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Prevalence of HIV, hepatitis B, and hepatitis C in people with severe mental illness: a systematic review and meta-analysis

Elizabeth Hughes, Shaan Bassi, Simon Gilbody, Martin Bland, Fabiola Martin

Summary

Background Although people with serious mental illnesses have a high risk of contracting blood-borne viral infections, sexual health has largely been neglected by researchers and policy makers involved in mental health. Failure to address this shortcoming could increase morbidity and mortality as a result of undetected and untreated infection. We did a systematic review and meta-analysis to estimate the prevalence of blood-borne viral infection in people with serious mental illness.

Method We searched the Cochrane Library, Medline, Embase, PsycInfo, CINAHL, and DARE for studies of the prevalence of HIV, hepatitis B virus, and hepatitis C virus in people with serious mental illness, published between Jan 1, 1980, and Jan 1, 2015. We group prevalence data by region and by virus and estimated pooled prevalence. We did a sensitivity analysis of the effect of study quality on prevalence.

Findings After removal of duplicates, we found 373 abstracts, 91 of which met our eligibility criteria. The prevalences of blood-borne viral infections in people with serious mental illness were higher than in the general population in places with low prevalence of blood-borne viruses, such as the USA and Europe, and on par with the general population in regions with high prevalence of blood-borne viruses (Africa for HIV and southeast Asia for hepatitis B virus and hepatitis C virus). Pooled prevalence of HIV in people with serious mental illness in the USA was 6·0% (95% CI 4·3–8·3). Sensitivity analysis showed that quality scores did not significantly affect prevalence.

Interpretation People with serious mental illness are at risk of blood-borne viral infections. However, because of methodological limitations of the studies the prevalence might be overestimated. Serious mental illness is unlikely to be a sole risk factor and risk of blood-borne viral infection is probably multifactorial and associated with low socioeconomic status, drug and alcohol misuse, ethnic origin, and sex. Health providers should routinely discuss sexual health and risks for blood-borne viruses (including risks related to drug misuse) with people who have serious mental illness, as well as offering testing and treatment for those at risk.

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co-occurring substance misuse problems that can lead to sexual risks while intoxicated. Finally, people with serious mental illness who live in shared accommodation might share personal equipment (eg, razors, toothbrushes), which might increase the risk of hepatitis B and hepatitis C transmission.

In the UK, 93 000 men and 40 000 women are infected with HIV, and in 2013, there were 6000 new cases of HIV.7 In 2012, the incidence of hepatitis B in England was 1·4 cases per 100 000 people per year and prevalence was 0·1–0·5%.8 In 2009, the overall incidence of reported acute hepatitis B in the USA9 was 1·5 per 100 000 people per year and 800 000–1·4 million people in the USA have chronic hepatitis B virus infection. 786 000 people worldwide die from hepatitis B virus-related liver disease each year.8,10 About 3% of the world’s population are infected with hepatitis C virus, with about 4 million carriers in Europe alone10 and 214 000 in the UK.10 There were 17 000 new cases of hepatitis C in the USA in 2007, with 3·2 million people infected in total.

Although previous reviews of blood-borne infection in people with serious mental illness have been published,3,5,6 no systematic reviews have been done and the reviews rarely reported the rate of HIV, hepatitis B, and hepatitis C.13 We did a systematic review and meta-analysis of prevalence studies to understand the global prevalence of HIV, hepatitis B virus, and hepatitis C virus in people with serious mental illness.

**Methods**

**Search strategy**

We searched the Cochrane Library, Medline, Embase, PsycInfo, CINAHL, and DARE for studies published in English between Jan 1, 1980, and June 5, 2012, with the terms “hepatitis C”, “HCV”, “hepatitis B”, “HBV”, “HIV”, “human immunodeficiency virus”, “blood borne virus” cross-referenced with “bipolar”, “psychiatr*”, “schizophreni*”, “psychosis”, “schizoaff ective”, “mental patient*”, “mental illness”, and “mental disorder*”. We also included eligible studies cited in reports identified by our database search. We repeated the search for June 5, 2012, to Jan 1, 2015, and identified two more papers.

