Disparities in diabetes treatment and monitoring for people with and without mental disorders: a systematic review and meta-analysis

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Summary

Background People with mental disorders have an increased risk of diabetes, yet conflicting evidence exists regarding the quality of diabetes care they receive. To address this evidence gap, we conducted a systematic review and meta-analysis to assess and compare diabetes quality of care in people with diabetes with mental disorders versus people with diabetes without mental disorders.

Methods In this systematic review and random-effects meta-analysis, we searched Scopus, Embase, MEDLINE, and PsycINFO for cohort and case-control studies published between database inception and Feb 8, 2025. We estimated summary odds ratios (ORs) for diabetes quality of care indicators in individuals with any mental disorder versus without mental disorders to investigate the association between the presence of a mental disorder and diabetes quality of care indicators, including overall diabetes monitoring and treatment. Studies were excluded if it was not possible to generate pooled quantitative data. The primary outcome was a binary composite measure of diabetes quality of care, meaning the percentage of people receiving any diabetes monitoring and treatment (ie, urine albumin-creatinine ratio test, HbA_{1c} test, blood pressure measured, foot surveillance, serum creatinine test, serum cholesterol test, BMI recorded, smoking status recorded, retinal monitoring). Secondary outcomes were study-specific diabetes quality of care individual indicators matched to the nine NICE diabetes monitoring indicators and specific diabetes interventions and anti-diabetes medications. We analysed primary and secondary outcomes according to any mental disorder and to specific diagnostic subgroups. Study quality was evaluated using the Newcastle–Ottawa Scale (NOS).

Findings Data from 49 studies (42 cohort and seven case-control) were included, comprising 5 503 712 individuals with diabetes, of whom 838 366 (15·2%) had a diagnosed mental disorder (defined using ICD-9 or ICD-10 criteria in 40 studies). Sex was reported in 35 of 49 studies, comprising 4 250 666 individuals, 1 956 506 (46·0%) of whom were female and 2 294 160 (54·0%) were male. The mean age was 61·4 years (SD 8·7; range 47–82 years). 38 studies reported on various mental disorders, 21 on mood disorders spectrum, 21 on major depressive disorder, 20 on schizophrenia, 11 on bipolar disorder, 11 on substance use disorder spectrum, including alcohol use disorder, six on dementia, five on anxiety disorder spectrum, and one on personality disorder spectrum. Most studies were high quality and spanned Asia, North America, Europe, and Australasia. Significant negative associations were observed between having any mental disorder and the likelihood of receiving any recommended diabetes monitoring (29 studies, OR=0·81 [95% CI 0·70–0·94], p=0·0049). Negative associations were also observed for HbA_{1c} measurement (24 studies, 0·81 [0·68–0·97], p=0·024), retinal screening (21 studies, 0·77 [0·63–0·95], p=0·013), lipid and cholesterol measurement (20 studies, 0·83 [0·69–0·99], p=0·043), foot examination (11 studies, 0·85 [0·76–0·95], p=0·0044), and renal investigation (16 studies, 0·78 [0·63–0·96], p=0·022). A significant positive association was found between any mental disorder and recorded smoking status (two studies, 1·09 [1·02–1·17]; p=0·0076). Any mental disorder was significantly associated with higher odds of receiving insulin (ten studies, 1·52 [95% CI 1·16–1·99]; p=0·0022), but negatively associated with treatment with a GLP-1 receptor agonist (two studies, 0·26 [0·13–0·49]; p<0·0001). There was no evidence of publication bias.

Interpretation Mental disorders are negatively associated with receiving adequate diabetes monitoring and GLP-1 agonist therapy. Addressing these disparities has the potential to address the increased mortality associated with mental disorders.

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Research in context

Evidence before this study

People with mental disorders have higher cardiometabolic mortality than the general population. One potential explanation is that they receive lower quality diabetes care, such as low rates of diabetes monitoring and inadequate treatment, which might lead to unfavourable outcomes for both diabetes and mental disorders. We comprehensively searched Scopus, Embase, MEDLINE, and PsycINFO and PubMed, with the terms "mental disorder", "diabetes", "quality of care" for systematic reviews and meta-analyses in any language from database inception to Feb 8, 2025. We identified no previous meta-analysis quantifying disparities in diabetes quality of care indicators between those with versus those without mental disorders. We augmented the search with a manual search for individual case-control and cohort studies and identified numerous studies focusing on individuals with severe mental illness; studies examining other mental disorders were relatively scarce. The findings were mixed: a few single studies reported equal or even better quality of care among people with mental disorders, but most studies indicated inferior quality of care compared with people without mental disorders. The studies used inconsistent subsets of diabetes quality of care indicators, limiting comparability across findings.

Added value of this study

To the best of our knowledge, this is the first comprehensive evidence synthesis of quantitative estimates of disparities in diabetes quality of care indicators and treatment rates in people affected by diabetes with versus without mental disorders. We analysed 49 studies comprising data on over 5·5 million individuals, and we found that the presence of any mental disorder was associated with lower rates of diabetes monitoring—including HbA_{1c}, retinal, lipid, renal, and foot examinations—compared with people without a mental disorder. Additionally, having any mental disorder was associated with less frequent use of GLP-1 agonist therapies and more frequent insulin prescriptions, suggesting disparities in access to novel treatments. Disparities were present for any mental disorder and within individual diagnostic groups, were more pronounced in men than women.

Implications of all the available evidence

Efforts are needed to enhance diabetes monitoring among both men and women with mental disorders and to enhance access to novel treatments, such as GLP-1 agonists. Partners in primary care and preventive services, including general practitioners and specialty psychiatric care providers, should address this gap in health system organisation and clinical practice. Future large-scale, multicentre randomised controlled trials evaluating multicomponent diabetes quality of care improvement strategies and care models in people with mental disorders are needed to determine which of those strategies are most effective (and most cost-effective) to ensure appropriate diabetes monitoring for individuals with mental disorders.

Introduction

Diabetes drives premature mortality and has severe health consequences, including vision loss, end-stage renal disease, lower-limb amputations, and cardiovascular events.[1] Effective management through lifestyle and pharmacological interventions decreases the risk of these adverse outcomes.[2] Clinical guidelines, such as those by the National Institute for Health and Care Excellence (NICE),[3] identify diabetes quality of care indicators.

Diabetes is up to three times more prevalent among people with a mental disorder compared with the general population;[1] they also have higher rates of other cardiovascular risk factors (eg, metabolic syndrome, poor nutrition, sedentary lifestyle, and smoking), all of which lead to poor cardiovascular health and premature mortality in people with mental disorders.[4,5] Some medications for mental disorders are associated with increased risk of metabolic syndrome components and type 2 diabetes.[6] Furthermore, mental disorders are a leading cause of poor outcomes in people with physical conditions (eg, depressive disorders can worsen diabetes outcomes).[7]

Inadequate diabetes management probably contributes to the premature mortality among people with mental disorders.[8] Psychiatric symptoms can compromise diabetes self-management and the ability to access and engage with routine care and recommended monitoring and treatment protocols. Despite the mortality gap between people with and without mental disorders, which should trigger intensified, high-quality care in people with mental disorders, disparities in quality of care also include screening, treatment, monitoring, and outcomes for cancer,[9] cardiovascular disease,[10] and other physical conditions.[6]

Although diabetes guidelines provide evidence-based recommendations to limit the risk of diabetes complications,[3] individual studies from different countries and care models offer inconsistent evidence regarding quality of care disparities among people with mental disorders, often due to the guidelines not considering individual mental disorders.[11,12] Currently, only one systematic review has descriptively summarised the evidence on managing cardiovascular risk factors in people with mental disorders.[13] No previous evidence synthesis has mapped diabetes quality of care indicators to established benchmarks in diabetes care (eg, those for adults with diabetes by NICE in the UK[3]) in people with versus without mental disorders. Therefore, this systematic review and meta-analysis aimed to quantify potential disparities in diabetes quality of care between

individuals with versus without mental disorders and to explore moderating factors. By identifying the extent and consistency of these disparities, we aimed to provide valuable evidence to guide interventions and policy efforts to reduce inequities in diabetes management.

