Psychotic Disorders and Sex Offending in a Danish Birth Cohort

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Context: Psychotic disorders are associated with an increased risk of aggressive behavior and violent crime. Whether there is also an association with sex offending is unknown.

Objectives: To estimate the lifetime prevalence of arrests for sexual offenses (with and without physical aggression) among men and women with psychotic disorders, the moderating effects of comorbid personality disorders and substance use disorders, and the prevalence rates for 4 specific psychotic disorders.

Design: We examined official records of arrests for sexual offenses with and without physical aggression to compare persons hospitalized with a psychotic disorder with those who had never been hospitalized.

Setting: Denmark.

Participants: All 358 180 persons born from January 1, 1944, through December 31, 1947, in Denmark.

Main Outcome Measure: Official arrest records.

Results: Among the men, 2.2% were hospitalized with psychotic disorders. These men committed 8.4% of the physically aggressive sexual offenses and 9.0% of the non–physically aggressive sexual offenses of the men in the cohort. Compared with men who had never been hospitalized, men with psychotic disorders without a personality disorder or a substance use disorder were not at increased risk of arrest for physically aggressive sexual offenses but were 3 times more likely to have been arrested for non–physically aggressive sexual offenses. Psychotic disorders with comorbid personality disorders or substance use disorders were associated with a 6-fold increased risk of physically aggressive sex offending and a 3- to 5-fold increased risk of non–physically aggressive sex offending.

Conclusions: Psychotic disorders comorbid with personality disorders and substance use disorders are associated with an increased risk of sex offending with and without physical aggression. Mental health policy and practice need to take account of these findings to improve functional outcome among persons with psychotic disorders.

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IN THE LITERATURE ON SEX OFFENDING, persons with psychotic disorders have been neglected,[1] with studies focusing primarily on paraphilias,[2] personality disorders (PDs), psychopathy,[3-6] and substance abuse.[5,7-9] Most of the studies that have addressed the specific relationship between sex offending and psychotic disorders have examined relatively small samples of patients or convicted offenders and have not included general population comparison groups.[1,8,10,11] Results from 2 large-scale studies that examined the relationship between schizophrenia and sex offending were mixed.[12,13]

To date, no general population studies have examined the relationship between psychotic disorders and sex offending. We aimed to fill this research gap to provide information that was sufficiently reliable and precise that could be used for policy planning and clinical practice. Sex offending is relatively rare and, we suspected, infrequent among individuals with psychotic disorders. Consequently, it was essential to examine a general population cohort that was large enough to provide reliable estimates. Furthermore, a large population cohort was essential to examine the associations of sex offending with each psychotic disorder—schizophrenia, organic brain disorder, affective psychosis, and other psychoses—and to distinguish sexual offenses that involved physical aggression and those that did not. The cohort had to be large and relatively old to accurately capture the offending of persons with psychotic disorders because we have previously shown that many men and women with psychotic disorders begin criminal offending after age 30 years.[14] Therefore, we collected data on cohort members to age 44 years.

Another advantage of a large population cohort was that it allowed us to examine the possible moderating effect of co-

Table 1. Description of the 173 559 Men in the Cohort[a]

Characteristic	Finding
Mean age, y	44
Socioeconomic status	
Low	42.4
Middle	31.2
High	19.1
Missing	7.3
Marital status	
Single	16.5
Married	69.6
Divorced	13.2
Widowed	0.7
Never hospitalized	94.3
Hospitalized at least once with a psychotic disorder	2.2
Mean hospitalization time for men with psychosis, d	457.9
Schizophrenia	0.7
With comorbid PD[b]	37.3
With comorbid SUD[b]	26.0
Organic brain disorder	0.6
With comorbid PD[b]	35.9
With comorbid SUD[b]	75.0
Affective psychosis	0.5
With comorbid PD[b]	41.8
With comorbid SUD[b]	27.3
Other psychotic disorder	0.8
With comorbid PD[b]	42.2
With comorbid SUD[b]	36.5
Any sex offending	1.1
Aggressive sex offending	0.6
Non–physically aggressive sex offending	0.5

