Title: Perceived discrimination and psychosis: A systematic review of the literature

Authors: Josie Pearce [a], Sonya Rafiq [b] [ORCID ID: 0000-0002-4431-156X], Jane Simpson [a] [ORCID ID: 0000-0001-5071-4077], Filippo Varese [b, c] [ORCID ID: 0000-0001-7244-598X]

[a] Faculty of Health and Medicine, Division of Health Research, Lancaster University

[b] School of Health Sciences, Division of Psychology and Mental Health, Faculty of Biology, Medicine and Health, Manchester Academic Health Sciences Centre, University of Manchester

[c] Complex Trauma and Resilience Research Unit, Greater Manchester Mental Health NHS Foundation Trust, Manchester, UK

Corresponding Author:

Filippo Varese

Email: filippo.varese@manchester.ac.uk

Abstract

Purpose: Higher rates of psychosis are reported in minority groups. Since individuals belonging to such groups are vulnerable to the experiences of discrimination, and in line with models proposing that social and life adversity may play a causal role in development and maintenance of psychotic experiences, it has been proposed that perceived discrimination may represent an important determinant of psychotic experiences. This paper reviews the literature examining the relationship between perceived discrimination and psychosis, examining whether discrimination is associated with an increased risk of psychosis, the severity of psychotic symptoms and whether there is an association with specific psychotic symptoms.

Methods: A systematic database search of PsycINFO, Embase and PubMed was conducted to identify quantitative cross-sectional and prospective studies that examined the association between discrimination and psychosis.

Results: Twenty-four studies met the inclusion criteria, four of which used prospective designs and twenty used cross-sectional designs. ~~The findings were mixed due to variability in the research methods. However, T~~the main findings indicated that discrimination may be ~~is~~ associated with an increased risk ~~severity~~ of psychosis (too few studies to determine whether discrimination is associated with severity). Some studies found associations between discrimination and positive psychotic experiences and/or specific psychotic experiences such as paranoia. A small number of studies found that greater exposures to discrimination was associated with a greater likelihood of reporting psychotic experiences, tentatively indicating a dose-response relationship. ~~and incidence of psychosis and that it might be more strongly associated with psychotic experiences that do not reach a threshold of 'clinical' levels, for example, with 'suspiciousness' rather than 'paranoid delusions'~~.

Conclusions: This review indicates that discrimination plays an important role in the experience of psychosis, however, future research is required to clarify the nature of this relationship. Avenues for further research and clinical implications are proposed.

Keywords: Perceived discrimination, trauma, minority, psychosis.

Introduction

Higher rates of psychosis are consistently found among minority groups such as immigrants, ethnic minorities and non-heterosexual individuals [1-3]. Research suggests that belonging to a minority group increases the risk of experiencing psychosis [2-7]. Although a variety of possible mechanisms have been proposed to explain the excess risk of psychosis in specific minority groups, these explanations have been largely specific to ethnic minorities. In studies focusing on immigration status, it has been argued that pre-migration factors or the experience of migration itself cannot explain the increased risk of psychosis, as the incidence rates for first- and second-generation immigrants are on average similar [5]. ~~second-generation immigrants are in fact at greater risk than first-generation immigrants [2].~~ Ethnic minorities who have not experienced migration are also at greater risk [3] and more visible minorities have a higher risk of psychosis [5,6]. The effect of ethnic minority status on psychosis risk is dependent on ethnic density (the greater the proportion of an ethnic minority in the population, the lower the risk) [8,9]. In light of this evidence, the degree to which a person is a minority, or stands out as a minority, in relation to the wider social environment may be an important factor. In recent social-developmental models of the development of psychosis, context-specific stressors, such as discrimination (unfair treatment or negative attitudes towards different categories (age, gender, race, religion, disability, sexual orientation) of people ~~a minority group by a dominant group~~), are assumed to contribute to the elevated risk for psychosis observed in minority groups [10]. Discrimination as a mechanism involved in the pathway between minority status and psychosis liability would also account for the increased risk observed across diverse minority groups as discrimination is one common experience that most minority groups share [11].

Given the negative impact of discrimination on a wide range of social, physical and mental health outcomes [2,12] it has been proposed that discrimination may also play a role in the development of psychosis, particularly in light of the robust and increasingly large evidence base linking other adverse experiences to an increased risk for psychosis and/or exacerbation of the severity of psychotic symptoms [12,13]. Such adverse experiences include bullying, social inequality and neglect [12,14], all of which share common experiences of discrimination including social threat, deprivation of resources and unfair treatment.

The potential role of discrimination in conferring vulnerability for psychosis is plausible in the light of several theoretical proposals, including the social defeat model. This model highlights how being in a subordinate, 'outsider' position within one's social environment can induce prolonged threat and chronic stress [15], potentially leading to the sensitization of the mesolimbic dopamine system and the ~~leading to neurobiological changes such as~~ dysregulation of the hypothalamic-pituitary-adrenal axis, these changes are~~that are~~ thought to be associated with a range of mental health difficulties, including psychosis [15-17]. Discrimination also shares similar experiences with social inequality, a

construct that has been linked to negative physical and mental health outcomes [18-23], including the risk of psychosis [6,24]. Research suggests that the impact of social inequality cannot be explained by deprivation alone [25,26]; rather it is the *relativity* of deprivation in which inequality is present that promotes adverse outcomes [27]. Although research into the impact of social inequality on psychosis is in its infancy, evidence suggests that it may explain the relationship between deprivation and psychotic symptoms, in particular, paranoia [14]. The potential importance of discrimination is consistent with a cognitive model of psychosis proposed by, for example, Garety, Kuipers, Fowler, Freeman, and Bebbington [28] ~~cognitive models of psychosis~~ suggesting that chronic experiences of power imbalance, threat and social humiliation can lead to the development of negative schemas (beliefs) about the self and others, which are often elevated in people with psychosis and are believed to fuel the development of psychosis ~~[28]~~. Since discrimination involves social threat and humiliation, it is plausible that this may influence the development of negative schematic beliefs, and cognitive models suggesting that chronic experiences of discrimination and negative schema may increase paranoid attributional styles, a theory that is supported by empirical evidence [29]. This may suggest that discrimination could be more strongly associated with paranoia (which involves mistrust or fear of others, perceptions of persecution and anticipation of threat) than with other psychotic experiences. These parallel research findings showing that deprivation predicts paranoia but not hallucinations [14] and that living in urban areas in which powerlessness and victimisation are experienced increases the risk of paranoia [30].

In light of the theoretical and empirical evidence cited above, the aims of the review were threefold. Firstly, findings were reviewed from studies to examine whether perceived discrimination might be more prevalent in service users with psychosis and individuals reporting psychotic experiences relative to controls. Secondly, the review examined whether discrimination was associated with more severe clinical presentations. Thirdly, in light of tentative proposals suggesting that exposure to discrimination may increase proneness to paranoid experiences specifically, the review intended to investigate the associations between minority discrimination and specific psychotic experiences.

Method

Inclusion and exclusion criteria

This systematic review was carried out in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards [31]. Studies that met the following criteria were included in the review: 1) quantitative analyses examining the cross-sectional and/or longitudinal relationship between perceived discrimination and psychosis; 2) studies employing validated diagnostic/dimensional measures of clinical or non-clinical experiences of psychosis; and 3) reports written in English. Studies were excluded if: 1) the type of

discrimination measured was related to mental health (e.g. stigma related to diagnosis, unfair treatment related to mental health difficulties); 2) they were presented in a conference extract or single case study format; or 3) participants had a primary diagnosis of substance-induced psychosis or psychosis secondary to organic pathology. No restrictions were placed on the measurement of perceived discrimination used in terms of validity or reliability.