Methods

Search strategy and selection criteria

We conducted a Meta-analysis Of Observational Studies in Epidemiology[14] and PRISMA[15] compliant systematic review and meta-analysis (appendix pp 3–8, https://osf.io/u5s2h/).

We included only observational studies, namely cohort and case-control studies with 100 or more participants, to avoid selection and excess of significance bias. Studies needed to include a population with type 1 or type 2 diabetes and to measure the monitoring or treatment of diabetes in people with versus without mental disorders (diagnosed according to the DSM or ICD, any version criteria, or based on clinical diagnosis in clinical records). Studies were excluded if it was not possible to generate pooled quantitative data. The primary outcome was a binary composite measure of quality of care, meaning the percentage of people receiving any diabetes monitoring (ie, the nine NICE diabetes monitoring indicators: urine albumin–creatinine ratio [uACR] test, HbA_{1c} test, blood pressure, foot surveillance, serum creatinine test, serum cholesterol test, BMI, smoking status, and retinal monitoring) or treatment. Secondary outcomes were study-specific diabetes quality of care indicators, which were matched to the nine NICE diabetes monitoring indicators, specific diabetes interventions, and anti-diabetes medications. We focused on ambulatory processes and intermediate outcomes, so hospitalisation for diabetes was not considered a quality of care measure, since it reflects the end result of complex patient, provider, and system factors rather than direct measurement of whether appropriate, evidence-based care was delivered. Therefore, hospitalisation is more accurately a marker of health outcome or health-care use, not a quality of care measure.

We searched Scopus, Embase, MEDLINE, and PsycInfo from database inception to Feb 8, 2025 (appendix pp 8–14) without language restrictions. We also conducted a manual search of references of previous reviews and included studies.[9,10,16]

Four authors (LP, MD, MC, and EW) independently screened the title, abstract, and full-text articles, with every article screened in duplicate. If full data were not available, we requested data from study authors twice. Any disagreements were resolved by discussion or by the senior author (MS). Excluded studies after full-text assessment, with reason for exclusion, are shown in the appendix (pp 14–19).

Data analysis

From the included studies, we extracted author, publication year, country of study conduct, study design, diagnostic criteria for diabetes and mental disorders, specific mental disorder diagnoses, treatment setting, veteran population, diabetes quality of care indicators matched to NICE guidelines (eg, retinal eye examination, foot examination), age, sex, proportion of patient-level moderating factors (eg, race, medical comorbidities, diabetes type, disorders duration, BMI, and psychotropic medications), association measures quantifying disparities in diabetes monitoring or treatment, and raw frequencies. Specific diabetes interventions and anti-diabetes medications were also extracted. Data extraction was performed independently by four authors (LP, MD, EW, and MH). Corresponding authors of included studies were contacted twice to provide missing data. When studies reported multiple timepoints, we extracted the estimate corresponding to the primary or most comprehensive observation period. In most studies, this observation period represented baseline or single-timepoint data; in those reporting longitudinal data, we used the overall or final follow-up estimate. Adjusted effect sizes were preferred, when studies reported both crude and adjusted effect sizes.

Four authors (LP, MD, MC, and EW) independently assessed the study quality with the Newcastle–Ottawa Scale (NOS), with a score of ≥7 indicating high quality.[17]

All diabetes quality of care indicators were matched to the nine NICE indicators (appendix p 20).[3] To improve interpretability and due to absence of specification in original studies, urine albumin or serum creatinine or uACR were combined as renal quality of care outcome and not separated into the two NICE indicators, serum creatinine and uACR. Consequently, eight indicators were analysed. Physical health-care use was a separate outcome since it might be a proxy of monitoring-related and treatment-related outcomes, comprising primary care, general practitioner, and diabetes specialist visits. A higher likelihood of receiving the care indicator among individuals with a mental disorder compared with those without (reflected by an odds ratio [OR] >1, a risk ratio [RR] >1, or a higher percentage) was defined as a positive association.

We used a random-effects model with the restricted maximum likelihood method to estimate between-study heterogeneity to estimate summary ORs with 95% CIs.[18] For meta-analyses including three to ten studies with non-zero between-study variance ($\tau^2>0$), we applied the Hartung–Knapp–Sidik–Jonkmann method to estimate the summary effect confidence interval.[19]

When multiple outcomes (eg, foot examination and retinal examination) or diagnostic subgroups (eg, schizophrenia and bipolar disorder) were reported within a single study, we computed a unique within-study weighted average estimate per study using a standardised approach[20] to account for the dependence between effect sizes from the same study. Effect sizes were converted using the metaConvert *R* package[21] (ie, RRs to ORs, or raw numbers and proportions to