Abbreviations: PD, personality disorder; SUD, substance use disorder.
[a] Unless otherwise specified, data are expressed as percentage of the study sample of 173 559 men.
[b] Indicates that the finding for the secondary characteristic represents the percentage of men with the primary characteristic.

morbid PDs and substance use disorders (SUDs) on the associations among psychotic disorders as a whole, 4 specific psychotic disorders, and aggressive and nonaggressive sex offending. Previous investigations have shown that, among persons with psychotic disorders, comorbid PDs and SUDs further increase the risks of violent offending and aggressive behavior beyond the risks conferred by the psychotic illness.[12,15-17]

We examined data from a Danish birth cohort that included 358 180 persons to answer the following research questions: (1) Are individuals with psychotic disorders at an increased risk of sex offending? (2) Does the type of psychotic disorder or the type of sexual offense affect the magnitude of the risk? and (3) Do comorbid PDs and SUDs moderate the relationship between psychotic disorders and sex offending? In light of the robust findings of an increased risk of aggressive behavior toward others among persons with psychotic disorders as a whole, and specifically among those with schizophrenia and organic brain disorder, we hypothesized that men who had been hospitalized for a psychotic disorder, schizophrenia, or an organic brain disorder would have an increased risk of arrest for any sexual offense and for physically aggressive sexual offenses compared with men who had never been hospitalized. We hypothesized that affective psychosis would not be as-

sociated with an increased risk of sex offending, unless accompanied by a comorbid PD or SUD. Based on evidence that PDs and SUDs further increased risks of aggressive behavior among persons with psychotic disorders and schizophrenia, we hypothesized that these comorbid disorders would further increase the risks of arrests for any sexual offenses and for physically aggressive sexual offenses among men with psychotic disorders, schizophrenia, and organic brain disorder. We were not aware of previous findings regarding non–physically aggressive sex offending among men with psychotic disorders, but, given the need for precise information for planning services, we explored these associations.

METHODS

PARTICIPANTS

The present study examined data from a cohort of all individuals born in Denmark from January 1, 1944, through December 31, 1947 (N=358 180). The data were obtained from official national registers in 1991. Identifiers were removed from all data before analysis, and the Minister of Justice in Denmark ensured ethical compliance in the merging of data from distinct registries.

The cohort included 171 949 women. Those who had died (n=3563) or emigrated before 44 years of age (n=6064) were excluded. The cohort included 186 231 men and, as with the women, those who had died (n=6441) or emigrated before 44 years of age (n=6122) were dropped from the analyses to hold constant the period for the recording of psychiatric hospitalizations and criminal offending. Also, men whose only recorded hospitalizations had occurred when the police transferred them to the hospital after an arrest (n=109) were excluded. The final cohort included 173 559 men. Socioeconomic status was indexed using occupational status and classified using a revision of the prestige scale developed by Svalastoga[18] for the Danish population. Occupation was not available for 7.3% of the subjects. As per the recommendation of Cohen and Cohen,[19] missing data were coded to the mean, and a dummy coded variable (1 indicates socioeconomic data are present) was included as a statistical control in the logistic regression analyses. The male cohort members are described in **Table 1**.

DIAGNOSES

In 1991, the records of psychiatric hospitalizations were obtained from the Danish Psychiatric Register at the Institute for Psychiatric Demography in Aarhus, Denmark. This register contains information for Denmark on all dates of admission to and discharge from psychiatric hospitals and the codes for primary, secondary, and tertiary diagnoses according to the *International Classification of Diseases, Eighth Revision* (*ICD-8*). Previous studies using data from the Psychiatric Register have found an agreement rate of greater than 90% between the *ICD-8* register diagnoses and the diagnostic systems of *DSM-III* and *DSM-III-R*.[20]

