicates if SMI prevalence is significantly higher

Table 9 Prevalence (age and sex standardised) of physical health conditions (obesity, asthma, hypertension and diabetes) by deprivation quintile for SMI and all patients aged 15 to 74

Condition	Deprivation quintile	Prevalence (%) in SMI patients (95% CIs)	Prevalence (%) in THIN patients	Rate Ratio*
Obesity	Least deprived	13.80 (11.78-16.06)	6.43	2.1
		12.29 (10.28- 14.59)	6.72	1.8
		12.90 (11.15-14.82)	7.02	1.8
		11.80 (10.29-13.47)	6.73	1.8
	Most deprived	13.15 (11.14-15.05)	7.49	1.8
Asthma	Least deprived	9.62 (7.86-11.64)	10.57	0.9
		11.04 (8.97-13.44)	10.19	1.1
		12.89 (11.01-14.98)	10.43	1.2
		14.31 (12.39-16.41)	10.60	1.4
	Most deprived	14.15 (12.10-16.43)	11.12	1.3
Hypertension	Least deprived	11.64 (9.85-13.66)	12.90	0.9
		12.37 (10.47-14.51)	12.70	1.0
		13.10 (11.48-14.88)	12.07	1.1
		11.03 (9.70-12.49)	11.08	1.0
	Most deprived	11.88 (10.44-13.46)	11.50	1.0
Diabetes	Least deprived	7.96 (6.46-9.70)	4.47	1.8
		9.86 (8.12-11.86)	4.84	2.0
		9.39 (8.03-10.93)	5.33	1.8
		9.01 (7.81-10.35)	5.74	1.6
	Most deprived	12.19 (10.62-13.92)	6.62	1.8

* Rate Ratio = prevalence in SMI/prevalence in all patients. **Bold** indicates if SMI prevalence is significantly higher

Table 10 Prevalence (age and sex standardised) of physical health conditions (COPD, cancer, CHD and stroke) by deprivation quintile for SMI and all patients aged 15 to 74

Condition	Deprivation quintile	Prevalence (%) in SMI patients (95% CIs)	Prevalence (%) in THIN patients	Rate Ratio*
COPD	Least deprived	1.28 (0.73-2.06)	0.94	1.4
		2.57 (1.77- 3.61)	1.21	2.1
		3.26 (2.49-4.20)	1.57	2.1
		3.45 (2.75-4.28)	1.89	1.8
	Most deprived	3.12 (2.44-3.94)	2.44	1.3
Cancer	Least deprived	3.66 (2.71-4.84)	3.53	1.0
		3.44 (2.49-4.62)	3.17	1.1
		2.34 (1.69-3.16)	2.67	0.9
		2.16 (1.59-2.85)	2.29	0.9
	Most deprived	1.90 (1.32-2.64)	2.01	0.9
CHD	Least deprived	3.39 (2.39-4.66)	2.06	1.6
		2.39 (1.61-3.42)	2.18	1.1
		2.84 (2.13-3.71)	2.19	1.3
		2.02 (1.49-2.68)	2.19	0.9
	Most deprived	1.95 (1.43-2.61)	2.45	0.8
Stroke	Least deprived	2.02 (1.29-3.00)	1.00	2.0
		1.49 (0.89-2.32)	1.01	1.5
		2.22 (1.59-3.01)	1.09	2.0
		1.24 (0.83-1.77)	1.10	1.1
	Most deprived	1.40 (0.92-2.04)	1.18	1.2

*

Rate Ratio = prevalence in SMI/prevalence in all patients. **Bold** indicates if SMI prevalence is significantly higher.

Table 11 Prevalence of physical health co-morbidities for SMI and patients aged 15 to 74

Number of conditions	Prevalence (%) in SMI patients (95% CIs)	Prevalence (%) in THIN patients	Rate Ratio*
Any physical health condition	41.44 (40.45-42.45)	29.50	1.4
2 or more	15.57 (14.85-16.32)	8.73	1.8
3 or more	5.07 (4.64-5.53)	2.74	1.8
4 or more	1.62 (1.39-1.90)	0.80	2.0
5 or more	0.41 (0.30-0.56)	0.2	1.9

* Rate Ratio = prevalence in SMI/prevalence in all patients. **Bold** indicates if SMI prevalence is significantly higher.