**Data collection**

We systematically searched the scientific literature for observational cross-sectional studies that reported the seroprevalence of HIV, hepatitis B virus, or hepatitis C virus according to opt-in, opt-out, or anonymous unlinked blood or other bodily fluids research methods, in people aged older than 15 years, diagnosed with serious mental illness, and treated in a psychiatric setting. We excluded studies in which prevalence data were only obtained from case notes or only from self-report (not independently verified by testing). We did not include grey literature.

After removing duplicates, SB screened the titles and abstracts using the eligibility criteria, with independent verification by EH and FM. For studies deemed suitable, we obtained the full text and they were again scrutinised against the eligibility criteria by SB and verified independently by EH and FM. Reports about which there was uncertainty were discussed by FM and EH with SB until a consensus about eligibility was achieved. We extracted data from eligible full-text articles including...
study characteristics, study date, publication date, location, diagnostic criteria, demographics (age, sex, ethnicity), consent, consent rate, ethics approval, post-test treatment, sample size, testing procedure, and prevalence.

We used the Quality Assessment Tool for Systematic Reviews of Observational Studies to assess the quality of the data. This instrument is reliable compared with other quality assessment tools. We modified the tool and each report was scored as follows: whether participants were clearly defined as representing the serious mental illness population (yes=1, no=0); participation rate (response rate >60%=1, response rate ≤60% or not reported=0); whether investigators controlled for confounding (eg, stratification, matching, restriction, adjustment) when analysing associations (controlled=1, only descriptive=0); and sample size (≥200 participants=1, <200 participants=0).

Data analysis
We did a meta-analysis to calculate combined estimates and 95% CIs for each continent separately. We did logistic regression to allow for the difficulties caused by proportions being unable to have values less than 0. We assumed random effects because there was clear clinical heterogeneity between the populations sampled. We did the calculations using Comprehensive Meta-Analysis 2. We transformed logits of estimated prevalence and their 95% CIs back to percentages. We prepared forest plots using Stata (version 12). We calculated relative weights for each continent, so that the weights for each continent sum to 100.

We did a sensitivity analysis relating to quality scores using Stata 13. The outcome variable was the logit-transformation of prevalence. We did two such analyses: one for all studies with quality score as a quantitative predictor, and one for all studies using quality score as a quantitative predictor and region as a qualitative predictor. The results are presented as odds ratio (OR) per unit increase in quality score with 95% CIs.

Results
Our literature search identified 373 reports, 169 of which were duplicates (figure 1). 41 publications were excluded because the full text was not available in English, followed by another 74 that were ineligible. With the addition of two papers from an updated search, we had 93 articles for quality assessment and meta-analysis. 44 studies assessed HIV infection (table 1), including a total of 21071 patients. The pooled prevalence of HIV was highest in Africa (19%, 95% CI 14–25) and it was 2% in Europe and 6% in the USA (tables 1, 2, figure 2). Few data were available from Europe, Central and South America, and Asia, and the prevalence of HIV was very poorly recorded in these regions. Only three studies were done in India, and only one study, done more than 20 years ago, was from Spain.

19 studies reported prevalence of hepatitis B virus, including a total of 8163 patients with serious mental illness tested for hepatitis B virus (table 3). The pooled prevalence of hepatitis B virus was 2.2% (95% CI 0.5–9.9) in North America, and 9.7% (95% CI 0.6–15.3) in Asia (table 2, figure 3). A study from Turkey reported 5% hepatitis B virus prevalence with 10% HBsAg positivity indicating active infection; the virus is highly prevalent in the general population of Turkey. A study from Taiwan reported an 18% prevalence of HBsAg, which is consistent with the general population: hepatitis B virus infection is endemic in Taiwan, with 80–90% of adults infected.
28 studies tested 14888 patients with serious mental illness for hepatitis C virus (tables 2, 4, figure 4). This set of participants was the largest of the three viral infections we investigated. The prevalence of hepatitis C in people with serious mental illness was greatest in Turkey, perhaps a result of the high prevalence in the general population.\(^\text{49}\) The prevalence of hepatitis C in people with serious mental illness was 2·5% (95% CI 1·0–5·9), which is higher than in the general population, of whom roughly 1% are infected (2·7 million).\(^\text{88}\) In Asia, pooled hepatitis C virus prevalence was 4·4% (95% CI 2·8–6·9). However, these data are from large and diverse geographical areas including southeast Asia and Turkey.