Diagnostic status was defined as it had been in previous research with this cohort.[15] In this sample, 9832 men (5.7%) had been hospitalized on a psychiatric ward at least once. These cohort members were further separated into diagnostic groups based on the *ICD-8* hospital discharge diagnoses. In the first group, 6023 men had been admitted to a hospital with a nonpsychotic disorder; in the second, 3809 participants had been

hospitalized with a psychotic disorder, including 1143 with schizophrenia or schizoaffective disorder (including all subtypes; hereinafter referred to as schizophrenia), 1030 with organic brain disorder (including dementia, alcoholic psychosis, psychosis associated with intercranial infection, and psychosis associated with cerebral infection or injury), 942 with affective psychosis (including depressive psychoses and mania), and 1309 with other psychoses (including reactive, paranoid, and unspecified psychoses). Some individuals received diagnoses of more than 1 type of psychotic disorder during their lifetime, so the individual psychotic disorder categories do not add to the total. Secondary diagnoses of PDs (including schizoid, antisocial, paranoid, explosive, hysterical, and/or asthenic) and SUDs (including alcohol and/or other drug abuse and/or dependence) (*ICD-8*) were also extracted from the psychiatric register.

SEX OFFENDING

In 1991, official arrest and conviction data were obtained from the Danish National Police Register. In Denmark, unlike common law countries, the police have no discretionary powers with regard to arrest, nor do they engage in plea bargaining. When a crime has been committed, suspects are arrested, and, if there is a possibility that they have a psychotic disorder, they are transferred for treatment only after a charge has been filed. Later, many of these individuals may not be prosecuted for their offenses. This differs from police practice in the United States, where mentally disordered individuals who have committed crimes may be diverted by police to a hospital rather than charged with an offense. The Danish practice of arresting and charging all suspected offenders regardless of their mental status reduces any prejudice, positive or negative, based on that suspect's mental status at the time of arrest. Therefore, arrest data, rather than conviction data, were examined in this study.

Lifetime arrest data were available for all offenses included in the Danish penal code (including traffic laws, special business laws, and index offenses). Physically aggressive sexual offenses included rape, pedophilia, and frotteurism. Non–physically aggressive sexual offenses included offenses against public decency, voyeurism, and exhibitionism.

Among the women in the cohort, 4153 (2.6%) had been hospitalized with a psychotic disorder by 44 years of age. Three of these women (0.07%) had been arrested for a sexual offense compared with 19 of the 150 988 women (0.01%) who had never been hospitalized. Given the low rate of sex offending for women, analyses in this report were restricted to the men in the cohort.

STATISTICAL ANALYSIS

We conducted logistic regression analyses and calculated odds ratios (ORs) to examine the associations between psychotic disorders as a whole and each type of psychotic disorder—schizophrenia, organic brain disorder, affective psychosis, and other psychoses—and lifetime arrests for any sexual offense, for sexual offenses involving physical aggression, and for non–physically aggressive sexual offenses. The comparison group consisted of the male cohort members who had never been hospitalized in a psychiatric ward. Next, we repeated these analyses among the men with psychotic disorders as a whole and each type of psychotic disorder, with and without comorbid PDs and SUDs. All of the analyses included statistical controls for marital status, socioeconomic status, and total time of hospitalization. The α levels were set at .05.

RESULTS

Of the 173 559 men in the cohort, 471 (0.3%) had been arrested for rape, 517 (0.3%) for pedophilia, 55 (0.03%) for frotteurism, and 950 (0.5%) for offenses against public decency, voyeurism, or exhibitionism. By age 44 years, 3809 (2.2%) had been hospitalized for a psychotic disorder. The men with psychotic disorders committed 8.4% of all the physically aggressive sexual offenses and 9.0% of the non–physically aggressive sexual offenses committed by men in the cohort. Men with psychotic disorders constituted 8.1% of the male sex offenders in this cohort.

ARE INDIVIDUALS WITH PSYCHOTIC DISORDERS AT AN INCREASED RISK OF SEX OFFENDING?

As presented in **Table 2**, men who had been hospitalized with a psychotic disorder at least once by the middle of their fifth decade of life, compared with those who had never been hospitalized, were almost 4 times more likely to have been arrested for any sexual offense, 4 times more likely to have been arrested for any sexual offense and for physically aggressive sexual offenses, and 3 times more likely to have been arrested for a non–physically aggressive sexual offense.

DOES TYPE OF PSYCHOTIC DISORDER OR SEXUAL OFFENSE AFFECT THE MAGNITUDE OF THIS RISK?

