

Rates of Homicide During the First Episode of Psychosis and After Treatment: A Systematic Review and Meta-analysis

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The observation that almost half of the homicides committed by people with a psychotic illness occur before initial treatment suggests an increased risk of homicide during the first episode of psychosis. The aim of this study was to estimate the rates of homicide during the first episode of psychosis and after treatment. A systematic search located 10 studies that reported details of all the homicide offenders with a psychotic illness within a known population during a specified period and reported the number of people who had received treatment prior to the offense. Meta-analysis of these studies showed that 38.5% (95% confidence interval [CI] = 31.1%–46.5%) of homicides occurred during the first episode of psychosis, prior to initial treatment. Homicides during first-episode psychosis occurred at a rate of 1.59 homicides per 1000 (95% CI = 1.06–2.40), equivalent to 1 in 629 presentations. The annual rate of homicide after treatment for psychosis was 0.11 homicides per 1000 patients (95% CI = 0.07–0.16), equivalent to 1 homicide in 9090 patients with schizophrenia per year. The rate ratio of homicide in the first episode of psychosis in these studies was 15.5 (95% CI = 11.0–21.7) times the annual rate of homicide after treatment for psychosis. Hence, the rate of homicide in the first episode of psychosis appears to be higher than previously recognized, whereas the annual rate of homicide by patients with schizophrenia after treatment is lower than previous estimates. Earlier treatment of first-episode psychosis might prevent some homicides.

Key words: homicide/schizophrenia/first-episode psychosis/systematic review/meta-analysis

The finding in 3 recent studies,^{1–3} that a large proportion of the homicides committed by those with psychotic illness occur before initial treatment, suggests that the risk of homicide is higher in the first episode of psychosis than later in the course of the illness. Two studies of consecutive periods in England and Wales found that 42%¹ and 38%² of patients with schizophrenia who committed homicides had never been treated, and a study from the Australian state of New South Wales found that 61% of the homicides during psychotic illness were committed during the first-episode psychosis.³

The period of time between the onset of psychotic symptoms and initial treatment with antipsychotic medication is measured in studies of the duration of untreated psychosis. This phase of psychotic illness corresponds closely with the first episode of psychosis and on average is about a year in duration.⁴ A finding that between 38% and 61% of homicides in psychotic illness occur before treatment indicates an increased risk in first-episode psychosis is short compared with the total duration of schizophrenia.⁵

Although the prevalence of schizophrenic disorders is usually estimated to be below 1% of the population, patients with schizophrenia comprise between 5% and 20% of all homicide offenders.^{6–8} It has been estimated that the average incidence of homicide by the severely mentally ill is about 0.13 per 100 000 per year in most countries⁷ although higher rates are found in countries with a higher total homicide rate.⁹ Few studies have attempted to estimate the annual rate of homicide by patients with schizophrenia, but the figure of 1 in 3000 for males found by Wallace⁸ has received a degree of acceptance.¹⁰ However, if a significant proportion of homicides occur before initial treatment, the true rate of homicide after treatment for psychosis would be lower. Furthermore, if the risk of homicide is higher in the first episode of psychosis, it might be possible to prevent some homicides by earlier treatment. This possibility is supported by the findings of 2 recent studies. The first found a lower proportion of homicide in first-episode psychosis in countries where the duration of untreated psychosis was shorter.¹¹ The second reported a dramatic decline in rates of homicide by people with mental illness in England and Wales from the time of widespread availability of

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primary psychiatric care, despite a rise in other forms of homicide.⁹

The first aim of this study was to systematically examine the published studies of homicide committed by people with psychotic illness in order to determine the proportion of homicides that are committed in the first episode of psychosis. The second aim was to estimate the rate of homicide in first-episode psychosis, the annual rate after treatment, and the rate ratio of homicide during first-episode psychosis and after treatment.

Methods

Inclusion Criteria

We used broad inclusion criteria because there are a small number of studies that report the history of treatment before a homicide committed by a person with a psychotic illness.¹¹ Studies that reported a consecutive series of people who had committed a homicide or attempted homicide and were diagnosed with a psychotic illness were included if the study reported sufficient information to establish how many homicide offenders had received treatment before the homicide offense. The history of previous treatment was defined using clinical definitions of first-episode psychosis, reports of earlier treatment, and reports of admission to a psychiatric hospital or documented contact with mental health services.

Studies that reported all the homicides by those with a psychotic illness in a defined population were included. Hence, case histories, small personal series, series based on groups of institutionalized patients, series of homicides committed by patients with specific syndromes such as Capgras syndrome, and articles describing particular offenses such as infanticide were excluded because homicide rates could not be calculated. Studies of homicides committed by a mix of psychotic and nonpsychotic offenders and studies reporting a mix of homicide and non-homicide offenders were also excluded because none of these studies reported the number of those with psychotic illness who had received treatment prior to committing a homicide.

