EFFECT OF HIV PREVENTION AND TREATMENT PROGRAM ON HIV AND HCV TRANSMISSION AND HIV MORTALITY AT AN INDONESIAN NARCOTIC PRISON

Erni J Nelwan[1,2], Agnes K Indrati[3], Ahmad Isa[2], Nurlita Triani[4], Nisaa Nur Alam[4], Maria S Herlan[4], Wahid Husen[4], Herdiman T Pohan[1], Bachti Alisjahbana[5], Andre Meheus[6], Reinout Van Crevel[7] and Andre Jam van der Ven[7]

[1]Division of Tropical and Infectious Disease, Department of Internal Medicine, University of Indonesia, Jakarta; [2]Health Research Unit, [3]Department of Clinical Pathology, [5]Department of Internal Medicine, Medical Faculty, Padjadjaran University/Hasan Sadikin Hospital, Bandung; [4]Banceuy Narcotic Prison, Medical Division, Bandung, Indonesia; [6]Department of Epidemiology and Social Medicine, University of Antwerp, Antwerp, Belgium; [7]Department of Internal Medicine, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

Abstract. Validated data regarding HIV-transmission in prisons in developing countries is scarce. We examined sexual and injecting drug use behavior and HIV and HCV transmission in an Indonesian narcotic prison during the implementation of an HIV prevention and treatment program during 2004-2007 when the Banceuy Narcotic Prison in Indonesia conducted an HIV transmission prevention program to provide 1) HIV education, 2) voluntary HIV testing and counseling, 3) condom supply, 4) prevention of rape and sexual violence, 5) antiretroviral treatment for HIV-positive prisoners and 6) methadone maintenance treatment. During a first survey that was conducted between 2007 and 2009, new prisoners entered Banceuy Narcotics Prison were voluntary tested for HIV and HCV-infection after written informed consent was obtained. Information regarding sexual and injecting risk behavior and physical status were also recorded at admission to the prison. Participants who tested negative for both HIV and HCV during the first survey were included in a second survey conducted during 2008-2011. During both surveys, data on mortality among HIV-seropositive patients were also recorded. All HIV-seropositive participants receive treatment for HIV. HIV/AIDS-related deaths decreased: 43% in 2006, 18% in 2007, 9% in 2008 and 0% in 2009. No HIV and HCV seroconversion inside Banceuy Narcotic Prison were found after a median of 23 months imprisonment (maximum follow-up: 38 months). Total of 484.8 person-years observation was done. Participants reported HIV transmission risk-behavior in Banceuy Prison during the second survey was low. After implementation of HIV prevention and treatment program, no new HIV or HCV cases were detected and HIV-related mortality decreased.

Keywords: HIV, HCV, transmission, prison, prevention, treatment, Indonesia

Correspondence: Andre Jam van der Ven, Department of Internal Medicine, Radboud University Nijmegen Medical Centre, Po Box 9101, 6500 HB Nijmegen, The Netherlands.
Tel: +31652626633; Fax: +31243614897
E-mail: Andre.vanderVen@radboudumc.nl

INTRODUCTION

The prevalences of human immunodeficiency virus (HIV) and hepatitis C virus (HCV) are often higher in prisons than in the general population due to a higher prevalence of those with a history of injecting drug use (Dolan *et al*, 2007). Continued injecting drug use and sexual risk behavior in prison may contribute to further transmission of HIV, HCV and other infections (Rotily *et al*, 2001; Boys *et al*, 2002; El Maerrawi and Carvalho, 2015). Testing for HIV of inmates on entry, periodically during incarceration, and before release, are recommended by the United States CDC (CDC, 2006); this testing could offer correctional institutions the opportunity to prevent and treat HIV and monitor prevalence and incidence of HIV infection in this population (Jürgens *et al*, 2011). Data regarding HIV transmission in prison is limited and primarily from developed countries (Horsburgh *et al*, 1990; Mutter *et al*, 1994; Krebs and Simmons, 2002; CDC, 2006; Jafa *et al*, 2009; Jürgens *et al*, 2011). The largest study documented 88 seroconverters between 1992 and 2005 among 73 prisons in Georgia, United States (CDC, 2006). Another study reported 2 seroconversions among 1,105 inmates in a single prison in Nevada (Horsburgh *et al*, 1990). There is indirect evidence of outbreaks and HIV transmission in prisons from different parts of the world (Wright *et al*, 1994; Weinbaum *et al*, 2005). Prisoners in low-income countries are at increased risk for becoming infected during incarceration, since HIV prevalence rates in prison are higher, there is overcrowding and sub-standard living conditions and less availability of HIV preventive and therapeutic services (Dolan *et al*, 2007; Angora *et al*, 2011; Jürgens *et al*, 2011). However, there is no direct evidence that supports this hypothesis. A study in Thailand in 1988 showed that 5% HIV monthly incidence among 1,091 injecting drug users (IDU) had occurred during imprisonment (Wright *et al*, 1994). A high prevalence of HCV among prisoners has been documented inside prisons of developed countries (Kim *et al*, 2013; Alvarez *et al*, 2014; Snow *et al*, 2014). The prevalences of HCV reported from several Australian prisons range from 21% to 58% with seroconversion rates being between 5 and 34 cases per 100 person years during incarceration (Snow *et al*, 2014).