Most studies consisted of convenience samples of people recruited from a particular treatment setting, typically inpatient psychiatric care. Although all the studies included patients with serious mental illness, the proportions of specific diagnoses in each sample varied. We assessed the effect of study quality on virus prevalence by meta-regression on quality score, for all studies combined and adjusting for geographical region. No analysis showed a significant effect of study quality on prevalence (table 5).

Most of the studies had additional data on risk factors for blood-borne viruses, such as intravenous drug use and sexual behaviour, to test associations with infection. The reporting and the nature of these risk factors varied widely. Infomation on risk factors was mainly extracted from routine clinical case notes as opposed to using a standardised risk tool.\(^\text{89}\) Because of the variability of data quality and reporting consistency, we could not calculate adjusted prevalence after controlling for these risk factors. However, three common factors seem to increase the likelihood of infection with a blood-borne virus: first, being black, which is higher than in the general population, of whom roughly 1% are infected (2·7 million).\(^\text{49}\) In Asia, pooled hepatitis C virus prevalence was 4·4% (95% CI 2·8–6·9). However, these data are from large and diverse geographical areas including southeast Asia and Turkey.
and female;3:26 second, injecting drug use;32 and third, engaging in risky sexual behaviour, including not using a condom, having multiple partners, sex trading, and unprotected sex with a partner who is infected with a blood-borne virus.

Discussion

Our aim was to estimate the prevalence of blood-borne infection in people with serious mental illness. Most of the studies were of moderate to low quality, and based on convenience samples drawn from treatment settings rather than representative samples. This sampling method means that the prevalence reported was possibly overestimated. However, a study in Brazil, which used a representative sample drawn from the community as well as treatment settings, still showed that blood-borne infections are common in people with serious mental illness.39 The quality of defining the sample in terms of diagnoses of mental illness varied. Many studies used case note diagnoses rather than independently verified diagnoses made with gold standard diagnostic tools. Inpatient settings are likely to treat the most acutely ill people often with complex needs and a history of substance misuse.

The prevalences of blood-borne viruses in people with serious mental illness were consistently higher than in the general population in regions with a low prevalence of blood-borne viruses, such as North America and Europe, and on par with the general population in regions with high general prevalence such as Africa for HIV and southeast Asia for hepatitis B virus and hepatitis C virus. The estimated prevalence of HIV in people with serious mental illness was 6% (95% CI 4.3–8.3), which is considerably higher than the 0.6% of the general population of the USA who have HIV.40

However, serious mental illness might not be an isolated risk factor for blood-borne virus infection, but might be better thought of as a potentially confounded association with poor socioeconomic background, drug and alcohol misuse, sex, and ethnic origin.

Three USA studies33,21,26 included odds ratios adjusted for risk factors and showed that they significantly increased the risk of HIV and other blood-borne viral infections. However, these studies were done in settings where dual diagnosis of substance misuse and mental illness is very common. The samples were drawn from psychiatric inpatient and outpatient services in deprived urban areas with substantial social deprivation and health inequality, especially in those of non-white ethnic backgrounds.