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	Year	Country	Design	With mental disorder	Without mental disorder	Total	Disorder and diagnostic criteria	Type 2 diabetes	SMI	NOS ≥7	Female	Age (mean, years)	Adjusted estimates
Banta et al[25]	2009	USA	Cohort	557	889	1446	SMI; ICD-9	..	Yes	Yes	..	..	Yes
Boulanger et al[26]	2009	USA	Cohort	4240	11 685	15 925	MDD or anxiety disorders; ICD-9-CM	..	No	Yes	51·6%	62·2	No
Bresee et al[27]	2012	Canada	Case-control	2952	126 817	129 769	SCZ; ICD-9, ICD-10	..	Yes	Yes	..	..	Yes
Buchanan et al[28]	2022	USA	Cohort	357 820	324 291	682 111	Any mental disorder; ICD-9-CM	100%	No	Yes	..	..	Yes
Corrao et al[29]	2021	Italy	Cohort	9250	27 725	36 975	SMI; clinical records	..	Yes	No	54·0%	..	No
Das-Munshi et al[30]	2021	UK	Cohort	2272	54 498	56 770	SMI; ICD-10	100%	Yes	Yes	46·0%	62·9	No
Desai et al[31]	2002	USA	Case-control	9025	27 503	36 528	SCZ, SUD; ICD-9	..	No	Yes	13·0%	65·0	No
Dixon et al[32]	2004	USA	Cohort	201	99	300	SMI; clinical records	100%	Yes	No	56·0%	51·8	No
Druss et al[33]	2012	USA	Cohort	118 190	539 438	657 628	Any mental disorder; ICD-9	..	Yes	Yes	67·0%	47·8	Yes
Egede et al[34]	2002	USA	Cohort	85	708	793	MDD; ICD-9-CM	..	Yes	No	79·0%	..	No
Frayne et al[35]	2005	USA	Cohort	76 799	236 787	313 586	Anxiety disorders, BD, MDD, PD, SCZ, SUD; ICD-9-CM	..	Yes	Yes	2·0%	..	No
Frayne et al[36]	2014	USA	Cohort	10 422	42 104	52 526	Anxiety disorders, BD, MDD, PD, SCZ, SUD; ICD-9-CM	..	Yes	Yes	2·0%	64·0	Yes
Gal et al[37]	2017	Israel	Case-control	19 258	38 516	57 774	BD, SCZ; ICD-10	100%	Yes	Yes	51·0%	63·0	Yes
Goldberg et al[38]	2007	USA	Case-control	175	90	265	SMI; clinical records	100%	Yes	No	..	..	Yes
Green et al[39]	2010	USA	Cohort	908	7909	8817	Any mental disorder; ICD-9	..	No	Yes	64·0%	55·0	No
Gungabissoon et al[40]	2022	UK	Cohort	725	3154	3879	Dementia; clinical records	100%	No	Yes	56·0%	79·0	No
Han et al[41]	2021	UK	Case-control	2192	7773	9965	SMI; clinical records	100%	Yes	No	52·0%	58·6	No
Horigian et al[42]	2023	USA	Cohort	6878	30 574	37 452	SUD; clinical records	100%	No	Yes	56·0%	52·9	No
Huang et al[43]	2017	Taiwan	Cohort	144	5492	5636	MDD; ICD-9-CM	85·0%	No	Yes	52·0%	..	No
Hutter et al[44]	2009	Germany	Cohort	40	106	146	SMI; CIDI	..	Yes	Yes	..	..	No
Hwong et al[45]	2021	USA	Cohort	634	18 021	18 655	SMI; ICD-9	100%	Yes	Yes	..	..	Yes
Jones et al[46]	2004	USA	Cohort	6627	24 570	31 197	Any mental disorder; ICD-9	64·6%	Yes	Yes	..	47·1	Yes
Jørgensen et al[47]	2018	Denmark	Cohort	1681	300 957	302 638	SCZ; ICD-10	58·0%	Yes	Yes	42·0%	..	No
Karim et al[48]	2021	Qatar	Case-control	73	73	146	SCZ; clinical records	..	Yes	No	42·0%	51·5	No
Kilbourne et al[49]	2008	USA	Cohort	3558	7385	10 943	MDD, SMI; ICD-9	..	Yes	No	3·0%	65·9	Yes
Knudsen et al[12]	2023	Denmark	Cohort	16 874	199 663	216 537	SMI; ICD-8, ICD-9, ICD-10	100%	Yes	Yes	45·0%	66·3	Yes
Krein et al[50]	2006	USA	Cohort	18 273	18 273	36 546	SMI; ICD-9-CM	..	Yes	Yes	..	..	No
Kreyenbuhl et al[51]	2006	USA	Cohort	95	48	143	SMI; clinical records	100%	Yes	Yes	..	53·0	No
Kreyenbuhl et al[52]	2010	USA	Cohort	11 454	10 560	22 014	SCZ; ICD-9-CM	100%	Yes	Yes	4·0%	60·4	No
Kurdyak et al[53]	2017	USA	Cohort	25 628	1 105 747	1 131 375	SCZ; ICD-9, ICD-10	..	Yes	Yes	48·0%	62·4	Yes
Le et al[54]	2011	USA	Cohort	5826	398 522	404 348	MDD; ICD-9-CM	..	Yes	Yes	47·0%	62·1	No
Le et al[55]	2006	USA	Cohort	2379	55 972	58 351	MDD; ICD-9	..	Yes	No	49·0%	46·7	No
Leung et al[56]	2011	USA	Cohort	26 652	76 402	103 054	MDD; ICD-9-CM	100%	Yes	Yes	53·0%	65·3	Yes
Lunghi et al[57]	2017	Canada	Cohort	3106	70 633	73 739	MDD; ICD-9, ICD-10	100%	Yes	Yes	49·0%	66·0	No
Mai et al[58]	2011	Australia	Cohort	1585	1624	3209	Any mental disorder; ICD-9	..	No	Yes	..	..	Yes
Mangurian et al[59]	2020	USA	Cohort	4399	264 844	269 243	SMI; ICD-9	..	Yes	Yes	47%	61·9	Yes
Morden et al[60]	2010	USA	Cohort	3801	7887	11 688	Any mental disorder, SUD; ICD-9	..	No	Yes	..	..	No
Nazu et al[61]	2020	Finland	Cohort	1604	6984	8588	MDD, dementia; ICD-10	100%	Yes	Yes	48%	67·1	No
Noll et al[11]	2016	USA	Cohort	7061	13 954	21 015	SMI; ICD-9	..	Yes	Yes	61%	52·8	No
O'Neill et al[62]	2023	Canada	Cohort	911	68 601	69 512	SCZ; clinical records	..	Yes	Yes	49%	..	Yes
Quinn et al[63]	2009	USA	Cohort	182	217	399	Dementia; clinical records	..	No	Yes	70%	78·9	No
Rathmann et al[64]	2016	Germany	Case-control	1321	1321	2642	SCZ; ICD-10	100%	Yes	Yes	61%	67·4	No
Scheuer et al[65]	2022	UK	Cohort	7680	151 221	158 901	SMI; ICD-9, ICD-10	100%	Yes	Yes	42%	59·4	Yes

(Table 1 continues on next page)

	Year	Country	Design	With mental disorder	Without mental disorder	Total	Disorder and diagnostic criteria	Type 2 diabetes	SMI	NOS ≥7	Female	Age (mean, years)	Adjusted estimates
(Continued from previous page)													
Spithoff et al[66]	2019	Canada	Cohort	1407	14 070	15 477	SUD; clinical records	..	No	Yes	..	..	No
Ter Braake et al[67]	2024	UK	Cohort	14 145	277 499	291 644	SMI; ICD-9, ICD-10	100%	Yes	Yes	..	60·2	No
Wargny et al[68]	2018	France	Cohort	40 117	47 699	87 816	Dementia; ICD-10	85·8%	No	Yes	58%	81·9	No
Weiss et al[69]	2006	USA	Cohort	214	3594	3808	SCZ; ICD-9	..	Yes	Yes	50%	64·8	Yes
Whyte et al[70]	2007	UK	Cohort	1043	10 000	11 043	SMI; clinical records	..	Yes	Yes	46%	..	Yes
Winkelmayer et al[71]	2005	USA	Cohort	7903	22 847	30 750	Dementia, MDD, SUD; clinical records	..	Yes	Yes	..	..	No

BD=bipolar disorder. CIDI=Composite International Diagnostic Interview. CM=clinical modification. MDD=major depressive disorder. NOS=Newcastle-Ottawa Scale. PD=personality disorder. SCZ=schizophrenia. SMI=severe mental illness. SUD=substance use disorder.

Table 1: **List of included studies**

ORs). If studies from the same population overlapped regarding diagnoses and more than 50% of the time periods, the largest study was analysed, to avoid double-counting participants. Sensitivity analyses focused on monitoring and treatment quality of care indicators, severe mental illness (SMI; ie, schizophrenia, bipolar disorder, or major depressive disorder), individual mental disorders, low-quality studies, case-control studies, studies with non-adjusted estimates, studies with veteran populations only, and studies with inpatients or mixed inpatients and outpatients. Subgroup analyses were conducted by country of origin. Variability not due to sampling error was assessed with the I^2 statistic.[22]

Random-effects meta-regression analyses on the log scale were conducted to explore potential moderators, restricted to those reported in ten or more studies. These moderators included the proportion of male individuals; proportions of type 1 and type 2 diabetes; race; prevalence of cardiovascular disease, hyperlipidaemia, stroke, renal disease, and obesity; duration of mental disorder; duration of diabetes; baseline BMI; and the proportion of individuals using antipsychotic or antidepressant medications.

We conducted the following sensitivity analyses: restricting to studies with a NOS score ≥7, excluding case-control studies, restricting to adjusted estimates, excluding veteran populations, restricting to outpatient populations, and restricting to studies including only type 2 diabetes patients.

Publication bias was assessed via visual inspection of funnel plots and Egger's test when ten or more studies were available per outcome.[23]

All analyses were conducted using R version 4.4.3 and the *meta* package.[24] Some co-authors have family experience of mental disorders or diabetes.

Role of the funding source

There was no funding source for this study.

Results

Of the initial search results, we screened 9530 studies at the title and abstract level, selecting 98 studies for full-text assessment, of which 49 were excluded after full-text assessment. We included 49 studies (42 cohort and 7 case-control), which comprised 5 503 712 individuals with diabetes, of whom 838 366 (15·2%) had a diagnosed mental disorder (defined using ICD-9 or ICD-10 criteria in 40 studies). Only 35 of 49 studies reported sex; this sample of 4 250 666 individuals included 1 956 506 (46·0%) females and 2 294 160 (54·0%) males. The type of diabetes was only reported in 22 out of

