# HIV and related infections in prisoners 3

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# Prevention of transmission of HIV, hepatitis B virus, hepatitis C virus, and tuberculosis in prisoners

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The prevalence of HIV, hepatitis B virus, hepatitis C virus, and tuberculosis are higher in prisons than in the general population in most countries worldwide. Prisons have emerged as a risk environment for these infections to be further concentrated, amplified, and then transmitted to the community after prisoners are released. In the absence of alternatives to incarceration, prisons and detention facilities could be leveraged to promote primary and secondary prevention strategies for these infections to improve prisoners health and reduce risk throughout incarceration and on release. Effective treatment of opioid use disorders with opioid agonist therapies (eg, methadone and buprenorphine) prevents blood-borne infections via reductions in injection in prison and after release. However, large gaps exist in the implementation of these strategies across all regions. Collaboration between the criminal justice and public health systems will be required for successful implementation of these strategies.

### Introduction

Prisoners worldwide have substantially increased prevalence of HIV, viral hepatitis (hepatitis B virus [HBV] and hepatitis C virus [HCV]), and tuberculosis disease relative to the general population (table 1).<sup>1</sup> A complex interplay of individual, social, and environmental factors before, during, and after incarceration results in an increased risk of these infections and diseases in prisoners. Particular risk behaviours by key populations

#### Search strategy and selection criteria

We searched MEDLINE, PsycINFO, Sociological Abstracts, PubMed, search engines Google and Google Scholar, and grey literature databases for articles published between Jan 1, 2007, and Dec 31, 2015. We made additional requests for reports to the UN and other international agencies. For consistency, our search focused on a set of HIV interventions in prisons originally identified in the 2007 WHO review that included information, education and communication, counselling and testing, needle and syringe programmes, opioid agonist therapies, condom provision, and antiretroviral therapy. We used the search terms "prisoner", "inmate", "incarcerate", "detention", "jail", "prison", and "penitentiar", which were combined with review-specific terms of "HIV", "violence", intravenous", "drug", "education", "testing", "treatment," "intervention", and "prevention". We searched for tuberculosis reports using the search terms "tuberculosis", "prisoner", "inmate", and "prisons", combined with review-specific terms "prevention", "isoniazid preventive therapy", "screening", "diagnosis", "HIV", and "infection control". We reviewed the reference lists of identified articles for additional relevant studies and, where possible, obtained studies referenced in review articles individually. Articles were excluded if they were published before Jan 1, 2007, or after Dec 31, 2015, or if the articles focused only on post-release or on partners of prisoners. include people who inject drugs (PWID), sex workers, men who have sex with men, and transgender people, placing them at an increased risk of these four infections in the community. Laws that criminalise behaviours such as those involving drug use and unprotected sex, concentrate these key populations who might already be living with HIV, HBV, and HCV infection, or tuberculosis disease in prisons. Risk behaviours—eg, unprotected sex and sharing contaminated injecting equipment—might consequently continue after incarceration.<sup>3</sup> Although prison infrastructure and conditions vary considerably

#### Key messages

- Individual, societal, and environmental factors in prisons create a conducive environment for the concentration and transmission of HIV, hepatitis B and C virus, and tuberculosis between prisoners, prison staff, and into the community
- Provision of prevention and treatment services is not only a health right for prisoners, but is also a public health concern in view of the high prevalence of infections in prisoners in combination with a high degree of mobility between a prison and the community
- The period of incarceration and after being released provide an opportunity to implement evidence-based programmes to prevent and treat these diseases, yet implementation of these interventions have fallen short in high-income and low-income settings
- Many individual and structural barriers exist along each phase of the incarceration process that prevent implementation of effective prevention measures
- Improvement of the delivery of prison prevention services will require systemic and organisational level changes and strengthening of health systems, including collaboration between the criminal justice and public health systems