Several studies, from both high prevalence and low prevalence locations, individually found a positive association between sex and infection. Women had a significantly higher risk of HIV infection than did men drawn from the same populations. One explanation might be that women with serious mental illness are

**Figure 3**: Prevalence of hepatitis B virus in people with serious mental illness

| Year    | Location | Number of patients | Hepatitis C virus (%) | Quality score |
|---------|----------|--------------------|-----------------------|--------------|
| North America
| Al Jurdi et al* | 2003 USA | 238 | 16 | 3 |
| Klinkenberg et al* | 2003 USA | 204 | 30 | 2 |
| Osher et al* | 2003 USA | 668 | 18 | 3 |
| Dinwiddie et al* | 2003 USA | 1556 | 85 | 3 |
| Butterfield et al* | 2003 USA | 376 | 18 | 3 |
| Rosenberg et al* | 2005 USA | 755 | 14 | 3 |
| Freudenreich et al* | 2007 USA | 98 | 8 | 2 |
| Tabibian et al* | 2008 USA | 129 | 38 | 1 |
| Goldberg et al* | 2008 USA | 100 | 31 | 1 |
| Matthews et al* | 2008 USA | 112 | 12 | 0 |
| Rothbard et al* | 2009 USA | 588 | 21 | 2 |
| Snellingsam et al* | 2010 Canada | 110 | 7 | 1 |
| Himelhoch et al* | 2011 USA | 153 | 24 | 8 |
| Europe
| Di Nardo et al* | 1995 Italy | 206 | 10 | 7 |
| Cividini et al* | 1997 Italy | 1180 | 67 | 2 |
| Strollofino et al* | 2003 Italy | 526 | 5 | 1 |
| Raja et al* | 2006 Italy | 1492 | 28 | 3 |
| De Hert et al* | 2009 Belgium | 595 | 07 | 2 |
| Kakisi et al* | 2009 Greece | 805 | 9 | 1 |
| Central and South America
| Alvarado-Esquivel et al* | 2008 Mexico | 99 | 4 | 8 |
| Guimaraes et al* | 2009 Brazil | 2238 | 263 | 3 |

(Table 4 continues on next page)
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more likely to experience exploitation and sexual assault, as well as power differentials, making them less empowered to negotiate condom use or to refuse sex.91 By contrast, men with serious mental illness were more likely to carry hepatitis B virus or hepatitis C virus, which could be because injecting drug use is more common in men. However, the causes of these sex differences were probably multifactorial, which we could not assess because of the heterogeneity of geography, demographics, and risk factors in the studies included.

Many of the studies have been done in the USA, with fewer located in other countries. Of particular note is the paucity of research in Europe, and there have been no prevalence studies done in the UK. However, two articles suggest a potential problem in the UK. A hepatitis C virus screening and referral project done by an assertive outreach mental health team92 showed more than expected infections amongst users of the service. Of 76 users, ten (13%) were hepatitis C virus positive, and almost half had a history of intravenous drug use. Another article93 reported on the acceptability and feasibility of offering testing for blood-borne viruses in psychiatric inpatient settings. The results suggest more HIV, hepatitis B virus, and hepatitis C virus in patients who participated in the study. Overall, 18% of participants had current or past exposure to a blood-borne virus, one of whom was newly diagnosed with HIV and three were newly diagnosed with hepatitis B virus. Therefore, there is an urgent need to undertake high quality epidemiological studies of blood-borne virus infections and their associated risk behaviours in the people with serious mental illness in the UK and northern Europe.

Few studies systematically collected data for risk factors directly from the participants. The risk data were mainly collected from case notes and routine clinical record systems. Sexual and drug use behaviours are probably under-reported in case notes, because there is evidence that mental health services do not consistently assess these behaviours in routine care.94,95 Without accurate and consistent measurement of risks, we could not calculate the effect of the risk factors as mediators of infection in this population, and have merely mentioned the factors identified by individual studies that warrant more rigorous investigation. There is a need for a prospective longitudinal study of a cohort of people with serious mental illness, which can track risk behaviour and infections powered sufficiently to identify the mediating factors between serious mental illness and blood-borne virus infection.