Search strategy

Studies were reviewed up to and including December 2017. Specifically, PsycINFO, Embase and PubMed were systematically searched using the following search string (discrimination OR discriminated OR victimi* OR prejudic* OR inequality OR homophob* OR sexualism OR racism OR racist OR racial OR sexis* OR ageis* OR disablism OR unfair treatment) AND (hearing voices OR voice hearing OR hallucinat* OR delusion* OR paranoid OR paranoia OR psychotic OR psychosis OR schizophren* OR 'severe mental' OR 'serious mental'). Eligibility was established in three stages: title, abstract, and full-article screening. Backward and forward searches of eligible papers were performed to identify additional studies. Figure 1 displays the PRISMA flowchart that details the systematic search and screening process.

[INSERT FIG 1 APPROXIMATELY HERE]

Quality assessment

Eligible studies were quality assessed using the Effective Public Health Practice Project tool (EPHPP [32]). This tool assesses quality in observational, cross-sectional, longitudinal studies, and presents good validity and inter-rater reliability [32,33]. Each study was assessed on selection bias, study design, confounding variables, blinding, data collection and attrition. Given the ambiguity surrounding assessing the confounding variable component, if the primary studies ~~examined,~~ controlled for variables found to influence the relationship between psychosis and discrimination (e.g. age, sex, ethnicity, socioeconomic status; [9,11]) ~~deemed important based on empirical research~~ different ratings were given. ~~[9,11].~~ For example, if age and sex were controlled for, it was only assumed less than 60% of the relevant confounders were controlled for. EPHPP guidelines also suggest giving each study a global quality rating (weak, moderate, and strong) based on components. However, global ratings were not provided in this review, as they may mask and mislead the quality appraisal of included studies [34]. Additionally, studies were quality assessed by two researchers. S.R assessed all studies, and J.P examined 60%. Disagreements were resolved by consultations with F.V.

Results

As shown in Figure 1, 24 eligible studies were identified. Table 1 provides a summary of the study characteristics and research findings of each study, grouped according to discrimination type: clinical and non-clinical samples.

Sample and design characteristics of eligible studies

Of the 24 eligible studies, eight were carried out in the UK, four in the Netherlands, eleven in the USA, and one in Norway. A total of 35,726 participants took part in the studies included in the review (regarding overlapping samples, the studies considering the largest sample sizes were included in the total). Four of the studies involved clinical samples (n = 1,017) [9,35-37] and the remaining eighteen recruited from non-clinical populations (n = 34,709) [11,38,39-54]; thirteen used eight different population-based ~~nationally representative~~ epidemiological samples (AESOP, EMPIRIC, Fourth National Survey of Ethnic Minorities, MEDINA, NAPLS 2, NEMESIS, NSLASS and NSAL). Within the twenty studies that reported the sex of the participants, 53% were female (regarding overlapping samples, the studies considering the largest sample sizes were included in the total).

The studies examined the relationship between different types of discrimination and psychosis. Twelve studies examined racial discrimination [9,11,35,36,38-43,55,56]; one examined race/cultural or religious discrimination [37], religious discrimination [46], gender discrimination [44], and discrimination based on sexual orientation [45]. Three examined racial/religious discrimination [47-49]; the remaining measured a range of discriminatory experiences requesting participants to attribute them to various factors including age, sex, sexual orientation, ethnicity, disability, skin colour, religion and appearance [50-54]. The clinical studies included in the review examined the impact of discrimination across the continuum of psychosis, including individuals at clinical high risk of developing psychosis [43,52,53], first episode psychosis [37] and people experiencing long-term psychosis [9,35,36].

Table 1 details the measures used to assess discrimination, the majority of which measured discrimination in the weeks and months prior to the study, with only a minority measuring lifetime discrimination.

[INSERT TABLE 1 APPROXIMATELY HERE]

Quality assessment

The studies which were quality assessed using the EPHPP varied in terms of study quality. ~~The majority of studies varied in terms of study quality according to the EPHPP~~ (see Table 2). Ten out of 24 studies were rated weak in

terms of selection bias, most were rated moderate/strong (14 out of 24) as large epidemiological datasets were used, reducing the likelihood of sample bias. In terms of study design, most were rated weak given the cross-sectional nature of identified studies. More than half of the studies were rated moderate/strong (13 out of 24) in terms of controlling for confounding variables, and all were rated moderate in terms of outcome assessor and participant blinding, and most were rated as strong/moderate in terms of data collection. However, per EPHPP guidance, if the outcome measures demonstrated face validity, the data collection component could be rated as moderate/strong (most perceived discrimination measures were unable to demonstrate robust validity).

[INSERT TABLE 2 APPROXIMATELY HERE]

Do people experiencing psychosis report more discrimination?

Only two clinical case-control studies tested whether racial discrimination is more prevalent among service users with psychosis than healthy controls, both studies found cases reported more discrimination (see Table 3). However, after controlling for various confounding variables (e.g. ethnicity, employment, education, etc.) no statistically significant relationships were found [9,37] ~~by Veling et al. [9]. While Cooper et al. [37] found a significant relationship only for the Black ethnic group (not combined sample)~~. In case-control studies with high-risk individuals [43,52,53], results indicated that perceived discrimination was significantly more common in people reporting prodromal psychotic experiences than controls. Regarding non-clinical studies [38,42,47,49,50,55,56] most found positive associations between discrimination and experiences related to psychosis. Interestingly, findings from Karlsen and Nazroo (2002) suggested more severe forms of discrimination may be particularly prevalent in people with psychotic experiences, as individuals reporting verbal racial abuse were two times more likely to report psychosis experiences (OR = 2.86). The association was seemingly greater for physical racial abuse (OR = 4.77) [48].

[INSERT TABLE 3 APPROXIMATELY HERE]

Is there a relationship between discrimination and severity of psychotic experiences?

One clinical study found evidence that discrimination was associated with significantly greater severity of psychotic experiences [35]. While, several non-clinical [38,40,44,46,54] and one at-risk study [43] found perceived discrimination to be associated with greater frequency of prodromal/psychotic-like symptoms (severity not investigated). In addition, Anglin et al. [38] reported that people perceiving discrimination were 1.29 times more likely to experience distress as a result of non-clinical psychotic experiences.

Is there a relationship between discrimination and specific experiences within psychosis?

Seven non-clinical [38,40,41,44,46,50,51], three at-risk studies [43,52,53], and two clinical studies [35,37] examined whether discrimination was associated with a range of specific psychotic experiences. Of the two clinical studies that examined this relationship, one [37] found no specific relationship, while Berg et al. [35] found a positive association between racial discrimination and 'positive psychotic symptoms' (not with 'negative symptoms' or 'cognitive disorganisation'). Of the at-risk studies, two used the same epidemiological dataset [52,53]; Stowkowy et al. [53] found weak associations between discrimination and specific 'positive psychotic symptoms', and Saleem et al. [52] found no association (smaller sample of dataset). The third study found a relationship between discrimination and paranoia [43]. Similarly, non-clinical studies found discrimination to be associated with paranoia [40,41,44], with males reporting higher levels of paranoia than women [40,46]. In other non-clinical studies, racial discrimination was significantly associated with an increase in all non-clinical psychotic experiences under scrutiny (i.e. cognitive disorganisation, unusual thinking, altered perceptions and paranoia [38]). When confounding variables were considered, one epidemiological study found racial discrimination to be associated with an increased risk of hallucinations (auditory and visual) and delusions [50]. Another epidemiology study [51], found no association with hallucinations, and instead found a relationship between discrimination and delusional ideation.

Can we regard discrimination as a risk factor for psychosis?

Evidence for discrimination as a risk factor for psychosis is limited due to the methodological designs of the primary studies. However, two epidemiological datasets showed evidence of a 'dose-response' relationship demonstrating that an increase in exposure to discriminatory experiences (based on sexual orientation, age, gender, disability, skin colour, ethnicity) increased the risk of psychosis in a graded, cumulative fashion [42,50,51]. Stowkowy et al. [53] also found that individuals at-risk of psychosis who reported greater discrimination were more likely to experience later conversion to psychosis, compared to individuals reporting less discrimination. Additionally, three studies (two clinical and one non-clinical) provided evidence that discrimination mediated the relationship between minority group status (racial and sexual orientation) and psychosis in cross-sectional analyses [35,37,45]. However, the strongest evidence for discrimination as a putative risk factor of psychosis was provided by a 3-year prospective study that recruited people with no experience of psychosis at baseline [51]. The authors found that discrimination at baseline predicted the onset of delusional ideation (but not hallucinations) at follow-up in a dose-response fashion. For example, the rate of delusional ideation was 0.5% for those reporting no discriminatory experience, 0.9% for those reporting one type of discriminatory experience (e.g. age) and 2.7% for individuals reporting more than one type of these

discriminatory experiences (e.g. age, gender, etc.). Interestingly, one study also found collective self-esteem to moderate the relationship between discrimination and paranoia in a non-clinical sample [41] suggesting a potential avenue for intervention.