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	Prison population*	General population HIV prevalence (LE and UE)†	Pooled HIV prevalence in prison populations (95% CI)	Pooled HBV prevalence in prison populations (95% CI)‡	Pooled HCV prevalence in prison populations (95% CI)§	Pooled tuberculosis prevalence in prison populations (95% CI)¶
Eastern and southern Africa	588000	4.7% (4.4-4.9)	15.6% (11.8–19.8)	5.7% (2.9-9.4)	1.8% (0.2–9.5)	5·3% (2·1–10·0)
Western and central Africa	201 500	4.7% (4.4-4.9)	8.2% (6.2-10.5)	23.5% (19.8–27.5)	16.9% (13.1–21.1)	2·9% (2·4–3·6)
Middle East and north Africa	645 000	0.1% (<0.1-0.2)	1.3% (0.2–3.3)	3·3% (2·4-4·5)	11.9% (5.8–19.8)	
Asia and Pacific	3 3 4 4 5 0 0	0.2% (0.2–0.2)	1.4% (0.9–1.9)	4.4% (1.4-9.0)	20.6% (15.4–26.4)	1.2% (0.7–1.7)
Eastern Europe and central Asia	1287000	0.6% (0.6–0.8)	4.1% (1.4-8.0)	10.4% (1.9–24.6)	20.2% (11.8–30.1)	4.9% (1.8–9.3)
Western Europe	412 000	0.3% (0.3–0.5)	4.2% (2.7-6.1)	2.4% (1.6-3.3)	15.5% (12.2–19.1)	
North America	2 255 000	0·3% (0·3–0·5)	1.3% (1.0–1.7)	1.4% (0.3–3.1)	15·3% (13·1–17·7)	
Caribbean	109000	1.1% (0.9–1.2)	3.3% (2.7-4.0)			
Latin America	1400000	0.4% (0.4–0.6)	2.3% (1.5-3.4)	2.3% (0.1–8.3)	4.7% (3.1-6.7)	2.0% (1.3–2.7)

All pooled prevalence estimates include only biologically confirmed test results and exclude those that are self-reported measures. Data are from Dolan and colleagues.<sup>1</sup> LE=lower estimate. UE=upper estimate. HBV=hepatitis B virus. HCV=hepatitis C virus. \*Prison population estimates have been rounded to the nearest 500 people. †Data are from UNAIDS Gap Report 2014;<sup>2</sup> HIV estimates for western and central Africa and eastern and southern Africa are reported under sub-Saharan Africa, and HIV estimates for western Europe and North America are reported jointly as western Europe and North America in the Gap Report. ‡HBV infection is determined via HBsAg testing. §HCV infection is determined by anti-HCV testing. ¶Active tuberculosis disease is determined by any of the following: tuberculin skin test, smear microscopy, culture, genetic testing, or chest radiograph with confirmatory diagnostics.

Table 1: Regional HIV, hepatitis B virus, hepatitis C virus, and tuberculosis infection in prisoners

from country to country, overcrowding and poor ventilation is common, thereby greatly amplifying tuberculosis transmission in prisons.4 The high-risk environment in prisons,<sup>5</sup> disruption of social and support networks which occurs as a consequence of incarceration.6 and eventual re-integration of nearly all prisoners into the community contribute to potential dissemination of infectious diseases to the public after release. As a result, prisons often provide fertile conditions for the concentration and transmission of these infections within their walls and after prisoners are released (figure 1).8 Paradoxically, in the absence of alternatives to incarceration, periods of incarceration present an underused opportunity to re-engage prisoners already infected and further diagnose those who are unaware that they are, prevent infections in those at risk, and to treat and continue care when back in the community. Many individual and structural (eg, societal and other environmental) barriers and challenges exist and seldom are criminal justice (security) and public health (prevention and treatment) priorities aligned.4