Search Strategies

Publications in English indexed in [Medline/PubMed], [PsychINFO], [CINHAL] and [Science Direct] were searched from January 1960 to January 2008, and [Embase] was searched from 1980 to January 2008 using the major subject search terms "Homicide AND ("Mental Illness" OR "Mental disorders" OR "Unspecified Mental Disorder" OR "Psychiatric Disorder" OR "Psychological Disorder" OR "Psychiatric Nonspecific" OR "Psychiatric Illness")." The search results were compared with that described in an earlier systematic review that used the search terms "psychosis OR schizophrenia OR

major mental disorder OR first episode psychosis AND violence OR homicide."¹¹ Both search methods produced the same 16 studies that reported the previous psychiatric treatment of groups of homicide offenders with psychosis.^{1-3,12-24} No further studies were located by hand searching the reference lists of these publications.

Of the 16 studies, 8 studies clearly included all the homicides in a defined region in a specific period of time so that rates of homicide could be estimated.^{1-3,13-17} The authors of the remaining studies were contacted, and 2 further studies were included after the region and time frame of their study was confirmed.^{12,18} (table 1, see footnotes table 2). The remaining 6 studies were excluded.¹⁹⁻²⁴ Since there were so few published studies and 1 study from the United States, we conducted a [Google] Internet search using the terms "(names of the 50 US states) AND Homicide OR Homicide Statistics" This search returned official homicide statistics from every state but no further information about the psychiatric diagnoses or treatment of those charged with homicide offenses. Finally, we checked our list of studies with those located by another research group, which revealed no additional studies.

Definitions

A history of admission to a psychiatric hospital and contact with mental health services have potential limitations when used as measures of first-episode psychosis, as discussed below. Four definitions of the end of the first episode of psychosis and beginning of previously treated psychosis were accepted, in order of preference:

1. *Clinical definition of first-episode psychosis:* Usually defined as the period after the onset of psychosis and before remission from acute symptoms following a period of adequate treatment with antipsychotic medication.²⁵
2. *Previous treatment:* Articles that reported whether patients had received any psychiatric treatment prior to the homicide were included because the treatment was assumed to be for a psychotic illness.
3. *Previous admission to a psychiatric hospital:* An admission to a psychiatric hospital was accepted as the end point of the first episode of psychosis. This definition is used in many studies of the duration of untreated psychosis⁴ and can be reliably established. Hospital admission is a valid end point of untreated first-episode psychosis because even in areas with specialist first-episode services about 80% of patients are admitted to hospital soon after contact with mental health services.^{26,27} Patients in 2 studies that were conducted prior to the advent of extensive community services^{14,15} were unlikely to have received antipsychotic treatment prior to admission to hospital, and some patients in more recent studies who were not admitted to hospital might have received adequate treatment in the community.

