

Table 1 Summary of studies investigating the association between mental health conditions and COVID-19 vaccine intention

Studies reporting less vaccine intention in people with mental health conditions								
Author	Region	Data source (Assessment timing)	Population	Size	Mental health conditions and measure	Confounder	Vaccine intention measure	Results
Dvorsky et al. (2022)	US	Survey (ADHD diagnostic evaluations were conducted pre-COVID-19. Data for vaccine outcomes were collected in spring 2020, summer 2020, fall 2020, and spring 2021.)	Adolescents in 11th and 12th grade	196 (male=87, mean age=17.5)	Attention-deficit/hyperactivity disorder (ADHD) Self-reported clinical diagnosis	No confounder adjusted.	"If a vaccine that could prevent COVID-19 were made available to you, would you accept it for yourself?" (No/Maybe/Yes/Already vaccinated)	Only 61.8% of adolescents with ADHD reported vaccine acceptance, compared to 81.3% of adolescents without ADHD. Adolescents with ADHD were significantly less likely to report intent to accept the COVID-19 vaccine, than adolescents without ADHD.
Eyllon et al. (2022)	US	Survey and electronic health record (Data were collected from February to May 2021)	Patients registered at a group medical practice	14365 (male=38%, female=63%)	Major depressive disorder, generalized anxiety disorder, other anxiety disorders, posttraumatic stress disorder (PTSD), attention deficit and hyperactivity disorder (ADHD), alcohol use disorder (AUD), and substance use disorder (SUD). Clinical diagnosis according to the International Classification of Diseases, Tenth Revision (ICD-10), obtained from medical records	Adjusted for gender, age, race, education, income, and payer type.	Participants were asked if they had received at least one dose of a COVID-19 vaccine. For those who had not yet received a vaccine, they were asked about their intention to be vaccinated (Yes/Unsure/I don't know/Probably would not/Definitely would not)	Vaccine hesitancy was significantly more prevalent among participants with substance use (29.6%), attention deficit and hyperactivity (23.3%), posttraumatic stress (23.1%), bipolar (18.0%), generalized anxiety (16.5%), major depressive (16.1%), and other anxiety (15.5%) disorders, and tobacco use (18.6%). After adjustment for sociodemographic characteristics and physical comorbidities, SUD conferred 68% higher odds for vaccine hesitancy. Bipolar disorder was associated with 35% lower odds for vaccine hesitancy. Nicotine dependence/tobacco use was associated with vaccine hesitancy.
Jefsen (2021)	Denmark	Longitudinal survey (The surveys were fielded from 9 February to 22 February 2021 (patient sample) and from 4 February to 21 February 2021 (general population sample).	Randomly selected patients with mental illness from the psychiatric services of the Central Denmark Region and one targeting the	Mental illness patients = 992, general Danish population = 2458	Not described Clinical diagnosis obtained from medical records	No confounder adjusted.	"Have you been offered vaccination against coronavirus? (Yes/No/Do not wish to answer). For those answered Yes: "Have you accepted this offer?" (Yes/No/Do not wish to answer). For those answered otherwise: "Will you accept vaccination against	Vaccine willingness was high in both groups, but slightly lower amongst patients with mental illness (84.8%), compared with the general population (89.5%).