On the basis of reviews documenting the effectiveness of interventions addressing HIV in prisons, several international agencies support a set of essential HIV prevention and treatment intervention strategies for prisoners including: provision of information (education and communication), counselling and testing, needle and syringe programmes (NSP), opioid agonist therapies (OAT) with methadone or buprenorphine, condom provision, and antiretroviral therapy (ART).<sup>9-11</sup> The aim of our Series paper is to build on these recommendations and to expand discussions on the interaction of HIV, HBV, HCV, and tuberculosis in prisons, which has not been well covered in previous reviews, and to update the evidence for risk-reduction strategies. We will further describe the extent to which evidence-based prevention practices are available and provide our recommendations on how suggested prevention services for these co-occurring epidemics could be optimised throughout the criminal justice system. The continuum of the criminal justice system is complex and includes police lock-up, pre-trial detention (jails) of variable duration, and prisons for convicted individuals; compulsory drug detention centres are other closed settings that imprison people who use drugs whose charges are not adjudicated. In this Series paper, we specifically focus on sites where individuals are detained in a closed setting. We use the term prison to represent all facilities housing on-remand prisoners (including jails and pre-trial detention centres) and convicted prisoners.

# Risk for blood-borne transmission of HIV, HBV, and HCV during the continuum of incarceration

The extent to which incarceration increases the transmission risk of HIV, HBV, and HCV varies in different population settings. Transmission risk also depends on the background prevalence of these infections in the general population and the presence and accessibility of interventions to prevent them.<sup>1,12</sup> Although most prisoners acquire these infections before incarceration,<sup>13</sup> for those not infected their risk of infection might be greatly increased during the continuum of incarceration and on release.

# Pre-trial detention centres and jails

Pre-trial detention centres and jails are intended to be short-term detention settings for individuals awaiting trial or for those who have short-term sentences for



Figure 1: Conceptual framework of the central role of prisons in concentrating, amplifying, and disseminating infectious diseases to individuals in contact with the criminal justice system

Prisons serve as a concentration mechanism for relatively unhealthy individuals, partly because the behavioural and structural factors that lead to poor health (eg, illicit drug use and alcoholism) are associated with increased likelihood of incarceration.<sup>47</sup> Prisons amplify adverse health conditions through overcrowding, poor physical infrastructure, and restricted access to health-care services. Additionally, malnutrition, infectious diseases, and inhumane attitudes and practices of some custodial officers toward inmates contribute to the deterioration of the physical and mental health status of individuals after incarceration.<sup>47</sup> More than 95% of incarcerated individuals eventually re-enter the general community, posing risk of dissemination of infectious diseases to the communities to which infected and untreated inmates return. Figure adapted from Awofeso and colleagues,<sup>8</sup> by permission of *Public Health Reports*.

misdemeanours; but in some settings this time can be extended for years. In these settings, both overcrowding and high detainee turnover of individuals with blood-borne infections and tuberculosis often restricts screening, prevention, and treatment services, and potentially places uninfected detainees at an increased risk of infection. Pretrial detention centres and prisons are often under-funded and without mandate to provide comprehensive health services that are available in prisons because of their supposed short-term function. Consequently, detainees are often denied access to treatment for pre-existing HIV, HBV, HCV, or tuberculosis infections, which increases the potential for ongoing transmission and the development of drug-resistant strains. Drug injecting in prisoners might start soon after arrest in police lock-up and jails as a way to alleviate symptoms of opioid withdrawal, to cope with being detained, and being in an overcrowded and chaotic environment.<sup>3,14</sup>

### **During incarceration**

Although drug use and drug injecting frequency might be low in prison because of reduced availability of drugs,<sup>15</sup> associated risks are often amplified compared with the community because prisoners share scarce injecting equipment with many inmates. Studies done in the early 2000s in UK prisons documented up to 25% of people who use drugs reported initiating drug use in prisons,<sup>16</sup> which is supported by more recent studies in prisons in Kyrgyzstan.<sup>17</sup> Evidence of HIV transmission in prisons via drug injection has resulted in explosive HIV outbreaks in Iranian, Lithuanian, Thai, UK, and Ukrainian prisons.<sup>18</sup>