Table 4: Included studies of hepatitis C virus in people with serious mental illness

| Year   | Location | Number of patients | Hepatitis C virus (%) | Quality score |
|--------|----------|--------------------|-----------------------|---------------|
| 2010   | Australia| 95                 | 3.1                   | 1             |
| 1993   | Taiwan   | 780                | 6.8                   | 3             |
| 1997   | Iran     | 170                | 1.9                   | 1             |
| 2000   | Japan    | 196                | 4.4                   | 2             |
| 2004   | Japan    | 455                | 6.5                   | 3             |
| 2006   | Turkey   | 255                | 2.7                   | 3             |
| 2009   | Iran     | 780                | 6.8                   | 3             |
| 2012   | Taiwan   | 388                | 1.9                   | 3             |

(Continued from previous page)

Table 5: Sensitivity analysis

| Adjustment | Odds ratio (95% CI) | p value |
|------------|---------------------|---------|
| HIV        | None                | 1.00 (0.68–1.48) | 0.99     |
| HIV        | Region              | 0.90 (0.67–1.21) | 0.49     |
| Hepatitis B| None                | 0.84 (0.46–1.55) | 0.55     |
| Hepatitis B| Region              | 0.69 (0.44–1.08) | 0.11     |
| Hepatitis C| None                | 0.92 (0.61–1.40) | 0.69     |
| Hepatitis C| Region              | 0.85 (0.63–1.19) | 0.36     |

Figure 4: Prevalence of hepatitis C virus in people with serious mental illness

| Year   | Location | Number of patients | Hepatitis C virus (%) | Quality score |
|--------|----------|--------------------|-----------------------|---------------|
| 2010   | Australia| 95                 | 3.1                   | 1             |
| 1993   | Taiwan   | 780                | 6.8                   | 3             |
| 1997   | Israel   | 121                | 4.1                   | 0             |
| 2000   | Japan    | 196                | 10.2                  | 2             |
| 2004   | Japan    | 455                | 6.5                   | 3             |
| 2006   | Turkey   | 255                | 2.7                   | 3             |
| 2009   | Iran     | 170                | 1.9                   | 1             |
| 2012   | Taiwan   | 588                | 1.9                   | 3             |

(Continued from previous page)
We included cross-sectional studies. None of the studies included a matched comparison group of people without serious mental illness. Prospective cohort studies are needed that use representative samples alongside matched controls of people without serious mental illness. Such studies are the only way to accurately test whether the prevalence of blood-borne viruses is significantly elevated in people with serious mental illness compared with the general population. Comparing the estimated prevalence with available data for the country or region is limited but it does offer some indication that prevalence is higher in people with serious mental illness. The prevalence of HIV infection in the general population is much lower in the UK than in the USA, and therefore the assumption is that HIV infection is less of a risk for people with serious mental illness who live in the UK. However, hepatitis C virus is prevalent in drug users in the UK, and there could be a risk of hepatitis C virus infection and co-infections in people with serious mental illness as a result of substance misuse.

This meta-analysis estimated pooled prevalence of HIV, hepatitis B virus, and hepatitis C virus in people with serious mental illness. Our review included only published work, and therefore might have missed studies yet to be reported. In addition, the search strategy included only reports published in English, which might have biased our findings towards English-speaking countries.

It is unclear why sexual health has been neglected as part of the physical health agenda for people with serious mental illness. One reason might be the perception that people with serious mental illness do not engage in activities that place them at risk, such as intravenous drug use or unprotected sex. However, 30–50% of people with serious mental illness have substance misuse disorders, and, although intravenous drug use is rare, patients might have sexual partners who inject drugs, facilitating viral transmission. Additionally, as with the population as a whole, a substantial proportion of people with serious mental illness are sexually active and see intimate relationships as an important part of their lives. The lack of attention of policy makers and educators has led to a lack of awareness and a failure to provide people with serious mental illness with access to assessment, screening, and education for sexually transmitted infections, including blood-borne viruses.

A qualitative study in London documented that most people with psychosis were engaged in seeking and forming intimate relationships. Additionally, some had negative and harmful relationship experiences, including sexual exploitation and violence, yet these issues were rarely part of their routine consultation with their health-care providers. This lack of attention to sexual health and safety has also been reported in a review, which found that although women with serious mental illness were twice as likely to be exposed to severe domestic violence compared with women in the general population, these incidents were rarely detected by the health-care services they attended. A survey of psychiatrists in a Sydney, Australia, mental health service found poor knowledge of hepatitis C virus, and clinicians perceived their patients to be at lower risk than prevalence studies suggest. A survey of mental health staff at a London NHS service also showed that workers underestimated the risk of HIV in people with schizophrenia. Although they reported feeling comfortable discussing sexual health, this rarely happened in practice. In addition, a qualitative study of Australian mental health nurses showed that discussions of sex and sexuality were generally avoided.

