

CONTEMPORARY REVIEW

Interaction Between Race, Ethnicity, Severe Mental Illness, and Cardiovascular Disease

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ABSTRACT: Severe mental illnesses, such as schizophrenia or bipolar disorder, affect ≈1% of the population who, as a group, experience significant disadvantage in terms of physical health and reduced life expectancy. In this review, we explore the interaction between race, ethnicity, severe mental illness, and cardiovascular disease, with a focus on cardiovascular care pathways. Finally, we discuss strategies to investigate and address disparities in cardiovascular care for patients with severe mental illness.

Key Words: bipolar disorder ■ critical pathways ■ ethnicity ■ life expectancy ■ mental disorders ■ schizophrenia

Mental health disorders are a common and significant health care problem,¹ with a global lifetime prevalence of up to 85% (in a predominantly White sample).² Approximately 1% of the UK population has a diagnosis of a “severe mental illness” (SMI), such as schizophrenia or bipolar disorder.³ A diagnosis of mental illness more than doubles the risk of developing subsequent physical diseases at a younger age, with the risk of death at a younger age almost 4 times higher than in those without a mental disorder.⁴ This effect is magnified in people with SMI in whom significant morbidity and mortality is evident.^{5,6} The number one cause of death in patients with SMI is not suicide or the primary psychiatric disease, but rather cardiovascular disease (CVD).^{5,6} In addition, CVD is responsible for a larger overall loss in life expectancy across the population with SMI than suicide,⁷ with up to two thirds of deaths being attributed to preventable CVD.⁶ Increased risk of CVD in SMI is observed in both sexes and across all adult age groups.⁵ Moreover, although in the general population, rates of CVD, cardiovascular death, and modifiable risk factors have decreased steadily over the past few decades, this trend to improvement has not been matched in patients with SMI and therefore a mortality gap persists.^{7,8} Currently in patients with SMI, rates of modifiable cardiovascular risk factors are high, whereas use of evidence-based therapies is low.^{9,10} The American

Heart Association recognizes that SMI predisposes young patients to accelerated atherosclerosis and early CVD.¹¹ People with bipolar disorder develop CVD over a decade earlier than nonpsychiatric controls (and with a standardized mortality rate of up to 8).¹²

It has been repeatedly reported that the prevalence of SMI varies between racial and ethnic groups and is affected by migration.^{13–16} For example, in 2 separate observational studies of patients with first episode psychosis in London, UK, higher incidence rates were reported among most self-ascribed racial and ethnic groups compared with the White British group, with this most marked in people of self-ascribed Black African and Black Caribbean race and ethnicity, although interestingly this gap appears to be narrowing over time, with an increase in incidence in the White British group and some reduction in the relative risk for Black Caribbean men.^{17,18} Of note, however, this is a phenomenon that is not worldwide, with limited epidemiological work on rates of psychosis in the Global South and the existing work not showing the large excess risk seen in people from underrepresented racial and ethnic groups as in large Western settings.¹⁹

A diagnosis of SMI confers an increased risk of all-cause mortality across racial and ethnic groups: In a longitudinal cohort study of 18201 people with SMI (defined as schizophrenia, schizoaffective disorder,

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Nonstandard Abbreviations and Acronyms

SMI	severe mental illness
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and bipolar affective disorders) in the UK over 8 years, there was an increase in all-cause mortality across all self-ascribed racial and ethnic groups; however, Black African and Black Caribbean patients had decreased mortality relative to White British patients, with a similar trend seen in South Asian patients compared with White British patients.²⁰ Likewise, in this study, all racial and ethnic groups demonstrated an increase in mortality from cardiovascular and cerebrovascular disease; the highest standardized mortality ratio was in Black African patients (3.85 [95% CI, 2.71–5.31]); however, the number of events was small and the standardized mortality ratio was not significantly different to the increased mortality seen in other racial and ethnic groups. In a larger US national retrospective cohort study (n=1 138 853) of patients with schizophrenia, all had increased mortality but with significant variation between (Medicaid-defined) races and ethnicities: the Black non-Hispanic group had a standardized mortality ratio less than half that of the White non-Hispanic group (2.0 [95% CI, 2.0–2.0] versus 4.3 [95% CI, 4.6–4.7]).⁵ It is striking that there is significant excess cardiovascular mortality even in young adults with schizophrenia who otherwise would be considered at low risk of CVD: the standardized mortality ratio in the 20- to 34-year-old group was 4.5 (95% CI, 4.1–4.8), with similar standardized mortality for ischemic and nonischemic CVD.