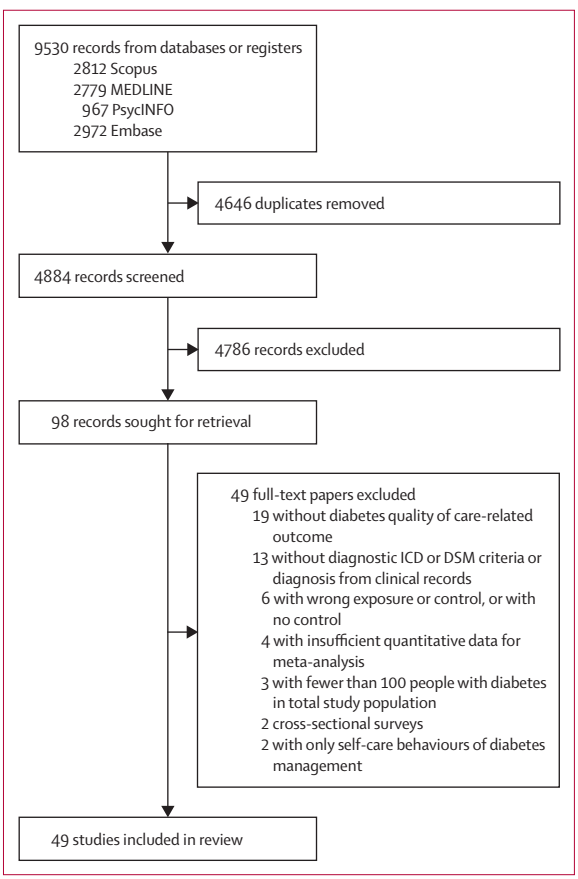

Figure 1: **PRISMA flowchart**

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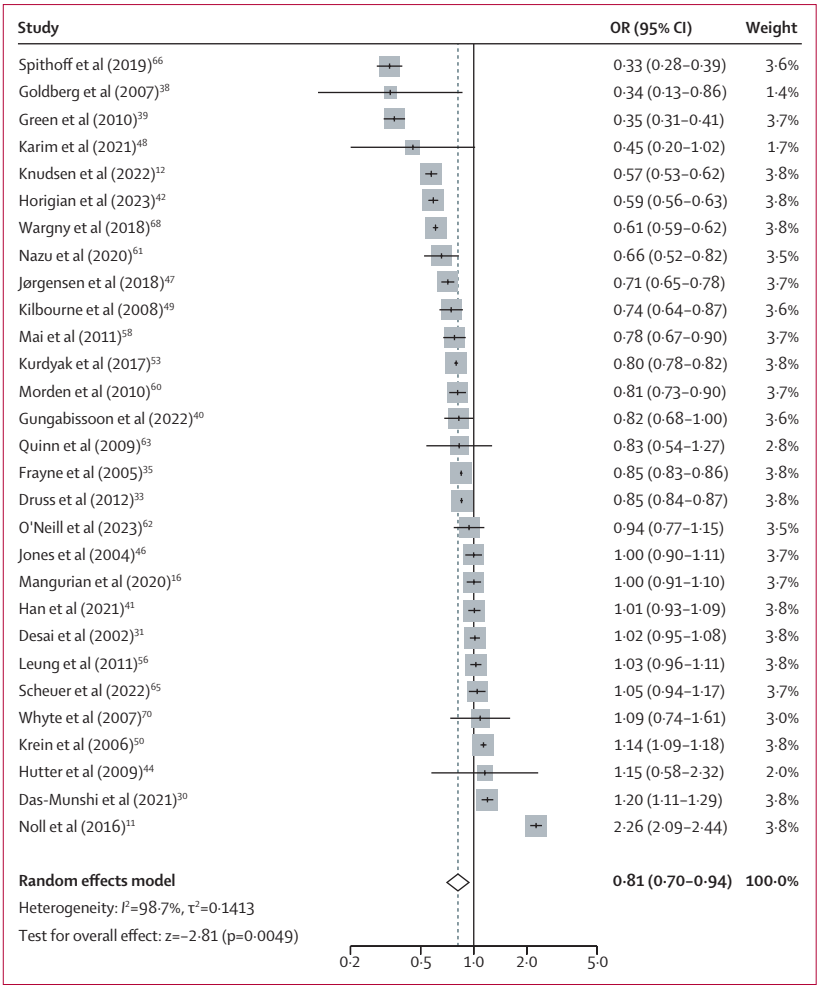

Figure 2: **ORs for diabetes monitoring in people with diabetes and a mental disorder versus people with diabetes and no mental disorder**
OR=odds ratio. SE=standard error.

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49 studies; this sample of 2 171 720 individuals included 2 020 253 (93%) participants with type 2 diabetes. The mean age, reported in 31 of 49 studies, was 61·4 years (SD=8·7; range 47–82 years). Data were collected between 1990 and 2020 (table 1, figure 1). Overall, 38 studies reported on various mental disorders, 21 on mood disorders spectrum, 21 on major depressive disorder, 20 on schizophrenia, 11 on bipolar disorder, 11 on substance use disorder spectrum (including alcohol use disorder), six on dementia, five on anxiety disorder spectrum, and one on personality disorder spectrum. Overall, 19 studies provided adjusted estimates, spanning Asia, North America, Europe, and Australasia. The quality of included studies was high in 41 (84%) studies (median NOS score 8 [IQR=7–9]; appendix pp 21–23).

Any mental disorder was significantly negatively associated with overall diabetes monitoring (k=29, OR=0·81 [95% CI 0·70–0·94]; I^2=99%; p=0·0049; figure 2). There was no evidence of publication bias (appendix p 35). Regarding the secondary outcomes of specific NICE quality of care indicators, any mental disorder was significantly negatively associated with retinal examination (k=21, 0·77 [0·63–0·95]; I^2=99%, p=0·013), HbA_{1c} measurement (k=24, 0·81 [0·68–0·97]; I^2=100%; p=0·024), lipid or cholesterol measurement (k=20, 0·83 [0·69–0·99]; I^2=99%; p=0·043), foot examination (k=11, 0·85 [0·76–0·95]; I^2=92%; p=0·0044) and renal investigation (k=16, 0·78 [0·63–0·96]; I^2=100%; p=0·022). There was a significant positive association between any mental disorder and recorded smoking (k=2, 1·09 [1·02–1·17]; I^2=0%; p=0·0076), whereas associations between any mental disorder and blood pressure measurement (k=8, p=0·61) and BMI recording (k=4, p=0·82) were not significant (table 2).

There was a significant positive association between any mental disorder and physical health-care use (k=17, OR 1·59 [95% CI 1·30–1·94]; I^2=99%; p<0·0001; table 2). There was no evidence of publication bias (appendix p 37). Any mental disorder was not significantly associated with treatment (k=22; p=0·87; figure 3). There was no evidence of publication bias (appendix p 36). No significant association emerged between being prescribed any anti-diabetic medication and the presence of any mental disorder (k=9; p=0·32).

Any mental disorder was significantly associated with higher odds of receiving insulin (k=10, OR 1·52 [95% CI 1·16–1·99]; I^2=99%; p=0·002). In contrast, a significant negative association was observed between any mental disorder and treatment with a GLP-1 receptor agonist (k=2, 0·26 [0·13–0·49]; I^2=0%; p<0·0001). There were no significant associations between any mental disorder and non-insulin anti-diabetic medications (k=11, p=0·99), lipid-lowering drugs (k=7, p=0·50), dietary counselling (k=2, p=0·33), or flu vaccination (k=2, p=0·63). Mental disorders were significantly associated with lower odds of receiving antihypertensive medications (k=5, 0·72 [0·52–0·98]; I^2=81%; p=0·044) and diabetes education referral (k=2, 0·39 [0·27–0·58]; I^2=0%; p<0·001). Finally, in a single study, a significant positive association was observed between mental disorders and receipt of smoking cessation advice (k=1, 2·19 [1·78–2·68]; p<0·001; table 1).

In sensitivity analyses, associations between any mental disorder and any diabetes monitoring remained significant when excluding studies with non-adjusted estimates (k=8, OR 0·82 [95% CI 0·69–0·98]; I^2=96%; p=0·026), low-quality studies (k=25, 0·83 [0·71–0·97]; I^2=99%; p=0·019), case-control studies (k=25, 0·82 [0·70–0·96]; I^2=99%; p=0·012), or studies with veteran populations (k=24, 0·79 [0·67–0·94]; I^2=99%; p=0·0087; appendix p 31). When inpatient or mixed inpatient and outpatient populations were excluded, associations became non-significant (k=11, p=0·12). In sensitivity analyses for any diabetes treatment, associations remained non-significant (all p>0·41; appendix p 31).