			general Danish population				coronavirus, once it is offered to you? (Yes/No/Do not wish to answer)	
Sekizawa et al. (2022)	Japan	Longitudinal survey (Wave 1 was conducted from October 27 to November 6, 2020. Vaccine outcomes were assessed only at Wave 3, between April 23 and May 6, 2021)	Community sample	11846 (male=50%, female=50%) participants.	Depression, anxiety Self-reported survey: Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 scale (GAD-7)	Adjusted for sex, age group, level of education, family members living together, employment, annual household income, bank and saving deposit amount, BMI, pre-existing conditions, and region of residence.	"Are you going to receive a vaccine against COVID-19?" (Willing to be vaccinated/Unwilling to be vaccinated/Undecided)	After adjusting for other factors, those with moderate-to-severe depression at wave 1 and 3 were more likely to be undecided than those who were not depressed. After adjusting for other factors, those who were mildly depressed at wave 1, moderately depressed at wave 3, and moderate-severely anxious at wave 3 were significantly more likely to be unwilling to be vaccinated.
Studies reporting greater vaccine intention in people with mental health conditions								
Author	Region	Data source	Population	Size	Mental health conditions and measure	Confounder	Vaccine intention measure	Results
Nguyen et al. (2022)	US	Longitudinal survey (Data were collected March 17–29, 2021)	Nationally representative sample of the population recruited from the community	77104 adults (30% had anxiety symptoms, 25% had depression symptoms, 35% had symptoms of either disorder)	Anxiety and depression Self-reported survey: the two-item Patient Health Questionnaire (PHQ-2) and the two-item Generalized Anxiety Disorder (GAD-2) scale	Analysis conducted both unadjusted and adjusted for sex.	"Have you received a COVID-19 vaccine?" (yes/no) For people who answered no, they were asked "Once a vaccine to prevent COVID-19 is available to you, would you...definitely/probably/probably not/or definitely not get a vaccine."	Adults with anxiety or depression were more likely to intend to get a vaccine than those without these conditions.
Raffard et al. (2022)	France	Survey (Data were collected between April 2021 and October 2021.)	Patients with diagnosis of schizophrenia	100 patients (female=38%) and 72 family caregivers (female=26%)	Schizophrenia Clinical diagnosis obtained from medical records	No confounder adjusted.	"If a vaccine for COVID-19 is available for me, I would get it". (1, strongly disagree – 4, strongly agree)	Among the non-vaccinated participants, the proportion of individuals intending to be vaccinated was significantly higher in patients compared to controls ($p = 0.03$, $\Phi = 0.29$).
Studies reporting no difference in vaccine intention in people with and without mental health conditions								
Author	Region	Data source	Population	Size	Mental health measure	Confounder	Vaccine intention measure	Results
Abramovich et al. (2022)	Canada	Survey (Data were collected between January 2021 to June 2021.)	2SLGBTQ+ youth (average age = 20 years) experiencing homelessness. The majority were White 61% (n = 56); identified their gender identity as transgender or gender	92	Anxiety, depression, substance use Self-reported survey	No confounder adjusted.	"Do you plan on receiving the COVID-19 vaccine?" (Yes or have already received it/No/Unsure)	Having mild-to-severe depression or anxiety were not significantly associated with less vaccine intentions compared to those with minimal depression or anxiety.

			diverse (n = 53; ~58%); and their sexual orientation as bisexual or pansexual (n = 40; ~ 43%).					
Afifi et al. (2021)	Canada	Longitudinal survey (Vaccine outcomes and current mental health data were collected at wave 3, between November and December 2020)	Young people between the age of 14-17 years (male=45%, female=55%).	1000 at baseline (2016-2017), 747 at wave 2 (2019) and 664 in wave 3 (664)	Depression, bipolar disorder, anxiety disorder, obsessive-compulsive disorder, posttraumatic stress disorder, attention-deficit/hyperactivity disorder, eating disorder, alcohol problems, drug problems, oppositional defiant disorder, and conduct disorder Self-reported current mental health conditions "Do you currently have a long-term health condition that is expected to last or has lasted 6 months or more and has been diagnosed by a medical doctor or other health care professional?"	No confounder adjusted.	"If a COVID-19 vaccine was available would you get it?" (Yes/No/Maybe/I don't know)	Having a mental health conditions were not significantly related to willingness to get a COVID-19 vaccine. Among people reporting having current mental health conditions, willingness to get a COVID-19 vaccine were: 67% yes, 9% no, 25% unsure. Among those without current mental health conditions, willingness were 65% yes, 9% no, 26% unsure.
Khaled (2021)	Qatar	Survey (Data were collected from 15 December 2020 through 25 January 2021)	Nationally representative sample of the population recruited from the community	1038 (male=67%, female=33%)	Depression and anxiety Self-reported survey: the Physician Health Questionnaire (PHQ-9) and the 7-item Generalized Anxiety Disorder Questionnaire (GAD-7)	Adjusted for age, gender, migrant status/type, ethnicity, education, employment, marital status, living arrangement, chronic disease, and COVID-19 related health conditions and concerns	"I am willing to get coronavirus vaccine if it became available for me" (5-point Likert Scale: 1 = Strongly agree, 2 = Somewhat agree, 3 = Neutral, 4 = Somewhat disagree, 5 = Strongly disagree). Responses were collapsed into three groups: vaccine accepting (strongly agree), vaccine resistant or refusers (strongly disagree) and vaccine hesitant (somewhat agree, neutral, somewhat disagree)	Having moderate-to-severe depression or anxiety did not significantly predict willingness to access COVID-19 vaccines, after controlling for other factors.
Nishimi et al. (2022)	US	Longitudinal survey Baseline data on mental health and COVID-19 experiences were collected in August-September 2020.	The sample included community-dwelling US adults with high levels of pre-pandemic	544 (male=21%, female=77%, other=3%)	posttraumatic stress disorder (PTSD) Self-reported survey: 20-item posttraumatic stress disorder (PTSD) Checklist-5 (PCL-5)	Adjusted for sexual orientation, race/ethnicity, education, income, political preference, living with children, medical conditions	"Have you received at least one shot of COVID-19 vaccine?" (yes/no) For people who answered no, they were asked "Once a vaccine to prevent COVID-19 is available to you, would	PTSD symptom clusters were not significantly associated with COVID-19 vaccine hesitancy in the full sample.