In summary, we show the high prevalence of blood-borne infections in people with serious mental illness, but more importantly we document the paucity of data on this topic. Although the physical health inequalities of people with serious mental illness have been identified and health policy is developing to ensure that these inequalities are addressed, little attention has been given to the sexual health and specifically risk factors facilitating transmission of blood-borne viruses in people with serious mental illness in the UK and worldwide. There is an urgent need for further robust epidemiological research using representative samples of people with serious mental illness to assess the relationship between lifestyle behaviour and risk of infections to more fully understand the relationship between serious mental illness and viral infection, and to inform preventive strategies in this population.

Contributors
EH, FM, and SG designed the study. SB did the literature search with support from EH and FM. MB analysed the data. FM, EH, and SG interpreted the data. EH, SB, and FM wrote the report, with input from SG and MB.

Declaration of interests
We declare no competing interests.

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1 Bhugra D. The global prevalence of schizophrenia. PLoS Med 2005; 2: e351.
2 BMA. Recognising the importance of physical health in mental health and intellectual disability. London: British Medical Association, 2014.
3 Lagios K, Deane FP. Severe mental illness is a new risk marker for blood-borne viruses and sexually transmitted infections. Aust N Z J Public Health 2007; 31: 562–66.
4 Cournos F, McKinnon K, Sullivan G. Schizophrenia and comorbid human immunodeficiency virus or hepatitis C virus. J Clin Psychiatry 2005; 66 (suppl 6): 27–33.
5 Campos LN, Guimaraes MD, Carmo RA, et al. HIV, syphilis, and hepatitis B and C prevalence among patients with mental illness: a review of the literature. Cad Saude Publica 2008; 24 (suppl 4): s607–20.
6 Cournos F, McKinnon K. Substance use and HIV risk among people with severe mental illness. NIDA Res Monogr 1997; 172: 110–29.
7 Public Health England. United Kingdom national HIV surveillance data tables. London, 2014.
8 Health and Safety Executive. Hepatitis B virus. http://www.hse.gov.uk/biosafety/blood-borne-viruses/hepatitis-b.htm (accessed Aug 31, 2015).
Articles

9 Public Health England. Hepatitis B epidemiology in London. London, 2012.

10 Public Health England. Hepatitis C in the UK. London, 2014.

11 Centers for Disease Control and Prevention. Hepatitis B FAQs for health professionals. http://www.cdc.gov/hepatitis/hbv/hbvfaq.htm (accessed Aug 31, 2015).

12 Hung CC, Loh el W, Hu TM, et al. Prevalence of hepatitis B and hepatitis C in patients with chronic schizophrenia living in institutions. J Chin Med Assoc 2012; 75: 275–80.

13 Carey MP, Carey KB, Kalichman SC. Risk for human immunodeficiency virus (HIV) infection among persons with severe mental illnesses. Clin Psychol Rev 1997; 17: 273–91.

14 Wong WCW, Chong CSK, Hart GJ. Development of a quality assessment tool for systematic reviews of observational studies (QATSO) of HIV prevalence in men having sex with men and associated risk behaviours. Emerg Themes Epidemol 2008; 5: 23.

15 Clarke WE, Eleazer GP, Hazlett LJ, Morales BA, Sercy JM. Woodbury LV. Seroprevalence of human immunodeficiency virus in mental health patients. J S C Med Assoc 1989; 85: 103–06.

16 Hatem DS, Hurowitz JC, Greene HL, Sullivan JL. Seroprevalence of hepatitis B, hepatitis C, and HIV infections among psychiatric patients in a New York City men’s shelter. J S C Med Assoc 1989; 85: 103–06.