Discussion

This review synthesised existing quantitative studies that examined: 1) whether perceived minority discrimination is more common in people with psychosis relative to controls; 2) whether discrimination is associated with increased severity of psychotic experiences, and 3) whether discrimination is associated with increased vulnerability to and/or severity of specific psychotic experiences. In regards to the first aim, of the two clinical case-control studies identified; neither study found a relationship after confounding variables had been controlled for [9, 37].~~The review identified two clinical case-control studies which examined whether people with diagnoses of psychosis reported greater levels of perceived discrimination; one reported study found no significant differences [9]; while another found a relationship only in the Black ethnic group [37].~~ However, non-clinical case-control studies found that non-clinical participants reporting psychotic like experiences reported more discrimination than controls (e.g. [43]) ~~several studies suggested that perceived discrimination was more frequently reported by non-clinical individuals with psychotic-like experiences than people who did not report such experiences (e.g. [47,49]), and by individuals at a clinical high risk of developing psychosis compared to healthy controls (e.g. [43,52]).~~ Regarding the second~~ary~~ aim, one clinical study [35] found that discrimination was associated with an increase in psychosis severity~~;~~ ~~as~~ the remaining eligible ~~majority of included~~ studies~~-~~ which were non-clinical~~(all non-clinical)~~ examined associations between discrimination and the frequency of psychotic experiences rather than severity. ~~and found significant relationships (e.g. [38]).~~ Furthermore, several investigations suggest that the relationship between discrimination and psychotic experiences might be more robust for positive symptoms of psychosis, and/or ~~the available evidence suggests exposure to discrimination may be associated with increased vulnerability to~~ specific psychotic experiences, in particular, paranoid/persecutory beliefs in non-clinical samples (e.g. [40,41,44]). ~~only one study found no relationship [52]. Additionally, several investigations provide tentative evidence indicating that the relationship between discrimination and psychotic experiences might be more robust for positive symptoms of psychosis compared to other symptom clusters (negative and cognitive disorganisation [35,38]), and for delusional ideation than hallucinations [51] in studies that examined specific positive psychotic symptoms~~.

The studies that examined the association between minority discrimination and psychosis are predominantly cross-sectional, therefore precluding the unambiguous determination of the direction of influence and/or causality. A

growing number of findings, however, suggest that the impact of discrimination on psychosis liability and severity should not be understated. First, meditational analyses (conducted on cross-sectional data) indicated that perceived discrimination is an important mediator of the relationship between belonging to a minority group and the likelihood of reporting psychotic experiences [35,37,45]. Second, prospective evidence indicates that non-psychotic individuals can develop psychotic-like experiences (delusional ideation) [51], and later conversion to psychosis [53] following experiences they perceived as discriminatory. Thirdly, a small number of studies tested whether the association between discrimination and psychosis varied in a dose-response fashion, a graded relationship was observed, with more severe and/or pervasive experiences of discriminations leading to heightened risk of psychotic symptoms [42,50,51]. These findings, although sparse, are particularly pertinent to key criteria to gauge whether the observed relationships between the phenomena under scrutiny might be causal (e.g. dose-response relationships and temporality are amongst the Bradford Hill criteria for causation [87]), therefore highlighting the need to investigate the relationship between minority discrimination and psychosis further. ~~Despite the above encouraging findings,~~ However, other variables ~~factors~~ may account for the possible association between discrimination and psychosis. For example, research evidence suggests that people experiencing psychosis are more vulnerable to a range of adverse life experiences after the onset of symptoms, including stigma [88,89] and violent victimisation [90,91]. These experiences could then be perceived/appraised as resulting from discrimination in people, belonging to ethnic, sexual or other minorities. Research has demonstrated that people experiencing psychosis often have more negative schema about others, which can lead to biased threat-based attributional styles [28,92]. These explanations are seemingly in line with research findings suggesting that perceived discrimination is associated with negative schemas regarding the self and others [52].

Research findings suggesting a relationship between minority discrimination and psychosis are concordant with psychological models of psychotic experiences and research evidence linking other social adversities to an increased risk for psychosis. The literature synthesised in this review bears parallels with studies that examined the contribution of social deprivation and inequality to the development of psychosis [14]. Growing evidence indicates that social and income inequality are more strongly associated with an increased risk of psychosis than overall deprivation per se [24,26,93]. Therefore, it is possible that the experience of discrimination may lead to increased vulnerability to psychotic experiences (and other mental health difficulties) due to the intrinsic social inequalities that underpin discrimination. Social defeat theory and cognitive models of psychosis also offer potential explanations for this link. According to these accounts, chronic social threat and experiences of subordination could lead to increased risk for psychosis via a number of neurophysiological (e.g. HPA axis dysregulation) and psychological (e.g. development of negative self-other schemas) changes; these proposed pathways to psychosis have already been supported by empirical studies [52,94]. These accounts not only provide plausible theoretical explanations to understand the apparent

associations between discrimination and psychosis, but could also guide future mechanistic research to understand the biological and psychosocial processes that might explain the development of psychotic experiences in people subjected to discrimination. Future carefully designed longitudinal research is required to clarify these findings and determine whether discrimination might represent a contributing factor for psychosis.

Despite the intriguing findings, some studies did not identify statistically significant associations between discrimination and psychosis. One issue is the self-report nature of the discrimination measures included in the review. Researchers suggest that when individuals are asked to disclose their exposure to discrimination, some may have either forgotten or respond in a socially desirable manner in order to avoid scepticism or 'looking bad', and therefore may under-report perceived discrimination [94]. There is some evidence to support this notion as Krieger et al. [95] found that individuals who score high on social desirability report less discrimination. Hence, these reporting biases might affect the magnitude and consistency of the associations between perceived discrimination and psychosis considered in the primary studies examined in this review. Additionally, several methodological issues with the primary studies should be considered while appraising the overall findings. There was considerable variation in the way that discrimination was operationalised and measured in the primary studies. For example, certain studies employed lifetime experiences of discrimination [37] others only considered recent experiences of perceived discrimination [36]. In most cases, the way discrimination was assessed in primary studies precluded to determine with confidence whether psychotic symptoms emerged and/or were aggravated following experiences of discrimination, or whether people who were already psychosis-prone might be more disposed to perceiving negative events as discriminatory. To distinguish between these two potential explanations, future studies should employ either longitudinal designs (which have already shown promising results [51]) or more detailed retrospective assessments of both discrimination and the participants' clinical history allowing to determine with greater confidence whether discrimination was experienced prior to or following the onset of psychotic experiences. The use of more thorough assessments of discrimination could also clarify certain null findings in the primary studies. For example, the studies that found no association between discrimination and psychosis [52] only considered recent experiences of discrimination (within twelve months), whereas research which considered lifetime discrimination bore more promising findings [35].

Another methodological difficulty intrinsic to this research area is the potential overlap between certain psychotic experiences (in particular paranoid ideation, an experience linked to appraisals of social scrutiny, threat to social status, self-consciousness and hypervigilance [80]) and the justified and ultimately non-pathological concerns about the intentions of others experienced by discriminated groups. The use of psychosis assessment measures that could better disentangle between common psychological consequences of discrimination and "frank" symptoms of psychosis may further clarify the nature of the relationship between discrimination and psychotic experiences. For

example, some of the review findings indicated that discrimination was more strongly associated with non-clinical paranoia [40,46] than clinical paranoia and that discrimination was associated with negative self-other schemas [52]. This might suggest that discrimination may not be necessarily involved in the development of clinical levels of paranoia but rather that it increases mistrust and suspiciousness (non-clinical paranoia), a hypothesis that is supported by previous findings reporting that ethnic minority groups, although scoring higher on non-clinical measures of paranoia, did not report higher levels of clinical paranoia than non-ethnic minority groups [9795]. Despite this, studies have demonstrated that minority groups demonstrate higher rates of clinically relevant experiences [6].