As can be seen in Table 2, different types of psychotic disorders were associated with different risks of sex offending. Men with affective psychoses were not more likely than nonhospitalized men to commit any sexual offense, an aggressive sexual offense, or a nonaggressive sexual offense. In contrast, men with other psychotic disorders, schizophrenia, and organic brain disorders had an increased risk of sex offending compared with nonhospitalized control subjects.

The patterns of risk of types of sexual offenses differed across the psychotic disorder categories as well. Men with organic brain disorder had higher ORs for any sexual offense and for physically aggressive sexual offenses than for nonaggressive sexual offenses, whereas men with schizophrenia and those with other psychotic disorders had higher ORs for nonaggressive than for aggressive sexual offenses.

DO COMORBID PDs AND SUDs MODERATE THE RELATIONSHIP BETWEEN PSYCHOTIC DISORDERS AND SEX OFFENDING?

Men with psychotic disorders alone, ie, no comorbid PD or SUD, were twice as likely as the never-hospitalized male cohort members to have been arrested for any sexual offense and 3 times more likely to have been arrested for a non–physically aggressive sexual offense. Psychotic disorders not accompanied by a PD or an SUD were not associated with an increased risk of arrest for offenses in-

Table 2. Odds of Arrest for Sexual Offenses for Men With Psychotic Disorders and for Men Who Were Never Hospitalized