		Follow-up data on mental health and vaccine perceptions and intentions were collected in March-April 2021.) (trauma and trauma-related distress based on sample recruitment.			contraindicating COVID-19 vaccines, perceived likelihood of contracting COVID-19, perceived severity of COVID-19 if contracted, COVID-19 test, COVID-19 infection in one's household.	you...definitely/probably/not sure/probably not/or definitely not get a vaccine.”	
Paul and Fancourt (2022)	UK	Longitudinal survey (Data on intent to receive a COVID-19 booster vaccine were collected 22 November to 6 December 2021. Data on initial intent to receive a first COVID-19 vaccine were collected 2 December 2020 to 31 March 2021. Data on receipt of at least two doses of a COVID-19 vaccine were collected at follow-up.)	Fully vaccinated adults recruited from the community	22139 adults (weighted: male=49%, female=51%)	Depression, anxiety, or other psychiatric diagnosis Self-reported mental health diagnosis (yes/no)	Adjusted for age, gender, ethnicity, education, income, employment, living arrangement, smoking status, key worker status, and physical health	"How likely do you think you are to get a COVID-19 vaccine when one is approved?" (1, very unlikely - 6, very likely) "How likely do you think you are to get a COVID-19 booster vaccine if/when you are offered one?" (1, very unlikely - 6, very likely)	Having a mental health condition was not associated with uncertainty or unwillingness to accept a COVID-19 booster vaccine.
Roberts et al. (2022)	US	Survey (Screening for mental health conditions was completed between June 3, 2020 and September 9, 2020. Survey data were collected between July 16, 2020 and September 17, 2020.)	Individuals with mental illness or substance use disorder	332 individuals with mental illness (male=47%, female=52%), 328 individuals with no illness (male=64%, female=36%)	Not described Self-reported diagnosis of mental illness (yes/no)	No confounder adjusted.	"How willing would you be to receive a vaccine [specify the stage of vaccine approval]" (1-7: 1 = "Not at all willing"; 4 = "Somewhat willing"; 7 = "Extremely willing")	Participants with mental illness and no illness responded similarly on willingness to accept a COVID-19 vaccine.
Studies reporting general vaccine intention in people with mental health conditions								
Author	Region	Data source	Population	Size	Mental health conditions and measure	Confounder	Vaccine intention measure	Results
Bai et al. (2021)	Mainland China	Survey (Data were collected between September 21, 2020 and October 8, 2021.)	Community-dwelling and hospitalised patients with	1853 (27% male)	Major depressive disorder (MDD), bipolar disorder (BD), and schizophrenia (SCZ)	No confounder adjusted.	"Do you intend to be vaccinated against COVID-19 in the future?" (No/Not having vaccination temporarily/Yes)	The proportion of COVID-19 vaccination hesitancy was 45.3%, with 45.3% in major depressive disorder, 43.6% in bipolar disorder, and 47.4% in schizophrenia subgroups. The