Although reliable data for injecting drug use behaviour in closed settings are challenging to obtain, in-prison injecting drug use and sharing of injecting equipment have been documented in low-income, middle-income, and high-income countries.<sup>19</sup> High proportions of in-prison drug injection have been reported in Australia (13%), Iran (6%), Mexico (61%), and the Ukraine (57%).<sup>20-23</sup> More than 70% of injecting drug users reported sharing equipment in Ukraine and Indonesian prisons.<sup>14,21</sup> Unsterile tattooing and body piercing represent another source of in-prison transmission of blood-borne infections.<sup>24</sup> More than 60% of inmates in a Puerto Rican prison acquired tattoos in prison in which reuse of needles and sharp objects was common.<sup>25</sup>

### **Community re-entry**

The immediate period after being released from prison represents some of the highest risks for relapse to drug use and drug-related death in PWID.26 Overdose is the most common cause of death for PWID in general and in released prisoners, with drug relapse and death occurring mostly within 2 weeks after being released.26 Studies from Canada,<sup>27</sup> Thailand,<sup>28</sup> and Ukraine,<sup>29</sup> showed that the same period resulted in especially high-risk of drug injection compared with individuals who did not report incarceration. Disruption in social networks, difficulties in finding employment and housing, and inadequate financial and family support are some of the main risk factors for relapse to drug and alcohol use and to heightened sexual and injection risk behaviours during community re-entry,30,31 which are likely to increase the incidence of blood-borne infections. In the Series paper by Altice and colleauges,<sup>29</sup> data from the Ukraine indicate that injection risk in PWID is markedly higher immediately after their release from prison. By use of mathematical modelling, OAT scale-up to 50% in PWID and its continuation after release during this transitional period is the most effective way to reduce HIV infections in PWID.

# Risk of sexual transmission of HIV, HBV, and HCV During incarceration

Incarceration might contribute to sexual transmission of HIV, HBV, and HCV by disrupting stable partnerships and promoting high-risk partnerships.<sup>6</sup> Few reliable data are available on the frequency and dynamics of risky sexual activity in pre-trial detentions centres and jails. However, sex for pleasure or recreation, or in exchange for drugs, money, protection, food, or other goods have been described.<sup>32</sup> Prisoners face the risk of forming new and sometimes coercive sexual partnerships with several individuals in the absence of available condoms and lubricants.<sup>33</sup> Reliable data for the frequency of high-risk

sexual activity in prisons have been difficult to obtain with estimates of consensual same sex activity (ever in life or ever in the same prison) was reported by 1–19% of prisoners.<sup>3</sup> In a 2012 survey<sup>34</sup> of more than 2000 Australian prisoners,  $7 \cdot 1\%$  reported having sex without a condom in prison with other prisoners and  $2 \cdot 6\%$  of men admitted to being coerced (forced or frightened) to complete unwanted sexual acts. Similarly, two large US surveys<sup>15,36</sup> found that 2–4% of prisoners reported being sexually victimised, whereas in some African prisons sex can be used in exchange for food, sleeping space privileges, or commodities such as soap.<sup>35–37</sup>

### Re-entry into the community

In addition to relapse to drug use, community re-entry is also associated with increased risky sexual behaviours and sex in exchange for money or goods such as drugs.<sup>30,38</sup> Being of a young age, being homeless, being bisexual, having hazardous alcoholic drinking patterns, and using heroin or heroin and cocaine combinations are risk factors associated with having unprotected sex in the immediate period after release, with sexual risk being higher in women than in men.<sup>39</sup>

# Risk of transmission of tuberculosis in prisons and to the community

Prisons can act as potential reservoirs and amplifiers for tuberculosis transmission, with onward contribution to disease spread after release (figure 1).8 Poor ventilation, overcrowding, and suboptimum screening practices facilitate droplet transmission of this disease, especially in immunocompromised people living with HIV.<sup>40,41</sup> The risk of tuberculosis infection in prisoners in combination with several other factors common in prisoners (eg, poor nutrition, stress, drug use, and HIV infection), increase the risk of infection progressing to tuberculosis disease. In many prisons, especially in low-income and middle-income settings, the absence of routine entry screening and suboptimum health infrastructure result in delayed case detection and treatment. Delayed contact tracing and inadequate or interrupted treatment of infectious cases further exacerbate the problem,<sup>41</sup> as does inconsistent diagnosis and treatment for latent tuberculosis infection.42