Prisons may create the circumstances that fuel HIV and HCV transmission. However, prisons may also offer interventions to reduce HIV and HCV transmission. An evidence-based HIV and HCV preventive program should include: 1) HIV/HCV education, 2) voluntary HIV/HCV testing and counseling, 3) condom supply, 4) prevention of rape and sexual violence, 5) treatment of HIV-positive prisoners and 6) a needle exchange and methadone maintenance program (Jürgens *et al*, 2009; Beckwith *et al*, 2010; Beyrer *et al*, 2010). Such activities can be established if there is commitment from prison authorities, endorsement of services by prison staff and prisoners, and collaboration with health care providers outside the prison (Nelwan *et al*, 2009). At risk populations outside the prison may be more difficult to access (Jürgens *et al*, 2009), but the at risk population in prison is easier to access and their treatment may be more cost-effective (WHO, 2008; Siregar *et al*, 2011; Wammes *et al*, 2012).

The present study was carried out in Indonesia, which has one of the fastest growing HIV epidemics in Asia, with injecting drug use as the main factor driving the epidemic (Dolan *et al*, 2007). We have

previously examined the prevalences and behavioral correlates with HIV, hepatitis B (HBV) and HCV infections among prisoners in Banceuy Prison, which is the main narcotic penitentiary in West Java, Indonesia. In this prison, injecting opioid users are incarcerated along with non-injecting cannabis users. We previously reported that among 639 all incoming prisoners that agreed to be included in the study and to be tested for HIV and hepatitis B/C, 18.0% reported a history of injecting drug use, 7.2% had HIV infection and 18.6% had HCV infection (Nelwan *et al*, 2010). Previous imprisonment was reported by 20% of these inmates whereby 95% of the prisoners also conveyed risky sexual behavior and 12% injecting drug use during previous incarceration (Nelwan *et al*, 2010). The purpose of the present study was to determine the prevalence of injecting drug use, sexual behavior and HIV and HCV infection status on entry and on release from prison. This study was conducted after an HIV prevention and treatment intervention was introduced at this prison. Prisoners who were HIV-seronegative at time of entering the prison were interviewed, examined and tested for HIV and HCV infection before release. To the best of our knowledge, this is the first study of its kind from developing country.

MATERIALS AND METHODS

Setting

This study was conducted in Banceuy Prison, Bandung, West Java, Indonesia. Bandung is the capital of West Java, with 43 million inhabitants (Statistics of Jawa Barat Province, 2012). This prison was built for a maximum of 450 prisoners, but it contains about 1,000 prisoners and every month 30-50 new prisoners arrive. Banceuy is a referral prison that receives prisoners who are sentenced to more than one year and are referred from other correctional facilities. Health care at the prison is provided in both outpatient and a small inpatient facility by general practitioners, dentists and three nurses.

Comprehensive HIV activities

Since 2004 Banceuy Prison has collaborated with Padjadjaran University (UNPAD) Bandung and Rumah Sakit Hasan Sadikin (RSHS), the main academic referral hospital in West Java, to prevent, control and treat HIV infection among prisoners. The HIV control program described elsewhere (Nelwan *et al*, 2010) was conducted between 2004 and 2007 with the help of psychologists and internists from UNPAD and RSHS, and included HIV education and training, HIV prevention, conseling, testing, and care for HIV/AIDS. Most of the prison staff have received training in the basics of HIV, such as its signs and sypmtoms, transmission, prevention and harm reduction. Paramedics were trained in voluntary counselling and testing (VCT) and addiction care, and the medical staff were trained in all aspects of HIV care, including treatment. All incoming prisoners were also educated in HIV. HIV VCT was introduced. Condoms were made available at the prison clinic. A psychologist visited the prison weekly and provided counseling for victims of rape and sexual violence. Harm reduction included training of health care workers in addiction care and conducting a methadone maintenance treatment (MMT) program. A needle exchange program was not conducted for safety reasons although studies indicate such methods are effective and safe (Alvarez *et al*, 2014). At the prison bleaching agent distribution was provided. Antiretroviral treatment (ART) and treatment of opportunistic infections