Social Determinants of Health Care Inequity

Race and ethnicity are social constructs and, as such, health disparities experienced by underrepresented racial and ethnic groups must be considered through the prism of social determinants of health, including structural racism.^{21,22} Furthermore, when analyzing the relationship between SMI and race and ethnicity, we must consider the well-documented disparities in cardiovascular health experienced by patients from underrepresented racial and ethnic groups.²³ There are also clearly documented effects of social factors on the risks of developing SMI, including unemployment, social isolation, employment achievement, and evidence of neighborhood-level variation, with effects consistent with the classic sociological models of mental disorders.^{24,25}

Stemming from the “double disadvantage hypothesis,” which predicts that multiple disadvantaged statuses interact to drive worse health status,²⁶ it has been proposed that patients from underrepresented racial and ethnic groups with a diagnosis of

SMI experience a “double jeopardy,” whereby SMI combines with factors relevant to race- and ethnicity-related health disparities to drive physical disease.²⁷ Furthermore, given that many of the adverse health effects experienced by patients with SMI are not driven solely by classic factors, such as race and ethnicity or social deprivation, it has been suggested that an SMI should be designated as a health disparity population in and of itself to both improve awareness and increase directed research.²⁸

The finding that patients from underrepresented racial and ethnic groups with SMI have a lower adjusted mortality from CVD raises the question of why? In a study from a racially and ethnically diverse population in London, UK, it was found that although measures of social deprivation, urbanicity, and social fragmentation were associated with mortality risk in SMI, the “ethnic density” of an area (the proportion of residents from underrepresented racial and ethnic groups) was most strongly associated with all-cause mortality: in the highest ethnic density areas, the relative risk of death reduced to approximately half of that of White British individuals.²⁹ It is therefore clear that strong social factors are at play in the complex interaction between SMI, risk of death, and race and ethnicity. It is also apparent that the relationship of SMI to CVD is not simply linear, but rather a result of the interplay between a constellation of disparities in which the individual factors can have multiplicative, rather than simply additive, effects on outcome.

Cardiovascular Risk Factors

CVD is known to be driven by a set of conditions and/or behaviors that are collectively referred to as “cardiovascular risk factors.” One such risk factor is diabetes. Diabetes leads to both microvascular and macrovascular disease, including coronary artery disease. It is well established that the prevalence of diabetes in SMI exceeds that in the general population (up to a 50% increase).³⁰ Possible contributing factors to this increased prevalence include the effects of antipsychotic medication, socioeconomic determinants, and inherited risk. In patients with SMI, a diagnosis of diabetes confers an increased risk of death.³¹ Interestingly, when considered as a single group, patients in London with SMI and diabetes have lower (age-adjusted) hemoglobin A1c levels than the non-SMI reference population with diabetes.^{32,33} There are also inequalities in diabetic control related to race and ethnicity: in an analysis of primary care data from the United Kingdom, patients of (self-ascribed) South Asian and East Asian ethnicity had higher hemoglobin A1c levels compared with those of White British ethnicity.³³

In addition to diabetes, SMI is associated with a higher prevalence of other modifiable cardiovascular

risk factors, such as obesity and sedentary lifestyle,³⁴ dyslipidemia,³⁵ and smoking. A greater proportion of patients with schizophrenia smoke; those who smoke do so more heavily than individuals without psychiatric disease.^{36,37} Although rates of smoking in the general population has declined over the past 2 decades, this is not the case in patients with mental illness.³⁸ Given the high rates of both smoking and cardiorespiratory mortality in SMI, it is reasonable to consider that smoking is a potential key driver of CVD in SMI.⁵

It is notable that cardiovascular risk screening tools in routine practice, such as the QRisk3 tool, may miss risk in younger individuals, even after inclusion of antipsychotic medication as a factor, and latterly cardiometabolic risk predictor tools, especially for people with first-episode psychosis, have been developed to address this unmet need.³⁹