A modelling study<sup>43</sup> from a South African prison with overcrowding exceeding 230% capacity showed that tuberculosis transmission probabilities could be reduced by 30% with implementation of current national cell occupancy recommendations or by 50% with international recommendations. Alternatively, improved passive case-finding, modest increase in ventilation, or decreased duration of incarceratation would minimally effect tuberculosis transmission if each intervention were separately introduced. The model showed that a 94% reduction in transmission can be achieved by active case-finding together with implementation of international standards of incarceration, which include the provision of 5.4 m<sup>2</sup> floor space, 14 h of cell occupancy per day, and 12 air changes per h.43 A 50% reduction in transmission can be achieved by implementation of current South African regulations for imprisonment with a slight increase of ventilation to three air changes per h.43 High numbers of people being incarcerated have been implicated in increased tuberculosis and multidrug-resistant tuberculosis prevalence in eastern European and central Asian countries,44 especially due to the high concentration of incarcerated immunocompromised people living with HIV.29 By use of molecular epidemiology, a population-based study<sup>45</sup> in Brazil documented that 54% of tuberculosis strains in the community were related to strains from people in prisons. This finding highlights the crucial association between prisons and community tuberculosis and the importance of prison controls to enhance community control of this disease.

# Prevention of transmission of HIV, HBV, HCV, and tuberculosis

Guidelines for the implementation of comprehensive evidence-based interventions in prison settings have been promoted by both WHO and the UN Office on Drugs and Crime.9,10 In this section, we review the evidence for six of the 15 key interventions to prevent the transmission of blood-borne and sexually transmitted viral infections, including information, education and communication, counselling and testing, NSP, OAT, condom and lubricant provision, and ART. Additionally, we review evidence for interventions to prevent transmission of tuberculosis in prisons. We selected these interventions on the basis of the likelihood of data being available worldwide (both in ongoing reviews and in databases of international and other organisations) and their specificity to the main transmission routes of blood-borne viruses and tuberculosis in prisons. Table 2 provides a summary of the evidence of effectiveness for HIV and HCV interventions in prison settings.

# Information, education, and communication as prevention strategies

Stand-alone information, education, and communication programmes are insufficient to affect transmission of these diseases, but HIV and HCV educational programmes incorporating peer-based education can effectively reduce risky behaviours.<sup>52</sup> These education programmes should be comprehensive, yet brief and easy to administer and, if possible, include components that address prisoners' concerns.<sup>11,51</sup> Participatory methods and sessions that include topics beyond HIV, such as employment and housing concerns, have high success in changing prisoner risky behaviours.<sup>11</sup> Despite the modest effectiveness of these peer-based interventions, very few prisons implement them, even in high-income settings.<sup>56</sup>

# HIV, HBV, and HCV counselling and testing

Counselling and testing prisoners is a crucial entry point to prevention, treatment, care, and support services for blood-borne viruses. Use of HIV testing services reduces HIV-related sexual risk behaviour in people diagnosed with HIV and is an important component in prevention in low-income and middle-income countries.57 Knowledge of ones' HIV positive status decreases HIV transmission risk through a combination of behavioural changes and treatment access, leading to decreases in HIV viral load. Prisons provide an opportunity to expanded HIV and viral hepatitis testing services, which should be offered routinely on admission, 6-12 months thereafter, and at release. Routine testing models include both opt-in (testing is offered to all and an individual chooses whether to have the test) and opt-out (an individual is informed that the test will be completed unless they actively refuse). Although little evidence exists relating to HCV and HBV testing, a systematic review47 of routine testing for blood-borne viruses in prisons showed that routine opt-in and opt-out HIV testing is both feasible and acceptable. Furthermore, the review<sup>47</sup> suggests that reasonable uptake can be achieved with opt-in HIV testing policies, but is markedly higher with opt-out.