was introduced and provided by prison doctors, under weekly supervision from specialists from RSHS following national guidelines. The health facilities of the prison were upgraded. Severely ill prisoners were referred to RSHS. CD4 cell counts and other necessary diagnostic tests were performed at RSHS. All medical services were provided free of charge through a memorandum of understanding (MoU) between Banceuy Prison and RSHS/UNPAD, a joint MoU between the Ministry of Law and Human Rights, Ministry of Social Affairs and Ministry of Health; local and international organizations also collaborated: the funded program called Integrated Management for Prevention And Care and Treatment (IMPACT) of HIV among IDU in West Java, Indonesia was funded by the European Commision (EC). These were the main sources of funding for the HIV-related activities during 2006-2011 at the Banceuy Prison. This funding allowed temporary allocation of medical staff, to carry out activities related to the study. The health care workers were trained in all aspects of HIV and the ethical aspects of the study, such as confidentiality and voluntary participation of subjects. One of the authors of this paper (E.N.) supervised all the activities of the present study to ensure confidentiality, the free will of the patients, and the laboratory samples were processed correctly. Laboratory results were given to the prisoners and treatment was initiated when indicated. Independent research staff safeguarded against interference from prison staff. Because of these activities, the Indonesian government appointed Banceuy Prison as a referral prison for comprehensive HIV care. Between August 2007 and January 2009, HIV testing was done in all incoming prisoners during routine medical screening on prison intake, unless inmates refused (opt-out).

Study design and procedures

A cross-sectional survey was conducted, this included an interview and serological testing for HIV and HCV infection. A total of 871 inmates entered Banceuy Prison between August 2007 and January 2009, the first survey was performed among 76% of the new prisoners. Two hundreds and nine inmates (24%) were excluded because they were transferred elsewhere before the survey was started (Nelwan *et al*, 2010). After written informed consent was given, a semi-structured interview using a questionnaire was conducted by the clinic doctor asking about related risk behavior during previous imprisonments, including a history of intraprison injecting drugs, receiving a tattoo and risky sexual behavior. Informed consent for HIV and HCV testing was also obtained. Those who tested negative on both the HIV and HCV tests during the first survey were eligible for the second survey, which was conducted between May 2008 and March 2011; the survey was conducted among prisoners at least one month before release. The second survey asked about the same risks as the first survey along with symptoms of HIV and other sexually transmitted diseases. Data from the first survey was compared with data from the second survey. Subjects who tested positive for HIV were treated with antiretroviral therapy (ART) for free and those leaving prison were informed about where to continue treatment.

Ethical approval for this study was obtained from the ethics committee of Padjadjaran University Bandung.

Laboratory testing

HIV antibodies were measured using commercially available rapid tests (Determine HIV-1/2, Abbott Laboratories, Tokyo,

Japan or SD HIV-1/2 3.0, Standard Diagnostics, Kyonggi-do, Korea); followed by commercial EIA methods for detecting HIV (Virolisa HIV 1/2, Index Union Diagnostics, Korea) or the electro-chemiluminescence immunoassay (ECLIA) method for detecting HIV (HIV combi, Roche Diagnostics, Mannheim, Germany) following Indonesian national guidelines. Anti-HCV antibodies were detected using ECLIA (Roche Diagnostics, Mannheim, Germany). External quality control for the HIV and HCV testing was done (National Serology Reference Laboratory, WHO collaborating center, Victoria, Australia) showing 100% accuracy. CD4 cell levels were measured using Facscount Flow Cytometry technology (BD Biosciences, Jakarta, Indonesia).

Data analysis

Data obtained from the questionnaires and laboratory results were entered in a database using a code for each study participant. Nominal and ordinal values were expressed as percentages, continuous data as mean (SD) if normally distributed or median (IQR) if not. Comparisons between groups were made using an X^2 test for nominal and ordinal variables, *t*-test for normally distributed data and a nonparametric Mann-Whitney *U* test for non-normally distributed continuous variables. The HIV incidence was calculated by comparing the first survey results with those of the second survey. The person-years at risk for HIV and HCV infection were calculated based on the total number exposed to risk and the mean duration of stay in prison. Data were analyzed using SPSS, version 18.0 (IBM, Armonk, NY) for Windows.

