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Psychotic Disorders and Repeat Offending: Systematic Review and Meta-analysis

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Objective: **To undertake a systematic review and meta-analysis on the risk of repeat offending in individuals with psychosis and to assess the effect of potential moderating characteristics on risk estimates.** ***Methods:*** **A systematic search was conducted in 6 bibliographic databases from January 1966 to January 2009, supplemented with correspondence with authors. Studies that reported risks of repeat offending in individuals with psychotic disorders (*n* = 3511) compared with individuals with other psychiatric disorders (*n* = 5446) and healthy individuals (*n* = 71 552) were included. Risks of repeat offending were calculated using fixed- and random-effects models to calculate pooled odds ratios (ORs). Subgroup and meta-regression analyses were conducted to examine how risk estimates were affected by various study characteristics including mean sample age, study location, sample size, study period, outcome measure, duration of follow-up, and diagnostic criteria.** ***Results:*** **Twenty-seven studies, which included 3511 individuals with psychosis, were identified. Compared with individuals without any psychiatric disorders, there was a significantly increased risk of repeat offending in individuals with psychosis (pooled OR = 1.6, 95% confidence interval [CI] = 1.4–1.8), although this was only based on 4 studies. In contrast, there was no association when individuals with other psychiatric disorders were used as the comparison group (pooled OR = 1.0, 95% CI = 0.7–1.3), although there was substantial heterogeneity. Higher risk estimates were found in female-only samples with psychosis and in studies conducted in the United States.** ***Conclusions:*** **The association between psychosis and repeat offending differed depending on the comparison group. Despite this, we found no support for the findings of previous reviews that psychosis is associated with a lower risk of repeat offending.**

Key words: schizophrenia/psychotic disorders/crime/violence/review/meta-analysis

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Introduction

With around 10 million prisoners worldwide,[1] there are approximately 400 000 individuals with psychosis who are currently in custody.[2] In the United States, this equates to around 80 000 individuals with psychosis, an estimate significantly more than all US public psychiatric hospital beds.[3,4] One of the important questions this raises is whether psychosis is associated with repeat offending. As rates of reoffending are high across different countries,[5–7] potentially modifiable determinants of recidivism have the potential to make a considerable contribution to public health and safety. One of these determinants is the improvement in the care and management of prisoners and offenders with schizophrenia and other psychoses. Furthermore, the number of forensic psychiatric inpatients has been growing markedly in many Western countries and other countries, including China,[8,9] and risk assessment and management of patients with severe mental illness are increasing priorities for mental health services.[10]

Despite robust evidence demonstrating an association between psychosis and violent outcomes,[11] particularly homicide,[12] it remains uncertain whether there is an association between psychosis and repeat offending. A meta-analysis from 1998 concluded that psychosis was inversely related to re-offending,[13] and, in keeping with this, some violence risk assessment instruments have included major mental illness as a protective factor.[14] However, more recent evidence in larger samples has found that schizophrenia is not protective. A recent study of 79 211 prisoners found associations between psychosis and the number of repeat incarcerations in a dose-response manner.[15] Another study of community offenders found no association between being diagnosed with schizophrenia and repeat violent offending.[16] Recent reviews have been descriptive and not quantitatively synthesized the evidence or explored sources of heterogeneity.[17,18] Therefore, we have undertaken a systematic review and meta-analysis of the risk of repeat offending in patients with psychotic disorders.

Methods

Studies of the association of psychotic disorders and criminal recidivism were sought by searches of

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computer-based databases (Medline, Embase, PsycInfo, Cinahl, US National Criminal Justice Reference System, and Web of Science) from January 1, 1966, to January 31, 2009. We used combinations of keywords relating to psychotic disorders (eg, psychotic, psychos*, and schiz*) and criminal recidivism (eg, recidi*, reoffend*, repeated offend*, rearrest, reconvict*, reincarerat*, revoke*, relapse, failure, and recur*). To improve our search, the terms mental disorder*, mental illness*, and psychiatric disorder* were also used, combined with the search terms for criminal recidivism. These were supplemented with scanning of article reference lists and correspondence with authors. We included case-control studies (including cross-sectional surveys) and cohort studies, which investigated the risk of criminal recidivism in persons with psychotic disorders, compared with individuals without psychiatric disorders or patients with other psychiatric disorders. We included articles in all languages. Studies were excluded if they (1) involved assessment of psychotic disorders based solely on self-report questionnaires;[19,20] (2) were restricted to single category of crime, for instance, repeat homicide,[21,22] sexual reoffending,[23] repeat fire setting,[24] or spousal assault recidivism[25]; (3) investigated inpatient violence;[26,27] and (4) did not provide information that allowed for the calculation of odds ratio (OR).[28]

A standardized form was used to extract data from the studies. Numbers of participants with or without psychotic disorders by criminal recidivism status were extracted for each article. The following information was recorded and coded according to a fixed protocol: study design, study period, geographical location of the study, diagnostic tool, comparison group, definition of cases, method of ascertainment, duration of follow-up, institutional setting, comorbidity with substance abuse, outcome measure, and descriptive statistics of the sample (eg, age and sex distribution). Data were extracted and cross-checked independently by the 2 authors. Discrepancies were resolved by discussion and if necessary by contacting authors of studies.