			severe mental illness		Clinical diagnosis according to the International Classification of Diseases, Tenth Revision (ICD-10), obtained from medical records			proportion of COVID-19 vaccination hesitancy was 49.2% in community-dwelling patients, and 31.3% in hospitalized patients. No significant difference in vaccine hesitancy was found across the three major psychiatric disorders.
Cai et al., (2022)	Mainland China	Survey	Patient with depression	1149 (male=842, female=307)	Depressive disorder Clinical diagnosis according to the International Classification of Diseases, Tenth Revision (ICD-10), obtained from medical records	NA	"Do you intend to be vaccinated against COVID-19 in the future?" ("I would be vaccinated against COVID-19"/ "I would not accept COVID-19 vaccination temporarily"/ "I would refuse to accept a COVID-19 vaccination")	A total of 617 depressed patients (53.7%) reported they would accept a future COVID-19 vaccination while 435 patients (37.9%) reported they would not accept COVID-19 vaccination temporarily, and 97 patients (8.4%) stated they would refuse to accept a COVID-19 vaccination.
Huang et al. (2021)	Mainland China	Survey	Outpatients and inpatients at a psychiatric speciality hospital	906 (male=39%, female=61%)	Psychotic disorders, mood disorders, anxiety disorders, other disorders Self-reported clinical diagnosis	NA	"Are you willing to take a COVID-19 vaccine?" (Yes/No/Unsure)	Among 906 participated patients, 526 (58.1%) reported that they were willing to take the vaccine, and 282 (31.1%) were hesitant to take the vaccine (17.1% unwilling and 14.0% unsure).
Mazereel et al. (2021)	Belgium	Healthcare assessment	Patients at a psychiatric hospital who were offered a COVID vaccine	1151 patients (male=41%, female=59%)	Cognitive disorder, psychotic disorder, bipolar disorder, depressive disorder, developmental disorder, anxiety disorder, personality disorder, substance use disorder, eating disorder, adjustment disorder, etc. Clinical diagnosis obtained from medical records	NA	Patients' acceptance of the COVID-19 vaccine when offered.	1070 (93%) patients accepted the COVID-19 vaccine they were offered. Logistic regression did not show any effect of diagnosis on vaccination status. This rate was not lower than that in the general population: by July 19, 2021, 88.9% of the adult population in the same area had received their first vaccine dose, and 61.6% were fully vaccinated.
Qin (2022)	Mainland China	Survey	Psychiatric patients who have previously been diagnosed with bipolar disorders, depressive disorders, anxiety disorders, obsessive compulsive disorders, sleep disorders, schizophrenia,	1328 patients (male=34%, female=66%)	Bipolar disorders, depressive disorders, anxiety disorders, obsessive compulsive disorders, sleep disorders, schizophrenia, and other mental disorders Clinical diagnosis obtained from medical records	NA	Not reported	85.5% of patients were willing to be vaccinated.

			and other mental disorders					
Ren et al. (2021)	Mainland China	Survey	Psychiatric patients who have previously been diagnosed with schizophrenia, bipolar disorder, major depression disorder, generalized anxiety disorder or other mental disorders.	229 patients and 143 family caregivers	Schizophrenia, bipolar disorder, major depression disorder, generalized anxiety disorder or other mental disorders Clinical diagnosis obtained from medical records	NA	"Would you like to be vaccinated if COVID-19 vaccines become available?" (Yes/No)	77.7% (n=178) of patients and 100% of the family caregivers said they intended to receive vaccination once the COVID-19 vaccine became available on the market.
Sullivan et al. (2022)	US	Survey	People with opioid use disorder (OUD) enrolled in a methadone maintenance program	109 (female=56%)	Opioid use disorder (OUD) Clinical diagnosis obtained from medical records	NA	Participants were asked to select which best described their COVID-19 vaccination intentions (Willing/Unwilling/Conditionally willing)	32.1% of the participants reported willingness to use a safe and partially effective vaccine against COVID-19. 47.7% endorsed willingness to be vaccinated only if safe and highly effective. 20.1% of the participants were unwilling to be vaccinated in either scenario.

Table 2 Summary of studies investigating the association between mental health conditions and COVID-19 vaccine uptake