In addition to the above, a number of methodological limitations should be considered. This review attempted to synthesise all quantitative empirical studies which examined the association between discrimination and psychosis, and the included studies varied considerably in terms of research designs, participant samples, assessment instruments and research questions. For this reason, we opted to provide a narrative integration of the research evidence rather than employing meta-analytic methods to describe and synthesise this research corpus. Narrative approaches to evidence syntheses are associated with numerous biases [9896]; as the volume of empirical research into the impact of discrimination increases, future evidence syntheses may attempt to examine the research questions considered in this review using meta-analysis. Additionally, most of the included studies varied in terms of study quality. The most notable limitation was that eleven out of twenty-four studies did not take into consideration important confounding variables (e.g. adverse experiences, ethnicity). Failing to control for such experiences hinders confidence that the association between discrimination and psychosis was not confounded by other variables known to affect the relationship [11,37,65].

Implications for research and clinical practice

This review bears several implications for future research. Studies aiming to clarify whether minority discrimination is associated with specific psychotic experiences will benefit from more robust methodological designs and the use of multidimensional, validated measures of psychotic experiences and discrimination (including specific experiences, frequency and severity). Additional prospective research, considerations of potential mediating mechanisms (e.g. attributional style, negative self and other schemas) and important covariates (e.g. previous trauma/adversity) may clarify the pathways linking discrimination to increased psychosis risk. The majority of studies included in the review examined the relationship between discrimination and psychosis in samples of people from ethnic minorities and therefore specifically focussed on racial discrimination. Due to this, it is not possible to examine whether the link between discrimination and psychosis is stronger/more prevalent in different minority groups or discrimination types. However, a few clinical studies [35,37] suggest individuals from Black ethnic groups are more

likely to experience discrimination (and consequently more likely to experience psychotic experiences). Future research should explore the relationship across a range of minority groups (e.g. people with physical disabilities, sexual orientation and gender minorities), and discrimination types (e.g. age, sex).

The results suggest that discrimination plays an important role in the experience of psychosis and, as such, during the development of clinical formulations it is essential that clinicians consider discrimination, particularly with persons from visible minorities. In addition to individual intervention, interventions informed by community psychology perspectives could show promise. Such interventions aspire to change social relations and social systems through, for example, empowerment, involvement, networking, and promoting equal opportunities for people from minority groups [9997] as well as improving ethnic identification and building collective self-esteem [39,41]. In support, Anglin et al. [39] found tentative support that having a stronger connection to one's ethnic background may reduce the risk for psychotic symptoms. Similarly, Kong [41] found no relationship between perceived discrimination and paranoia in those with high collective self-esteem than low self-esteem. Therefore, an intervention (considering discrimination and other adverse social equalities) involving the promotion of a sharing, supporting and trusting society in which communities experience togetherness, acceptance and solidarity, may represent a promising option for the prevention and management of severe psychological difficulties linked to minority discrimination.

Conflict of interest

All authors declare that they have no conflict of interest.

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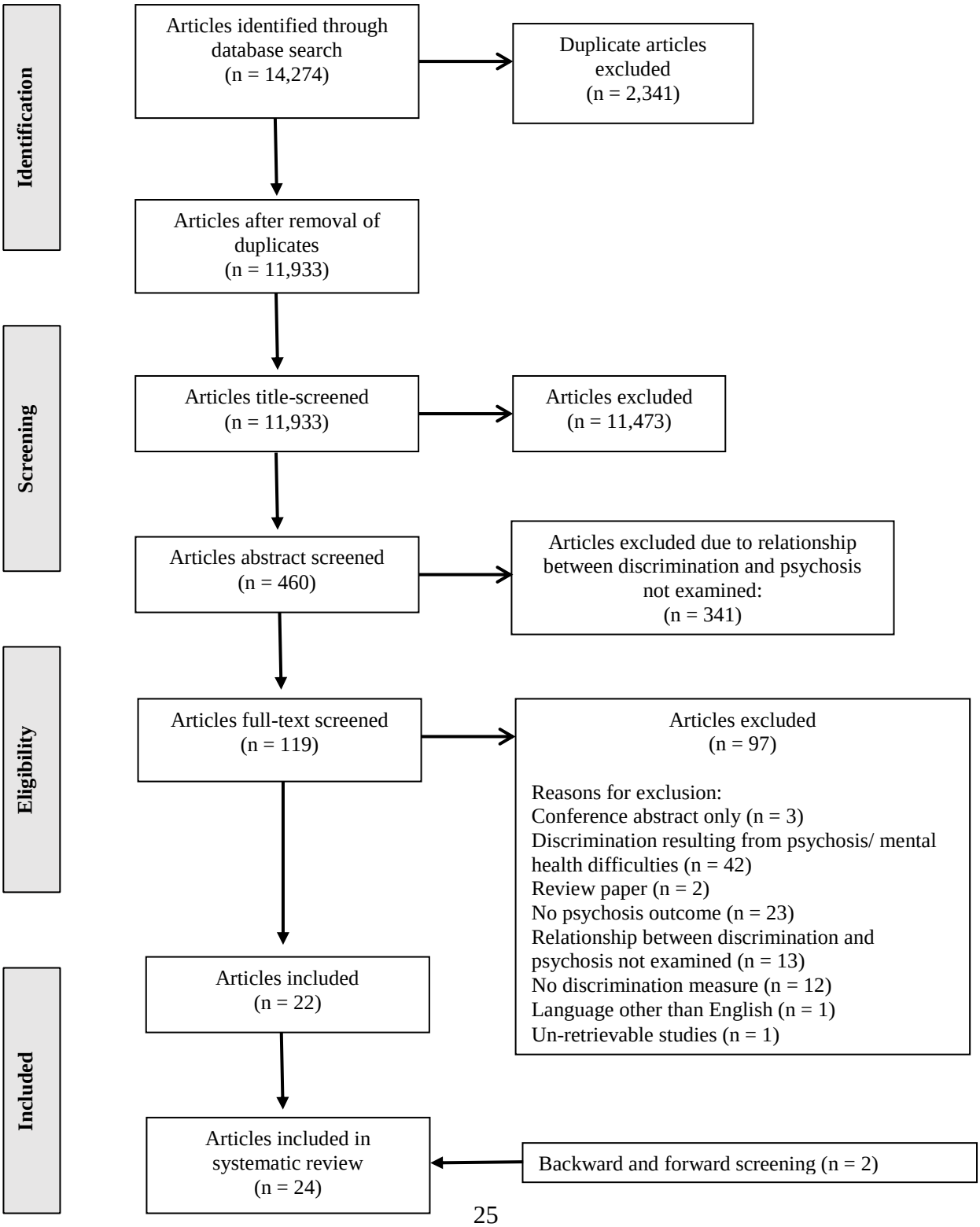