ORs with 95% confidence intervals (CIs) of the risk of criminal recidivism in psychotic disorders compared with control subjects were combined using meta-analysis, with the data presented in forest plots. The percentage of heterogeneity was estimated using Cochran Q (reported with a χ^2-value and P value) and Higgins I^2. The former examines the null hypothesis that all studies are evaluating the same effect[29] and the latter describing the percentage of variation across studies that is due to heterogeneity rather than chance and presented with 95% CIs.[29] I^2, unlike Q, does not inherently depend on the number of studies considered. For I^2, the values of 25%, 50%, and 75% indicated low, moderate, and high levels of heterogeneity, respectively. When the heterogeneity among studies was high, random-effects models were used. Random-effects models incorporate an estimate of between-study heterogeneity into the calculation of the common effect and give a relatively similar weight to studies of different size.[30] If the heterogeneity was not high, fixed-effects estimates of pooled ORs were calculated. Fixed-effects models average the summary statistics, weighting them according to a measure of the quantity of information they contain, and hence the estimates are weighted by study size.[30] Potential sources of heterogeneity were investigated further by subgroup analysis and meta-regression. The characteristics investigated were study design (cohort vs case-control), study period (before 1990 vs 1990 and after), geographical location of the study (United States vs other countries), gender (male/female/mixed), mean age (older than 30 y vs 30 y or younger, and as a continuous variable in metaregression), diagnostic tool (*Diagnostic and Statistical Manual of Mental Disorders* vs *International Classification of Diseases*), institutional setting (psychiatric hospital vs prison), follow-up period (less than 6 y/6–10 y/more than 10 y), comparison group (control subjects without psychiatric disorders vs a comparison group who had other psychiatric disorders), outcome measure (violent recidivism vs any criminal recidivism [including violent outcomes]), and the definition of cases (schizophrenia vs schizophrenia and other psychoses). There was insufficient information in the included studies to make a comparison between schizophrenia and nonschizophrenia psychoses or violent outcomes compared with nonviolent outcomes. One study provided comparison data from both healthy control subjects and patients with other psychiatric disorders,[31] and we used the data from healthy control subjects in order to avoid duplication. Meta-regression was not conducted if there were less than 10 studies.[32] The influence of individual studies on the summary effect was explored using an influence analysis, in which meta-analysis estimates are computed omitting one study at a time.[33] In addition, publication bias was tested by funnel plot asymmetry using the rank correlation method (Begg's method)[34] and weighted regression approach (Egger's test).[35] All the analyses were performed in STATA statistical software package, version 10.0 (Statacorp, College Station, TX 2007)[36].

Results

Study Characteristics

The final sample consisted of 27 studies that included 3511 individuals with psychotic disorders reported in 24 publications.[14–16,31,37–56] Three studies reported male and female samples separately.[40,41,50] Of the case subjects with psychosis, 1067 (30.4%) were repeat offenders. Overall, these were compared with 76 998 control subjects, of whom 29 767 (38.7%) were criminal recidivists. Publications were from 10 countries: 9 studies from the United States (1252 case subjects, 35.7% of the total number of the case subjects),[15,38,39,41,42,44,52,54] 7

from the United Kingdom (1038 case subjects, 29.7%),[37,40,46,50,51] 4 from Canada (322 case subjects, 9.0%),[14,43,47,48] and 1 each from Japan (315 case subjects, 8.9%),[56] Sweden (248 case subjects, 7.0%),[16] France (229 case subjects, 6.5%),[55] Brazil (50 case subjects, 1.4%),[45] Italy (43 case subjects, 1.2%),[49] Germany (12 case subjects, 0.3%),[31] and Belgium (2 case subjects, 0.1%).[53] Register-based studies were the source of all outcome data. All investigations were conducted after 1974 (for details of the studies included, see table 1).

Risk Estimates by Comparison Group

There were 2 comparison groups—those with other psychiatric disorders and control subjects without any such disorders. The first comparison group included 23 studies with 5446 individuals with other psychiatric disorders, of whom 2104 (38.6%) were repeat offenders.[14,37–41,43–56] In these studies, the rate of repeat offending in those with psychotic disorders was 23.5% (562 recidivists among 2390 case subjects). There were 4 studies with individuals without any mental disorders as control subjects. These amounted to 71 552 control subjects, of whom 27 663 (38.7%) reoffended.[15,16,31,42] The rate of repeat offending in the case subjects with psychotic disorders in these 4 studies was 45.0% (505/1121).