RESULTS

During the first survey, conducted between August 2007 and January 2009, 46 of the 639 prisoners examined (7.2%) were seropositive for HIV (Nelwan *et al*, 2010). All HIV positive prisoners were given free treatment and HIV/AIDS-related deaths decreased: 43% in 2006, 18% in 2007, 9% in 2008 and 0% in 2009. Of the remaining 593 prisoners who were HIV negative during the first survey 309 (52%) could be re-evaluated during the second survey. The median length of incarceration among these subjects was 23 months (484.6 person-years). Of these 28, refused repeat HIV testing, leaving 281 to be included in the second survey in the study. Regarding HCV, 18.6% (118/635) were HCV-seropositive and 517 of the 635 prisoners tested (81.4%) were HCV-seronegative during the first survey. Of these 265 (51.2%) could be re-evaluated during the second survey, but 26 (9.8%) refused repeat HCV testing (Fig 1). Comparing inmates who were re-tested for HIV and HCV with those who were not re-tested, no significant differences in age, educational level, marital status or history of injecting drug use were seen. Prisoners included in the second survey reported more risky sexual activities (10.5% *vs* 5.4%, p=0.03) and more tattooing (51.5% *vs* 37.5%, p=0.01) during previous incarceration prior to being incarcerated at Banceuy Prison. Only 11 inmates had ever received methadone.

Risky behavior was more frequently reported for a previous incarceration than during the current incarceration at Banceuy Prison. Ninety-six percent of prisoners had a previous history of incarceration, with a median length of incarceration of 31 days (Table 1). Ten percent of study subjects reported injecting drug use, and 55% reported having a tattoo for ornamental purposes by another prisoner during a previous incarceration. Sexual contact

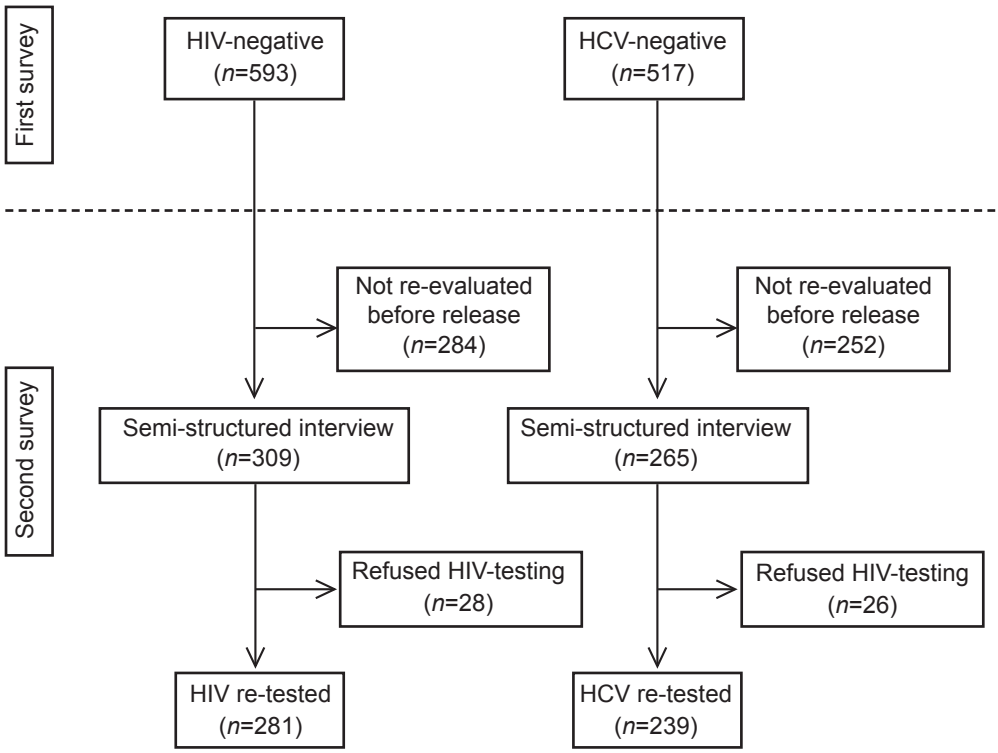

Fig 1–Flow diagram of study subjects.

during a previous incarceration was reported by 7.8% of incoming inmates for whom data were available (*n*=562). Most of these sexual encounters (75%) took place with a spouse on a conjugal visit; very few sexual encounters with other male inmates were reported (Table 1). Only one prisoner (0.3%) reported a sexual encounter and one prisoner (0.3%) reported injecting drugs during incarceration at Banceuy Prison; however, other unsafe skin-penetrating activities did still occur (Table 2).