Studies reporting lower vaccine uptake in people with mental health conditions								
Author	Region	Population	Size	Mental health conditions and measure	Vaccine uptake measure (Assessment timing)	Confounder	Barrier to vaccine uptake	Results
Curtis et al., (2022)	UK	All patients registered with a general practice in England	57.9 million	Severe mental illness Clinical diagnosis (yes/no), obtained from medical records	Electronic health records (Data were collected between 8 December 2020 and 25 May 2021.)	Adjusted for age, sex, ethnicity, socioeconomic status	NA	Presence of a severe mental health condition was associated with lower vaccination rates (71% vs 85% in those without severe mental health conditions) and more declines (5% vs 3% in those without severe mental health conditions) being recorded, and a similar but less divergent pattern was seen in those with a learning disability.
Curtis et al., (2022)	UK	All patients registered with a general practice in England	57.9 million	Severe mental illness Clinical diagnosis (yes/no), obtained from medical records	Electronic health records (Data were collected between 8 December 2020 and 17 March 2021.)	Adjusted for age, sex, ethnicity, socioeconomic status, and clinical risk groups	NA	Vaccination coverage was substantially lower among those living with severe mental illness (89.5%).
Murphy et al., (2022)	Northern Ireland	Patients registered with the Northern Ireland National Health Authority Information System	1433814 individuals (male=49%, female=51%). 267 049 (19%) individuals had received psychotropic medication in both 3-month periods before the vaccination programme started.	Recipients of anxiolytics, antipsychotics, hypnotics, and antidepressant. Prescription of psychotropic drugs obtained from medical records	Electronic health records (COVID-19 vaccine data for up to and including 9 September 2021 were included.)	Adjusted for age, gender, household size, socioeconomic and physical health factors,	NA	After adjusting for sociodemographic, socioeconomic and physical health factors, individuals in receipt of anxiolytics, on antipsychotics and hypnotics were less likely to receive the COVID-19 vaccination. Antidepressant use was not associated with vaccination.
Nguyen et al., (2022)	US	Nationally representative sample of the population	77104 adults (30% had anxiety symptoms, 25% had depression symptoms, 35%	Anxiety and depression Self-reported survey: the two-item	Longitudinal survey (Data were collected March 17–29, 2021)	Analysis conducted both unadjusted and adjusted for sex.	Among those who did not get vaccinated but probably will later, concerns about side effects and uncertainty about whether the vaccine will work were higher	A lower proportion of adults with anxiety (39.9%), depression (37.7%), and either disorder (40.2%) received at least 1 dose of the COVID-19 vaccine compared to adults without

		recruited from the community	had symptoms of either disorder)	Patient Health Questionnaire (PHQ-2) and the two-item Generalized Anxiety Disorder (GAD-2) scale			among people with anxiety or depressive symptoms than those without any symptoms (56.9% compared to 47.1%, and 19.6% compared to 13.5%, respectively). Among those who did not get vaccinated and probably will not get vaccinated, both a lack of trust in COVID-19 vaccines and in the government were higher among people with anxiety or depression compared to people without these disorders. Among people who did not get vaccinated and definitely will not get a vaccine, dislike of vaccines was higher among those with anxiety or depression compared to those without either disorder (24.4% compared to 16.2%, respectively).	any symptoms (52.9%). Adults with anxiety or depression were less likely to receive COVID-19 vaccination than those without these conditions.
Nilsson et al., (2022)	Denmark	All Danish residents being alive and living in Denmark on Dec 27, 2020 (i.e. first date of vaccination against SARS-CoV-2 infection in Denmark) and aged at least 15 years on the day of inclusion.	4935344 individuals, accounting for 2560981 person-years under observation for two doses of vaccines against SARS-CoV-2 infection.	Substance abuse, supported psychiatric housing, psychiatric hospital admission, and severe mental illness (schizophrenia, bipolar disorder, or depressive disorder) Clinical diagnosis obtained from medical records	Electronic health records (Cohort participants were followed from Dec 27, 2020, or from the study participants' 15th birthday, whichever came last, and until they received their second dose of vaccine against SARS-CoV-2 infection, disappeared or left the country, died, or until the end of study on Oct 15, 2021)	Analysis conducted both unadjusted and adjusted for sex.	NA	The vaccine uptake for people with psychiatric exposures were lower than in the nonexposed individuals. Among the psychiatric groups, highest cumulative vaccine uptake was found for severe mental illness and lowest uptake for substance abuse.
Qin et al., (2022)	Mainland China	Psychiatric patients who have previously been diagnosed	1328 patients (male=34%, female=66%)	Bipolar disorders, depressive disorders, anxiety disorders, obsessive	Survey (Data were collected between August	No confounder adjusted.	Patients who were willing to be vaccinated were more likely to get inoculated (77.5%) and patients who were unwilling	69.4% of patients had been vaccinated at the time of the survey, which was lower than their family members (89.8%)