As there was substantial heterogeneity in risk estimate between the studies (χ^2_{27}=153.1, $P < .001$, I^2 = 83.0%), we analyzed these data separately by comparison group. Compared with individuals with other mental disorders, there was no significant risk of criminal recidivism in individuals with psychosis (pooled random-effects OR of 1.0, 95% CI = 0.7–1.3). There was high heterogeneity between the studies (χ^2_{23}=105.0, $P < .001$, I^2 = 79%) (figure 1). Compared with control subjects without psychiatric disorders, the risk of criminal recidivism was increased in those with psychotic disorders. We found a pooled fixed-effects OR of 1.6 (95% CI = 1.4–1.8) with low heterogeneity among studies (χ^2_4=3.3, P = .35, I^2 = 9.0%) (figure 2). As the heterogeneity was high in the first of these analyses, possible differences between risk estimates by various characteristics were further investigated.

Twenty studies provided comparison data for individuals with personality disorders.[16,31,37,38,40–43,45,47,49–52,54,55] Compared with personality disorder, individuals with psychosis had a lower risk of repeat offending (OR = 0.5, 95% CI = 0.4–0.7, with moderate heterogeneity: χ^2_{20}=51.4, $P < .001$, I^2 = 63.0%). Nine studies provided comparison data for individuals with substance use disorders.[16,31,37,38,47,51,53–55] Those with psychosis had a similar risk of repeat offending with an OR of 0.9 (95% CI = 0.5–1.4) with moderate heterogeneity (χ^2_9=28.5, $P < .001$, I^2 = 72.0%). Four studies provided comparison data from patients with depression,[15,16,31,51] and psychosis was associated with a higher risk of repeat offending (OR = 1.9, 95% CI = 0.9–4.0, with high heterogeneity between studies [χ^2_4=20.4, $P < .001$, I^2 = 85.3%]). Three studies provided data from patients with mental retardation/learning disability,[31,38,55] and the risk of recidivism was similar to those with psychosis (OR = 1.2, 95% CI = 0.3–4.4, with moderate heterogeneity: χ^2_3=9.1, P = .01, I^2 = 77.9%).

Gender

Significant differences in risk estimates were found between genders. When the analysis was limited to studies where persons with other psychiatric disorders were control subjects, the OR was 0.7 (95% CI = 0.5–1.2) in males, whereas it was 2.1 (95% CI = 1.2–3.5) in females. Studies with mixed gender samples reported an OR of 1.2 (95% CI = 0.9–1.7) (figure 3). Investigations with healthy control subjects did not provide a breakdown by gender.

Region

When all reports were included, we found significant differences in risk estimates by study region. Studies from the United States reported an OR of 1.6 (95% CI = 1.2–2.1), whereas investigations from the rest of the world reported an OR of 0.8 (95% CI = 0.6–1.2). These differences were less pronounced when stratified by comparison group—when compared with individuals with other mental disorders, an OR of 1.5 (95% CI = 1.0–2.4) was reported in US-based studies compared with an OR of 0.8 (95% CI = 0.5–1.2) in others. When analysis was limited to investigations with healthy control subjects, the US-based studies reported an OR of 1.7 (95% CI = 1.5–1.9), whereas for the others, the OR was 1.1 (95% CI = 0.7–1.7).

Institutional Setting

Differences in risk estimates depending on the setting (hospital vs. prison) of individuals with psychosis were examined in studies where information was available. A nonsignificant higher risk of repeat offending was found in individuals with psychosis released from prison (OR = 1.5, 95% CI = 1.3–2.1, with low heterogeneity [χ^2_4=5.1, P = .16, I^2 = 40.5%]), than in patients discharged from psychiatric hospital (OR = 0.9, 95% CI = 0.6–1.5, with high heterogeneity [χ^2_{13}=62.6, $P < .001$, I^2 = 80.8%]).

Other Characteristics

There were no significant differences in risk estimates for the other characteristics examined including study period, sample size, diagnostic criteria, mean age, definition of diagnosis, study location, outcome measure, study type, and duration of follow-up, in the studies where

Table 1. Characteristics of the Included Studies Reporting on Risk of Recidivism in Patients With Psychotic Disorders