Hospitalization Status and Diagnosis	Any Sexual Offense		Sexual Aggression[a]		Other Sexual Offenses[b]	
	Sex Offenders, No. (%)	OR (95% CI)	% of Offenders	OR (95% CI)	% of Offenders	OR (95% CI)
Never been hospitalized	163 727 (0.9)	1 [Reference]	0.5	1 [Reference]	0.4	1 [Reference]
Hospitalized with psychotic disorder						
All psychotic disorders	3809 (4.0)	3.67 (3.05-4.43)	2.2	3.92 (3.05-5.04)	1.8	3.33 (2.52-4.38)
Schizophrenia	1143 (4.1)	4.19 (2.91-6.01)	1.2	2.63 (1.39-4.99)	2.9	5.77 (3.74-8.90)
Organic brain disorder	1030 (5.1)	4.27 (3.13-5.82)	3.5	5.47 (3.76-7.96)	1.7	2.71 (1.58-4.65)
Affective psychoses	942 (2.0)	1.61 (0.94-2.73)	1.1	1.87 (0.93-3.78)	1.0	1.39 (0.62-3.10)
Other psychotic disorder	1309 (4.9)	4.50 (3.39-5.96)	2.3	3.94 (2.63-5.91)	2.6	4.95 (3.37-7.27)
Hospitalized with psychotic disorder alone						
All psychotic disorders	1657 (2.5)	2.36 (1.67-3.33)	0.9	1.61 (0.92-2.83)	1.6	3.16 (2.05-4.86)
Schizophrenia	586 (3.6)	3.54 (2.07-6.03)	0.5	0.93 (0.23-3.70)	3.1	6.27 (3.52-11.17)
Organic brain disorder	196 (3.1)	2.53 (1.02-6.24)	1.5	2.41 (0.70-8.34)	1.5	2.63 (0.73-9.55)
Affective psychoses	454 (0.9)	0.87 (0.30-2.53)	0.7	1.19 (0.34-4.13)	0.2	0.94 (0.07-12.28)
Other psychotic disorder	541 (3.9)	3.80 (2.38-6.08)	1.5	2.48 (1.15-5.31)	2.4	5.25 (2.92-9.43)
Hospitalized with psychotic disorder with PD						
All psychotic disorders	1374 (5.7)	6.03 (4.61-7.89)	3.3	6.77 (4.74-9.68)	2.4	4.94 (3.31-7.39)
Schizophrenia	426 (4.7)	5.75 (3.24-10.20)	2.1	4.85 (2.08-11.29)	2.6	6.43 (3.01-13.74)
Organic brain disorder	370 (7.6)	7.87 (4.89-12.65)	4.9	9.39 (5.16-17.07)	2.7	5.46 (2.57-11.59)
Affective psychoses	394 (2.5)	2.34 (1.14-4.84)	1.3	3.29 (1.01-10.68)	1.3	2.17 (0.77-6.09)
Other psychotic disorder	552 (6.0)	5.96 (3.95-8.99)	3.3	6.42 (3.70-11.16)	2.7	5.24 (2.87-9.57)
Hospitalized with psychotic disorder without PD						
All psychotic disorders	2435 (3.0)	2.62 (2.02-3.42)	1.5	2.62 (1.83-3.76)	1.5	2.60 (1.78-3.80)
Schizophrenia	717 (3.8)	3.64 (2.26-5.87)	0.7	1.37 (0.47-3.97)	3.1	6.00 (3.53-10.20)
Organic brain disorder	660 (3.8)	2.99 (1.93-4.63)	2.7	4.13 (2.49-6.85)	1.1	1.57 (0.67-3.69)
Affective psychoses	548 (1.6)	1.16 (0.52-2.61)	0.9	1.51 (0.56-4.11)	0.7	0.86 (0.23-3.24)
Other psychotic disorder	757 (4.1)	3.67 (2.47-5.44)	1.6	2.59 (1.40-4.80)	2.5	4.82 (2.93-7.94)
Hospitalized with psychotic disorder with SUD						
All psychotic disorders	1480 (5.3)	4.39 (3.37-5.72)	3.5	5.83 (4.22-8.06)	1.8	2.74 (1.74-4.31)
Schizophrenia	297 (5.7)	5.60 (2.90-10.80)	2.7	5.18 (2.03-13.22)	3.0	5.78 (2.37-14.13)
Organic brain disorder	772 (5.3)	4.18 (2.92-5.98)	3.8	5.75 (3.77-8.78)	1.6	2.26 (1.16-4.42)
Affective psychoses	257 (3.9)	2.24 (0.98-5.14)	1.9	2.99 (1.04-8.57)	1.9	1.71 (0.46-6.31)
Other psychotic disorder	478 (5.9)	4.49 (2.86-7.04)	2.9	5.00 (2.70-9.26)	2.9	4.13 (2.14-7.95)
Hospitalized with psychotic disorder without SUD						
All psychotic disorders	2329 (3.1)	3.06 (2.35-3.99)	1.3	2.49 (1.67-3.71)	1.8	3.62 (2.56-5.17)
Schizophrenia	846 (3.5)	3.68 (2.36-5.74)	0.7	1.59 (0.62-4.11)	2.8	5.85 (3.54-9.64)
Organic brain disorder	258 (4.7)	4.34 (2.30-8.20)	2.7	4.69 (2.07-10.63)	1.9	3.72 (1.40-9.89)
Affective psychoses	685 (1.3)	1.25 (0.61-2.58)	0.7	1.40 (0.54-3.66)	0.6	1.10 (0.36-3.30)
Other psychotic disorder	831 (4.3)	4.34 (3.01-6.26)	1.9	3.43 (2.00-5.91)	2.4	5.19 (3.20-8.43)

Abbreviations: CI, confidence interval; OR, odds ratio; PD, personality disorder; SUD, substance use disorder.
[a] Indicates any sexual offense and physically aggressive sexual offenses.
[b] Indicates non–physically aggressive sexual offenses.

volving any sexual offense and for physically aggressive sexual offenses. The presence of a PD or an SUD significantly increased the risk of arrest for any sexual offense and for physically aggressive sexual offenses and nonaggressive sexual offenses.

Schizophrenia

The presence of a comorbid PD or SUD appeared to moderate the relationship between schizophrenia and aggressive sex offending. As can be seen in Table 2, men with schizophrenia who did not have a comorbid PD or SUD were not at an increased risk of any sexual offense or of physically aggressive sexual offenses, whereas men with schizophrenia who also had a PD or an SUD were 5 times as likely as nonhospitalized men to be arrested for any sexual offense and for physically aggressive sexual offenses. In contrast, ORs for nonaggressive

sex offending remained fairly constant (6.00) for men with schizophrenia, regardless of whether they had a comorbid PD or SUD.