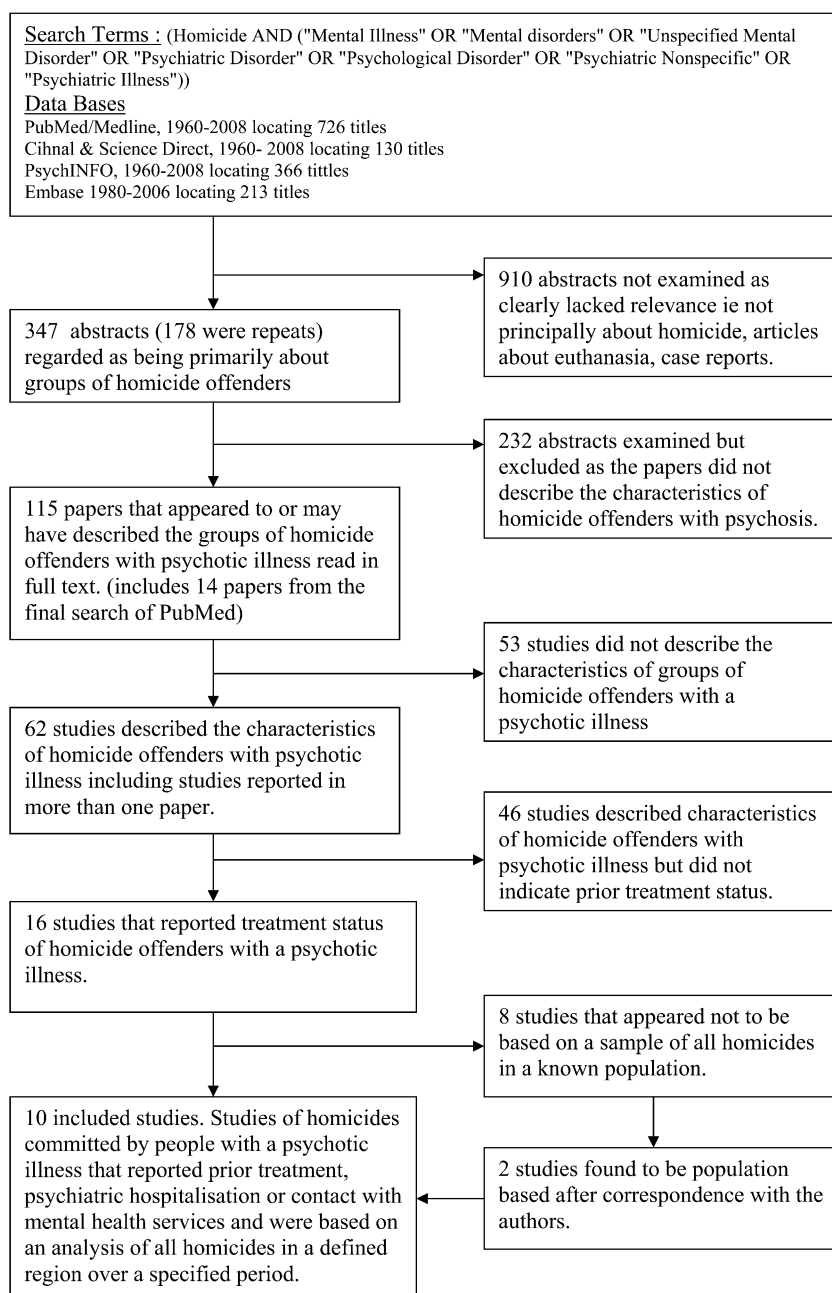


Fig. 1. Flow Chart of the Main Search Strategy.

4. *Contact with mental health services.* It is unlikely that the patients who had no prior contact with mental health services had received treatment. Some patients might have had contact with services for reasons other than treatment for psychosis, might not have received treatment with antipsychotic medication, or might not have received adequate antipsychotic treatment and would therefore still effectively be in the first episode of psychosis.²⁸

Three ways of defining homicide caused by psychotic illness were accepted:

1. a finding during legal proceedings that the homicides occurred in the presence of a psychotic illness,
2. transfer to a forensic hospital after a homicide conviction with a diagnosis of a psychotic illness,
3. a legal finding of not guilty by reason of insanity after a homicide.

Data Extraction and Statistics

Both authors examined the abstracts and full-text articles and independently extracted the data. We contacted the

Table 1. Summary of Methods in 10 Population-Based Studies of Homicide in Psychosis

First Author	Country (Region)	Years	% of All Homicides	Recruitment and Inclusion Criteria	Information About Treatment Status	Diagnosis of Psychosis	Diagnostic Scheme
Appleby ²	England and Wales	1999–2003	5.2%	Schizophrenia	No previous treatment ^a	Statutory inquiry, comprehensive records	Clinicians' discretion
Bourget ¹²	Canada (Ontario)	1990–2000 ^b	Not reported	Forensic examination and psychosis	Clinical	Clinical assessment	<i>DSM-IV</i>
Erb ¹³	Germany(Hessen)	1992–1996	10.0% ^c	Both hospital disposition and schizophrenia	Never admitted	Consensus diagnosis, hospital records	<i>DSM-III,R</i>
Grunberg ¹⁴	United States (Albany county)	1963–1975	Not reported	Not guilty by reason of insanity	Never admitted	Legal decisions	Not stated
Häfner ¹⁵	Federal Republic of Germany	1955–1964	8.2% ^c	Schizophrenia	Never admitted	Legal decision, hospital records	Not stated
Laajasalo ¹⁶	Finland	1987–2002 ^c	Not reported	Schizophrenia	No previous contact with mental health services	Statutory inquiry	<i>DSM-IV</i>
Meehan ¹	England and Wales	1996–1999	5.0%	Schizophrenia	No previous treatment ^a	Statutory inquiry, comprehensive records	Clinician's discretion
Nielssen ³	Australia (New South Wales)	1993–2002	8.8%	Mental illness defense and psychosis	Clinical	Clinical assessment, hospital records	<i>DSM-IV</i>
Simpson ¹⁷	New Zealand	1988–2000	7.1%	Both a mental illness defense and psychosis	Never admitted	Legal definition, hospital records	<i>DSM-III</i>
Valevski ¹⁸	Israel	1963-1997 ^b	Not reported ^c	Both not guilty by reason of insanity and schizophrenia	No Previous contact with mental health services	Research interview, hospital records	<i>DSM-IV</i>

Note: *DSM-IV*, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*; *DSM-III-R*, *Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised*.