New HCV treatment advances have led to calls for increased HCV testing and treatment for prisoners.<sup>58</sup> The latest technologies, including point-of-care HIV and HCV testing and dried blood-spot testing, will facilitate case-finding and testing in prisons and the likelihood that prisoners receive their results, especially for prisoners with short-term sentences.<sup>54</sup>

Concerns about implementation of HIV and viral hepatitis testing in prison include coercion and mandatory testing, staff ability to deliver appropriate counselling and results in a confidential and ethical manner, and how to ensure linkage to care such as after release.<sup>3,10,56</sup> In the absence of testing, however, prisoners with these infections will have no access to treatment. Other obstacles and challenges to provide universal testing include resources and time commitment for staff, a reluctance by prisoners to be tested for fear of stigma and discrimination, and disclosure of status to staff and fellow prisoners.<sup>10,56</sup> To date, prison-based counselling and testing have been adopted by 69 countries globally.59 The high cost of the directlyacting antivirals for HCV restricts the expansion of HCV testing and treatment in both community and prison settings worldwide.60

### NSP as a prevention strategy

Although the NSP reduce HIV transmission risk, the evidence for its effectivenss in reducing HCV transmission are less compelling.<sup>61</sup> Despite its inclusion as an essential intervention in the HIV prevention package as recommended by WHO, the UN Office on Drugs and Crime, and UNAIDS,<sup>9</sup> prison-based NSP