Study Name	Region	Study Type	No. of Case Subjects	No. of Control Subjects	Diagnostic Criteria	Mean Age (y)	Gender	Definition of Cases	Institutional Setting	Follow-up (y)	Comparison Group	Definition of Outcomes
Ganzer and Sarason[41] (M)	United States	Case-control	14	86	NA	15.3	Male	Psychosis	Juvenile rehabilitation institution	2	Other PD	All recidivism
Ganzer and Sarason[41] (F)	United States	Case-control	5	95	NA	14.7	Female	Psychosis	Juvenile rehabilitation institution	2	Other PD	All recidivism
Payne et al[46]	United Kingdom	Cohort	93	31	NA	NA	Mixed	Schizophrenia	General psychiatric or special (secure) hospital	NA	Other PD	All recidivism
Quinsey et al[47]	Canada	Cohort	38	53	NA	32	Male	Psychosis	Maximum secure hospital	NA	Other PD	All recidivism
Tennent and Way[51]	United Kingdom	Cohort	32	374	NA	NA	Male	Schizophrenia	Special (secure) hospital	8.8	Other PD	Violent recidivism
Yesavage et al[55]	France	Cohort	229	981	*DSM-III*	NA	Mixed	Schizophrenia	Special (secure) hospital	22	Other PD	All recidivism
Bieber et al[39]	United States	Cross-sectional	48	84	NA	NA	Mixed	Psychosis	NGRI (hospitalized)	NA	Other PD	All recidivism
Komer and Galbraith[43]	Canada	Cohort	15	15	NA	28.4	Mixed	Schizophrenia	Held on warrant in community	14.8	Other PD	All recidivism
Bailey and Macculloch[37]	United Kingdom	Cohort	47	65	*DSM-III-R*	>30	Male	Schizophrenia	Special (secure) hospital	3.28	Other PD	All recidivism
Harris et al[14]	Canada	Cohort	143	475	*DSM-III*	27	Male	Schizophrenia	Half from secure hospital and half were assessed briefly in secure hospital	6.8	Other PD	Violent recidivism
Russo[49]	Italy	Cohort	43	48	NA	40	Male	Psychosis	Maximum secure hospital	5	Other PD	All recidivism
Rice and Harris[48]	Canada	Cohort	126	321	*DSM-III*	>30	Male	Schizophrenia	Half from maximum secure hospital and half from prison	6.5	Other PD	Violent recidivism
Harris and Koepsell[42]	United States	Cohort	12	24	NA	NA	Mixed	Psychosis	Psychiatric hospital	NA	No PD	All recidivism
Ventura et al[52]	United States	Cohort	42	133	*DSM-III-R*	28.7	Mixed	Schizophrenia	Jail	3	Other PD	All recidivism

Table 1. Continued

Study Name	Region	Study Type	No. of Case Subjects	No. of Control Subjects	Diagnostic Criteria	Mean Age (y)	Gender	Definition of Cases	Institutional Setting	Follow-up (y)	Comparison Group	Definition of Outcomes
Singleton et al[50] (M)	United Kingdom	Cohort	49	1058	*DSM-IV*	NA	Male	Psychosis	Prison	NA	Other PD	All recidivism
Singleton et al[50] (F)	United Kingdom	Cohort	56	513	*DSM-IV*	NA	Male	Psychosis	Prison	NA	Other PD	All recidivism
Moscatello[45]	Brazil	Cross-sectional	50	50	*ICD-10*	38.9	Male	Schizophrenia	Secure hospital	NA	Other PD	All recidivism
Vermeiren et al[53]	Belgium	Cohort	2	46	*DSM*	16	Male	Psychosis	NA	2	Other PD	All recidivism
Lee[44]	United States	Cohort	39	86	NA	>30	Mixed	Schizophrenia	State hospital or court	11	Other PD	All recidivism
Bertman-Pate et al[38]	United States	Cohort	48	71	*DSM-IV*	38	Mixed	Schizophrenia	Hospital or jail	NA	Other PD	All recidivism
Stadtland and Nedopil[31]	Germany	Case-control	12	36	*ICD-10*	NA	Mixed	Schizophrenia	NA	8.5	No PD	All recidivism
Coid et al[40] (M)	United Kingdom	Cohort	690	422	*DSM-III-R*	31.6	Male	Schizophrenia	Medium secure hospital	6.2	Other PD	All recidivism
Coid et al[40] (F)	United Kingdom	Cohort	71	97	*DSM-III-R*	31.6	Female	Schizophrenia	Medium secure hospital	6.2	Other PD	All recidivism
Yoskikawa et al[56]	Japan	Cohort	315	174	*DSM-IV-TR*	NA	Mixed	Schizophrenia	NGRI (hospitalized)	NA	Other PD	Violent recidivism
Grann et al[16]	Sweden	Cohort	248	159	*DSM-III*	35.7	Mixed	Schizophrenia	Community-based sanctions	4.8	No PD	Violent recidivism
Vitacco et al[54]	United States	Cohort	195	168	*DSM-IV*	41	Mixed	Psychosis	NGRI (released to community after a brief assessment)	2.85	Other PD	All recidivism
Baillargeon et al[15]	United States	Cohort	849	71 333	*DSM-IV*	NA	Mixed	Schizophrenia	Prison	6	No PD	All recidivism

Note: M = male; NA = information not available; PD = psychiatric disorders; F = female; *DSM-III* = *Diagnostic and Statistical Manual of Mental Disorders* (Third Edition); *DSM-III-R* = *Diagnostic and Statistical Manual of Mental Disorders* (Third Edition Revised); *DSM-IV* = *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition); *ICD-10* = *International Classification of Diseases, Tenth Revision*; *DSM-IV-TR* = *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition, Text Revision); NGRI = not guilty by reason of insanity.