^aReported previous contact with mental health services and prior treatment.

^bDuration by personal communication.

^cIncluded some cases of attempted homicide.

Table 2. Meta-analysis of the Proportion of Homicides in First-Episode Psychosis in Studies of People Who Committed Homicide During Psychotic Illness

First Author	Psychotic Homicide, <i>N</i>	First Episode of Psychosis, <i>N</i> (%)	Proportion in First-Episode Psychosis	95% Lower Limit of Proportion in First-Episode Psychosis	95%Upper Limit of Proportion in First-Episode Psychosis
Appleby ²	141	53 ^a	0.376	0.300	0.459
Bourget ¹²	51 ^b	22	0.431	0.304	0.569
Erb ¹³	29	9	0.310	0.170	0.497
Grunberg ¹⁴	9	3	0.333	0.111	0.667
Häfner ¹⁵	284	116	0.408	0.353	0.467
Laajasalo ¹⁶	109	17	0.156	0.099	0.237
Meehan ¹	85	36 ^a	0.424	0.323	0.530
Nielssen ³	88	54	0.614	0.508	0.709
Simpson ¹⁷	65	26	0.400	0.289	0.523
Valevski ¹⁸	33	13	0.394	0.244	0.566
Pooled estimate (random-effects model)			0.385	0.311	0.465

^aIncluding patients who had had prior contact with mental health services for reasons other than psychosis.

^bTreated patients by personal communication.

authors of the studies to confirm aspects of their data (see footnotes, table 2). There was 1 disagreement in data collection was with respect to the number of treated homicide offenders in 1 study.¹⁴ Since the author of this study could not be contacted, this was resolved by further examination of the article by both authors and a colleague (Dr. Glen Smith.).

In view of the potential limitations of the definitions of prior treatment, the authors of the studies were asked if they were confident about the reported proportions of treated and untreated homicide offenders. Treatment status was the main subject of the study in which the authors could not be contacted,¹⁴ and we did not contact the authors of another study¹⁵ because the results were comprehensively reported and the lead author had stated elsewhere that only the patients admitted to hospital were likely to have received antipsychotic treatment.¹³ The remaining 8 authors confirmed the accuracy of their reports of previous treatment for psychosis.

Statistics

Meta-analyses were performed using Comprehensive Meta Analysis (CMA) version 2.2. CMA software allows the meta-analysis of rates in a single group using the number of events and the total sample and meta-analysis of the rate ratio using the event rates and populations in 2 groups. CMA employs the same computational algorithms used by the Cochrane Collaborators to weight studies by the inverse variance method and to assess treatment effects.²⁹ The rate ratios of homicides in first-episode and previously treated psychosis in each study were used as the effects measure in the calculations

of the pooled estimate of the rate ratio, and no assumptions were made about the common variance between the groups. CMA was also used to assess heterogeneity using *Q* value and *I*-square statistics, and the choice of random or fixed effects models was made on the basis of heterogeneity considerations.

Estimation of Rates of Homicide in First-Episode and Previously Treated Psychosis. Population figures at the mid-point of the study reported in the articles or by communication with the authors were confirmed using the US Census Bureau records of world populations. The figures were used in estimations of the rate of homicide in first-episode psychosis and in each year of previously treated psychosis.

Recent systematic reviews of the incidence and prevalence of schizophrenia^{30–32} confirmed that we could not match the homicide studies with studies of the epidemiology of schizophrenia from the same regions. Hence, the estimates of the rates of homicide by those with psychosis were made on the basis of pooled estimates of the incidence and prevalence of schizophrenia. The pooled estimate for the incidence of schizophrenia reported in the systematic review and meta-analysis of McGrath and associates was 21.9 per 100 000 per year (95% confidence interval [CI] = 19.4–24.4).^{30,32} More than 90% of studies reported an incidence of between 10 and 40 new cases per 100 000 per year. McGrath and associates calculated a pooled period prevalence of 440 per 100,000 (95% CI = 330–540).^{31,32} We used an estimated incidence of 20 new cases per 100 000 people per year and an estimated prevalence of 500 per 100 000 people of schizophrenia-related psychosis in rate calculations.