	Number of participants	Country	Intervention	Outcomes	Findings			
Beneficial								
Ferrer-Castro et al (2012) <sup>46</sup>	429	Spain	NSP	Syringes distributed and returned; HIV prevalence; HCV prevalence	Over 10 years 15 962 syringes were distributed to 429 people and 70-9% of syringes wer returned; HIV prevalence decreased from 21-0% to 8-5%; HCV prevalence decreased from 40-0% to 26-1%			
Likely to be beneficial								
Rumble et al (2016) <sup>47</sup>	NA (systematic review of 44 articles)	Australia, Europe (countries not specified), Jamaica, USA	Counselling and testing; opt-in or opt-out	HIV testing success; HIV testing acceptance	HIV testing successful in prisons; HIV testing acceptance range 47–89%; higher acceptance with opt-out (22–98%) vs opt-in (40–73%) testing strategies			
Hedrich et al (2012) <sup>48</sup>	8461 (systematic review of 21 articles)	Australia, Canada, France, Iran, Spain, USA	OAT	Drug injection; illicit opioid use; after release heroin and cocaine use	Comparison of OAT with no OAT: drug injection use was 11% vs 42%, 34% vs 70%, and 15% vs 38% from three studies in the systematic reivew; illicit opioid use decreased from 94% to 21%, 67% to 25%, and from 65% to 6%; reductions in use of heroin and cocaine use after prison release			
Larney (2010) <sup>49</sup>	NA (systematic review of five articles)	Australia, Canada, Iran, USA (Puerto Rico)	OAT and NSP	Illicit opioid use; drug injecting needle sharing	Large reductions in illicit opioid use by people receiving treatment (62%) vs no treatmer (91%); risk of needle sharing reduced from 73% to 47%			
Butler et al (2013) <sup>50</sup>	2018	Australia	Condoms	Condom use; sex frequency increase	Condoms likely to be used during consensual sex acts in prison when available (yes 57% no 19%); no evidence that availability of condoms increases sex frequency			
Fluhmann et al (2012)⁵¹	21	Switzerland	Education	Knowledge of HCV, HIV/AIDS, and other sexually transmitted diseases	After completing the Structured Information Exchange, participants showed improved knowledge of HCV, HIV/AIDS, and other sexually transmitted diseases vs before intervention			
Bagnall et al (2015) <sup>52</sup>	NA (systematic review of 16 articles specific to peer education)	Australia, Canada, Mozambique, South Africa, UK, USA	Education	No use of condom at first intercourse; drug injecting use after prison release; injected drugs in past 4 weeks; sharing of injection equipment after prison release; never had an HIV test	Peer-based education reduced no use of a condom at first intercourse after prison releass (relative risk 0-73, 95% CI 0-61–0-88), injecting drugs after prison release (0-66, 0-53–0-82), injecting of drugs in past 4 weeks (0-11, 0-01–0-85), sharing injection equipment after prison release (0-33, 0-20–0-54), never having had an HIV test (0-31, 0-12–0-78)			
Moller et al (2008) <sup>53</sup>	1000	Kyrgyzstan	Education	Drug injecting use of heroin; injecting opium; injection drug use; needle sharing; wanted and received clean needles	After introduction of intervention in two prisons, prisoners injecting heroin in the past 3 months decreased from 83% to 64% and from 65% to 31%; prisoners injecting opium decreased from 83% to 56% and from 58% to 11%; overall injection drug use during the past 3 months decreased from 86% to 64% and from 67% to 31%; needle sharing during the past 3 months decreased from 23% to 8% and from 17% to 8%; prisoners who want and received clean needles in the past 3 months in prison increased from 92% to 100% and from 94% to 94%			
Coats et al (2015) <sup>54</sup>	NA (systematic review of six articles)	UK	HCV testing using dried blood spots	Uptake of HCV testing	Uptake of HCV testing 15% (95% CI 1·3–28) higher in intervention sites (dried blood spo testing testing), and increased from 1·75 clients to 52 clients per 3 months in a second study; in a third study, HCV diagnoses increased from 32·1 per 100 000 people before to 68·5 per 100 000 people after intervention			
Unknown effectiveness								
Larney (2010) <sup>49</sup>	NA (systematic review of five articles)	Australia, Canada, Iran, USA (Puerto Rico)	OAT	HIV risk behaviours and HIV incidence	Few available studies focusing on the effect of OAT in prisons on HIV risk behaviours and incidence; evidence suggests OAT has a role in HIV prevention in prisons, but the few available studies have methodological flaws			
Hedrich et al (2012) <sup>48</sup>	8461 (systematic review of 21 articles)	Australia, Canada, France, Iran, Spain, USA	OAT	HCV and HIV incidence	Few available studies focusing on effect of OAT on HCV (three studies) and HIV (one study) incidence in prison			
Wright et al (2011) <sup>55</sup>	NA (systematic review of ten articles)	Russia, South Africa, USA	Education	HIV risk behaviours; condom use; illicit drug use; injection drug use	Peer education might have an effect on attitudes, knowledge, and behavioural intentio regarding HIV risk behaviour; increased condom use at latest sexual encounter, increase knowledge in risk factors for HIV transmission, and improved self-efficacy in condom us reported; research was inconclusive for the effect of peer education on illicit drug use an injection drug use			
					injection drug use			

Some reviews might include articles cited individually or might include studies cited in other reviews. NSP=needle and syringe programmes. HCV=hepatitis C virus. NA=not applicable. OAT=opioid agonist therapies.

### Table 2: Evidence of effectiveness of HIV and hepatitis C virus interventions in prison settings

remain controversial. NSP are available in only eight countries, ranging from those with very limited funding and infrastructural support (Afghanistan, Armenia, Kyrgyzstan, Moldova, and Tajikistan) to countries that are comparatively well-resourced and financed (Germany, Spain, and Switzerland).<sup>59</sup> Despite these programmes being under-scaled, no sero-conversions for HIV, HBV, or HCV have been reported

in prisons operating NSP, and no instances of syringes being used as weapons against other prisoners or prison staff have been reported in any of these programmes.<sup>3,19</sup> In countries where NSP have been implemented, programme evaluations showed reductions in needle sharing from 20% to 8% in Kyrgyzstan  $^{\scriptscriptstyle 46,53}$  and return of distributed needles was 71% in Spain.46 Four effective models of prison NSP have been deployed, including hand-to-hand distribution by prison health staff (in Armenia, Kyrgyzstan, Spain, and Switzerland), by peers trained by non-governmental organisations (Moldova) who also provide other harm reduction services, and by automated dispensing machines (Germany and Switzerland). Collectively, these programmes demonstrate that NSP can be effective in a range of prison systems and successfully delivered via a range of methods in response to staff and inmate needs.