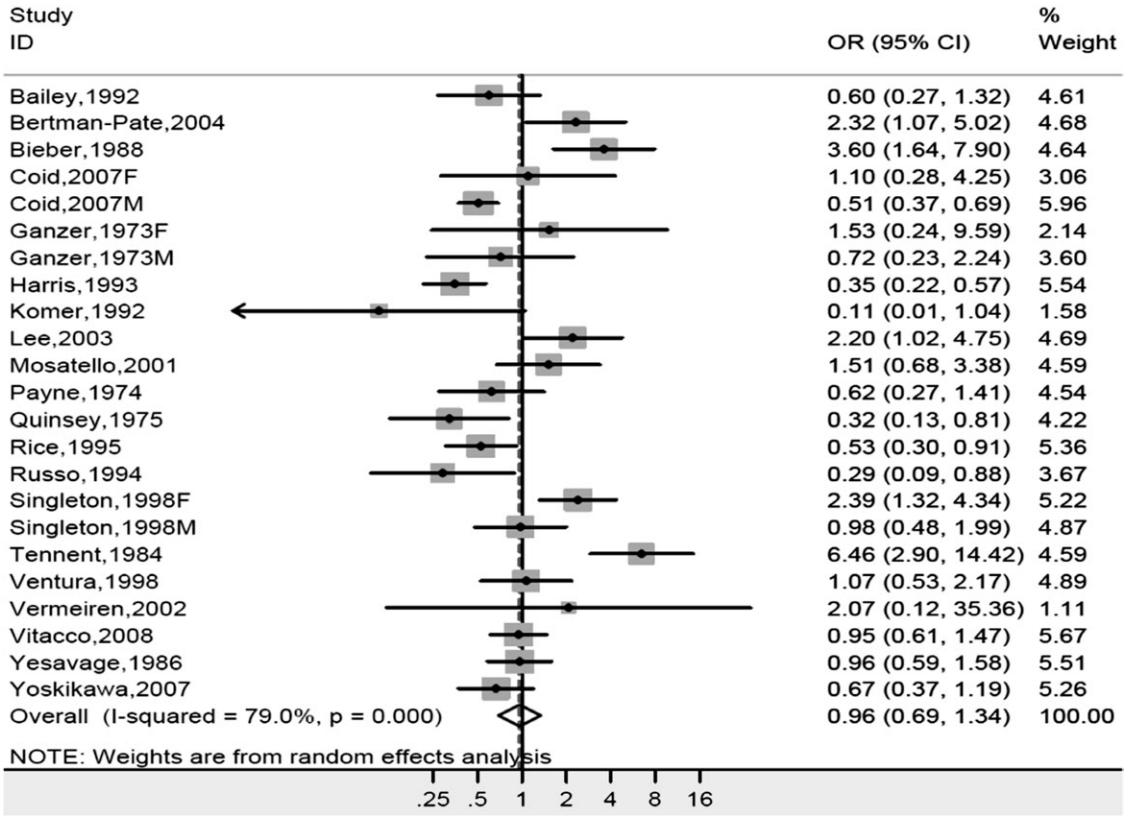

Fig. 1. Risk Estimate for Repeat Offending in Psychotic Disorders Compared With Individuals With Other Psychiatric Disorders.
Note: OR = odds ratio

information was available (table 2). Studies of violent recidivism reported an OR of 1.0 (95% CI = 0.5–1.9), compared with other investigations of any criminal recidivism (which included violent outcomes) that reported an OR of 1.1 (95% CI = 0.8–1.5).

Meta-regression

Meta-regression confirmed the findings of the subgroup analyses and found that the heterogeneity was partly explained by region (studies conducted in the United States reported a higher risk estimate; $\beta = -.68$, SE[β] = 0.30, $P = .03$) and gender (studies with female samples reported a higher risk estimate; $\beta = .48$, SE[β] = 0.23, $P = .05$). When limiting the meta-regression to studies that used other mental disorders as controls, nonsignificant associations were found with region (US-based studies reported a higher risk estimate; $\beta = -.68$, SE[β] = 0.36, $P = .07$) and gender (studies with female samples reported a higher risk estimate; $\beta = .44$, SE[β] = 0.25, $P = .09$).

Publication Bias and Influence of Individual Studies

There was no evidence for publication bias in studies with patients with other psychiatric disorders as control subjects using the weighted regression (Egger) method ($t = 1.19$, $P = .25$) or the rank correlation (Begg) method ($P = .48$). Similarly, no publication bias was evident in studies with healthy individuals as control subjects when using either Egger ($t = -0.62$, $P = .59$) or Begg method ($P = .34$). Influence analysis revealed that there was no individual study with significant influence on the overall risk estimate for criminal recidivism in reports with patients with other psychiatric disorders as control subjects, which means that the omission of any single study made little or no difference of the summary risk estimate. Analysis of investigations with healthy control subjects found that study by Baillargeon et al[15] had a significant influence on the overall risk estimate. When this study was omitted, the OR was lower than when it was included (OR = 1.2, 95% CI = 0.8–1.8, vs OR = 1.6, 95% CI = 1.4–1.8). The omission of any other single report made little or no difference to the summary risk estimate.