		with bipolar disorders, depressive disorders, anxiety disorders, obsessive compulsive disorders, sleep disorders, schizophrenia, and other mental disorders		compulsive disorders, sleep disorders, schizophrenia, and other mental disorders Clinical diagnosis obtained from medical records	9 and August 24, 2021)		(20.8%) and uncertain (12.5%) about vaccination were less likely to be inoculated compared to those who were indifferent (43.2%) about vaccines.	
Raffard et al., (2022)	France	Patients with diagnosis of schizophrenia	100 patients (female=38%) and 72 family caregivers (female=26%)	Schizophrenia Clinical diagnosis obtained from medical records	Survey (Data were collected between April 2021 and October 2021.)	No confounder adjusted.	Non-vaccinated individuals had higher negative attitudes towards vaccine benefit, unforeseen future effects of the vaccine, and commercial profiteering of the vaccine, and had higher preference for natural immunity. Non-vaccinated individuals had lower levels of trust in institutions than did the vaccinated participants.	A statistical trend was noted with respect to the proportion of vaccinated participants, showing lower rates of vaccination in patients (64%), compared to controls (77.8% of n=72, p = 0.07, Phi = 0.15).
Tzur Bitan et al., (2022)	Israel	Patients with schizophrenia	4797 individuals (male=60%) with schizophrenia and 34797 matched controls (male=60%)	Schizophrenia Clinical diagnosis obtained from medical records	Electronic health records (Data were mined at the end of November 2021.)	Adjusted for demographic and clinical risk factors previously associated with vaccination uptake, including socioeconomic status, sector (ie, population group), marital status, diabetes, hypertension, hyperlipidemia, chronic obstructive pulmonary disease, and ischemic heart disease.	NA	20.7% of individuals with schizophrenia were completely unvaccinated, compared with 14.5% of matched control participants. No significant differences were observed in the uptake of the second vaccine. 74.7% of individuals with schizophrenia completed the booster vaccine, lower than 77.9% in the control group.
Studies reporting greater vaccine uptake in people with mental health conditions								
Author	Region	Population	Size	Mental health conditions and measure	Vaccine uptake measure (Assessment timing)	Confounder	Barrier to vaccine uptake	Results

Balut et al., (2021)	US	Veterans experiencing homelessness	83528 (male=90%, female=10%)	Alcohol use disorder, drug use disorder, posttraumatic stress disorder, psychotic disorders, depression, anxiety, schizophrenia, or bipolar disorder Self-reported mental health diagnosis (yes/no)	Electronic health records (The study period was from 14 December 2020 through 1 August 2021)	Both unadjusted and adjusted (for sociodemographic, other health conditions, and healthcare and housing service utilisation variables) results were reported.	NA	Veterans with any mental health conditions (47.2% vs. 38.3%) were more likely to get vaccinated.
Hassan et al., (2022)	UK	All patients registered with a general practice in England	1152831 adults with and without severe mental illness: exclusive groups of individuals with schizophrenia or related psychotic disorders (N=46,859), bipolar disorder (N=3,461), and recurrent major depressive disorder (N=134,661), and a 10% sample of individuals with diagnoses of other depressive disorders, excluding all previously mentioned diagnoses (N=45,586).	Schizophrenia or related psychotic disorders, bipolar disorder, and recurrent major depressive disorder, and a 10% sample of individuals with diagnoses of other depressive disorders, excluding all previously mentioned diagnoses. Clinical diagnosis obtained from medical records	Electronic health records (Data were mined up to June 30, 2021.)	Analyses controlled for sociodemographic covariates, including age, gender, ethnicity and Index of Multiple Deprivation (IMD) decile.	NA	Compared to matched controls, vaccination rates were highest among people with recurrent major depression (77.1%), followed by bipolar disorder (75.7%), other depressive disorders (75.1%), and psychotic disorders (69.6%). The prevalence of vaccination among all controls was 68.4%. The proportion of individuals recorded as having declined vaccination by June 30, 2021 among all controls was 2.0%. Rates of having been recorded as declining vaccination were significantly higher across all mental disorders examined, with psychotic disorder diagnoses highest (5.0%), followed by bipolar disorder (3.8%), recurrent major depression (2.9%) and other depressive disorders (2.8%).
Studies reporting similar vaccine uptake in people with and without mental health conditions								
Author	Region	Population	Size	Mental health conditions and measure	Vaccine uptake measure (Assessment timing)	Confounder	Barrier to vaccine uptake	Results
Mazereel et al. (2021)	Belgium	Patients at a psychiatric hospital who	1151 patients (male=41%, female=59%)	Cognitive disorder, psychotic disorder, bipolar disorder, depressive disorder,	Clinical diagnosis obtained from medical records	No confounder adjusted	NA	1070 (93%) patients accepted the COVID-19 vaccine they were offered. This rate was not lower than that in the general population: by