Pathways to CVD Health Care: Recognition of CVD in Patients With SMI

The importance of the ECG in risk stratification of patients with SMI is highlighted by Danish primary care data suggesting that ECG abnormalities in patients with SMI confer a proportionally greater risk of cardiovascular death than controls.⁴⁰ It is likely that a proportion of short-term cardiac events go unreported and/or undiagnosed in patients with SMI. Retrospective analysis of ECGs at a Danish psychiatric hospital suggested that 75% of acute myocardial infarctions in psychiatric patients were or had been missed.⁴¹ Recognition of incident CVD is clearly of importance in patients with SMI: patients presenting with ST-segment–elevation myocardial infarction (STEMI) had a longer duration of ischemic symptoms before undergoing primary angioplasty.⁴² Aside from ischemic heart disease, clinical studies have demonstrated increased rates of a range of cardiac abnormalities in patients with SMI, including structural issues, such as concentric cardiac remodeling (independent of age, race and ethnicity, and blood pressure),⁴³ and electrophysiological pathological conditions, such as Brugada syndrome.⁴⁴ Although antipsychotic medications are associated with prolongation of the QT interval, the underlying prevalence of long-QT syndrome in patients with SMI is low.⁴⁵

Pathways to CVD Health Care: Revascularization

In the United Kingdom, ischemic heart disease and heart failure are managed through highly protocolized care pathways that are specifically designed to avoid delays in initiation of treatment. For example, when a patient is diagnosed with a STEMI, the first responder is empowered to deliver the patient directly to the regional Heart Attack Centre for emergency primary angioplasty, bypassing any local hospitals without these facilities to avoid delay in achieving reperfusion.

Likewise, heart failure pathways are designed to ensure patients are under the care of a specialist heart failure multidisciplinary team to ensure rapid initiation and up-titration of prognostic heart failure therapies.

Despite these systems, patients with SMI are much less likely to receive revascularization after an acute coronary syndrome (as suggested by a meta-analysis of US studies),⁴⁶ with the disparity more marked in patients with schizophrenia.¹⁰ Canadian data suggest that a mortality gap following acute myocardial infarction exists between patients with schizophrenia: patients with schizophrenia benefit as much as nonpsychiatric controls but have restricted access to revascularization.⁴⁷ Furthermore, despite the commencement of highly protocolized heart attack pathways, the disparity in terms of revascularization rate between patients with and without SMI did not significantly improve between 1991 and 2014 in Scotland,¹⁰ or between 1996 and 2015 in Denmark.⁴⁸

With particular regard to STEMI, US national data demonstrate that patients with SMI are less likely than controls to receive reperfusion therapy.⁴⁹ Data from within the past decade from countries with established primary angioplasty networks suggest that patients with SMI and STEMI who undergo primary angioplasty have increased baseline risk versus controls (higher rates of smoking and longer duration of ischemic symptoms), but *once selected for invasive therapy* had similar procedural characteristics.⁴² They were, however, also less likely to receive prognostic secondary prevention medications at 1 year. Interestingly, rates of target vessel revascularization were unchanged across all durations of follow-up. This may suggest 2 points: First, once selected for invasive therapy, angioplasty is likely to be technically successful with durable procedural results; and second, once patients are within the system, they are considered to be appropriate for future invasive approaches.

Given that there is retrospective US data to suggest that Black and Hispanic men with STEMI complicated by cardiogenic shock have worse outcomes than White men (as did women of any racial or ethnic group),⁵⁰ it is important to identify whether racial and ethnic (and sex) disparities that are apparent in the care of the general population also have an effect in patients with SMI. The counterpoint to this is found in UK outcomes data, where no similar disparities have been demonstrated in the general population with acute coronary syndrome, but this has not been explored in patients with SMI.^{51,52}

Secondary Prevention of CVD in Patients With SMI

The mortality gap from CVD between patients with SMI versus nonpsychiatric controls persists following a diagnosis of myocardial infarction or stroke.⁹ Following an event, patients with SMI are less likely

to receive prognostic therapies, such as appropriate medication (aspirin or β -blockers).⁹ It is also important to recognize that patients with SMI from underrepresented racial and ethnic groups also have less access to evidence-based therapies for their psychiatric disease.⁵³ Clozapine is the gold standard antipsychotic drug for resistant schizophrenia (albeit with significant adverse metabolic effects, which are most marked in patients of non-White ethnicity).⁵⁴ Patients with schizophrenia of Black ethnicity are less likely to be prescribed clozapine.^{55,56} Whether this applies in CVD secondary prevention is not known, but antipsychotic use is associated with greater adherence to cardiac medications.⁵⁷

Given this lack of access to therapies, it is perhaps unsurprising that patients with SMI have not derived the same decrease in mortality seen in the general population. It should go without saying that none of this is the fault of patients with SMI, but perhaps this is a message that cardiologists need to hear aloud and proactively discuss with their psychiatry colleagues. Health care professionals are more likely than psychiatrists to have a negative attitude toward patients with SMI.⁵⁸ It is presumed that psychiatrists do not have an equally negative view of patients experiencing lobar pneumonia or ischemic gut.