Figure 1. Flowchart of studies included in review

Table 1. Demographic information

Discrimi-nation type	Author, date, *country of recruitment*	Design	Sample ethnicity (%) / immigration status (%)	Sample information	Sample size (N)	Mean age	N (F:M) **	Measures	
								Psychosis	Perceived discrimination
Clinical									
	Berg et al. (2011), *Norway* [35]	Cross-sectional	Europe = 26.7%, Africa = 21.1%, Asia = 46.7%, American = 2.2%	Immigrant 1st and 2nd generation clinical participants with psychotic diagnoses (DSM-IV) recruited from inpatient and outpatient services.	90	30.16*	40 F: 50 M	1. SCI-PANSS	1. Self-report questionnaire developed by Berry et al. [57]
	Gilvarry et al. (1999), *UK* [36]	Prospective (12- and 24-month follow-ups)	White British = 23.1%, African Caribbean = 53.1%, Others = 23.8%	Clinical multi-ethnic participants discharged from the hospital or receiving outpatient care for psychotic disorders (schizophrenia or affective psychosis)	147	36.67*	69 F: 77 M	1. OCCPI	1. RALES
Racial	Veling et al. (2008), *Netherlands* [9]	Cross-sectional	Morrocan = 29%, Turkish = 19%, Surinamese = 32%, Other Non-Western = 20%	Schizophrenia spectrum disorder participants	100	26.60	26 F: 74 M		
			Morrocan = 30, Turkish = 20%, Surinamese = 34%, Other Non-Western = 17%	Control group 1 (general hospital)	100	27.20	28 F: 72 M	1. CIDI	1. Self-report questionnaire developed by Berry et al. [57]
			Morrocan = 32%, Turkish = 19%, Surinamese = 33%, Other Non-Western = 16%	Control group 2 (sibling to clinical sample)	63	26.50	34 F: 29 M		
Racial, religious, cultural or social class	Cooper et al. (2008), *UK* [37]	Cross-sectional	White British = 59.9%, Black = 40.1%.	AESOP study sample including first episode psychosis sample	224	32.10	122 F: 102 M	1. SCAN	1. CANDID-2
			White British = 87.6%, Black = 12.4%.	AESOP study sample including healthy controls	293	38.70	171 F: 122 M		
Non-clinical									

Racial	Anglin et al. (2014), *USA* [a] [38]	Cross-sectional	Black = 32.8%, Asian = 27.5%, Hispanic = 24.2%, Other = 15.6%.	Undergraduate student sample compromising of Black/African American, Asian, Hispanic or Other.	644	19.90	426 F: 215 M	1. PQ	1. EOD
	Anglin et al. (2014), *USA* [a] [11]	Cross-sectional	Black = 32.8%, Asian = 27.5%, Hispanic = 24.2%, Other = 15.6%.	Undergraduate student sample compromising of Black/African American, Asian, Hispanic or Other.	644	19.90	426 F: 215 M	1. PQ	1. EOD
	Anglin et al. (2016), *USA* [a] [39]	Cross-sectional	Black = 32.8%, Asian = 27.5%, Hispanic = 24.2%, Other = 15.6%.	Undergraduate student sample compromising of Black/African American, Asian, Hispanic or Other.	644	19.90	426 F: 215 M	1. PQ	1. EOD
	Becares et al. (2009), *UK* [b] [55]	Cross-sectional	White = 41%, Caribbean = 17%, Indian = 18% Bangladeshi = 8%, Pakistani n = 16%	Epidemiological sample (Fourth National Survey of Ethnic Minorities)	7257	44.0	3834 F: 3423 M	1. PSQ	1. Author measure of interpersonal racism
	Combs et al. (2006), *USA* [40]	Cross-sectional	African American = 100%	African American college students recruited from three universities	128	20.50	96 F: 32 M	1. PS 2. PAI – persecutory ideation subscale	1. PRS
	Das-Munshi et al. (2012), *UK* [c] [56]	Cross-sectional	White = 20%, Irish = 17%, Black Caribbean = 16%, Bangladeshi = 15%, Indian = 15%, Pakistani n = 17%	Epidemiological sample (EMPIRIC; Ethnic Minority Psychiatric Illness Rates in the Community dataset)	4281		2340 F: 1941 M	1. PSQ	1. Author measure of work-related discrimination 2. Author measure of interpersonal racism
	Kong (2016), *USA* [41]	Prospective (baseline and 1-month follow-up) Prospective (baseline and 3-week follow-up)		Study 1: Asian American employees recruited form 'StudyResponse' a nonprofit organisation which recruits participants for academic research Study 2: Latino/Hispanic employees recruited from 'StudyResponse'	116 76	34.33 37.08	57 F: 59 M 18 F: 58 M	1. BSI - paranoia items	1. Items from Triana and Garcia's perceived ethnic discrimination measure [58] 1. Adapted Stephan et al. scale [59]

	Oh et al. (2016), *USA* [d] [42]	Cross-sectional	African American = 93.13%, Afro-Caribbean American = 6.87%	Epidemiological sample (NSAL; National Survey of American Life)	4384			1. WHO - CIDI 3.0 – psychosis section	1. Adapted Lifetime Discrimination subscale [60]
	Shaikh et al. (2016), *UK* [43]	Cross-sectional	Black = 30%, White British = 36%, White Other = 17%, Other = 17%.	UHR participants recruited from specialist services for young people at risk of psychosis.	64	22.55	26 F: 38 M	1. SSPS 2. PQ – paranoia	1. PEDQ-CV
		Cross-sectional	Black = 23%, White British = 37%, White other = 16%, Other = 23%	Matched (demographics) control sample recruited by advertisements	43	24.02	23 F: 20 M		
Gender orientation	Thoroughgood et al. (2017), *USA* [44]	Cross-sectional	White = 75%, African American = 9%, Hispanic = 2%, Asian = 2%, Pacific Islander = 1%, Other = 5%	Full time or part-time transgender participants recruited from a health conference and snowball sampling	160	41.20	66 M-to-F: 68 F-to-M: 26 Other	1. PS 2. Author Paranoid cognition measure	1. Perceived gender discrimination
Sexual orientation	Gevonden et al. (2014), *Netherlands* [e] [45]	Cross-sectional		Epidemiological sample NEMISIS-1 (NEMESIS; Netherlands Mental Health Survey and Incidence Studies), participants categorised as heterosexual (N = 5812) or LGB (N = 115)	5927	40.57*	3096 F: 2831 M	1. CIDI – psychosis section 2. SCID	1. Items developed by authors
				Epidemiological sample NEMISIS-2, participants categorised as heterosexual (N = 5816) or LGB (N = 114).	5300	43.47*	2877 F: 2423 M		
Religious	Rippy & Newman (2006), *USA* [46]	Cross-sectional	Immigrant Muslims = 56.8%, 2nd generation Muslim = 13.8%, Adult Muslim convert = 29.1%,	Sample of Muslim participants recruited from the community in Oklahoma.	152	33.94*	60 F: 92 M	1. PS	1. PRDS

Racial or religious	Chakraborty et al. (2010), *UK* [c] [47]	Cross-sectional	White = 20%, Irish = 17%, Black Caribbean = 16%, Bangladeshi = 15%, Indian = 15%, Pakistani n = 17%	Epidemiological sample (EMPIRIC) with greater proportion of ethnic minority groups: Black Caribbean, Indian, Pakistani, Bangladeshi and Irish.	4281		2340 F: 1941 M	1. PSQ	1. Questions taken from the self-report Fourth National Survey [61]
	Karlsen and Nazroo (2002), *UK* [b] [48]	Cross-sectional	Caribbean = 23%, Indian = 39%, Pakistani and Bangladeshi = 34%, Chinese = 4%	Epidemiological sample (Fourth National Survey of Ethnic Minorities)	2507			1. CIS 2. PSQ	1. Questionnaire from Smith and Prior (1997) [62]
	Karlsen et al. (2005), *UK* [c] [49]	Cross-sectional	Irish n = 21%, Caribbean = 20%, Bangladeshi = 19%, Indian = 19%, Pakistani = 21%	Epidemiological sample (EMPIRIC dataset)	3446	37.36*		1. PSQ	1. Questionnaire from Smith and Prior (1997) [62]
General (appearance, age, skin colour, ethnicity, sex, religion, disability, sexual orientation	Oh et al. (2014), *USA* [d] [50]	Cross-sectional	Asian = 15.98%, Hispanic = 44.06%, African American = 37.6%, African-Caribbean = 2.35%.	Epidemiological sample (NLASS; National Latino and Asian American Survey and NSAL; National Survey of American Life dataset)	8990		4660 F: 4330 M	1. WHO - CIDI 3.0 – psychosis section	1. EDS
	Janssen et al. (2003), *Netherlands* [e] [51]	Prospective (baseline and 3-year follow-up).		Epidemiological sample (NEMESIS) of people who had no history of experiencing psychosis.	4076	41.40	2144 F: 1923 M	1. CIDI 2. BPRS	1. Questionnaire developed by authors
	Saleem et al. (2014), *USA* [f] [52]	Cross-sectional		Epidemiological sample recruited as part of NAPLS 2 (North American Prodrome Longitudinal Study 2) and categorised as CHR	360	18.99	149 F: 211 M	1. SIPS-SOPS	1. Adapted self-report measure of perceived discrimination [51]
				Epidemiological sample recruited as part of NAPLS 2 and categorised as healthy controls	180	19.54	93 F: 93 M		
	Stowkowy et al. (2016), *USA* [f] [53]	Prospective (baseline and 2-year follow-up)	Caucasian = 57.3%, Other = 42.7%	CHR sample recruited as part of an epidemiological study (NAPLS 2)	764	18.50	328 F: 436 M	1. SIPS-SOPS	1. Adapted self-report measure of perceived discrimination [51]
			Caucasian = 54.3%, Other = 45.7%	Health control participants recruited as part of an epidemiological study (NAPLS 2)	280	19.73	139 F: 141 M		