Organic Brain Disorder

Men with an organic brain disorder and no comorbid PD or SUD were more likely than the nonhospitalized men to have been arrested for any sexual offense, but there was no increase in the risk of sex offending with or without physical aggression. The presence or absence of comorbid SUDs did not substantially change the relation between organic brain disorder and sex offending. In contrast, ORs for sexual offenses of all types were more than double (physically aggressive, 9.39 vs 4.13; non–physically aggressive, 5.46 vs 1.57) for men with organic brain disorder when a comorbid PD was present (Table 2).

Affective Disorder

Affective psychoses were related to an increased risk of sex offending only when combined with a PD or an SUD, and this increased risk was specific to any sexual offense and to physically aggressive sexual offenses. This same general pattern of results was noted when analyses were restricted to men with bipolar and manic conditions.

Other Psychotic Disorders

For men with other psychotic disorders, comorbid PDs and SUDs increased the ORs for any sexual offense and for physically aggressive sexual offenses but did not substantially alter the ORs for nonaggressive sex offending.

EFFECT OF EXCLUDING COHORT MEMBERS WHO HAD DIED

Post hoc analyses indicated that excluding men in the cohort who had died or emigrated before 44 years of age did not change the results.

COMMENT

To our knowledge, this is the first epidemiological investigation of a large general population cohort to examine the prevalence of sex offending among persons with psychotic disorders. Even in this birth cohort, which included 358 180 persons, too few women had been arrested for sexual offenses to permit analyses. Among the 4153 women who had been hospitalized with a psychotic disorder, there were only 3 who had been arrested for a sexual offense. Previous studies have consistently shown that, although proportionately more men than women with psychotic disorders and with schizophrenia engage in physical aggression and violent crime, the psychotic disorders as a whole (and specifically schizophrenia) are associated with a greater incremental risk of aggressive behavior and violent crime in women than in men.[15,21] The results of recent studies suggest that the prevalence of assaults by women and men with psychotic disorders living in the community is similar.[22] However, the findings from the present study indicate that, among women with psychotic disorders, violent offending and aggressive behavior rarely include any sexual aggression.

The cohort examined in the present study was large enough to thoroughly examine the association between psychosis and sex offending among men. As we had hypothesized, men who had been hospitalized for a psychotic disorder were significantly more likely to have been arrested for a sexual offense than were men who had never been hospitalized. This finding is consistent with evidence from studies that show an increased prevalence of violent crime among men with psychotic disorders compared with the general population where they live[23,24] and with studies of random samples of convicted offenders showing elevated rates of psychotic disorders compared with age- and sex-matched samples of the general population.[25]

The type of psychotic disorder, the type of sexual offense, and comorbidity were all influential factors in the psychotic disorder–sex offending relationship. Schizophrenia was associated with an increased risk of any sexual offense and of physically aggressive sexual offenses and other types of sexual offenses. Schizophrenia in the absence of comorbid PDs and SUDs did not increase the risk of arrest for any sexual offense and for physically aggressive sexual offenses. In light of the findings that schizophrenia alone is associated with increased risks of physical aggression[12,15,26] and violent crime,[26] the present findings, if replicated, further circumscribe the type of aggressive behavior engaged in by men with schizophrenia. Many studies have shown an increased prevalence of physical aggression and violent crime by men with schizophrenia and any PD,[15] with antisocial PD,[26-29] with conduct disorder before 15 years of age,[30,31] and with SUDs.[32,33] Findings from the present study concur and extend previous findings by showing that schizophrenia plus a PD or an SUD was associated with an increased risk of any sexual offense and of physically aggressive sexual offenses.

In the present study, schizophrenia alone and combined with a PD or an SUD were associated with an increased risk of non–physically aggressive sex offending. This finding is consistent with evidence showing that schizophrenia confers a risk of nonviolent offending.[12,15,26] Again, a pattern of antisocial behavior in childhood and adolescence, well before the onset of schizophrenia, increases the risk of persistent nonviolent offending.[30] These offenses have negative consequences for the perpetrators: they lead to imprisonment, association with antisocial and criminal peers, and rejection by the community.