Strategies to Investigate the Interaction Between SMI, CVD, and Race and Ethnicity

As discussed above, patients with SMI have reduced access to revascularization, even in highly protocolized STEMI pathway. This is associated with poor outcomes. To identify exactly why this is will require analysis in racially and ethnically diverse populations who have a combination of both a high proportion of urbanicity and well-established STEMI pathways with large patient volumes. It is for these reasons that London (which has an established STEMI pathway since 2005 and where health care is socialized) is an ideal population to study. London is much more racially and ethnically diverse than some other populations in the current evidence base. This diversity is vital to identify the role of race and ethnicity in outcomes for patients with SMI.

Addressing a problem as complex as the interaction between SMI and CVD necessarily requires a multifaceted approach. Strategies to enhance disease prevention, identification, and evidence-based treatment initiation for those with incident CVD are urgently needed. Education on the enhanced risk of CVD in people with SMI and the potential for clinician bias should be embedded in our teaching. Linkage of psychiatric and cardiology observational data from electronic health records affords an opportunity to

deploy data science solutions to identify patients at risk of CVD and/or those patients with CVD who are not yet receiving optimal medical therapy. Coworking with mental health colleagues to plan reasonable adjustments where active symptoms of mental illness impede access or uptake of standard treatment pathways should be routine and early. At the heart of the matter, strategies must be in place to ensure that advances in medical treatment and technology are made available to and enjoyed by patients with SMI.

Another solution is to actively involve cardiologists in the care of patients with SMI, to afford the opportunity to actively seek out and treat cardiovascular risk factors and CVD, while at the same time providing appropriate management of cardiovascular complications of antipsychotic therapy.⁷ This would be consistent with the “outreach” approach increasingly being adopted by cardiologists in recent years (eg, subspecialties such as cardio-oncology and maternal medicine) and should be offered in both the hospital and the community.

In summary, patients with SMI, which is more frequent in Black and other underrepresented racial and ethnic groups in Western societies, are at increased risk of CVD and have inadequate access to evidence-based therapies. Given the existence of such highly effective therapies, the increased burden of CVD and cardiovascular death that is seen in the population with SMI would be considered as “avoidable” in the general population. Strategies must be urgently put in place to abolish this gap in effective health care.

ARTICLE INFORMATION

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REFERENCES

- Vigo D, Thornicroft G, Atun R. Estimating the true global burden of mental illness. *Lancet Psychiatry*. 2016;3:171–178. doi: [10.1016/S2215-0366\(15\)00505-2](https://doi.org/10.1016/S2215-0366(15)00505-2)
- Caspi A, Houts RM, Ambler A, Danese A, Elliott ML, Hariri A, Harrington H, Hogan S, Poulton R, Ramrakha S, et al. Longitudinal assessment of mental health disorders and comorbidities across 4 decades among participants in the Dunedin birth cohort study. *JAMA Netw Open*. 2020;3:e203221. doi: [10.1001/jamanetworkopen.2020.3221](https://doi.org/10.1001/jamanetworkopen.2020.3221)