van de Beek et al. (2017), *Netherlands* [54]	Cross-sectional	1st generation immigrants = 19%, 2nd generation immigrants = 81%	Epidemiological dataset (MEDINA) of the Moroccan Dutch population	267	24.50	231 F: 36 M	1. PQ-16	1. EDS

Notes: [a] Overlapping student sample, [b] Overlapping sample using the Fourth National Survey on Ethnic Minorities, [c] Overlapping sample using the EMPIRIC dataset, [d] Overlapping sample using the NSAL dataset, [e] Overlapping sample using the NEMESIS dataset, [f] Overlapping dataset using the NAPLS dataset. * Means combined using a formula. ** Not all studies reported on the gender of all participants (i.e. in some cases the gender of most but not all participants was reported).

Abbreviations: APPS = attenuated psychotic positive symptoms; CHR = clinical high risk of psychosis; CI = confidence interval; IRR = incident rate ratio; UHR = ultra-high risk.

Psychosis measure: Brief Psychiatric Rating Scale (BPRS:[63]); Brief Symptom Inventory (BSI: [64]); Clinical Interview Schedule (CIS: [65]); Composite International Diagnostic Interview (CIDI: [66-68]; CIDI 3.0: [69]); Paranoia Scale (PS: [70]); Operational Criteria for Psychotic Illness (OCCPI: [71]); Personality Assessment Inventory – persecutory ideation subscale (PAI: [72]); Prodromal Questionnaire (PQ: [73]; PQ-16: [74]); Psychosis Screening Questionnaire (PSQ: [75]); SIPS and the Scale for Assessment of Prodromal Symptoms (SIPS-SOP; [76]); Schedule for Clinical Assessment in Neuropsychiatry (SCAN: [77]); State Social Paranoia Scale (SSPS: [78]); Structured Clinical Interview for DSM-IV (SCID: [79]); Structured Positive and Negative Syndrome Scale (SCI-PANSS: [80]); Trait paranoia (Fenigstein & Vanable 1992).

Discrimination measure: Cultural and Identity Schedule 2 (CANDID: [81]); Every Day Discrimination Scale (EDS: [82]); Experiences of Discrimination (EOD: [83]); Perceived Ethnic Discrimination Questionnaire – Community Version (PEDQ-CV: [84]); Perceived Racism Scale (PRS: [85]); Perceived Religious Discrimination Scale (PRD; [Rippy, 2004, unpublished measure]); Perceived Transgender Discrimination [86]; Racial Life Events Schedule ([RALES: Bhugra & Mallet unpublished measure, 1991]).

Table 2: Quality appraisal

Name of study	Selection bias	Study design	Confounders	Blinding	Data collection	Withdrawals and dropouts
Anglin et al. [38]	Weak	Weak	Moderate	Moderate	Strong	NA
Anglin et al. [11]	Weak	Weak	Weak	Moderate	Strong	NA
Anglin et al. [39]	Weak	Weak	Weak	Moderate	Strong	NA
Becares et al. [55]	Moderate	Weak	Strong	Moderate	Moderate	NA
Berg et al. [35]	Moderate	Weak	Weak	Moderate	Strong	NA
Chakraborty et al. [47]	Moderate	Weak	Strong	Moderate	Moderate	NA
Combs et al. [40]	Weak	Weak	Weak	Moderate	Strong	NA
Cooper et al. [37]	Moderate	Moderate	Moderate	Moderate	Strong	NA
Das-Munshi et al. [56]	Moderate	Weak	Strong	Moderate	Moderate	NA
Gevonden et al. [45]	Moderate	Weak	Strong	Moderate	Moderate	NA
Gilvarry et al. [36]	Weak	Moderate	Weak	Moderate	Moderate	Strong
Janssen et al. [51]	Strong	Moderate	Strong	Moderate	Moderate	Moderate
Karlsen and Nazroo [48]	Moderate	Weak	Weak	Moderate	Moderate	NA
Karlsen et al. [49]	Moderate	Weak	Moderate	Moderate	Moderate	NA
Kong [41]	Weak	Moderate	Weak	Moderate	Strong	Strong
Oh et al. [50]	Strong	Weak	Strong	Moderate	Strong	NA
Oh et al. [42]	Moderate	Weak	Strong	Moderate	Strong	NA
Rippy and Newman [46]	Weak	Weak	Weak	Moderate	Strong	NA
Shaikh et al. [43]	Weak	Weak	Moderate	Moderate	Strong	NA
Saleem et al. [52]	Moderate	Moderate	Weak	Moderate	Moderate	NA

Stowkowy et al. [53]	Moderate	Moderate	Weak	Moderate	Moderate	Weak
Thoroughgood et al. [44]	Weak	Weak	Weak	Moderate	Strong	NA
van de Beek et al. [54]	Weak	Weak	Strong	Moderate	Strong	NA
Veling et al. [9]	Moderate	Moderate	Strong	Moderate	Strong	NA