Only 0.6% of prisoners reported an HIV-related health complaint prior to release from Banceuy Prison (Table 3), such as weight loss, prolonged fever, chronic diarrhea or chronic cough. Sixty-three percent of subjects had no health complaints during incarceration and did not visit the clinic, 17.6% visited the clinic once and 19.4% visited more than once, usually for symptoms such as diarrhea, common cold or itching. These may be attributable to poor sanitary living conditions in the prison. Symptoms of suggesting sexually transmitted diseases (STD) were reported by 2.9% of subjects. Thirty-seven prisoners were advised to follow up medically after release from prison. Repeat serological testing for HIV and HCV was done among 281 prisoners (91%); 9% refused repeat testing. No HIV or HCV seroconversions were found.

DISCUSSION

In recent years, prisons have been recognized as a key intervention site to

Table 1
Baseline characteristics of HIV-seronegative incoming prisoners.

	Total subjects (n = 593)
Age in years (IQR)	29 (25-36)
Educational level	
No education	6.3%
Primary school education	54.9%
Higher education	38.8%
Marital Status	
Not married	37.9%
Married/divorced	62.1%
History of injecting drug use	12.4%
HCV seropositive	12.1%
Previous incarceration	96%
Risk behavior during previous incarceration	
Injecting drug use	1.1%
Receiving a tattoo	55.2%
Drug use[a]	7.7%
Sexual contact[b]	7.8%
Sex with male partner	0.5%
Sex with visiting wife	5.5%
100% condom use	0.1%
Time in prison in days (IQR)	31 (22-51)

[a]Includes heroin, marijuana, amphetamines, benzodiazepines, other stimulants and alcohol use; history of ever using these drugs not just in prison.
[b]Prisoners were allowed to have sex in private with their spouse for several hours.
Data are missing for education, marital status (n=5), history of drug use (n=4), previous imprisonment (n=11), history of having a tattoo (n=13), risky sexual behavior (n=31).

Table 2
Reported drug use and risk behavior during incarceration at Banceuy Prison.

	Total subjects (n = 309)
Reported drug user	
Injecting drug use	0.3%
Heroin use	0%
Marijuana	9.4%
Amphetamine	1.6%
Benzodiazepine	1.3%
Other drugs[a]	1.7%
Alcohol	7.3%
Sexual behavior	
Sexual contact	0.3%
100% condom use	0.3%
Pay for sex	0.3%
Selling sex	0.3%
Skin penetration	
Tattoo	7.0%
Male genital paraphernalia	7.8%

Study subjects (309) were interviewed regarding their behavior in prison one month prior to planned release.
[a]Other drugs include dextromethorphan, ephedrine, hallucinogens (magic mushrooms) and other tranquilizer drugs (clozapine).
Data are missing for marijuana, amphetamine, benzodiazepine, other drugs, alcohol (n=20), tattoos (n=24), genital paraphernalia (n=23).

address the HIV epidemic (Flanigan and Beckwith, 2011). Injecting drug use has been fuelling HIV epidemics in many parts of the world and imprisonment is a common and recurrent event for most Injecting Drug Users (IDUs) (Dolan *et al*, 2007). The WHO, UNODC and UNAIDS have published a technical guide for countries to set targets for universal access to HIV prevention, treatment and care of IDUs (WHO, 2009) which is increasingly being used as a framework for developing a comprehensive package for core public health interventions (Jürgens *et al*, 2009). There is good evidence that these interventions when implemented in prisons,

Table 3
Health evaluation of prisoners prior to release from prison.

	Total subjects (n = 309)
Clinical signs and symptoms	
HIV related symptoms 1 month prior to release[a]	0.6%
Symptoms suggesting a STD[b]	2.9%
HIV/HCV counseling and testing	
HIV test during clinic visit[c], (positive/tested)	0/8
HIV test at time of release, (positive/tested)	0/281
HCV test at time of release, (positive/tested)	0/239

[a]HIV related symptoms included weight loss >10% of body weight, chronic diarrhea, fever >1 month, chronic cough, oral thrush.
[b]STD (sexually transmitted disease) includes any clinical condition of genital erosion, ulcer, discharge or vesicle.
[c]Tested in prison either because of withdrawal symptoms during imprisonment, perceived risk because shared utilities for tattoo, had a recurrent STD or during hospitalization at a referral hospital.

are effective in reducing risk behaviors, preventing HIV infections, and providing essential care and treatment services for IDUs (Jürgens *et al*, 2009). Most evidence comes from studies from industrialized countries evaluating a specific intervention while data from a combination of interventions in prisons are rarely reported and do not include data regarding HIV transmission in prison.