3. Grigoroglou C, Munford L, Webb RT, Kapur N, Ashcroft DM, Kontopantelis E. Prevalence of mental illness in primary care and its association with deprivation and social fragmentation at the small-area level in England. *Psychol Med*. 2020;50:293–302. doi: 10.1017/S0033291719000023
4. Richmond-Rakerd LS, D'Souza S, Milne BJ, Caspi A, Moffitt TE. Longitudinal associations of mental disorders with physical diseases and mortality among 2.3 million New Zealand citizens. *JAMA Netw Open*. 2021;4:e2033448. doi: 10.1001/jamanetworkopen.2020.33448
5. Olfson M, Gerhard T, Huang C, Crystal S, Stroup TS. Premature mortality among adults with schizophrenia in the United States. *JAMA Psychiatry*. 2015;72:1172–1181. doi: 10.1001/jamapsychiatry.2015.1737
6. Walker ER, McGee RE, Druss BG. Mortality in mental disorders and global disease burden implications: a systematic review and meta-analysis. *JAMA Psychiatry*. 2015;72:334–341. doi: 10.1001/jamapsychiatry.2014.2502
7. Firth J, Siddiqi N, Koyanagi A, Siskind D, Rosenbaum S, Galletly C, Allan S, Canejo C, Carney R, Carvalho AF, et al. The lancet psychiatry commission: a blueprint for protecting physical health in people with mental illness. *Lancet Psychiatry*. 2019;6:675–712. doi: 10.1016/S2215-0366(19)30132-4
8. Hayes JF, Marston L, Walters K, King MB, Osborn DPJ. Mortality gap for people with bipolar disorder and schizophrenia: UK-based cohort study 2000–2014. *Br J Psychiatry*. 2017;211:175–181. doi: 10.1192/bjp.bp.117.202606
9. Laursen TM, Mortensen PB, MacCabe JH, Cohen D, Gasse C. Cardiovascular drug use and mortality in patients with schizophrenia or bipolar disorder: a Danish population-based study. *Psychol Med*. 2014;44:1625–1637. doi: 10.1017/S003329171300216X
10. Fleetwood K, Wild SH, Smith DJ, Mercer SW, Licence K, Sudlow CLM, Jackson CA. Severe mental illness and mortality and coronary revascularisation following a myocardial infarction: a retrospective cohort study. *BMC Med*. 2021;19:67. doi: 10.1186/s12916-021-01937-2
11. Goldstein BI, Carnethon MR, Matthews KA, McIntyre RS, Miller GE, Raghuvver G, Stoney CM, Wasiak H, McCrindle BW, American Heart Association A, et al. Major depressive disorder and bipolar disorder predispose youth to accelerated atherosclerosis and early cardiovascular disease: a scientific statement from the American Heart Association. *Circulation*. 2015;132:965–86. doi: 10.1161/CIR.0000000000000229.
12. Westman J, Hallgren J, Wahlbeck K, Erlinge D, Alfreðsson L, Osby U. Cardiovascular mortality in bipolar disorder: a population-based cohort study in Sweden. *BMJ Open*. 2013;3:e002373. doi: 10.1136/bmjopen-2012-002373
13. Leaute E, Dealberto MJ, Luck D, Grot S, Zeroug-Vial H, Poulet E, Brunelin J. Ethnic minority position and migrant status as risk factors for psychotic symptoms in the general population: a meta-analysis. *Psychol Med*. 2019;49:545–558. doi: 10.1017/S0033291718002271
14. Tarricone I, D'Andrea G, Jongsma HE, Tosato S, Gayer-Anderson C, Stilo SA, Suprani F, Iyegbe C, van der Ven E, Quattrone D, et al. Migration history and risk of psychosis: results from the multinational EU-GEI study. *Psychol Med*. 2021;1–13. doi: 10.1017/S003329172000495X
15. Jongsma HE, Turner C, Kirkbride JB, Jones PB. International incidence of psychotic disorders, 2002–17: a systematic review and meta-analysis. *Lancet Public Health*. 2019;4:e229–e244. doi: 10.1016/S2468-2667(19)30056-8
16. Halvorsrud K, Nazroo J, Otis M, Brown Hajdukova E, Bhui K. Ethnic inequalities in the incidence of diagnosis of severe mental illness in England: a systematic review and new meta-analyses for non-affective and affective psychoses. *Soc Psychiatry Psychiatr Epidemiol*. 2019;54:1311–1323. doi: 10.1007/s00127-019-01758-y
17. Oduola S, Das-Munshi J, Bourque F, Gayer-Anderson C, Tsang J, Murray RM, Craig TKJ, Morgan C. Change in incidence rates for psychosis in different ethnic groups in South London: findings from the clinical record interactive search-first episode psychosis (CRIS-FEP) study. *Psychol Med*. 2021;51:300–309. doi: 10.1017/S0033291719003234
18. Fearon P, Kirkbride JB, Morgan C, Dazzan P, Morgan K, Lloyd T, Hutchinson G, Tarrant J, Fung WL, Holloway J, et al. Incidence of schizophrenia and other psychoses in ethnic minority groups: results from the MRC AESOP study. *Psychol Med*. 2006;36:1541–1550. doi: 10.1017/S0033291706008774
19. Bhugra D, Hilwig M, Hossein B, Marceau H, Neehall J, Leff J, Mallett R, Der G. First-contact incidence rates of schizophrenia in Trinidad and one-year follow-up. *Br J Psychiatry*. 1996;169:587–592. doi: 10.1192/bjp.169.5.587