Discussion

This systematic review identified 27 studies from 10 countries that examined the risk of repeat offending in 3511 individuals with psychosis. There were 3 main findings.

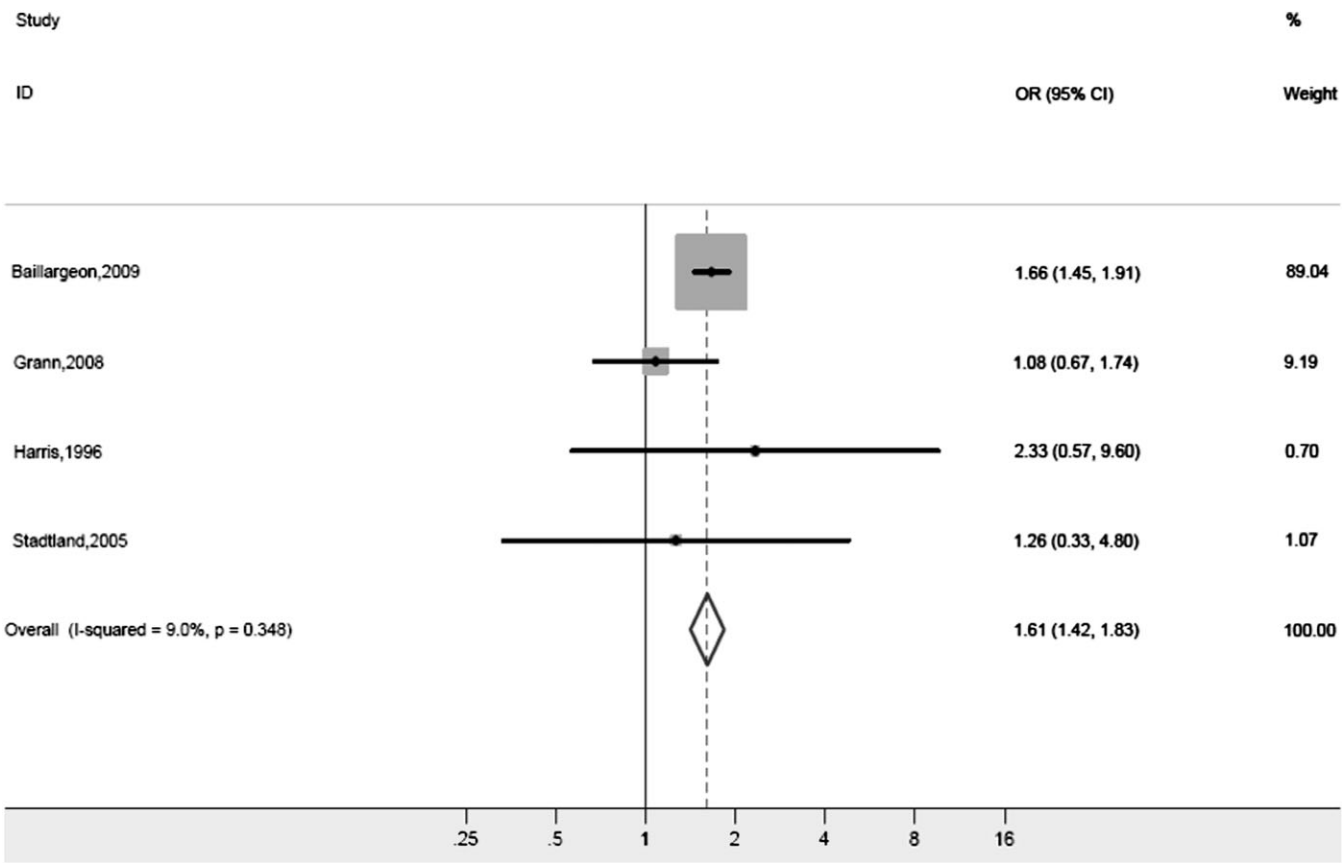

Fig. 2. Risk Estimate for Repeat Offending in Psychotic Disorders Compared With Control Subjects Without Psychiatric Disorders. Note: OR = odds ratio. Weights are from fixed-effects model.

First, there was a modest association between psychosis and repeat offending when individuals with psychosis were compared with general population control subjects who did not have any mental disorders. Second, the risk of repeat offending differed according to the comparison group, and there was no association between psychosis and reoffending when persons with other psychiatric disorders were used as control subjects. Third, some of the heterogeneity across the studies was explained by the proportion of women with psychosis in the research sample and whether the investigation was US based.

Our main finding is in contrast to an influential meta-analysis that reported an inverse association with the psychoses[13] and contributed to the development of widely used violence risk assessment instruments that rated any major mental illness as a protective factor for future violence risk.[14] One of the possible explanations for the present review's contrasting finding is that the previous meta-analysis included only studies where other psychiatric disorders were used as comparison.