Table 12 Prevalence (age and sex standardised) of 3 and more physical health co-morbidities for SMI and all patients aged 15 to 74

	Sub-group	Prevalence (%) in SMI patients (95% CIs)	Prevalence (%) in THIN patients	Rate Ratio*
Sex	Female	4.03 (3.52-4.60)	2.40	1.7
	Male	4.67 (4.10-5.30)	3.08	1.5
Age group (years)	15-34	0.44 (0.23-0.83)	0.09	5.1
	35-54	2.99 (2.52-3.54)	1.26	2.4
	55-74	11.17 (10.10-12.34)	8.18	1.4
Deprivation quintile	Least deprived	3.83 (2.82-5.07)	2.54	1.5
		3.27 (2.33-4.45)	2.68	1.2
		4.97 (3.99-6.11)	2.90	1.7
		4.08 (3.32-4.97)	3.15	1.3
	Most deprived	4.30 (3.48-5.26)	3.68	1.2

* Rate Ratio = prevalence in SMI/prevalence in all patients. **Bold** indicates if SMI prevalence is significantly higher.

References

- ¹ DE Hert M and others. 'Physical illness in patients with severe mental disorders' *World Psychiatry* 2011: volume 10, issue 1, pages 52-77 (viewed on 2 July 2018)
- ² Chesney E and others. 'Risks of all-cause and suicide mortality in mental disorders: a meta-review' *World Psychiatry* 2014: volume 13, issue 2, pages 153-160 (viewed on 2 July 2018)
- ³ Hayes JF and others. 'Mortality gap for people with bipolar disorder and schizophrenia: UK-based cohort study 2000-2014' *The British Journal of Psychiatry* 2017: volume 211, pages 175-181 (viewed on 2 July 2018)
- ⁴ The Mental Health Taskforce, NHS England. 'Five Year Forward View for Mental Health' 2016 (viewed on 2 July 2018)
- ⁵ John A and others. 'Premature mortality among people with severe mental illness' *Schizophrenia Research* 2018 (available online only) (viewed on 2 July 2018)
- ⁶ Appleby L and others. 'Safety First: Five-year report of the National Confidential Inquiry into Suicide and Homicide by People with Mental Illness' 2001 (viewed on 2 July 2018)
- ⁷ Reilly, S and others 'Inequalities in physical comorbidity: a longitudinal comparative cohort study of people with severe mental illness in the UK' *British Medical Journal* 2015: vol. 5, issue 12 (available online only) (viewed on 2 July 2018)
- ⁸ Clinical Practice Research Datalink. 'Welcome to Clinical Practice Research Datalink', accessed 2 July 2018
- ⁹ IQVIA. 'The Health Improvement Network (THIN)', accessed 2 July 2018
- ¹⁰ NHS Digital. 'General Practice Extraction Service', accessed 2 July 2018
- ¹¹ Reilly, S, Olier, I, Planner, C et al, 2015. 'Inequalities in physical comorbidity: a longitudinal comparative cohort study of people with severe mental illness in the UK'. *British Medical Journal*. vol. 5, no. 12
- ¹² QuintilesIMS. 2017. 'THIN Data Guide for Researchers. Version: 1705
- ¹³ Blak, BT, Thompson, M, Dattani, M, 2011. 'Generalisability of The Health Improvement Network (THIN) database: demographics, chronic disease prevalence and mortality rates.' *Informatics in Primary Care*. vol. 19, issue. 4. p251-255
- ¹⁴ Hardoon, S, Hayes, J F, Blackburn, R,. 'Recording of Severe Mental Illness in United Kingdom Primary Care, 2000–2010'. *PLOS ONE* 2013: volume 8, number 12 (available online only) (viewed on 2 July 2018)
- ¹⁵ NHS Digital. 'Quality and Outcome Framework (QOF) business rules', accessed 2 July 2018
- ¹⁶ NHS Digital, 2018. 'Quality and Outcomes Framework (QOF) 2016/17 results', accessed 2 July 2018
- ¹⁷ NHS Digital, 2017. 'Quality and Outcomes Framework (QOF) – 2016-17', accessed 2 July 2018
- ¹⁸ NHS Digital, 2017. 'Quality and Outcomes Framework – Prevalence, Achievements and Exceptions Report', accessed 2 July 2018
- ¹⁹ Public Health England, 2017. 'Technical Guide Calculating Directly Standardised Rates', accessed 2 July 2018
- ²⁰ Greenland S and others 'Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations' *European Journal of Epidemiology* 2016: volume 31, pages 337-350 (viewed 2 August 2018)
- ²¹ Public Health England. 'Fingertips: Technical Guidance', accessed 2 July 2018
- ²² University College London. 'THIN data: Strengths & Limitations', accessed 2 July 2018