Notes: NA = not applicable given the cross-sectional nature of studies

Table 3: Results

Discrimination type	Author, date, *country of recruitment*	Results
Clinical		
Racial	Berg et al. (2011), *Norway* [35]	Positive correlations were found between perceived discrimination and positive psychotic symptoms (r = 0.26, p < .050). No associations were found between perceived discrimination and negative psychotic symptoms. African Americans reported the most severe 'positive symptoms' and higher rates of perceived discrimination (t = 2.472, df = 88, p < .015). Multiple linear regression demonstrated that the relationship between African immigrant status and severity of symptoms reduced when perceived discrimination was added in to the model (Model 1 without covariate: B = 3.096, SE = 1.103, p = .006; Model 2 controlling for perceived discrimination: B = 2.535, SE = 1.123, p = .270), indicating that it partially mediated the relationship.
	Gilvarry et al. (1999), *UK* [36]	Logistic regression indicated that Black and ethnic minority individuals were more likely to report life events (financial, health, assault) as being related to discrimination than White British individuals (but not housing life events). Perceptions of racial discrimination were not associated with diagnosis (schizophrenia vs affective psychosis) or course of illness (episodic vs continuous).
	Veling et al. (2008), *Netherlands* [9]	Cases reported slightly higher levels of perceived discrimination (52%) than both control groups (42%), but the relationship was not statistically significant. However, cases significantly reported more personal experiences of discrimination than group 1 controls (OR = 1.08, 95% CI [1.01, 1.17]). However, after controlling for employment, education, marital status, cultural distance, mastery, ethnic identity, self-esteem, social support and cannabis use, no statistically significant differences in perceived discrimination was found between cases and group 1 controls. Additionally, perceived discrimination was reported more by males than females (50% vs 37%, x^2 = 3.38, df = 1, p = .046) in the total sample.
Racial, religious, cultural or social class	Cooper et al. (2008), *UK* [37]	People experiencing psychosis were more likely to experience racial perceived disadvantage (OR = 1.2, 95% CI [1.1, 1.4], p < .009) than the control group. However, when higher perceived disadvantage scores by Black people were controlled for, people experiencing psychosis were less likely to attribute disadvantage to skin colour (OR = 0.82, 95% CI [0.68, 0.98], p < .027). Additionally, greater perceptions of disadvantage were not significantly associated with persecutory delusions, delusions of reference or hallucinations. Psychosis cases were more likely to be from Black ethnic group, and were also more likely to believe they were at a greater disadvantage compared to White people (OR = 1.3, 95% CI [1.1, 1.5], p < .001). Additionally, Black ethnic groups were 4 times more likely to experience psychosis (OR = 4.7, 95% CI [3.1, 7.2], p < .001) than White people, after controlling for age and gender. This association reduced when perceived disadvantage was added in to the model, indicating that it partially mediated the relationship (OR= 4.1, 95% CI [2.5, 6.8], p < .001) between case status (controls or psychosis) and Black ethnicity.
Non-clinical		
	Anglin et al. (2014), *USA* [a] [38]	Positive correlations were found between number of racial discrimination domains (getting housing, credit or medical care, at work, getting hired, in police or courts, getting a service, at school and on the street or in public) and 'attenuated psychotic symptoms' (APPS) (r = .242, p < .001), as well as, the frequency of discrimination and APPS (r = .249, p < .001). Discrimination domains were significantly (p < .001) associated with an increased risk of all psychotic domains: cognitive disorganisation (r = .229), unusual thinking (r = .197), perceptual abnormalities (r = .199) and paranoia (r = .204). Additionally, discrimination frequency was significantly (p < .001) associated with an increased risk of all psychotic domains: cognitive disorganisation (r = .234), unusual thinking (r = .204), perceptual abnormalities (r = .196) and paranoia (r = .210). Racial discrimination was associated with an increased risk of being in the high than low APPS-distress category OR = 1.41 (95% CI [1.23, 1.60]). The association remained when race/ethnicity, gender, age and income had been adjusted for OR = 1.29 (95% CI [1.10, 1.51]). Therefore, racial discrimination was found to increase the risk of higher levels of distress associated with psychosis.

	Anglin et al. (2016), *USA* [a] [11]	Black people were significantly more likely to report racial discrimination compared to 'other' racial groups ($p < .001$), but not significantly more likely than Asian and Hispanic ethnic/racial groups. Also, there were no racial differences in the number of APPS-distress endorsed. Racial discrimination was associated with APPS-distress and remained significant after adjusting for age ($\beta = .105$, $p < .001$). Bootstrapping analyses suggested that the relationship between racial discrimination and APPS-distress was partially mediated by RS-scores (Rejection Sensitivity Questionnaire-Race; participants concerns and expectations of rejection based on their race).
	Anglin et al. (2016), *USA* [a] [39]	At least 70% of the student sample experienced one type of perceived discrimination, and a positive significant relationship between perceived discrimination and positive psychotic symptoms ($r = .211$, $p < .001$). Additionally, the relationship between discrimination and positive psychotic symptoms differed based on participant's commitment and exploration of their ethnicity i.e. ethnic identity (e.g. low ethnic identity, moderate ethnic identity and high ethnic identity). For example, the effect of perceived racial discrimination on positive psychotic symptoms was higher for participants with low ethnic identity ($F(4, 165) = 19.71$, $p < .001$, $R^2 = .30$, adjusted $\beta = .76$) than higher (moderate and high ethnic identity combined) ethnic identity participants ($F(4, 457) = 51.14$, $p < .001$, $R^2 = .30$, adjusted $\beta = .23$).
Racial	Becares et al. (2009), *UK* [b] [55]	Racial abuse was associated with an increased likelihood of reporting psychotic experiences in the combined ethnic minority group (adjusted OR = 3.13, $p < .001$), with Indians (adjusted OR = 4.15, $p < .001$) and Caribbean people (adjusted OR = 3.47, $p < .001$) demonstrating the strongest likelihood of psychotic experiences. An interaction was found between racial abuse and ethnic density on psychotic symptoms (not significant), with the association between racism and psychotic experiences smaller in areas of high ethnic density.
	Combs et al. (2006), *USA* [40]	Perceived discrimination was associated with non-clinical ($r = .40$, $p < .001$) and clinical ($r = .24$, $p = .008$) levels of paranoia. Males had higher levels of clinical paranoia ($t = 2.7$, df = 124, $p = .007$). Multiple regression model was overall significant ($R = .69$, Adj $R^2 = .38$, F (15, 81) = 5.0, $p < .001$) showing that perceived discrimination was a significant predictor of non-clinical paranoia, but not a significant predictor of clinical paranoia.
	Das-Munshi et al. (2012), *UK* [c] [56]	In the combined ethnic minority sample (after adjusting for confounding variables), interpersonal racism (OR = 2.26, 95% CI [1.62, 3.14], $p < .001$) and work-related discrimination (OR = 1.46, 95% CI [1.06, 2.00], $p = .020$) was associated with psychotic experiences. When own-group density decreased by 10%, individuals were more likely to report psychotic experiences in all ethnic groups (except for White British). This relationship achieved significance only in the combined (OR = 1.03, $p = .030$) and Indian (OR = 1.38, $p = .030$) samples (not Black Caribbean, Irish, Bangladeshi, and Pakistani samples). Additionally, ethnic minority groups were more likely to report discriminatory experiences and less social support when living in areas of low own-group density.
	Kong (2016), *USA* [41]	Study 1: Path analysis found that perceived ethnic discrimination was significantly related to paranoia ($\beta = .48$, $p < .001$, bootstrap 95% CI [.33, .61]) Study 2: Similar to study 1, path analysis found that perceived ethnic discrimination was significantly related to paranoia ($\beta = .21$, $p < .05$, bootstrap 95% CI [.04, .39]). Additionally, collective self-esteem was found to moderate the relationship between perceived ethnic discrimination and paranoia, because when collective self-esteem was low, discrimination was positively related to paranoia ($\beta = .10$, $SE = .03$, $t = 2.99$, $p < .01$). However, when collective self-esteem was high, the relationship was not significant ($\beta = -.06$, $SE = .05$, $t = -1.14$, $p = .26$).