The finding in the present review that individuals with psychosis are associated with a higher risk of reoffending does not necessarily imply a causative role or that those such clinical factors can make an important contribution to risk prediction. It is possible that the association is confounded by sociodemographic, criminal history, and other clinical factors, such as substance abuse, which have not been adequately adjusted for in the individual studies that make up this review. In addition, research in patients leaving high secure hospital,[57] general psychiatric patients,[58] and community offenders[16] suggests that diagnostic factors make a small contribution to risk prediction. However, as this contribution is potentially treatable unlike sociodemographic and criminal history factors, its role in risk assessment and management deserves careful consideration and further research. As rates of reoffending were around 30% in those with psychotic disorders, any risk reduction is likely to lead to considerably less criminality in absolute terms.

Women with psychotic disorders appeared to be at higher risk for repeat offending compared with women with other psychiatric disorders than the corresponding comparison in men. This is in keeping with risk estimates for any violence in schizophrenia and other psychoses where women also have higher risk estimates.[11] Theoretical explanations for this difference include the view that females who develop antisocial behavior surmount

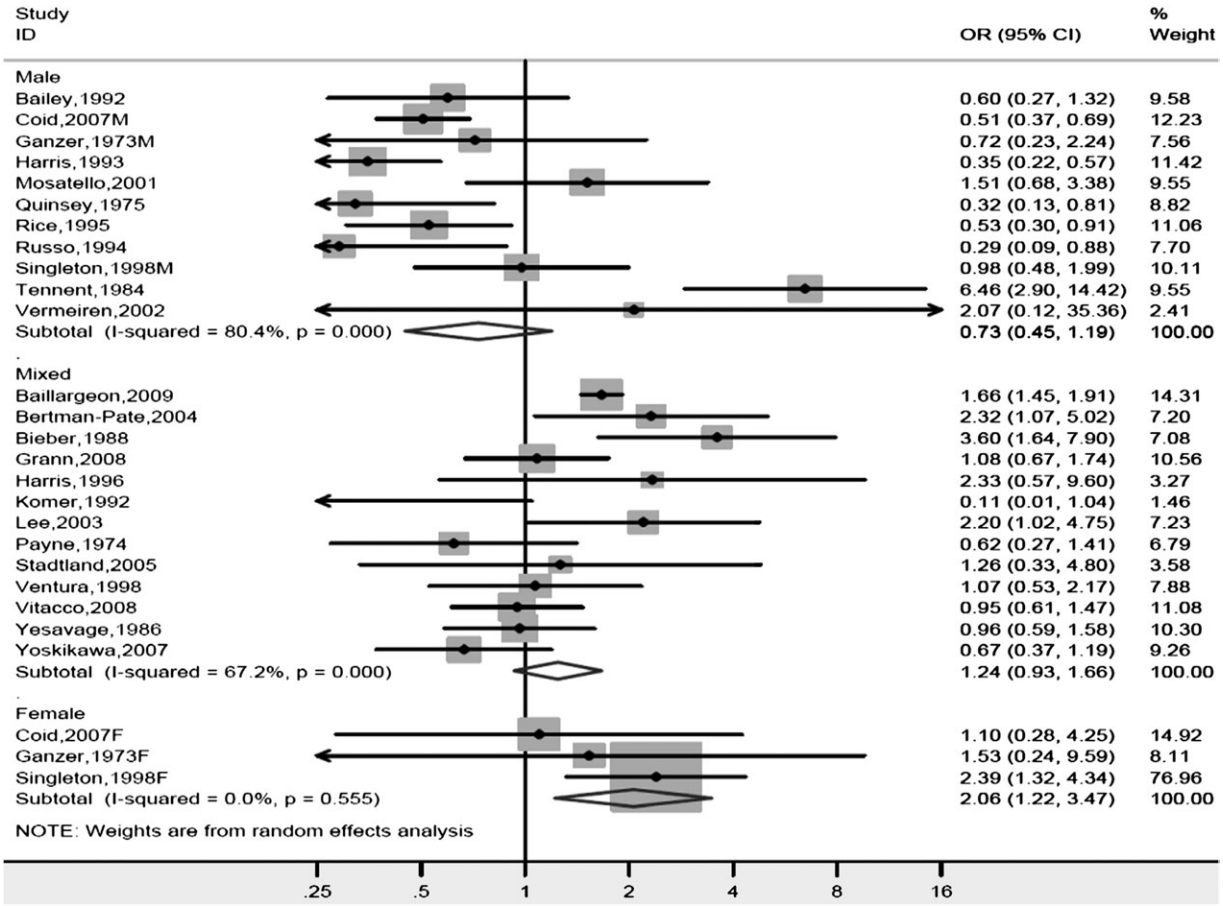

Fig. 3. Risk Estimate for Repeat Offending in Psychotic Disorders by Gender Compared With Individuals With Other Psychiatric Disorders. Note: OR = odds ratio.

a threshold of risk higher than that of males and are therefore more severely afflicted.[59]

Studies conducted in the United States reported higher risk estimates than investigations from the rest of the world. This finding lends some support to the view that national differences may play an important role in determining the association between mental illness and crime.[60] With regard to reoffending, national differences in the efficacy of community-based mental health programs and prison discharge planning programs may be relevant. Some writers have argued that this should lead to greater public policy and public health initiatives to impact on criminal recidivism.[61] It is also possible that due to pressures on US prison health care, where only half of all intimates with mental illness receive treatment,[62] prisoners with psychosis are less likely to receive treatment than the other countries included in our review. In addition, it is possible that the relative lack of development of community psychiatric services in the United States contributes to higher rates of repeat offending.[63] The role of treatment is further suggested by studies on homicide offenders[12] and our tentative finding that those leaving psychiatric hospitals had lower risks of recidivism than individuals with psychotic disorders leaving prison.