20. Das-Munshi J, Chang CK, Dutta R, Morgan C, Nazroo J, Stewart R, Prince MJ. Ethnicity and excess mortality in severe mental illness: a cohort study. *Lancet Psychiatry*. 2017;4:389–399. doi: 10.1016/S2215-0366(17)30097-4
21. Flanagan A, Frey T, Christiansen SL, Committee AMAMoS. Updated guidance on the reporting of race and ethnicity in medical and science journals. *JAMA*. 2021;326:621–627. doi: 10.1001/jama.2021.13304
22. Churchwell K, Elkind MSV, Benjamin RM, Carson AP, Chang EK, Lawrence W, Mills A, Odom TM, Rodriguez CJ, Rodriguez F, et al. Call to action: structural racism as a fundamental driver of health disparities: a presidential advisory from the American Heart Association. *Circulation*. 2020;142:e454–e468. doi: 10.1161/CIR.0000000000000936.
23. Mazimba S, Peterson PN. JAHA spotlight on racial and ethnic disparities in cardiovascular disease. *J Am Heart Assoc*. 2021;10:e023650. doi: 10.1161/JAHA.121.023650
24. Reininghaus UA, Morgan C, Simpson J, Dazzan P, Morgan K, Doody GA, Bhugra D, Leff J, Jones P, Murray R, et al. Unemployment, social isolation, achievement-expectation mismatch and psychosis: findings from the AESOP study. *Soc Psychiatry Psychiatr Epidemiol*. 2008;43:743–751. doi: 10.1007/s00127-008-0359-4
25. Kirkbride JB, Fearon P, Morgan C, Dazzan P, Morgan K, Murray RM, Jones PB. Neighbourhood variation in the incidence of psychotic disorders in Southeast London. *Soc Psychiatry Psychiatr Epidemiol*. 2007;42:438–445. doi: 10.1007/s00127-007-0193-0
26. Grollman EA. Multiple disadvantaged statuses and health: the role of multiple forms of discrimination. *J Health Soc Behav*. 2014;55:3–19. doi: 10.1177/0022146514521215
27. Das-Munshi J, Stewart R, Morgan C, Nazroo J, Thornicroft G, Prince M. Reviving the 'double jeopardy' hypothesis: physical health inequalities, ethnicity and severe mental illness. *Br J Psychiatry*. 2016;209:183–185. doi: 10.1192/bjp.bp.114.159210
28. Bartels SJ, DiMilia P. Why serious mental illness should be designated a health disparity and the paradox of ethnicity. *Lancet Psychiatry*. 2017;4:351–352. doi: 10.1016/S2215-0366(17)30111-6
29. Das-Munshi J, Schofield P, Bhavsar V, Chang CK, Dewey ME, Morgan C, Stewart R, Thornicroft G, Prince MJ. Ethnic density and other neighbourhood associations for mortality in severe mental illness: a retrospective cohort study with multi-level analysis from an urbanised and ethnically diverse location in the UK. *Lancet Psychiatry*. 2019;6:506–517. doi: 10.1016/S2215-0366(19)30126-9
30. Ward M, Druss B. The epidemiology of diabetes in psychotic disorders. *Lancet Psychiatry*. 2015;2:431–451. doi: 10.1016/S2215-0366(15)00007-3
31. Vinogradova Y, Coupland C, Hippisley-Cox J, Whyte S, Penny C. Effects of severe mental illness on survival of people with diabetes. *Br J Psychiatry*. 2010;197:272–277. doi: 10.1192/bjp.bp.109.074674
32. Mathur R, Hull SA, Boomla K, Robson J. Ethnic differences in primary care management of diabetes and cardiovascular disease in people with serious mental illness. *Br J Gen Pract*. 2012;62:e582–e588. doi: 10.3399/bjgp12X653642
33. Das-Munshi J, Schofield P, Ashworth M, Gaughran F, Hull S, Ismail K, Robson J, Stewart R, Mathur R. Inequalities in glycemic management in people living with type 2 diabetes mellitus and severe mental illnesses: cohort study from the UK over 10 years. *BMJ Open Diabetes Res Care*. 2021;9:e002118. doi: 10.1136/bmjdr-2021-002118
34. Vancampfort D, Firth J, Schuch FB, Rosenbaum S, Mugisha J, Hallgren M, Probst M, Ward PB, Gaughran F, De Hert M, et al. Sedentary behavior and physical activity levels in people with schizophrenia, bipolar disorder and major depressive disorder: a global systematic review and meta-analysis. *World Psychiatry*. 2017;16:308–315. doi: 10.1002/wps.20458
35. Correll CU, Robinson DG, Schooler NR, Brunette MF, Mueser KT, Rosenheck RA, Marcy P, Addington J, Estroff SE, Robinson J, et al. Cardiometabolic risk in patients with first-episode schizophrenia spectrum disorders: baseline results from the RAISE-ETP study. *JAMA Psychiatry*. 2014;71:1350–1363. doi: 10.1001/jamapsychiatry.2014.1314
36. de Leon J, Diaz FJ. A meta-analysis of worldwide studies demonstrates an association between schizophrenia and tobacco smoking behaviors. *Schizophr Res*. 2005;76:135–157. doi: 10.1016/j.schres.2005.02.010
37. Tidey JW, Rohsenow DJ, Kaplan GB, Swift RM. Cigarette smoking topography in smokers with schizophrenia and matched non-psychiatric controls. *Drug Alcohol Depend*. 2005;80:259–265. doi: 10.1016/j.drugaldep.2005.04.002