In meta-regression analyses, the associations between the proportion of male participants and the likelihood of

receiving any diabetes monitoring were not significant (k=23, p=0·92; appendix p 31). Similarly, the associations between diabetes monitoring and mean age (k=19, p=0·65), proportion of individuals with type 1 diabetes (k=12, p=0·41) or type 2 diabetes (k=11, p=0·46), proportion of White participants (k=12, p=0·94), proportion of Black participants (k=12, p=0·24), or median observation period (k=28, p=0·39) were non-significant.

There was a significant negative association between the proportion of male participants and the likelihood of receiving any diabetes treatment (β –0·011 [95% CI –0·021 to –0·0002]; p=0·021). There were no significant associations between diabetes treatment and mean age (k=19, p=0·97), proportion of White participants (k=10, p=0·93), proportion of individuals with type 1 diabetes (k=14, p=0·80) or type 2 diabetes (k=14, p=0·57), or the median observation period (k=32, p=0·23; appendix p 31).

In subgroup analyses by country, significant associations emerged for diabetes monitoring. Negative associations—indicating lower odds of monitoring—were found in studies from Australia (k=1, OR 0·78 [95% CI 0·67–0·90]; p<0·001), Denmark (k=2, 0·64 [0·52–0·79]; I^2=93%; p<0·001), Finland (k=1, 0·66 [0·52–0·82]; p<0·001), and France (k=1, 0·61 [0·59–0·62]; p<0·001), whereas non-significant associations were found in the UK (k=5, p=0·61) and the USA (k=15, p=0·15).

For diabetes treatment, country-specific associations also emerged; however, results were mainly based on a single study per country (appendix p 32). A negative association was found in Italy (k=1, OR 0·82 [95% CI 0·78–0·86]; p<0·001), whereas positive associations were observed in Israel (k=1, 1·12 [1·02–1·23]; p=0·023) and Germany (k=1, 1·41 [1·13–1·75]; p=0·002). In terms of subgroups of mental disorders, there were significant negative associations between SMI and retinal examination (k=14, OR 0·76 [95% CI 0·62–0·94]; I^2=98%; p=0·01) and foot examination (k=8, 0·82 [0·70–0·95]; I^2=82%; p=0·011). No significant associations were found between SMI and renal investigation (k=10, p=0·21), HbA_{1c} testing (k=17, p=0·68), BMI (k=4, p=0·27), blood pressure (k=8, p=0·62), smoking status (k=3, p=0·22), and lipid status measurement (k=16, p=0·42).

SMI was significantly positively associated with insulin use (k=8, OR 1·59 [1·14–2·22]; I^2=99%; p=0·006). No significant associations were found between SMI and receipt of any anti-diabetic treatment (k=7, p=0·28), non-insulin anti-diabetic treatment (k=9, p=0·49), or lipid-lowering therapy (k=6, p=0·26). In a single study, SMI showed a significant positive association with prescribed smoking cessation treatment (k=1, 2·19 [1·78–2·68]; p<0·001). SMI was significantly positively associated with physical health-care use (k=17, 1·59 [1·31–1·94]; I^2=99%; p<0·001).

	k	OR (95% CI)	p value	I^2
Any mental disorder				
NICE diabetes monitoring indicators				
Retinal examination	21	0·77 (0·63–0·95)	0·013	99%
HbA_{1c} recorded	24	0·81 (0·68–0·97)	0·024	100%
Lipid status recorded	20	0·83 (0·69–0·99)	0·043	99%
Foot examination	11	0·85 (0·76–0·95)	0·0044	92%
Renal investigation	16	0·78 (0·63–0·96)	0·022	100%
Blood pressure recorded	8	1·08 (0·77–1·52)	0·61	95%
BMI recorded	4	1·01 (0·86–1·19)	0·82	63%
Smoking status recorded	2	1·09 (1·02–1·17)	0·0076	0
Anti-diabetes and other treatment				
Anti-diabetes, any	9	1·17 (0·83–1·64)	0·30	98%
Anti-diabetes, insulin	10	1·50 (1·16–1·99)	0·0022	99%
Anti-diabetes, non-insulin	11	1·00 (0·83–1·20)	0·99	99%
GLP-1RA	2	0·26 (0·13–0·49)	<0·0001	0
Lipid lowering drugs	7	0·93 (0·73–1·19)	0·50	96%
Antihypertensive treatment	5	0·72 (0·52–0·98)	0·044	81%
Diet counselling	2	0·77 (0·45–1·31)	0·33	55%
Diabetes education referral	2	0·39 (0·27–0·58)	<0·0001	0
Flu vaccination	2	1·04 (0·89–1·20)	0·63	0
Smoking cessation	1	2·19 (1·78–2·68)	<0·0001	NA
Other				
Physical health-care use	17	1·59 (1·30–1·94)	<0·0001	99%
Severe mental illness				
NICE diabetes monitoring indicators				
Retinal examination	14	0·76 (0·62–0·94)	0·010	98%
HbA_{1c} recorded	17	0·96 (0·80–1·16)	0·68	98%
Lipid status recorded	16	0·92 (0·74–1·13)	0·42	99%
Foot examination	8	0·82 (0·70–0·95)	0·011	82%
Renal investigation	10	0·83 (0·62–1·11)	0·21	99%
BMI recorded	4	1·04 (0·97–1·12)	0·27	59%
Blood pressure recorded	8	1·08 (0·80–1·46)	0·62	95%
Smoking status recorded	3	1·06 (0·97–1·16)	0·22	0
Anti-diabetes and other treatment				
Anti-diabetes, any	7	1·24 (0·84–1·83)	0·28	97%
Anti-diabetes, insulin	9	1·59 (1·14–2·22)	0·0064	99%
Anti-diabetes, non-insulin	9	0·91 (0·69–1·20)	0·49	98%
Lipid lowering medication	6	0·91 (0·76–1·08)	0·26	96%
Antihypertensive treatment	5	0·75 (0·63–0·88)	0·0006	64%
Diabetes education referral	2	0·40 (0·25–0·65)	0·0002	0
Diet counselling	2	0·77 (0·45–1·31)	0·33	55%
Flu vaccination	1	1·03 (0·78–1·37)	0·83	NA
Smoking cessation	1	2·19 (1·78–2·68)	<0·0001	NA
Other				
Physical health-care use	17	1·59 (1·31–1·94)	<0·0001	99%
Schizophrenia				
NICE diabetes monitoring indicators				
Retinal examination	8	0·74 (0·51–1·08)	0·12	97%
HbA_{1c} recorded	9	0·88 (0·68–1·14)	0·33	98%
Lipid status recorded	9	0·86 (0·66–1·12)	0·27	98%
Foot examination	4	0·85 (0·70–1·04)	0·12	90%
Renal investigation	6	0·72 (0·46–1·11)	0·14	99%

(Table 2 continues on next page)