Men with organic brain disorder and no PD or SUD were not at increased risk of aggressive or non–physically aggressive sexual offending. The addition of a PD, however, increased the risk of both types of sex offending. In a previous study with this same group, we found that approximately 30% of the men with organic brain disorder had committed at least 1 criminal offense before 18 years of age.[34] The organic brain disorder onset occurred, on average, when these men were in the middle of their fourth decade of life. An examination of their criminal records led us to speculate that these men may have demonstrated antisocial behavior since childhood. Such a pattern of behavior includes repeated engagement in reckless activities such as driving while intoxicated, driving with excessive speed, and using illicit drugs. The organic brain disorder in this subgroup may have resulted from injuries caused by the individual's tendency to take unnecessary risks with his own safety. More research is required to test the hypothesis that a subgroup of boys who demonstrate conduct disorder in childhood injure themselves and cause an organic brain syndrome and that this subgroup shows elevated rates of aggressive and nonaggressive sex offending.

Among men, affective psychosis in the absence of comorbid PDs and SUDs was not associated with increased risk of sex offending. However, the addition of a PD or an SUD increased the risk of offenses involving any sexual offense and of physically aggressive sexual of-

fenses. These findings are consistent with the results of previous investigations with this cohort[15] and others[35-37] showing that affective psychosis was not associated with an increased risk of violent crimes except when combined with a PD or an SUD.

Other psychotic disorders with and without comorbid PDs or SUDs significantly increased the risk for physically aggressive and non–physically aggressive sex offending.

LIMITATIONS

The findings from the present study need to be considered in light of limitations in the method. First, the use of arrest data likely underestimates the incidence of sex offending. Victims often do not report attacks and the perpetrators of many reported incidents are never identified. On the other hand, persons with psychotic disorders may be more easily identified than other offenders because their crimes may be less sophisticated and more easily detected by law enforcement officials.

We used hospital admissions and clinical diagnoses to classify cohort members. Studies show that, in Denmark in the period when the data were collected, almost all persons with psychosis would have been hospitalized at least once by the middle of their fifth decade of life.[38] Hospital diagnoses of psychotic disorders are also not ideal, but, as noted, studies indicate that the discharge diagnosis recorded in the files closely resembles the independent diagnosis using *DSM* criteria. Secondary and tertiary diagnoses are difficult to make in individuals with psychosis. The rather lengthy stays in inpatient wards at the time of the study, however, increase the validity of these diagnoses.[39]

Another limitation identified in this study is the possibility that psychotic disorders were diagnosed after an arrest for a sexual offense when they would not have been diagnosed otherwise. Such occurrences would have artificially inflated the rates of sex offending among men diagnosed as having psychosis. In a series of secondary analyses (not reported herein; A.A., unpublished data, 2007), we examined whether psychotic disorders and sex offending were still related when only those men who had been hospitalized before their first arrest were included in the analyses. As for the whole cohort, there was an increase in the risk of sex offending among men who had been admitted for a psychotic disorder before the first offense.

Cultural factors may affect the generalizability of these results. This study was conducted using a birth cohort from Denmark, where cultural norms concerning sexuality and definitions of criminality differ from those in the United States. The results of the present investigation may not be generalizable to US society.

IMPLICATIONS

The results of the present study have implications for understanding and treating psychotic disorders, for the prevention of sex offending, and for the rehabilitation of sex offenders. The results further extend the evidence showing that psychotic disorders other than affective psychosis, and even psychotic symptoms in the absence of a dis-

order, are associated with an increased risk of aggressive behavior toward others. These consistent findings impel us to identify the specific factors that confer risk of aggressive behavior among individuals with each type of psychotic disorder. Some of these factors will be distal and will involve patterns of behavior that emerged long before the illness, whereas others will be more proximal to the incident. For example, among men with schizophrenia, the findings from the present investigation concur with those from other studies suggesting that comorbid PDs and SUDs are associated with increasing the risk of aggressive behavior. At least 1 PD, that involving a stable pattern of antisocial behavior since childhood, is more prevalent among persons with schizophrenia than in the general population.[40] Children and adolescents with conduct disorder are exposed earlier than other children to alcohol and illicit drugs,[41] and abuse is part of their antisocial lifestyle. Thus, before schizophrenia onset, a long-established pattern of antisocial behavior is evident. Among persons with other subtypes of psychotic disorders, SUDs are associated with aggressive behavior, although there is no history of antisocial behavior before illness onset.[31]