The rate of homicide in first-episode psychosis, prior to treatment, was calculated by dividing the number of homicides by the estimated number of cases of first-episode psychosis, assuming an incidence of 20 per 100 000 per annum. The annual rate of homicide among people with previously treated psychosis was calculated for each study by dividing the average annual number of homicides per year of the study by the total number of people with schizophrenia, assuming a prevalence of 500 per 100 000. A rate ratio was calculated using the number of homicides by those in first-episode and previously treated psychosis and the populations assumed in earlier calculations. This figure is similar to an odds ratio for homicide in first-episode and previously treated psychosis.³³

Results

Characteristics of the Homicide Offenders

The studies described a total of 894 people, of whom 349 (39.0%) were defined as being in first-episode psychosis (table 2). All but 2 studies reported the age and gender of the offenders, and 2 studies reported the age of those in first-episode psychosis separately. The weighted mean age (calculated by dividing the sum of the products of the mean age and number of those in each study) was 33.2 years, and 713 of 843 (84.6%) were male. The psychiatric diagnosis was reported in 7 studies with 769 people (86% of the sample), of whom 761 (99%) were diagnosed with schizophrenia, partly because of the exclusion of other diagnoses in 6 studies. Six studies reported that 199 of 289 (68.9%) patients with a previously treated psychosis were in contact with mental health services at the time of the homicide, and 5 studies reported that 126 of 269 (46.8%) of the previously treated patients were taking antipsychotic medication at the time of the homicide. Eight studies reported that 126 of 778 (16.2%) homicide offenders had alcohol abuse or dependence, and 5 studies reported that 162 of 432 (37.5%) homicide offenders had other forms of substance abuse. Nine studies reported that 240 of 769 (31.2%) of the homicide offenders had a history of previous violence. Six studies noted the importance of threatening delusions as a common reason for homicide.

The Proportion of Homicide Offenders in First-Episode Psychosis

The proportions of homicide offenders in the first episode of psychosis were statistically heterogeneous (Q value = 41.3, $df = 9$, $P < .001$, I -squared = 78.2). Hence, a random-effects meta-analytic model was used, which estimated that 38.5% (95% CI = 31.1%–46.5%, $z = -2.813$, $P = .005$) of homicides during a psychotic illness occurred prior to initial treatment. When 2 studies from Finland¹⁶ and Australia³ with the lowest and highest proportions of homicides in first-episode

psychosis were excluded, there was no significant heterogeneity (Q value = 1.958, $df = 7$, $P = .962$, I -squared < 0.001). A fixed-effect model meta-analysis of the remaining 8 studies estimated the proportion of homicide offenders in first-episode psychosis to be 39.9%, with narrower CIs (95% CI = 36.3%–43.6%, $z = -5.276$, $P < .001$).

The Rates of Homicide in First-Episode and Previously Treated Psychosis

Rates of homicide in first-episode psychosis were estimated using the number of homicide offenders and the estimated populations of patients in first-episode psychosis. The calculated rates of homicide in first-episode psychosis were heterogeneous (Q value = 117.0, $df = 9$, $P < .001$, I -squared = 92.3). A random-effects meta-analysis found that the overall rate of homicide in first-episode psychosis was 1.59 homicides per 1000 presentations (95% CI = 1.06–2.40 per 1000, $z = -30.7$, $P < .001$, table 3), equivalent to one in 629 presentations. The event rate was highest in the studies from the United States,¹⁴ Australia,³ and New Zealand¹⁷ and was lowest in the study from Israel.¹⁸ When these 4 studies were excluded, the remaining 6 studies were not significantly heterogeneous (Q value = 7.3, $df = 5$, $P = .20$, I -squared = 41.3) and the estimated rate, calculated using a fixed-effects model, was 1.20 per 1000 presentations (95% CI = 1.06–1.36, $z = -106.8$, $P < .001$), equivalent to a rate of 1 homicide per 833 presentations.

The annual rate of homicide in those with a previously treated psychotic illness, calculated using the estimated prevalence, was heterogeneous (Q value = 184.9, $df = 9$, $P < .001$, I -squared = 95.32). An analysis using a random-effects model showed an annual rate of homicide by previously treated patients of 0.11 per 1000 per annum (95% CI = 0.07–0.16 per 1000, $z = -44.4$, $P < .001$, table 4), which is equivalent to 1 homicide per 9090 previously treated patients per year. The sample of studies remained heterogeneous after the exclusion of the study from Israel¹⁸ with the lowest rate and the study from the United States¹⁴ with the highest rate.

Meta-analysis of the rate ratios of homicide in first-episode and previously treated psychosis had the same heterogeneity considerations as the analysis of proportions of homicide offenders in first-episode psychosis. A random-effects model meta-analysis found that the rate ratio of homicides in first-episode psychosis when compared with annual rates of homicide in previously treated psychosis was 15.5 (95% CI = 11.0–21.7, $z = 15.88$, $P < .001$) table 5, figure 2). After the exclusion of the studies from Australia³ and Finland¹⁶ with the highest and lowest proportions of homicide in first-episode psychosis, a fixed-effects model meta-analysis found a rate ratio of 16.5 (95% CI = 14.1–19.2, $z = 36.3$, $P < .001$).