38. Szatkowski L, McNeill A. Diverging trends in smoking behaviors according to mental health status. *Nicotine Tob Res.* 2015;17:356–360. doi: [10.1093/ntr/ntu173](https://doi.org/10.1093/ntr/ntu173)
39. Perry BI, Osimo EF, Upthegrove R, Mallikarjun PK, Yorke J, Stochl J, Perez J, Zammit S, Howes O, Jones PB, et al. Development and external validation of the psychosis metabolic risk calculator (PsyMetRiC): a cardiometabolic risk prediction algorithm for young people with psychosis. *Lancet Psychiatry.* 2021;8:589–598. doi: [10.1016/S2215-0366\(21\)00114-0](https://doi.org/10.1016/S2215-0366(21)00114-0)
40. Polcwiartek C, Atwater BD, Kragholm K, Friedman DJ, Barcella CA, Attar R, Graff C, Nielsen JB, Pietersen A, Sogaard P, et al. Association between ECG abnormalities and fatal cardiovascular disease among patients with and without Severe mental illness. *J Am Heart Assoc.* 2021;10:e019416. doi: [10.1161/JAHA.120.019416](https://doi.org/10.1161/JAHA.120.019416)
41. Nielsen J, Juel J, Alzuhairi KS, Friis R, Graff C, Kanters JK, Jensen SE. Unrecognised myocardial infarction in patients with schizophrenia. *Acta Neuropsychiatr.* 2015;27:106–112. doi: [10.1017/neu.2014.41](https://doi.org/10.1017/neu.2014.41)
42. Jakobsen L, Terkelsen CJ, Christiansen EH, Maeng M, Jensen LO, Veien K, Raungaard B, Jensen SE, Mehnert F, Johnsen SP. Severe mental illness and clinical outcome after primary percutaneous coronary intervention. *Am J Cardiol.* 2017;120:550–555. doi: [10.1016/j.amjcard.2017.05.021](https://doi.org/10.1016/j.amjcard.2017.05.021)
43. Osimo EF, Brugger SP, de Marvao A, Pillinger T, Whitehurst T, Statton B, Quinlan M, Berry A, Cook SA, O'Regan DP, et al. Cardiac structure and function in schizophrenia: cardiac magnetic resonance imaging study. *Br J Psychiatry.* 2020;217:450–457. doi: [10.1192/bjp.2019.268](https://doi.org/10.1192/bjp.2019.268)
44. Rastogi A, Viani-Walsh D, Akbari S, Gall N, Gaughran F, Lally J. Pathogenesis and management of Brugada syndrome in schizophrenia: a scoping review. *Gen Hosp Psychiatry.* 2020;67:83–91. doi: [10.1016/j.genhosppsych.2020.09.003](https://doi.org/10.1016/j.genhosppsych.2020.09.003)
45. Salvati B, Miola A, Toffanin T, Pigato G, Pavan C, Favaro A, Sambataro F, Solmi M. Prevalence and risk factors for QTc prolongation in acute psychiatric hospitalization. *Prim Care Companion CNS Disord.* 2022;24:
46. Mitchell AJ, Lawrence D. Revascularisation and mortality rates following acute coronary syndromes in people with severe mental illness: comparative meta-analysis. *Br J Psychiatry.* 2011;198:434–441. doi: [10.1192/bjp.bp.109.076950](https://doi.org/10.1192/bjp.bp.109.076950)
47. Hauck TS, Liu N, Wijeyesundera HC, Kurdyak P. Mortality and revascularization among myocardial infarction patients with schizophrenia: a population-based cohort study. *Can J Psychiatry.* 2020;65:454–462. doi: [10.1177/0706743720904845](https://doi.org/10.1177/0706743720904845)
48. Attar R, Jensen SE, Nielsen RE, Polcwiartek C, Andell P, Pedersen CT, Kragholm K. Time trends in the use of coronary procedures, guideline-based therapy, and all-cause mortality following the acute coronary syndrome in patients with schizophrenia. *Cardiology.* 2020;145:401–409. doi: [10.1159/000507044](https://doi.org/10.1159/000507044)