		were offered a COVID vaccine		developmental disorder, anxiety disorder, personality disorder, substance use disorder, eating disorder, adjustment disorder, etc. Clinical diagnosis obtained from medical records	(Data were collected on July 19, 2021, while administering COVID-19 vaccines to hospitalised patients.)			July 19, 2021, 88.9% of the adult population in the same area had received their first vaccine dose, and 61.6% were fully vaccinated. No effect of diagnosis on vaccination status was found.
Moeller et al., (2021)	US	Patients at a academic child and adolescent psychiatric hospital	174 (male=35%, female=66%)	Attention-deficit/hyperactivity disorder, adjustment disorder, anxiety disorder or trauma-related disorder, autism spectrum disorder, disruptive mood dysregulation disorder, major depressive disorder/suicidal ideations, others Clinical diagnosis obtained from medical records	Healthcare assessment (A 4-week retrospective chart review was performed on all patients admitted from May 27, 2021, to June 23, 2021.)	No confounder adjusted	NA	29.8% of adolescent inpatients with mental illness screened for the COVID-19 vaccine requested and consented to vaccination. 30.5% of adolescent patients have already received one dose of the vaccine before admission. This is comparable to the national average on June 30, 2021, with 30.9% of adolescents aged 12–15 years having at least one dose of the vaccine.
Shkalim Zemer et al., (2022)	Israel	Adolescents diagnosed with attention-deficit/hyperactivity disorder (ADHD)	46511 adolescents aged 12-17 years (n=8241 with ADHD, 18%)	Attention-deficit/hyperactivity disorder (ADHD) Clinical diagnosis obtained from medical records	Survey (A retrospective chart review was performed on all adolescents aged 12–17 years registered from January 1st 2021 to October 31st 2021. Data cut-off was August 31, 2021.)	Adjusted for age, sex, ethnicity. Censoring was also applied in analysis (i.e. removing from analysis at the time of the event), due to infection prior to vaccination	NA	In total, 52.5% of adolescents with ADHD were vaccinated, compared with 47.8% of adolescents without ADHD. 1.2% of adolescents with ADHD aged 12-15 years received the booster dose, which was comparable to 1.4% of adolescents with non-ADHD aged 16-17 years. A total of 45.8% of adolescents with ADHD aged 16-17 years received the booster dose, higher than 42.5% of adolescents with non-ADHD aged 16-17 years.
Studies reporting general vaccine uptake in people with mental health conditions								
Author	Region	Population	Size	Mental health conditions and measure	Vaccine uptake measure (Assessment timing)	Confounder	Barrier to vaccine uptake	Results

Gibbon et al., (2021)	UK	In-patients within a medical secure psychiatric hospital	85	Not described Clinical diagnosis obtained from medical records	Survey (Not reported)	NA	NA	68 (80.0%) consented and 17 (20.0%) declined to consent to the COVID-19 vaccine.
Huang et al., (2021)	Mainland China	Outpatients and inpatients at a psychiatric speciality hospital	906 (male=39%, female=61%)	Psychotic disorders, mood disorders, anxiety disorders, other disorders Self-reported clinical diagnosis	Survey (Between March 24 and April 27, 2021)	NA	Compared to vaccine-hesitant persons, vaccine-recipients were more likely to agree that the preventive effect of vaccines is good, believe that at least half of vaccine-recipients would be immune to COVID-19, believe that vaccines are safe, be not worried about the side effects of vaccines.	98 (10.8%) patients had taken the vaccine at the time of this survey.
Sekizawa et al., (2022)	Japan	Community sample	11846 (male=50%, female=50%) participants. 1705 participants reported moderate-to-severe depression symptoms at wave 1, 1751 participants reported at wave 3. 1021 participants reported moderate-to-severe anxiety symptoms at wave 1 and 1057 reported at wave 3.	Depression, anxiety Self-reported survey: Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 scale (GAD-7)	Longitudinal survey (Wave 1 was conducted from October 27 to November 6, 2020. Vaccine outcomes were assessed only at Wave 3, between April 23 and May 6, 2021.)	NA	NA	2% of participants with moderate-to-severe depression symptoms at wave 1 were already vaccinated at wave 3, 3% of participants with moderate-to-severe depression symptoms at wave 3 were already vaccinated at wave 3. 3% of participants with moderate-to-severe anxiety symptoms at wave 1 were already vaccinated at wave 3, 3% of participants with moderate-to-severe anxiety symptoms at wave 3 were already vaccinated at wave 3.
Uvais, N.A., (2022)	India	Patients with severe mental illness	62 patients (male=69%, female=31%)	Bipolar affective disorder, schizophrenia, psychosis, obsessive-compulsive disorder, depressive disorder Clinical diagnosis obtained from medical records	Survey (Between April 21, 2021, to August 3, 2021)	NA	Respondents in the vaccinated group perceived the vaccine to be more effective in preventing COVID-19 infection than those in the unvaccinated group. Vaccinated respondents were also less in agreement with the statement about the risk of COVID-19 vaccine worsening mental illness. Both vaccinated and unvaccinated respondents tended to disagree with the	Only 27.9% of the respondents received the first dose of COVID-19 vaccination, and 59.7% were recommended for vaccination from a healthcare provider.