17 Cournos F, Empfield M, Dermautz H, Looser-Ott S, Burton W, Perry S. Undetected HIV infection among acutely ill psychiatric inpatients. Am J Psychiatry 1992; 149: 546–45.

18 Sacks M, Dermautz H, Looser-Ott S, Burton W, Perry S. Undetected HIV infection among acutely ill psychiatric inpatients. Am J Psychiatry 1993; 150: 2209.

19 Lee HK, Travin S, Bluestone H. HIV-1 in inpatients. Arch Intern Med 1990; 150: 2209.

20 Krakow DS, Galanter M, Dermatis H, Westreich LM. HIV risk factors in dually diagnosed patients. Hosp Community Psychiatry 1993; 43: 181–82.

21 Schwartz-Watts D, Montgomery LD, Morgan DW. Seroprevalence of hepatitis B, hepatitis C, and HIV infections among inpatients of a public psychiatric hospital. J S C Med Assoc 1989; 85: 103–06.

22 Schwartz-Watts D, Montgomery LD, Morgan DW. Seroprevalence of human immunodeficiency virus in a state psychiatric institution. Arch Intern Med 1990; 150: 2209.

23 Cournos F, Empfield M, Horwath E, et al. HIV seroprevalence among patients admitted to two psychiatric hospitals. Am J Psychiatry 1991; 148: 1225–30.

24 Arolva J, Convat A, Czebors F, Deyoung R, O’Donnell J, Ventura F. HIV seroprevalence and risk factors in psychiatric patients. Psychiatry Res 1991; 39: 109–14.

25 Lee HK, Travin S, Bluestone H. HIV-1 in inpatients. Hosp Community Psychiatry 1992; 43: 181–82.

26 Cournos F, Horwath E, Guido J, et al. HIV-1 infection at two public institutions. J S C Med Assoc 1989; 85: 103–06.

27 Harel DS, Loh el W, Hu TM, et al. Prevalence of hepatitis B and hepatitis C in patients with chronic schizophrenia living in institutions. J Chin Med Assoc 2012; 75: 275–80.

28 Schwartz-Watts D, Montgomery LD, Morgan DW. Seroprevalence of hepatitis B, hepatitis C, and HIV infections among psychiatric patients in a New York City men’s shelter. J S C Med Assoc 1989; 85: 103–06.

29 Doyle ME, Labbate LA. Incidence of HIV infection among an outpatient urban sample of people with serious mental illness and co-occurring substance abuse. J Community Psychol 2011; 39: 231–39.

30 Porta M, Herrera R, Prats F, Yabeck H, Gasso JM. Absence of antibodies to HIV in short-, mid- and long-term institutionalized psychiatric patients in Barcelona. Eur J Epidemiol 1990; 6: 438–39.

31 Naber D, Pajonk F, Perro C, Lohmer B. Human immunodeficiency virus antibody test and seroprevalence in psychiatric patients. Acta Psychiatr Scand 1989; 80: 358–61.

32 Rosenberg SD, Drake RE, Brunette MF, Wolford GL, Marsh BJ. Rapid oral fluid testing for HIV in veterans with mental health patients. Bull Am Acad Psychiatry Law 2011; 39: 257–60.

33 Rothbard AB, Blank MB, Staab JP, et al. Previously undetected retroviruses and HIV infection among psychiatric patients in a New York City psychiatric hospital. Int J STD AIDS 2003; 14: 532–38.

34 Acuda SW, Sebit MB. Serostatus surveillance testing of HIV-V infection among Zimbabwean psychiatric inpatients, in Zimbabwe. Cent Afr J Med 1996; 42: 254–57.

35 Hitchcock SF, Mkize DL. HIV seropositivity in patients with first-episode psychosis. J Child Adolesc Ment Health 2007; 13: 99–94.

36 Collins PY, Berkman A, Mestry K, Pillai A. HIV prevalence among men and women admitted to a South African public psychiatric hospital. AIDS Care 2009; 21: 863–67.

37 Singh D, Berkman A, Bresnahan M. Seroprevalence and HIV-associated factors among adults with severe mental illness - a vulnerable population. S Afr Med J 2009; 99: 523–527.