	k	OR (95% CI)	p value	I^2
(Continued from previous page)				
Blood pressure recorded	4	1·01 (0·65–1·55)	0·98	94%
BMI recorded	2	0·71 (0·27–1·86)	0·49	87%
Smoking status recorded	2	1·07 (0·97–1·17)	0·19	0
Anti-diabetes and other treatment				
Anti-diabetes, any	4	1·27 (1·19–1·35)	<0·0001	7%
Anti-diabetes, insulin	3	1·59 (0·86–2·96)	0·14	88%
Anti-diabetes, non-insulin	4	0·60 (0·46–0·78)	0·0001	77%
Lipid-lowering medication	4	0·90 (0·84–0·96)	0·0030	44%
Antihypertensive treatment	3	0·51 (0·24–1·06)	0·071	83%
Diabetes education referral	2	0·42 (0·25–0·69)	0·0007	0
Diet counselling	1	0·50 (0·23–1·10)	0·083	NA
Other				
Physical health-care use	7	1·03 (0·87–1·23)	0·69	97%
Bipolar disorder				
NICE diabetes monitoring indicators				
Retinal examination	5	0·75 (0·49–1·15)	0·19	90%
HbA_{1c} recorded	5	0·87 (0·68–1·10)	0·24	91%
Lipid status recorded	5	0·91 (0·69–1·19)	0·49	95%
Foot examination	2	1·02 (0·89–1·15)	0·82	0
Renal investigation	3	0·92 (0·47–1·80)	0·80	99%
Blood pressure recorded	1	0·98 (0·76–1·26)	0·88	NA
BMI recorded	1	1·09 (0·87–1·36)	0·45	NA
Smoking status recorded	1	0·96 (0·79–1·16)	0·68	NA
Anti-diabetes and other treatment				
Anti-diabetes, any	1	0·96 (0·86–1·08)	0·54	NA
Lipid-lowering medication	1	0·97 (0·87–1·08)	0·55	NA
Other				
Physical health-care use	2	1·31 (1·25–1·38)	<0·0001	0
Major depressive disorder				
NICE diabetes monitoring indicators				
Retinal examination	5	0·80 (0·55–1·16)	0·24	98%
HbA_{1c} recorded	5	0·86 (0·72–1·04)	0·13	90%
Lipid status recorded	5	0·84 (0·70–1·01)	0·063	95%
Foot examination	3	0·84 (0·72–0·98)	0·031	89%
Renal investigation	3	0·79 (0·59–1·06)	0·12	98%
Blood pressure recorded	1	1·03 (0·93–1·14)	0·56	NA
BMI recorded	1	0·95 (0·87–1·03)	0·24	NA
Smoking status recorded	1	1·12 (1·03–1·21)	0·0058	NA
Anti-diabetes and other treatment				
Anti-diabetes, any	2	1·86 (0·66–5·21)	0·24	99%
Anti-diabetes, insulin	3	2·07 (1·20–3·57)	0·0087	99%
Anti-diabetes, non-insulin	3	1·37 (0·98–1·92)	0·068	96%
Lipid-lowering medication	2	1·08 (0·82–1·40)	0·59	99%
Antihypertensive treatment	1	0·84 (0·78–0·91)	<0·0001	NA
Other				
Physical health-care use	4	2·36 (1·63–3·40)	<0·0001	90%
Mood disorders				
NICE diabetes monitoring indicators				
Retinal examination	6	0·80 (0·58–1·11)	0·19	93%
HbA_{1c} recorded	6	0·89 (0·74–1·06)	0·18	87%
Lipid status recorded	6	0·88 (0·73–1·08)	0·22	94%

(Table 2 continues on next page)

Schizophrenia was not significantly associated with any of the diabetes quality of care indicators. There were significant negative associations between schizophrenia and non-insulin anti-diabetic treatment (k=4, OR 0·60 [95% CI 0·46–0·78]; I^2=77%; p<0·001), lipid-lowering medication use (k=4, 0·90 [0·84–0·96]; I^2=44%; p=0·003), and diabetes education referral (k=2, 0·42 [0·25–0·69]; I^2=0%; p<0·001), whereas there was a significant positive association between schizophrenia and treatment with any anti-diabetic agent (k=4, 1·27 [1·19–1·35]; I^2=7%; p<0·001). Schizophrenia was not significantly associated with physical health-care use (k=7, p=0·69; table 2; appendix p 34).

There were no significant associations between bipolar disorder and any diabetes quality of care indicators or other diabetes monitoring or treatment outcomes. However, a significant positive association was found between bipolar disorder and physical health-care use (k=2, OR 1·31 [95% CI 1·25–1·38]; I^2=0%; p<0·001; table 2; appendix p 34).

There was a significant negative association between major depressive disorder and foot examination (k=3, OR 0·84 [95% CI 0·72–0·98]; I^2=89%; p=0·031) and antihypertensive treatment (k=1, 0·84 [0·78–0·91]; p<0·001). Positive associations emerged for recording of smoking status (k=1, 1·12 [1·03–1·21]; p=0·006), insulin use (k=3, 2·07 [1·20–3·57]; I^2=99%; p=0·009), and physical health-care use (k=4, 2·36 [95% CI 1·63–3·40]; I^2=90%; p<0·001).

There were significant positive associations between substance use disorders and renal investigation (k=3, OR 1·13 [95% CI 1·07–1·20]; I^2=0%; p<0·001) and physical health-care use (k=2, 1·28 [1·12–1·48]; I^2=52%; p<0·001; table 2). No significant associations were found for the other diabetes quality of care indicators (table 2; appendix p 34).

There were significant negative associations between dementia and HbA_{1c} measurements (k=4, OR 0·63 [95% CI 0·43–0·91]; I^2=92%; p=0·014), retinal investigation (k=3, 0·60 [0·52–0·69]; I^2=59%; p<0·001), and renal investigation (k=2, 0·69 [0·67–0·71]; I^2=0%; p<0·001).

There was a significant negative association between dementia and antihypertensive treatment (k=1, OR 0·82 [95% CI 0·74–0·91]; p<0·001) and a significant positive association between dementia and insulin treatment (k=1, 1·38 [1·13–1·69]; p=0·002). No other significant associations emerged (table 2). Outcomes in other specific mental disorder groups were reported in a single study only (ie, anxiety and personality disorders; table 2).

Discussion

In our meta-analysis of over 5·5 million individuals with diabetes (predominantly type 2), we found comprehensive quantitative evidence for disparities in diabetes care between people with versus without mental disorders. Mental disorders were negatively associated with

guideline-recommended retinal examination, HbA_{1c} testing, lipid or cholesterol assessment, foot examination, and renal investigation. Mental disorders were negatively associated with GLP-1 agonist prescription and positively associated with insulin use and physical health-care use.

The lower rates of GLP-1 agonist use might be partly due to early concerns about suicidality risk, which have not been supported by recent evidence.[72] Additionally, socioeconomic disparities evident in GLP-1 agonist use[73] might contribute to reduced access to and uptake of these branded therapies in people with mental disorders. Lower GLP-1 agonist use in people with mental disorders should be addressed via additional research, training and education, and policies, including updated guidelines. Higher insulin use might indicate more severe clinical pictures at presentation, which is a potential proxy of longer duration of untreated diabetes. Higher insulin use might also reflect higher rates of type 1 diabetes in individuals with mental disorders. Although physical health-care use was higher among people with mental disorders than those without, this did not translate into improved diabetes monitoring rates (except in the study by Noll and colleagues[11]). This finding suggests there is an increased clinical complexity or diabetes severity and poorer self-management capacity in individuals with mental disorders, and a gap in the use of effective treatments, which results in increased cardiovascular mortality in individuals with mental disorders.[4,5]

In the study by Noll and colleagues of Medicaid recipients in the USA,[11] the high availability of health-care providers in the urban region, combined with participation in a managed care plan featuring a designated primary care provider and a separate behavioural health carve-out programme with case management for people with severe mental disorders, might have neutralised or compensated for the typical disparities in diabetes quality of care. This finding suggests that such gaps in care can be effectively addressed.[11]

Our findings align with more recent literature on reverse integration models[74] and intersectoral collaboration,[75] which show that service design—including where and how care is delivered and coordinated—is a crucial determinant of quality of care. Future efforts to address diabetes care disparities in people with mental disorders should therefore go beyond guideline adherence and focus on scalable, sustainable care delivery models that facilitate integration across clinical domains and provider types.