							<p>statement about COVID-19 vaccines can cause COVID-19 infection, COVID-19 vaccines can cause mental illness, or it is harmful to take COVID-19 vaccination while taking medications for mental illness. Apart from age, recommendation for vaccination from health care providers was significantly and positively associated with vaccination.</p>	
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Table 3 Summary of studies investigating the association between mental health conditions and COVID-19 vaccine breakthrough

Author	Region	Data source (Assessment timing)	Population	Size	Mental health conditions and measure	Confounder	Results
Nishimi et al., (2022)	US	Electronic health records (Data were mined between February 20, 2020, and November 16, 2021)	Patients who accessed Veterans Affairs (VA) health care during the study period, had at least 1 SARS-CoV-2 test recorded in the electronic health record, had no record of SARS-CoV-2 infection prior to vaccination, and had completed a full SARSCoV-2 vaccination regimen 14 days or more prior.	263697 patients (male=90.8%)	Depressive, posttraumatic stress, anxiety, adjustment, alcohol use, substance use, bipolar, psychotic, attention-deficit/hyperactivity, dissociative, and eating disorders. Clinical diagnosis obtained from medical records	Adjusted for sociodemographic factors (ie, age, sex, and race and ethnicity), vaccine type, and time since vaccination (including an interaction term for vaccine type by time since vaccination to account for differential waning effectiveness, medical conditions, obesity, and smoking.	51.4% of the fully vaccinated patients had at least 1 psychiatric disorder diagnosis, and 14.8% developed a breakthrough infection. A diagnosis of any psychiatric disorder was associated with increased incidence of breakthrough infection, both in models adjusted for potential confounders and additionally adjusted for medical comorbidities and smoking. Most specific psychiatric disorder diagnoses were associated with an increased incidence of breakthrough infection, with the highest relative risk observed for adjustment disorder and substance use disorders.
Wang et al., (2022)	US	Electronic health records (Data were mined between December 1, 2020 and August 14, 2021)	Fully vaccinated patient with substance use disorders (SUD)	579,372 individuals (30,183 with a diagnosis of SUD and 549,189 without such a diagnosis) who were fully vaccinated between December 2020 and August 2021, and had not contracted COVID-19 infection prior to vaccination	Substance use disorder (SUD) Clinical diagnosis obtained from medical records	Adjusted for demographics (age, gender, ethnicity) and vaccine types for all SUD subtypes, and adverse socioeconomic determinants of health and comorbid medical conditions.	Among SUD patients, the risk for breakthrough infection ranged from 6.8% for tobacco use disorder to 7.8% for cannabis use disorder, all significantly higher than the 3.6% in non-SUD population. Breakthrough infection risk remained significantly higher after controlling for demographics (age, gender, ethnicity) and vaccine types for all SUD subtypes, except for tobacco use disorder, and was highest for cocaine and cannabis use disorders. When matching patients with SUD and non-SUD individuals for lifetime comorbidities and adverse socioeconomic determinants of health, the risk for breakthrough infection no longer differed between these populations, except for patients with cannabis use disorder, who remained at increased risk. The risk for breakthrough infection was higher in SUD patients who received the Pfizer than the Moderna vaccine. In the vaccinated SUD population, individuals with breakthrough infections had higher risk for hospitalisation and death, compared to non-breakthrough infections.