Table 3. Meta-analysis of the Rate of Homicide in First-Episode Psychosis

First Author	Annual Number of First-Episode Psychoses	Psychotic Homicide Per 1000	Lower 95% Confidence Interval of Psychotic Homicide Per 1000	Upper 95% Confidence Interval of Psychotic Homicide Per 1000
Appleby ²	10 400	1.42	1.08	1.85
Bourget ¹²	1400	1.57	1.03	2.39
Erb ¹³	940	1.91	1.00	3.68
Grunberg ¹⁴	60	3.85	1.24	11.86
Häfner ¹⁵	11 000	1.05	0.88	1.26
Laajasalo ¹⁶	1000	1.06	0.66	1.71
Meehan ¹	10 400	1.15	0.83	1.60
Nielssen ³	1200	4.50	3.45	5.87
Simpson ¹⁷	720	3.01	2.05	4.42
Valevski ¹⁸	800	0.48	0.28	0.82
Pooled estimate (random-effects model)		1.59	1.06	2.40

Discussion

The main findings of this study can be summarized as (i) approximately 4 in 10 of the homicides committed by people with a psychotic illness occur before treatment, (ii) approximately 1 in 700 people with psychosis commit a homicide before treatment, (iii) approximately 1 in 10 000 patients with psychosis who have received treatment will commit a homicide each year, and (iv) the rate of homicide in psychosis before treatment is approximately 15 times higher than the annual rate after treatment.

In view of the implications of the findings for mental health services, we considered the limitations of the study and whether the findings are consistent with other studies of violence in psychosis. We also considered pos-

sible reasons for the lower rate of homicide in those who have received treatment.

Methodological Limitations

The first methodological limitation is that the studies relied upon elements of legal proceedings to establish the diagnosis of psychosis. Legal proceedings might not be a sensitive method of diagnosing psychosis⁶ and might have biased the study toward finding fewer cases of homicide in first-episode psychosis because early or previously unknown psychosis might be less likely to come to the attention of the courts. In addition, the use of legal definitions of criminal responsibility in 4 studies probably excluded some offenders with psychotic illness who committed homicides for reasons other than their illness. The

Table 4. Meta-analysis of the Annual Rate of Homicide in Previously Treated Psychosis

First Author	Estimated Number of Previously Treated Patients	Psychotic Homicide Per 1000 pa	Lower 95% Confidence Interval of Psychotic Homicides Per 1000 pa	Upper 95% Confidence Interval of Psychotic Homicides Per 1000 pa
Appleby ²	260 000	0.10	0.08	0.12
Bourget ¹²	35 000	0.08	0.06	0.12
Erb ¹³	23 500	0.17	0.11	0.26
Grunberg ¹⁴	1500	0.33	0.15	0.74
Häfner ¹⁵	275 000	0.06	0.05	0.07
Laajasalo ¹⁶	25 000	0.25	0.20	0.30
Meehan ¹	260 000	0.06	0.05	0.08
Nielssen ³	30 000	0.11	0.08	0.16
Simpson ¹⁷	18 000	0.18	0.13	0.25
Valevski ¹⁸	20 000	0.03	0.02	0.05
Pooled estimate (random-effects model)		0.11	0.07	0.16

Table 5. Meta-analysis of the Rate Ratio of Homicide in First-Episode Psychosis and the Annual Rate After Treatment

First Author	Rate Ratio	Lower 95% Confidence Interval Limit	Upper 95% Confidence Interval Limit	Z Value	P Value
Appleby ²	14.20	10.09	19.98	15.23	.000
Bourget ¹²	18.94	10.88	32.69	10.40	.000
Erb ¹³	11.24	5.11	24.70	6.02	.000
Grunberg ¹⁴	11.56	2.89	46.22	3.46	.000
Häfner ¹⁵	17.18	13.56	21.78	23.53	.000
Laajasalo ¹⁶	4.81	2.54	7.36	4.66	.000
Meehan ¹	19.17	12.41	29.61	13.31	.000
Nielssen ³	40.91	25.53	63.08	16.80	.000
Simpson ¹⁷	16.63	10.13	27.31	11.11	.000
Valevski ¹⁸	16.26	8.09	32.68	7.83	.000
Pooled estimate (random-effects model)	15.48	11.04	21.71	15.88	.000

legal definitions were different in each of these 4 studies. Two studies included those found not guilty by reason of insanity according to local definitions,^{14,18} and 2 used legal tests for any mental illness defense, even if the offender entered a plea of guilty to manslaughter.^{3,17} Differences in the legal tests might not have greatly increased the heterogeneity in the proportion of homicide offenders in first-episode psychosis because the 2 studies with the higher threshold of not guilty by reason of insanity had high¹⁴ and low¹⁸ proportions of homicide in first-episode psychosis. Our study, which had a low legal threshold of the availability of a mental illness defense,

included all but a very small percentage of the homicide offenders with psychotic illness and reported the highest homicide proportion of offenders in first-episode psychosis. This finding could in part be due to the inclusion of 8 of 54 first-episode homicide offenders with a diagnosis of affective psychosis or psychosis arising from substance abuse.³