In our study we found a dramatic reduction in HIV-related deaths as the mortality rate dropped from 43% in 2006 to 0% in 2009 at Banceuy Narcotic Prison. No HIV or HCV seroconversions were seen among the 393 prisoners during the study period and reported risk behavior at this particular prison was low. It appears likely that the HIV prevention and treatment interventions at Banceuy Prison contributed to this result, although the transmission risk was limited since only 12.4% reported injecting drug use as HIV transmission risk behavior. Transmission risk behavior was assessed during incarceration by history only and not accurately reflect actual behavior but the lack of seroconversions speaks for itself. Indonesia has one of the fastest growing HIV epidemics in Asia and an important factor is IDU. IDU in Indonesia is illegal; many drug users are incarcerated, often more than once (Nelwan *et al*, 2010). Data regarding the prevalence of IDU in Indonesian prisons is lacking; however, national and international newspapers and books have reported rampant conditions (Bonella, 2009). HIV prevention programs and harm reduction strategies, such as opioid substitution and needle exchange, are virtually lacking in most Indonesian prisons so there is a legitimate concern that prisons fuel the current HIV epidemic in Indonesia. In many low and middle income countries prisons are high-risk environments for HIV transmission (Dolan *et al*, 2007). The present study indicates risk behavior and HIV transmission can be reduced in prison and supports the need to implement evidence based and

HIV prevention programs in prisons as part of a national HIV prevention AIDS program (Jürgens *et al,* 2009).

The HIV program implemented at the Banceuy Narcotic Prison was part of a large scale, integrated, European Commission (EC) funded program on prevention, control and treatment of HIV among IDU in West Java, Indonesia. The knowledge, attitudes, and practices of prison staff were addressed repeatedly, and prisoners received intense counselling regarding risk behavior and HIV and from peer support groups. General health care was improved, HIV-treatment and care for opportunistic infections was introduced, and universal (voluntary) screening for incoming prisoners for HIV infection was established, using an opt-out approach. Previous studies have shown the favorable effects of opt-out HIV testing. The US CDC recommends regular HIV testing at intake and release (Kavasery *et al,* 2009a,b; CDC, 2010). A needle exchange program was discussed with prison authorities but not allowed (Nelwan *et al,* 2009). A methadone maintenance program was instituted free of charge, with support from the UNODC and the Indonesian government. Interestingly, only 11 inmates used the methadon maintenance program. This may be due to the fact that many IDUs in Indonesia are not continuously injecting but may be characterized as recreational drug users. For them, methadone may not be the best solution (Iskandar *et al,* 2010; Sarasvita *et al,* 2012). The total number of IDUs may not have been very much since only 12.4% reported this HIV transmission risk behavior. Substance use is not restricted to opioids. It can included other drugs for which MMT is not indicated. Our program was successfully implemented in an Indonesian narcotic prison and may be more cost-effective than conducting it outside a prison (Nelwan *et al,* 2010; Siregar *et al,* 2011). Treatment of HIV infection lowers the HIV viral load and the risk of HIV transmission, as seen in our study.

It is not always easy to implement some strategies and services inside a prison, even if the prison authorities support the program. Prison authorities may be hesitant to dispense clean needles, even though there have been no reports of syringes being used as weapons in prisons with syringe exchange programs (Alvarez *et al,* 2014). Prisons lack the necessary skilled staff, infrastructure and budgets to implement preventive or therapeutic services, such as opioid substitution, drug rehabilitation programs, HIV testing or HIV treatment. These services are therefore not widely provided, especially in low-resource settings (Larney *et al,* 2007; Afriandi *et al,* 2009; Wolfe *et al,* 2010). The HIV program implemented at Banceuy Prison was facilitated by an European Commission (EC) grant and may not have occurred without this funding. It is important to have sponsoring organizations finance interventions in prisons in low-income countries (Sharma and Chatterjee, 2012). National HIV prevention and treatment programs should also provide funding for prisons as interventions in these settings since they are cost effective and the subjects have poor access to treatment.