38 Omoregie E, Efam MO, Iloegbe JC, Ogefeller HO, Omokaro EU. Seroprevalence of HIV infection among psychiatric patients in Benin City, Nigeria. Neurosci Res 2009; 94: 10:00–01.

39 De Hert M, Franic T, Vidovic D, et al. Prevalence of HIV and hepatitis B, C, and HIV infections among patients in a psychiatric hospital in Greece. Psychiatr Serv 2009; 60: 1269–72.

40 Acuda SW, Sebit MB. Serostatus surveillance testing of HIV-V infection among Zimbabwean psychiatric inpatients, in Zimbabwe. Cent Afr J Med 1996; 42: 254–57.

41 Acuda SW, Sebit MB. Serostatus surveillance testing of HIV-V infection among Zimbabwean psychiatric inpatients, in Zimbabwe. Cent Afr J Med 1996; 42: 254–57.

42 Henning MP, Kruger C, Fletcher L. HIV sero-positivity in recently arrested offenders in South Africa. Br J Psychiatry 1996; 169: 47–53.

43 Maling S, Todd J, van der Paal L, Pillai A. HIV prevalence among men and women admitted to a South African public psychiatric hospital. AIDS Care 2009; 21: 863–67.

44 Singh D, Berkman A, Bresnahan M. Seroprevalence and HIV-associated factors among adults with severe mental illness - a vulnerable population. S Afr Med J 2009; 99: 523–527.

45 Henning MP, Kruger C, Fletcher L. HIV sero-positivity in recently admitted and long-term psychiatric in-patients: prevalence and diagnostic profile. Afr J Psychiatry 2012; 15: 47–53.

46 Lundberg P, Nakasuji N, Mussi S, Thorson AE, Canton-Graae E, Allebeck P. HIV prevalence in persons with severe mental illness in Uganda: a cross-sectional hospital-based study. Int J Ment Health Syst 2013; 7: 20.

47 Dasanaraj T. The prevalence of HIV infection among mentally ill offenders in Thailand. J Med Assoc Thai 1994; 77: 257–60.

48 Chandra PS, Carey MP, Carey KB, Prasad Rao PSDV, Jairam KR, Thomas T. HIV risk behaviour among psychiatric inpatients: results from a hospital-wide screening study in southern India. Int J STD AIDS 2003; 14: 532–38.

49 Tharyan P, Ramalingam S, Kannangai R, Sudhiran G, Muhly J, Tharyan A. Prevalence of HIV infection in psychiatric patients attending a general hospital in Tamil Nadu, south India. AIDS Care 2003; 15: 197–205.

50 Chen C-H. Seroprevalence of human immunodeficiency virus infection among Chinese psychiatric patients in Taiwan. Acta Psychiatr Scand 1994; 89: 441–42.

51 Carew MP, Ravi V, Chandra PS, Desai A, Neel DJ. Prevalence of HIV, hepatitis B, syphilis, and chlamydia among adults seeking treatment for a mental disorder in southern India. AIDS Behav 2007; 11: 289–97.

52 Rodgers-Johnson PE, Hickling FW, Irons A, et al. Retroviruses and schizophrenia in Jamaica. J Med Virol 1996; 28: 237–43.

53 Hutchinson GA, Simeon DT. HIV infection rates and associated factors in high risk patients admitted to a psychiatric hospital in Trinidad and Tobago. West Indian Med J 1999; 48: 129–31.

54 Alvarado-Esquivel C, Arreola-Valenzuela M, Weintraub R, Perez-Aguilar O, et al. Seroprevalence of selected viral, bacterial and parasitic infections among inpatients of a public psychiatric hospital of Mexico. Rev Inst Med Trop Sao Paulo 2008; 50: 161–64.

55 Guimarães MDC, Campos LN, Melo APS, et al. Prevalence of HIV, syphilis, hepatitis B and C among adults with mental illness: a multicenter study in Brazil. Rev Bras Psiiquiatr 2009; 31: 43–47.