There were several nonsignificant findings for different study characteristics including study date, diagnostic criteria, duration of follow-up, and age as a dichotomous variable (above and below 30 y). Cohort studies found a nonsignificant lower risk of criminal recidivism than in cross-sectional or case-control studies. A major advantage of cohort designs is that it can potentially demonstrate a temporal sequence between exposure and outcome,[64] and future research using longitudinal designs would be worthwhile.

Limitations in the present review include the lack of information on potential confounders. A recent review found that individuals with schizophrenia and comorbid substance use disorders have increased risk of violence[11] and other work has demonstrated that substance use disorders are highly prevalent in individuals with schizophrenia.[65] In our study, the effect of such comorbidity was not calculated as no study provided data for risk in psychotic disorder with substance use disorder and without separately. Similarly, the influence of comorbidity of other psychiatric disorders was not investigated

Table 2. Risk Estimates for Criminal Recidivism in Schizophrenia and Other Psychoses by Sample or Study Characteristics

Sample or Study Characteristics	Number of Studies	Number of Case Subjects With Psychosis	OR (95% CI)
Type of psychosis			
Schizophrenia	17	871	1.0 (0.7–1.4)
Schizophrenia and other psychoses	10	196	1.1 (0.7–1.9)
Study period			
Study conducted before 1990	12	186	0.8 (0.4–1.4)
Study conducted in 1990 or after	15	881	1.2 (0.9–1.7)
Diagnostic criteria[a]			
DSM criteria	15	891	0.9 (0.7–1.3)
ICD criteria	2	37	1.4 (0.7–2.9)
Design			
Case-control	5	68	1.7 (0.9–3.0)
Cohort	22	999	1.0 (0.7–1.3)
Mean age[b]			
30 y or younger	6	59	0.6 (0.3–1.3)
Older than 30 y	11	348	0.8 (0.6–1.2)
Number of cases			
<100 cases	17	242	1.2 (0.7–1.9)
≥100 cases	10	825	0.9 (0.6–1.3)
Outcome			
Violent recidivism	6	177	1.0 (0.5–1.9)
Any criminal recidivism	21	890	1.1 (0.8–1.5)
Duration of follow-up (y)[c]			
<6	8	596	0.9 (0.7–1.2)
6–10	7	1923	1.0 (0.5–2.0)
>10	3	283	1.0 (0.5–2.7)

Note: OR, odds ratio; CI, confidence interval; *DSM*, *Diagnostic and Statistical Manual of Mental Disorders*; *ICD*, *International Classification of Diseases*.
[a]Number of studies and case subjects differ in this analysis because 10 studies[39,41–44,46,47,49,51] did not provide information on diagnostic criteria.
[b]Number of studies and case subjects differ in this analysis because 10 studies[15,31,39,42,46,50,51,55,56] did not provide information on mean age of the sample.
[c]Number of studies and case subjects differ in this analysis because 9 studies[38,39,42,45–47,56] did not provide information on years of follow-up.

because of limited data. Personality disorders are likely to be important in this regard.[66] Also, most of the studies did not take into account other factors. An offender's sociodemographic background such as social class, educational history, current employment status, and homelessness has been shown to be associated with criminal behavior in psychotic disorders.[67,68] Therefore, it is likely that the risk estimates reported in this review overestimate the association between psychotic disorders and criminal recidivism. In addition, the clinical utility of the category "other psychiatric disorders" was limited as it included heterogeneous disorders with different risks of repeat offending. We explored this and found that when compared with samples with high rates of personality disorder, individuals with psychosis had lower risks of repeat offending. When compared with depression, individuals with psychosis had a higher risk. This underlines the importance of taking into account diagnostic information in comparison groups. Furthermore, only one study in the systematic review was from a non-Western country (Japan[56]), and future work could analyze the association between psychosis and reoffending in other settings.

In conclusion, this systematic review has found that individuals with psychotic disorders have a modestly higher risk of repeat offending compared with persons without any psychiatric disorders and a similar risk compared with individuals other psychiatric disorders. As the absolute numbers of prisoners with psychosis are large and continuing to rise worldwide, improvements to their treatment and management in custody and on release have the potential to make a considerable impact in public health terms.[69,70] Furthermore, as rates of reoffending are high throughout Western countries, any interventions to manage this risk have the potential to make a significant contribution to public safety.

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