An important limitation of this study was the fact that the situation inside Banceuy Narcotic Prison is not representative of other prisons in Indonesia. Generalizability to other prisons in Indonesia or Southeast Asia is limited since IDU prevalence and type may vary by location. We do not have comparison data about HIV/HCV transmission inside a prison without the effects of a comprehensive

HIV program. For ethical reasons it would not be acceptable to study HIV/HCV transmission without HIV prevention or treatment strategies in place. All the elements of the comprehensive HIV program were implemented before the study was carried out. It is therefore not possible to evaluate which element was most effective. A considerable number of prisoners might not have been re-evaluated since they were released or transferred from prison in very short notice. The reliability of the self-reported behaviors during imprisonment can be questioned, since prisoners may not want to disclose HIV transmission risk behaviors. The sample size and duration of our study may have been too limited to document HIV or HCV transmission. However, with a background HCV seroprevalence of 18%, we would expect to find HCV seroconversion if substantial risk behaviors were present.

In conclusion, after introduction of HIV-prevention and treatment interventions at a single prison in Indonesia, low risk-behavior and no HIV and HCV transmission was documented. Importantly, a significant reduction in HIV-related mortality was also reported.

REFERENCES

Afriandi I, Aditama TY, Mustikawati D, Oktavia M, Alisjahbana B, Riono P. HIV and injecting drug use in Indonesia: epidemiology and national response. *Acta Med Indones* 2009; 41 (suppl 1): 75-8.

Alvarez KJ, Befus M, Herzig CTA, Larson E. Prevalence and correlates of hepatitis C virus infection among inmates at two New York State correctional facilities. *J Infect Public Health* 2014; 7: 517-21.

Angora B, Assemien J, Laurent A, *et al*. HIV in prison in low income countries. *AIDS* 2011; 25: 1244-6.

Beckwith CG, Zaller ND, Fu JJ, Montague BT, Rich JD. Opportunities to diagnose, treat, and prevent HIV in the criminal justice system. *J Acquir Immune Defic Syndr* 2010; 55 (suppl 1): S49-55.

Beyrer C, Malinowska-Sempruch K, Kamarulzaman A, Kazatchkine M, Sidibe M, Strathdee SA. Time to act: a call for comprehensive responses to HIV in people who use drugs. *Lancet* 2010; 376: 551-63.

Bonella K. Hotel K: The shocking inside story of Bali's most notorious jail. Sydney: Pan Macmillan Australia Pty Limited, 2009.

Boys A, Farrell M, Bebbington P, *et al*. Drug use and initiation in prison: results from a national prison survey in England and Wales. *Addiction* 2002; 97: 1551-60.

Centers for Disease Control and Prevention (CDC). HIV transmission among male inmates in a state prison system--Georgia, 1992-2005. *MMWR Morb Mortal Wkly Rep* 2006; 55: 421-6.

Centers for Disease Control and Prevention (CDC). Routine jail-based HIV testing - Rhode Island, 2000-2007. *MMWR Morb Mortal Wkly Rep* 2010; 59: 742-5.

Dolan K, Kite B, Black E, Aceijas C, Stimson GV. HIV in prison in low-income and middle-income countries. *Lancet Infect Dis* 2007; 7: 32-41.

El Maerrawi I, Carvalho HB. Prevalence and risk factors associated with HIV infection, hepatitis and syphilis in a state prison of São Paulo. *Int J STD AIDS* 2015; 26: 120-7.

Flanigan TP, Beckwith CG. The intertwined epidemics of HIV infection, incarceration, and substance abuse: a call to action. *J Infect Dis* 2011; 203: 1201-3.

Horsburgh CR, Jarvis JQ, McArther T, Ignacio T, Stock P. Seroconversion to human immunodeficiency virus in prison inmates. *Am J Public Health* 1990; 80: 209-10.

Iskandar S, Basar D, Hidayat T, *et al*. High risk behavior for HIV transmission among former injecting drug users: a survey from Indonesia. *BMC Public Health* 2010; 10: 472.

Jafa K, McElroy P, Fitzpatrick L, *et al*. HIV transmission in a state prison system, 1988-2005. *PLoS ONE* 2009; 4: e5416.

Jürgens R, Ball A, Verster A. Interventions to reduce HIV transmission related to injecting drug use in prison. *Lancet Infect Dis* 2009; 9: 57-66.

Jürgens R, Nowak M, Day M. HIV and incarceration: prisons and detention. *J Int AIDS Soc* 2011; 14: 26.

Kavasery R, Maru DS-R, Cornman-Homonoff J, Sylla LN, Smith D, Altice FL. Routine opt-out HIV testing strategies in a female jail setting: a prospective controlled trial. *PLoS ONE* 2009a; 4: e7648.