The reliance on legal findings of psychosis probably has the advantage of other insensitive tests, in that it is likely to be specific. When a mental illness defense is raised in court, the accused is usually examined by more than one psychiatrist, and a legal finding of reduced criminal responsibility would be unusual without evidence of preexisting illness or disability. For this reason, it is unlikely that many of those included in the studies were misdiagnosed, malingering, or did not actually commit a homicide.

The second methodological limitation was that the total homicide rate was not available for each region. Although it has been asserted that rates of homicides by the mentally ill are unrelated to total homicide rates,⁷ studies with a high total homicide rate often report a higher rate of homicide by the mentally ill.⁹ The accuracy of the calculated rates for both the first episode of psychosis and previously treated psychosis might have been reduced because the true rate of homicide in psychosis might be higher in regions with high total homicide rates. This limitation is relevant because we were able to locate 1 study from the United States, where total homicide rates are several times higher than in most other developed countries.

The first 2 methodological limitations might affect the estimates of the number of homicides during psychosis (the numerator), whereas a third limitation relates to

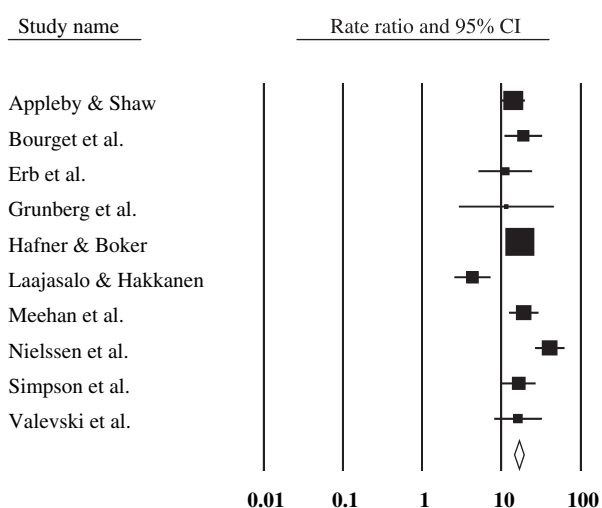


Fig. 2. Forest Plot of the Rate Ratio of Homicide in First-Episode Psychosis and the Annual Rate After Treatment. Log₁₀ scale > 1 indicates a rate of homicide in first-episode psychosis that is greater than the annual rate after treatment (footnote). Diamond indicates the pooled result, calculated with a random-effects model.

the assumptions about the number of patients with psychosis who do not commit a homicide (the denominator). While the study relied on the best available pooled estimates of the incidence and prevalence of psychosis, it is possible that some of the heterogeneity in the homicide rates resulted from variation in the actual incidence and prevalence of psychosis. For example, some regions might have had fewer homicides by people with psychosis because psychosis was less common.

Factors such as legal tests, the total homicide rate, and the uncertainty about the incidence and prevalence of psychosis add to the uncertainty of the calculated rates and CIs. However, these factors are less likely to have altered the proportion of homicide offenders in first-episode psychosis or the rate ratio of homicide in first-episode and previously treated psychosis. Sociological factors such as drug and firearm use that are associated with total homicide rates and the legal tests used to find cases are likely to have a similar effect on the number of homicides before and after treatment. Moreover, areas with a higher incidence of psychosis are also likely to have a higher prevalence of psychosis. Hence, estimates of the rate ratios are likely to be insensitive to the total homicide rate, legal tests, and variation in the incidence and prevalence of schizophrenia because all these factors can be expected to have a similar effect on the number of treated and untreated patients.

An exception would be if the incidence of psychosis is higher and the prevalence lower than generally accepted. However, even with unlikely assumptions about the incidence and prevalence of psychosis, the increased rate of homicide before treatment is still apparent. For example, if it is assumed that the incidence of first-episode psychosis is 40 per 100 000 per year (a figure that has been reported in less than 5% of incidence studies³²) and the prevalence is 250 per 100 000 (a figure that is lower than all but about 20% of prevalence studies³²), the rate ratio of homicide in first-episode psychosis is still 4 times greater than the annual rate after treatment.