49. Schulman-Marcus J, Goyal P, Swaminathan RV, Feldman DN, Wong SC, Singh HS, Minutello RM, Bergman G, Kim LK. Comparison of trends in incidence, revascularization, and in-hospital mortality in ST-elevation myocardial infarction in patients with versus without Severe mental illness. *Am J Cardiol.* 2016;117:1405–1410. doi: [10.1016/j.amjcard.2016.02.006](https://doi.org/10.1016/j.amjcard.2016.02.006)
50. Ya'qoub L, Lemor A, Dabbagh M, O'Neill W, Khandelwal A, Martinez SC, Ibrahim NE, Grines C, Voeltz M, Basir MB. Racial, ethnic, and sex disparities in patients with STEMI and cardiogenic shock. *JACC Cardiovasc Interv.* 2021;14:653–660. doi: [10.1016/j.jcin.2021.01.003](https://doi.org/10.1016/j.jcin.2021.01.003)
51. Moledina SM, Shoaib A, Weston C, Aktaa S, Gc Van Spall H, Kassam A, Kontopantelis E, Banerjee S, Rashid M, Gale CP, et al. Ethnic disparities in care and outcomes of non-ST-segment elevation myocardial infarction: a nationwide cohort study. *Eur Heart J Qual Care Clin Outcomes.* 2021. doi: [10.1093/ehjqcco/qcab030](https://doi.org/10.1093/ehjqcco/qcab030)
52. Krishnamurthy A, Keeble C, Burton-Wood N, Somers K, Anderson M, Harland C, Baxter PD, McLenachan JM, Blaxill JM, Blackman DJ, et al. Clinical outcomes following primary percutaneous coronary intervention for ST-elevation myocardial infarction according to sex and race. *Eur Heart J Acute Cardiovasc Care.* 2019;8:264–272. doi: [10.1177/2048872617735803](https://doi.org/10.1177/2048872617735803)
53. Das-Munshi J, Bhugra D, Crawford MJ. Ethnic minority inequalities in access to treatments for schizophrenia and schizoaffective disorders: findings from a nationally representative cross-sectional study. *BMC Med.* 2018;16:55. doi: [10.1186/s12916-018-1035-5](https://doi.org/10.1186/s12916-018-1035-5)
54. Pillinger T, McCutcheon RA, Vano L, Mizuno Y, Arumham A, Hindley G, Beck K, Natesan S, Efthimiou O, Cipriani A, et al. Comparative effects of 18 antipsychotics on metabolic function in patients with schizophrenia, predictors of metabolic dysregulation, and association with psychopathology: a systematic review and network meta-analysis. *Lancet Psychiatry.* 2020;7:64–77. doi: [10.1016/S2215-0366\(19\)30416-X](https://doi.org/10.1016/S2215-0366(19)30416-X)
55. Whiskey E, Olofinjana O, Taylor D. The importance of the recognition of benign ethnic neutropenia in black patients during treatment with clozapine: case reports and database study. *J Psychopharmacol.* 2011;25:842–845. doi: [10.1177/0269881110364267](https://doi.org/10.1177/0269881110364267)
56. Taipale H, Tanskanen A, Mehtala J, Vattulainen P, Correll CU, Tiihonen J. 20-year follow-up study of physical morbidity and mortality in relationship to antipsychotic treatment in a nationwide cohort of 62,250 patients with schizophrenia (FIN20). *World Psychiatry.* 2020;19:61–68. doi: [10.1002/wps.20699](https://doi.org/10.1002/wps.20699)
57. Solmi M, Tiihonen J, Lahteenvuo M, Tanskanen A, Correll CU, Taipale H. Antipsychotics use is associated with greater adherence to Cardiometabolic medications in patients with schizophrenia: results from a Nationwide, within-subject design study. *Schizophr Bull.* 2022;48:166–175. doi: [10.1093/schbul/sbab087](https://doi.org/10.1093/schbul/sbab087)
58. Stone EM, Chen LN, Daumit GL, Linden S, McGinty EE. General medical Clinicians' attitudes toward people with serious mental illness: a scoping review. *J Behav Health Serv Res.* 2019;46:656–679. doi: [10.1007/s11414-019-09652-w](https://doi.org/10.1007/s11414-019-09652-w)