Most treatment programs for sex offenders are learning based. Some also use hormonal treatments.[42] Offenders with psychotic disorders are usually excluded from such treatments. Psychotic disorders and sex offending are often treated separately, with only one or the other condition being the focus of care. For example, a recent examination of the treatments provided to an inpatient sample of 84 sex offenders with schizophrenia found that only 10 of these men received cognitive behavioral treatment aimed at preventing further sex-offending behavior.[11] Moreover, descriptions of treatment for sex offenders often do not attend to the potential role that antipsychotic medications might play in the treatment process, although a recent clinical review has pointed out the need for a change in this practice.[43] Thus, the few existing reports suggest that clinical practice is based on the presumption that treating the psychotic illness will prevent further sex offending. The findings of the present investigation indicate that this may be a faulty assumption.

Policy planners and clinicians responsible for the treatment of patients with schizophrenia, organic brain disorders, and other nonaffective psychoses need to recognize the increase in risk these disorders confer for sex offending and for other forms of aggressive behavior. Assessment of the distal and proximal factors associated with these behaviors will establish the level of risk and identify proximal factors that can be targeted by interventions to reduce risk.[44] Studies have shown the usefulness of specific medications[45,46] and of community treatment orders that remain in place for at least 18 months in reducing violent behavior. Naturalistic follow-up studies of patients with psychotic disorders and histories of violence who have been treated in specialized hospitals and community programs report good outcome, even in very high-risk samples.[47-49] These findings suggest that adequate and appropriate treatment could theoretically prevent violent crimes and aggressive behavior in this population.

The results of the present investigation also have implications for treatment programs for sex offenders that usually do not include men with psychosis. Studies of the effectiveness of these cognitive behavioral programs and hormonal treatments for sex offenders with psychotic disorders are needed. One strategy would be to modify the learning-based programs for sex offenders with psychotic disorders. An alternative treatment strategy would be to view the sexual offending as one aspect of a problem with aggressive behavior and to target aggressive behavior using social learning–based programs with proven efficacy.

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Correction

Error in Table. In the Original Article by Gurling et al titled "Genetic Association and Brain Morphology Studies and the Chromosome 8p22 Pericentriolar Material 1 (*PCM1*) Gene in Susceptibility to Schizophrenia," published in August 2006 (2006;63(8):844-854), Table 2 contained errors in 3 columns of data. The columns "Frequency in Cases, %" and "Frequency in Controls, %" contained the actual estimated haplotype counts rather than the percentages of estimated haplotype frequencies. In addition, the marker labeled 87366_66 in the table should have appeared with the official SNP database label, rs13276297. The corrected Table 2 is published below.

Table 2. Haplotypic Associations With Schizophrenia

Haplotype Label	No. of Marker Loci	Alleles Increased in Haplotypes Showing Association With Schizophrenia	Frequency in Cases, %	Frequency in Controls, %	Global Log Ratio χ^2	Permutation Significance
PCM1A1	3 marker	rs445422 allele C, rs13276297 allele T, rs370429 allele G*	3.6	1.9	14.66	.003†
PCM1A2		rs445422 allele T, rs13276297 allele C, rs370429 allele A*	2.9	1.4		
PCM1B1	3 marker	rs454755 allele A, rs3780103 allele G, rs6991775 allele A*	5.0	2.4	18.28	.002†
PCM1B2		rs454755 allele G, rs3780103 allele A, rs6991775 allele A*	0.8	0		
PCM1C1	4 marker	rs454755 allele A, rs13276297 allele C, rs3780103 allele G, rs6991775 allele A*	5.0	2.4	28.72	.002†
PCM1C2		rs454755 allele G, rs13276297 allele C, rs3780103 allele A, rs6991775 allele A*	0.8	0		

*Denotes most likely alleles to be associated with schizophrenia in each haplotype.
†Permutation test empirical *P* value.