Sensitivity analyses confirmed the robustness of the findings, although exclusion of inpatient or both inpatient and outpatient populations rendered the association non-significant, suggesting that care settings influence monitoring practices. Subgroup analyses further indicated that national context contributed to variability in diabetes monitoring and treatment, highlighting the importance of health-care system factors. There was no evidence of publication bias in the primary outcome results.

	k	OR (95% CI)	p value	I^2
(Continued from previous page)				
Foot examination	3	0·90 (0·80–1·02)	0·11	61%
Renal investigation	4	0·89 (0·59–1·33)	0·56	99%
Blood pressure recorded	1	1·01 (0·85–1·19)	0·95	NA
BMI recorded	1	1·02 (0·88–1·18)	0·82	NA
Smoking status recorded	1	1·04 (0·91–1·18)	0·59	NA
Anti-diabetes and other treatment				
Anti-diabetes, any	5	1·46 (0·87–2·45)	0·16	95%
Anti-diabetes, insulin	5	1·75 (1·12–2·72)	0·013	98%
Anti-diabetes, non-insulin	4	1·30 (0·96–1·77)	0·091	94%
Lipid-lowering medication	3	0·60 (0·19–1·88)	0·38	92%
Antihypertensive treatment	2	0·75 (0·48–1·19)	0·22	36%
Diabetes education referral	1	0·36 (0·20–0·65)	0·0006	NA
Other				
Physical health-care use	8	1·73 (1·28–2·36)	0·0004	96%
Substance use disorders				
NICE diabetes monitoring indicators				
Retinal examination	5	0·91 (0·58–1·43)	0·69	93%
HbA_{1c} recorded	5	0·90 (0·61–1·35)	0·62	98%
Lipid status recorded	3	1·03 (0·53–1·99)	0·94	99%
Foot examination	2	0·87 (0·75–1·02)	0·081	0
Renal investigation	3	1·13 (1·07–1·20)	<0·0001	0
Anti-diabetes and other treatment				
Antihypertensive treatment	1	0·89 (0·75–1·05)	0·17	NA
Other				
Physical health-care use	2	1·28 (1·12–1·48)	0·0004	52%
Dementia				
NICE diabetes monitoring indicators				
Retinal examination	3	0·60 (0·52–0·69)	<0·0001	59%
HbA_{1c} recorded	4	0·63 (0·43–0·91)	0·014	92%
Lipid status recorded	3	0·52 (0·17–1·59)	0·25	98%
Foot examination	1	0·84 (0·71–1·01)	0·059	NA
Renal investigation	2	0·69 (0·67–0·71)	<0·0001	0
Anti-diabetes and other treatment				
Anti-diabetes, insulin	1	1·38 (1·13–1·69)	0·0020	NA
Anti-diabetes, non-insulin	1	0·63 (0·17–2·32)	0·49	NA
Lipid-lowering medication	1	1·09 (0·90–1·32)	0·40	NA
Antihypertensive treatment	1	0·82 (0·74–0·91)	0·0002	NA
Flu vaccination	1	1·04 (0·87–1·24)	0·66	NA
Anxiety disorders				
NICE diabetes monitoring indicators				
Retinal examination	1	1·09 (1·04–1·13)	0·0002	NA
HbA_{1c} recorded	1	0·81 (0·79–0·83)	<0·0001	NA
Lipid status recorded	1	0·92 (0·89–0·95)	<0·0001	NA
Personality disorders				
NICE diabetes monitoring indicators				
Retinal examination	1	0·89 (0·84–0·93)	<0·0001	NA
HbA_{1c} recorded	1	0·73 (0·68–0·79)	<0·0001	NA
Lipid status recorded	1	0·75 (0·69–0·81)	<0·0001	NA

Diabetes quality of care indicators for adults with type 2 diabetes defined by NICE. GLP-1RA=glucagon-like peptide-1 receptor agonist. NA=not applicable. NICE=National Institute for Health and Care Excellence. OR=odds ratio.

Table 2: **NICE diabetes monitoring benchmarks in people with diabetes and with versus without any mental disorder**

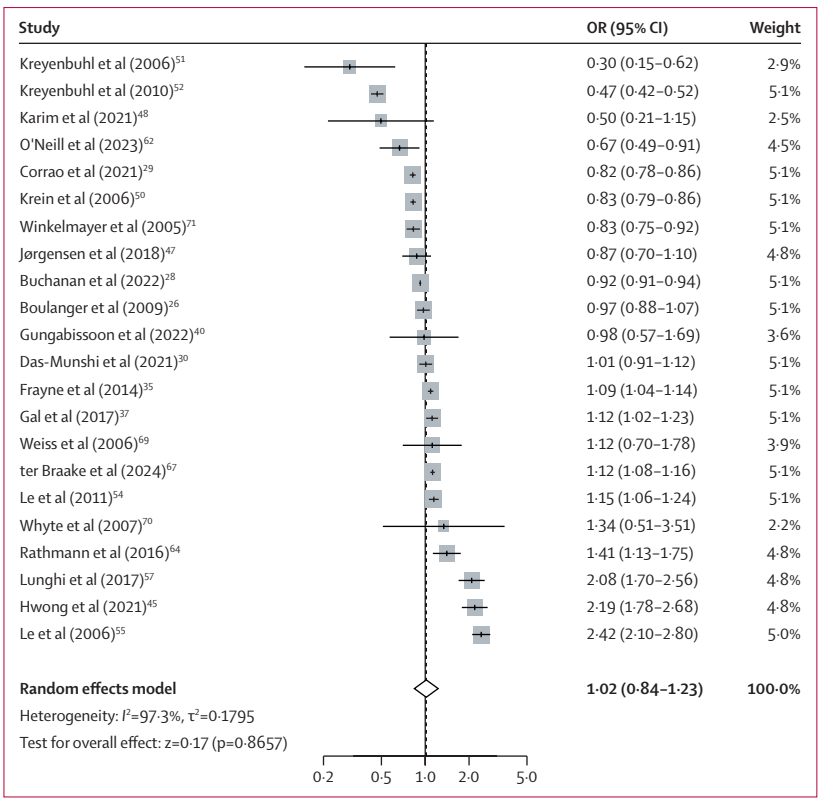

Figure 3: **ORs for diabetes treatment in people with diabetes and a mental disorder versus people with diabetes and no mental disorder**
OR=odds ratio.

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The reasons for the observed disparities in diabetes monitoring indicators are probably multifactorial. Contributing factors include fragmentation within health-care systems (eg, psychiatrists often do not collaborate adequately with diabetes care providers), stigma, diagnostic overshadowing, patient-level barriers (eg, impaired daily functioning and reduced self-care), and a scarcity of integrated guidelines and awareness among mental health professionals. A recent systematic review focusing on health-care professionals' perspectives identified several additional barriers to delivering type 2 diabetes care to individuals with SMI.[76] These barriers included challenges in communication, unclear role boundaries, and a lack of confidence or training among providers. The review emphasised the need for collaborative health-care environments that actively support type 2 diabetes care, improved communication between professionals and service users, and a clear delineation of roles and responsibilities to enhance care delivery.[76]

Lower quality of diabetes care only partly explains the mortality gap between people with and without mental disorders, particularly SMI. Poor cardiovascular risk management probably plays a key role, especially in the context of modifiable lifestyle factors and preventive actions, such as early off-label metformin use in schizophrenia.[10] Evidence on the balance between the beneficial and harmful effects of antidepressant[77] and antipsychotic[78] prescribing on diabetes treatment and outcomes is still limited. It is crucial to establish clear, minimal transdisciplinary benchmarks for guideline-recommended diabetes monitoring and treatment—representing the minimal standard of care. Additionally, there is an urgent need to implement effective multicomponent strategies for managing risk factors in individuals affected by both diabetes and mental disorders.[78] Although some NICE diabetes quality of care indicators reflect good clinical practice in the context of antipsychotic safety monitoring, foot and retinal examinations are specific to diabetes care and showed consistent gaps across all mental disorder groups. We observed less pronounced quality of care gaps in people with SMI and its diagnostic entities compared with the any mental disorders category, and it is possible that psychotropic medications at least partly mitigate the gap.[77] Another potential explanation is that the prescription of antipsychotics increases the use of cardiometabolic medications,[79] which could enhance routine monitoring of metabolic measures in clinical practice. Improved diabetes care might decrease mortality due to vision loss, infection, or renal diseases;[2] therefore, ensuring optimal monitoring is crucial. Although there was only evidence from a single study, disparities in other mental disorders, such as anxiety disorders and personality disorders, were also present.