	Oh et al. (2016), *USA* [d] [42]	Logistic regression demonstrated that police abuse (adjusted OR = 1.69, 95% CI [1.20, 2.39], $p < .01$), being denied a promotion (adjusted OR = 1.44, 95% CI [1.07, 1.95], $p < .05$) or a loan (adjusted OR = 1.93, 95% [1.16, 3.26], $p < .05$) was associated with increased lifetime psychotic experiences (these discriminatory experiences were attributed to race, skin colour or ancestry). Also, those who reported one or two discriminatory experiences were 63% more likely to report psychotic experiences (compared to those reporting none), and those who reported three or more, were twice as likely. Additionally, after controlling for confounders, being denied a promotion (adjusted OR = 1.53, $p < .01$) or a loan (OR = 2.02, $p < .05$), police abuse (adjusted OR = 1.82, $p < .01$), and being discouraged from education (adjusted OR = 2.02, $p < .01$) was associated with an increased risk of visual hallucinations. Whilst, not being hired (adjusted OR = 2.60, $p < .05$), or excluded from the neighborhood (adjusted OR = 2.81, $p < .05$), or discouraged from education (adjusted OR = 2.99, $p < .01$), was associated with an increased risk of delusional ideation. No discriminatory experience was associated with auditory hallucinations.
	Shaikh et al. (2016), *UK* [43]	Perceived ethnic discrimination was significantly higher in the UHR group compared to health controls, $t = 3.63$, $p < .001$. Positive correlation between perceived ethnic discrimination and persecutory paranoia in virtual reality for the whole sample ($r = .25$, $p = .009$), but not in individuals at UHR risk ($r = .119$, $p = .360$), or healthy controls ($r = .212$, $p = .180$). Logistic regression found that perceived discrimination was not a significant predictor of paranoid ideation in virtual reality for the whole sample ($p = .25$) or the UHR group ($p = .95$). However, it was a significant predictor in healthy controls (OR = 0.046, $p = .049$) Positive correlations between perceived discrimination and prodromal psychotic symptoms in the whole sample ($r = .42$, $p < .001$) and UHR group ($r = .33$, $p = .009$) no significant correlation in healthy controls ($r = .09$, $p = .560$).
Gender orientation	Thoroughgood et al. (2017), *USA* [44]	Perceived transgender discrimination was significantly associated with trait paranoia ($r = .40$, $p < .01$) and paranoid cognition at work ($r = .61$, $p < .001$). After controlling for trait paranoia and negative affect, perceived discrimination was related to paranoid cognition at work ($\beta = .45$, $p < .001$).
Sexual orientation	Gevonden et al. (2014), *Netherlands* [e] [45]	Psychosis incidence was significantly elevated in the LGB group compared to the heterosexual group (NEMESIS-1: adjusted OR = 2.56, 95% CI [1.71, 3.84]; NEMESIS-2: adjusted OR = 2.30, 95% CI [1.42, 3.71]). Discrimination in the past year mediated 34% of the total effect of sexual minority status (e.g. homosexual behavior) on occurrence of psychotic symptoms ($z = 3.52$, $p < .001$) in NEMESIS-1.
Religious	Rippy and Newman (2006), *USA* [46]	Between group analysis demonstrated there were significant differences ($p < .020$) between the immigrant, second generation immigrant, or convert Muslims living in the US in level of perceived discrimination, with second generation Muslims reporting greater amounts of perceived discrimination than convert ($p < .050$) and immigrant Muslims. A positive correlation was found between perceived discrimination and non-clinical paranoia in male but not female Muslims ($r = .42$, $p < .010$).
Racial or religious	Chakraborty et al. (2010), *UK* [c] [47]	Racial verbal insults were associated with being categorized as experiencing psychosis (PSQ positive) in Black Caribbean (OR = 3.35, 95% CI [1.79, 6.26]), Bangladeshi (OR = 5.46, 95% CI [1.79, 6.26]) and Pakistani groups (OR = 2.65, 95% CI [1.26, 5.55]). Also, job refusal was associated with being PSQ positive in the Pakistani origin group (OR = 2.26, 95% CI [1.08, 4.75]). There were no significant associations found between racial discrimination and psychosis in the Indian origin group. (All odds ratios were adjusted for age, gender, social class, number of close persons, and distance of closest person).
	Karlsen and Nazroo (2002), *UK* [b] [48]	Logistic regression analysis revealed that the perception of racial discrimination increased the risk of psychosis (OR = 1.57, 95% CI [1.02, 2.42]) Experiencing verbal racial abuse (OR = 2.86, 95% CI [1.69, 4.83]) and physical racial attacks (OR = 4.77, 95% CI [2.32, 9.80]) were significantly associated with experiencing psychosis.

	Karlsen et al. (2005), *UK* [c] [49]	In the combined sample risk of psychosis was associated with experienced racial verbal abuse (OR = 2.18, 95% CI [1.31, 3.63]), and physical racial attack (OR = 2.94, 95% CI [1.14, 7.57]), similar results were found for males and females. The Bangladeshi group showed the greatest risk (OR = 7.83, 95% CI [2.00, 30.61]) followed by Caribbean (OR = 3.45, 95% CI [1.73, 6.90]) and Pakistani participants (OR = 3.36, 95% [1.58, 7.18]). Perceived work-related discrimination (attributed to race, religion or ethnic background) was not significantly related to an increased risk of psychosis in the combined sample. However, Caribbean people who perceived employers to be racist had an increased risk of psychosis (OR = 2.34, 95% CI [1.28, 4.28]).
General (appearance, age, skin colour, ethnicity, sex, religion, disability, sexual orientation	Oh et *al. (2014), USA* [d] [50]	Discriminatory experiences were mostly attributed to race (64.87%, SE = 1.9), followed by other reasons (23.1%, SE = 0.97), height or weight (2.35%, SE = 0.20), gender (3.7%, SE = 0.29) and age (5.99%, SE = 0.57). Participants experiencing psychosis were more likely to be African-American and less likely to be Asian. Multiple logistic regression models demonstrated that participants who reported the highest levels of perceived discrimination (compared to those who experienced no discrimination) were more likely to report experiences of psychosis (moderate levels OR = 2.432, high levels OR = 3.262). Lower levels of perceived discrimination did not significantly predict psychosis (low levels OR = 1.497 and mild levels OR = 1.24). The overall likelihood of psychotic experiences increased with greater exposure to discrimination (z = 12.22, $p < .001$) indicating a dose-repose relationship. Also, higher levels of perceived discrimination were associated with an increased the risk of delusions OR = 4.278, auditory hallucinations OR = 3.843, and visual hallucinations OR = 2.971 after controlling for covariates (e.g. age, gender, income, education, immigration status, race, substance abuse, PTSD, region, social interaction and complex survey design).
	Janssen et al. (2003), *Netherlands* [e] [51]	Rates of baseline perceived discrimination were: ethnicity/skin colour (n = 75, 2%), age (n = 261, 6%), disability (n = 77, 2%), gender (n = 182, 4%), appearance (n = 80, 2%), and sexual orientation (n = 13, 0.3%). Perceived discrimination predicted the onset of delusional ideation in a dose response fashion (OR = 2.1, 95% CI [1.2, 3.8], $p = .027$), as rate of delusion ideation was 0.5% in participants reporting one discriminatory, and 2.7% in those who reported more than once domain. The relationship remained significant after controlling for confounding variables (OR = 2.3, 95% CI 95% [1.2, 4.2]). No association was found between baseline discrimination and hallucinations.
	Saleem et al. (2014), *USA* [f] [52]	CHR participants had significantly higher frequencies of total perceived discrimination (z = -6.04, $p < .001$) and individual experiences (perceived discrimination based on appearance, age, skin colour, religion, disability, sexual orientation, and other, not ethnicity or gender) than the healthy comparison group. CHR had higher levels of negative schemas about self (U = 196.23, $p < .0001$), and about others (U = 136.04, $p < .0001$) than the comparison group. Perceived discrimination was not associated with total 'positive symptoms' and specific experiences (unusual thoughts, suspiciousness, grandiose ideas, perceptual abnormalities, disorganised communication) in either the CHR or the comparison group. Perceived discrimination was significantly associated with negative schemas.

	Perceived discrimination was significantly associated with being in an ethnic minority group in both CHR (r = -.15, p < .0001) and healthy control groups (r = -.21, p < .01). However, CHR participants reported more perceived discrimination compared to controls (z = -6.44, p < .0001).
Stowkowy et al. (2016), *USA* [f] [53]	In the CHR group, perceived discrimination was positively associated with the following psychotic symptoms: grandiose ideas (r = .09, p < .05), disorganized communication (r = .15, p < .003 after Bonferroni correction), and suspiciousness (r = .16, p < .003 after Bonferroni correction). Additionally, individuals at a clinical high risk of psychosis who reported significantly more perceived discrimination were more likely to experience later conversion to psychosis, compared to CHR individuals who reported less perceived discrimination. For example, for one discrimination experience endorsed, an individual had a 52.4% chance of conversion to psychosis (HR 1.101, 95% CI [1.002, 1.209], p = .0449).
van de Beek et al. (2017), *Netherlands* [54]	Regression analyses found that perceived discrimination was associated with greater psychotic experiences (β = .257, p < .001), the relationship remained significant after adjusting for age, gender, education, immigration status and social support (β = .197, p < .01), and the regression models explained variance increased after adjusting for the above mentioned variables (adjusted R^2 = 0.179 vs unadjusted R^2 = 0.062).

Notes: [a] Overlapping student sample, [b] Overlapping sample using the Fourth National Survey on Ethnic Minorities, [c] Overlapping sample using the EMPIRIC dataset, [d] Overlapping sample using the NSAL dataset, [e] Overlapping sample using the NEMESIS dataset, [f] Overlapping dataset using the NAPLS dataset.