Other limitations do not directly relate to uncertainty in the calculation of rates but do warrant consideration. The review relied on a small number of studies, which raises the possibility that the studies that found a higher number of homicides in first-episode psychosis were more likely to be published. However, publication bias is unlikely to have been a major factor because the history of treatment prior to the homicide was a main focus of 3 articles and personal communication with authors of studies who did not report the history of treatment before the homicide did not locate additional data. Moreover, there were no studies that did not show an increased rate of homicide in first-episode psychosis.

Another limitation was that most of the studies excluded patients who were thought to have forms of psychosis other than schizophrenia. Hence, the finding of this study might not be generalized to other forms of psychosis.

A final and potentially important limitation is that we assumed that the rate of homicide was constant over the course of later illness after initial treatment. However, the annual rate of homicide probably declines further because in our study 8 of the 34 (24%) homicides by previously treated patients occurred within 1 year of initial treatment.³ Hence, the true rate of homicide in patients with well-established treatment could be lower than our estimate.

Is This Finding Consistent With Studies of Non-lethal Violence?

The risk of violence in the first episode of psychosis has recently been highlighted.^{34–36} Studies of violence and mental disorder have generally only considered violence by patients following discharge from hospital or have not distinguished between treated and untreated patients.^{37–39} However, the findings of this study are consistent with other studies that report serious violence in first-episode psychosis. First, the 6 studies of homicide in psychosis that were excluded because homicide rates could not be calculated had a pooled proportion of first-episode homicide offenders of 40.8% (119 of 292).^{19–24} Second, 3 studies that were excluded because they included patients who committed nonlethal assaults reported that 30%, 48%, and 56% had never received treatment.^{40–42} Third, case linkage studies of violent offenses and psychiatric treatment show that a high proportion of the violence by mentally ill people occurs before treatment. A Danish case register study reported that 24.9% of violent offenses committed by psychotic men occurred after treatment,⁴³ and an Australian case register study also found that the rate of conviction for violent offenses by schizophrenic patients is greatest in the years immediately prior to initial treatment.^{44,45}

Finally, in a study that was prompted by the observation of numerous homicides in first-episode psychosis, we investigated whether major self-mutilation, another rare, violent and catastrophic complication of psychosis, is also more common prior to treatment. An examination of all the case reports published since 1960 of people who had removed an eye or a testicle or had severed a limb or their penis found that 143 of 189 had clearly documented psychotic illness and that 119 of the 143 (83.2%) were diagnosed with a schizophrenia-spectrum psychosis. Of the 119, treatment status could be ascertained in 101 cases and 54 (53.5%, 95% CI = 43.7%–63.2%) had never received treatment.⁴⁶ We estimated the risk of major self-mutilation prior to initial treatment to be 25 times greater than the annual risk after treatment. Moreover, the delusions associated with this extreme type of deliberate self-injury were similar to those reported in many cases of psychotically motivated homicide, in that the patients generally believed that their life was threatened, although by their own body part rather than another person.

Possible Explanations

Further research is needed to establish why the rate of homicide is higher in first-episode psychosis. A possible explanation is that there are more people with untreated psychotic symptoms or milder forms of the illness in the community than has previously been recognized.⁴⁷ However, we believe this to be unlikely because programs designed to find untreated patients detect only a small number of additional cases.^{48,49} Moreover, the cumulative distribution of treatment delay after the onset of psychosis in the published studies of duration of untreated psychosis shows that few patients present for treatment after 5 years, which suggests that few patients with the syndrome of schizophrenia never receive treatment.⁴

Another possibility is that people in the first episode of psychosis are more likely to commit homicide because they are younger, and younger people are known to be more prone to violence. However, the 2 studies that reported the age of the first-episode homicide offenders^{2,3} both reported a mean age over 30 years, which is older than the mean age of presentation in most studies of psychosis⁴ and is older than most nonpsychotic homicide offenders.

Other possible explanations for the decline in homicide after treatment include that dangerous patients who do not commit a homicide in their first episode might receive more intensive treatment, preventing further violence. It might also be that patients who experience a remission after treatment or receive an explanation for their symptoms retain sufficient insight to prevent them from committing a later homicide. Patients in the first episode of psychosis might have a pattern of positive symptoms that is associated with violence or that negative symptoms later in the illness reduces the incidence of violence. It is even conceivable that a period of treatment with antipsychotic medication has an enduring neurobiological effect that reduces the likelihood of extreme violence.

Conclusion

The findings of this study suggest that the rate of lethal violence by patients with previously treated schizophrenia is lower than previous estimates. In contrast, the rate of homicide prior to treatment of psychotic illness is higher than has previously been recognized. Homicide is a rare event, and it might never be possible to accurately predict who will commit homicide. However, awareness of the increased risk of homicide in patients in the first episode of psychosis should alert health care workers to the need for urgent treatment of emerging psychosis.

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