The present meta-analysis has several limitations. First, the composite outcome of any diabetes monitoring or treatment assumes homogeneity of relevance of the individual items, which is unlikely to be the case. Second, for some of the individual outcomes and mental disorders, the number of studies was small. Third, the studies included were performed in different countries with different diabetes guidelines, care models, and follow-up periods, so high heterogeneity was present in most of the analyses. Since high heterogeneity persisted in the sensitivity and subgroup analyses, these results must be interpreted with caution. Fourth, countries in Africa, South America, and Asia were either not represented or were under-represented; therefore, results are not globally representative and indeed mostly mirror US quality of care processes, since most studies were based in the USA. Fifth, for specific mental disorders, for which few studies existed, results should be considered preliminary. Hence, more studies are needed within specific mental disorders. For instance, depending on the health-care system, people with dementia might or might not be followed by mental health services, so context-specific variability with local findings should be explored. Sixth, although type 2 diabetes was predominant in the included studies, several studies did not specify the diabetes type. More evidence is needed from individuals with type 1 diabetes. Seventh, information on the proportion of people treated with antipsychotic or

antidepressant medications was only available in three studies.[30,32,69] Eighth, we could only analyse referral to and not uptake of diabetes education or anti-diabetic treatments that were described in the analysed studies. Ninth, despite aiming to minimise selection and excess of significance bias, the threshold of sample size >100 was an arbitrary one. Tenth, we did not adjust for multiple testing in our meta-analyses. However, we have used conservative methods to estimate the 95% CI of the effect size. Finally, there were insufficient quantitative data on GLP-1 agonist use and diabetes quality of care for the analyses stratified on specific mental disorders.

Our findings highlight persistent gaps in diabetes quality of care for people with mental disorders, warranting targeted interventions to address these inequities. The findings also underscore the need to address underlying structural and organisational barriers to guide preventive actions regarding diabetes quality of care in high-risk populations. These results should inform best practices in evidence-based monitoring and treatment guidelines for people with both diabetes and a mental disorder. Randomised controlled trials evaluating multicomponent diabetes quality of care improvement strategies in people with mental disorders are needed.[1] Improving quality of care will also depend on the adoption of system-level strategies, including integrated care models, proactive coordination mechanisms, and sustainable financing approaches that support continuity across mental and physical health services. Especially for people with SMI and diabetes, it is crucial to consider how to effectively implement diabetes quality of care benchmarks and quality of care improvement strategies regarding feasibility, economic resources, and sustainability to decrease premature mortality and extend the health span.

Contributors

LP, MD, EW, MH, MC, and MM performed the systematic literature search, selected eligible studies, and extracted data. EW, AH, MH, and MS wrote the manuscript. EW and MH performed the statistical analyses. A librarian performed the search. CUC, RIGH, and MS conceptualised the study, verified underlying data, and supervised the first authors during all processes of the manuscript. SDØ, MH, JGF, REN, AH, IHH, RIGH, CUC, SC, AFC, LB, ED, EDR, JF, RDG, KL, PL, MM, MN, KS-Z, A-AV, WM, AH, BS, HT, DV, ED, EW, and MS contributed to the design of the study. All authors contributed to the interpretation of the results of the study. All authors contributed to critical revisions of the manuscripts and approved the final version of the manuscript before submission. EW and MH are the guarantors of this work and, as such, had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Declaration of interests

MH received honoraria for lectures from and has been a consultant for Lundbeck and Otsuka. MS received honoraria from and has been a consultant for Angelini, AbbVie, Bausch Health, Boehringer Ingelheim, DynaMed, Lundbeck, Otsuka, and Teva, and holds shares of MESAS, S2M. SDØ received the 2020 Lundbeck Foundation Young Investigator Prize. SDØ owns and has owned units of mutual funds with stock tickers DKIGI, IAIMWC, SPIC25KL, and WEKAFKI, and exchange traded funds with stock tickers BATE, TRET, QDV5, QDVH, QDVE, SADM, IQQH, USPY, EXH2, 2B76, IS4S, OM3X, EUNL, and SXRV. SC is funded by the NIHR for this research project (NIHR303122). The views expressed in this publication are those of the authors and not necessarily those of the NIHR, NHS, or the UK Department of Health and Social Care. SC is also supported by NIHR grants NIHR203684, NIHR203035, NIHR130077, NIHR128472, and RP-PG-0618–20003 and by grant 101095568-HORIZONHLTH-2022-DISEASE-07–03 from the European Research Executive Agency. SC has declared reimbursement for travel and accommodation expenses from the Association for Child and Adolescent Central Health (ACAMH) in relation to lectures delivered for ACAMH, the Canadian ADHD Alliance Resource, the British Association of Psychopharmacology, and Healthcare Convention and CCM Group team for educational activity on ADHD and has received honoraria from Medice. CUC has been a consultant or advisor to or has received honoraria from AbbVie, Alkermes, Allergan, Angelini, Aristo, Boehringer Ingelheim, Bristol-Meyers Squibb, Cardio Diagnostics, Cerevel, CNX Therapeutics, Compass Pathways, Darnitsa, Delpor, Denovo, Eli Lilly, Gedeon Richter, Hikma, Holmusk, IntraCellular Therapies, Jamjoom Pharma, Janssen, Johnson & Johnson, Karuna, LB Pharma, Lundbeck, MedInCell, MedLink, Merck, Mindpax, Mitsubishi Tanabe Pharma, Maplight, Mylan, Neumora Therapeutics, Neuraxpharm, Neurocrine, Neurelis, Newron, Noven, Novo Nordisk, Otsuka, PPD Biotech, Recordati, Relmada, Reviva, Rovi, Saladax, Sanofi, Seqirus, Servier, Sumitomo Pharma America, Sunovion, Sun Pharma, Supernus, Tabuk, Takeda, Teva, Terran, Tolmar, Vertex, Viatris, and Xenon Pharmaceuticals. CUC has provided expert testimony for Janssen, Lundbeck, and Otsuka and has served on a Data Safety Monitoring Board for Compass Pathways, IntraCellular Therapies, Relmada, Reviva, and Rovi. CUC has received grant support from Boehringer Ingelheim, Janssen, and Takeda; has received royalties from UpToDate; and is a stock option holder of Cardio Diagnostics, Kuleon Biosciences, LB Pharma, Medlink, Mindpax, Quantic, and Terran. EW has been invited to advisory boards from Boehringer Ingelheim, Teva and Recordati. RIGH received honoraria for lectures from Boehringer Ingelheim Eli Lilly, Novo Nordisk, MSD, ROVI, and USV. EV has received grants and served as consultant, advisor, or CME speaker for AB-Biotics, Abbott, AbbVie, Adamed, Adium, Alcediag, Angelini, Biogen, Beckley-Psytech, Biohaven, Boehringer Ingelheim, Casen-Recordati, Celon Pharma, Compass, Dainippon Sumitomo Pharma, Esteve, Ethypharm, Ferrer, Gedeon Richter, GH Research, Glaxo-Smith Kline, HMNC, Intra-Cellular therapies, Idorsia, Johnson & Johnson, Lundbeck, Luye Pharma, Medincell, Merck, Mitsubishi Tanabe Pharma, Newron, Novartis, Organon, Orion Corporation, Otsuka, Roche, Rovi, Sage, Sanofi-Aventis, Sunovion, Takeda, Teva, and Viatris, outside the submitted work. REN has received funding for research or been an investigator for Lundbeck Pharmaceuticals, Otsuka Pharmaceuticals, Compass Pharmaceuticals, Sage, Boehringer Ingelheim, and Janssen-Cilag. REN has received speaking fees from Bristol-Myers Squibb, Astra Zeneca, Janssen Cilag, Lundbeck Pharmaceuticals, Otsuka Pharmaceuticals, Teva, and Eli Lilly, and has been part of an advisory board for Astra Zeneca, Eli Lilly, Lundbeck Pharmaceuticals, Otsuka Pharmaceuticals, Takeda, Janssen-Cilag, and Medivir. HL is funded by the Swedish Research Council (2025-03176). HL reports receiving grants from Shire–Takeda Pharmaceuticals; personal fees from and serving as a speaker for Medice, Shire–Takeda Pharmaceuticals, and Evolan Pharma AB; all outside the submitted work. HL is Editor in Chief of JCPP Advances. PL reports institutional grants from AstraZeneca, MSD, NovoNordisk, and Roche. AH has served as a consultant for AbbVie, Axunio, Boehringer Ingelheim, Lundbeck, Otsuka, and Teva; has served as an advisory board member for or received speakerships from AbbVie, Advanz, Boehringer Ingelheim, Janssen, Lundbeck, Otsuka, Recordati, and Rovi; and is the Editor of the German schizophrenia guideline. All other authors declare no competing interests.

Data sharing

The data collected and analysed during the current study are available from the corresponding author upon reasonable request.

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See **Online** for appendix

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