Kavasery R, Maru DS-R, Sylla LN, Smith D, Altice FL. A prospective controlled trial of routine opt-out HIV testing in a men's jail. *PLoS ONE* 2009b; 4: e8056.

Kim AY, Nagami EH, Birch CE, Bowen MJ, Lauer GM, McGovern BH. A simple strategy to identify acute hepatitis C virus infection among newly incarcerated injection drug users. *Hepatology* 2013; 57: 944-52.

Krebs CP, Simmons M. Intraprison HIV transmission: an assessment of whether it occurs, how it occurs, and who is at risk. *AIDS Educ Prev* 2002; 14 (5 suppl B): 53-64.

Larney S, Morton P, Dolan K. HIV prevention, treatment and care in prisons in South-east Asia [Webpage]. Sydney: National Drug and Alcohol Research Centre, 2007. [Cited 2014 Sep 16]. Available from: https://ndarc.med.unsw.edu.au/sites/default/files/ndarc/resources/TR.290.pdf

Mutter RC, Grimes RM, Labarthe D. Evidence of intraprison spread of HIV infection. *Arch Intern Med* 1994; 154: 793-5.

Nelwan EJ, Diana A, van Crevel R, *et al*. Indonesian prisons and HIV: part of the problem, part of the solution? *Acta Med Indones* 2009; 41 (suppl 1): 52-6.

Nelwan EJ, Van Crevel R, Alisjahbana B, *et al*. Human immunodeficiency virus, hepatitis B and hepatitis C in an Indonesian prison: prevalence, risk factors and implications of HIV screening. *Trop Med Int Health* 2010; 15: 1491-8.

Rotily M, Weilandt C, Bird SM, *et al*. Surveillance of HIV infection and related risk behaviour in European prisons. A multicentre pilot study. *Eur J Public Health* 2001; 11: 243-50.

Sarasvita R, Tonkin A, Utomo B, Ali R. Predictive factors for treatment retention in methadone programs in Indonesia. *J Subst Abuse Treat* 2012; 42: 239-46.

Sharma M, Chatterjee A. Partnering with law enforcement to deliver good public health: the experience of the HIV/AIDS Asia regional program. *Harm Reduct J* 2012; 9: 24.

Siregar AYM, Komarudin D, Wisaksana R, van Crevel R, Baltussen R. Costs and outcomes of VCT delivery models in the context of scaling up services in Indonesia. *Trop Med Int Health* 2011; 16: 193-9.

Snow KJ, Young JT, Preen DB, Lennox NG, Kinner SA. Incidence and correlates of hepatitis C virus infection in a large cohort of prisoners who have injected drugs. *BMC Public Health* 2014; 14: 830.

Statistics of Jawa Barat Province. Jawa Barat in figures [Webpages]. Bandung: Division of Integration Processing and Dissemination of Statistics, 2012. [Cited 2014 Sep 16]. Availavle from: http://www.jabarprov.go.id/root/dalamangka/dda2012.pdf

Wammes JJG, Siregar AY, Hidayat T, *et al*. Cost-effectiveness of methadone maintenance therapy as HIV prevention in an Indonesian high-prevalence setting: a mathematical modeling study. *Int J Drug Policy* 2012; 23: 358-64.

Weinbaum CM, Sabin KM, Santibanez SS. Hepatitis B, hepatitis C, and HIV in correctional populations: a review of epidemiology and prevention. *AIDS* 2005; 19 (suppl 3): S41-6.

Wolfe D, Carrieri MP, Shepard D. Treatment and care for injecting drug users with HIV infection: a review of barriers and ways forward. *Lancet* 2010; 376: 355-66.

World Health Organization (WHO). HIV and

AIDS in places of detention: a toolkit for policymakers, programme managers, prison officers and health care providers in prison settings [Webpage]. Geneva: WHO, 2008. [Cited 2014 Sep 16]. Available from: http://www.who.int/hiv/pub/idu/detention_toolkit.pdf?ua=1

World Health Organization (WHO). HIV testing and counselling in prisons and other closed settings [Webpage]. Geneva: WHO, 2009. [Cited 2014 Sep 16]. Available from: http://www.who.int/hiv/pub/idu/tc_prison_tech_paper.pdf?ua=1

Wright NH, Vanichseni S, Akarasewi P, Wasi C, Choopanya K. Was the 1988 HIV epidemic among Bangkok's injecting drug users a common source outbreak? *AIDS* 1994; 8: 529-32.