Resistance towards implementation of prison NSP has centred mostly on workplace health and safety concerns by staff and on whether the programme will result in encouraging drug use in custody.<sup>62</sup>

# OAT as a prevention strategy

Community-based OAT with methadone or buprenorphine significantly reduce harms associated with drug injection, including reductions in injection itself, risky injection practices, and HIV transmission. However, their effect on HCV transmission is less well documented mainly because PWID enter OAT late into their drug use trajectory when most are already infected with this disease.61,63 Accumulating evidence shows the effectiveness of OAT initiated in prison, which results in reduction in heroin use, in-prison injecting drug use, and syringe sharing, if OAT doses were adequate. Pre-release OAT has been found to be significantly associated with increased treatment entry and retention after release if continued treatment services are coordinated.48 Retention in treatment after release, however, requires adequate dosing with therapeutic levels.<sup>64</sup> Disruption of OAT especially because of brief periods of detention, has been shown to be associated with very large increases in HCV incidence.48

In more than 40 countries OAT is now available in prisons, with many programmes geographically clustered in Europe. However, worldwide OAT coverage in prisons remains suboptimum, is mostly delivered as pilot programmes in many countries with less than 1% of prisoners who need it actually receiving this treatment.<sup>59,65</sup> Some programmes restrict OAT access to prisoners who were receiving it before incarceration, or to those with short sentences.<sup>65</sup> Only one prison-based OAT programme exists in Africa (Mauritius), with services limited to male prisoners with identification cards.

Despite its demonstrated effectiveness, several barriers exist in the implementation of OAT in prison. Individual barriers include poor knowledge and treatment readiness for OAT<sup>66</sup> and intolerance towards drug addiction and people living with HIV among prison staff.<sup>67</sup> Other barriers affecting use of prison-based OAT include preferences for drug-free treatment in the prison system, security concerns, and absence of qualified medical staff.<sup>66</sup> Continuation of OAT after release has been shown to result in more than eight times reduced risk of drug-related mortality.<sup>69</sup> The challenge is to ensure continuation and adherence to OAT after release given the frequently poor continuity of care and collaboration between prison and community health services.<sup>7</sup>

#### **Condom provision**

Consistent condom use (with lubricants) during sex reduces HIV incidence by 80% in heterosexual couples.<sup>70</sup> Despite its effectiveness, only 45 countries have prison-based condom distribution programmes.<sup>3</sup> Legal sanctions against and stigma toward sodomy and sexual activity in prison impede condom distribution and implementation strategies. Misguided and exaggerated concerns about safety and security operations have restricted condom introduction in prisons as an HIV prevention measure, despite the urgent need.<sup>3,19</sup> Condom distribution in prisons can be unobtrusive to prison routines, represents no threat to security or prison operations, does not lead to increases in sexual activity or drug use, and is accepted by most prisoners and staff once introduced.<sup>3,50</sup>

#### **ART and vaccination**

Evidence from clinical trials and observational studies showed early initiation of ART in people living with HIV results in improved clinical outcomes compared with delayed treatment.<sup>71</sup> Furthermore data show that individuals who are fully virologically suppressed on ART rarely transmit HIV.72 WHO's 2015 guidelines for ART now recommend ART initiation for everyone living with HIV, irrespective of CD4 cell count.73 Immediate ART initiation would facilitate early engagement of prisoners living with HIV in treatment and care, reduce prison community viral load, and might reduce incident infections during incarceration and early after release.74 Post-exposure prophylaxis with ART after either occupational (with blood or another blood-containing fluid) or non-occupational (mainly sexual or injection drug use) contact is now used worldwide and should be made available in all prisons.75 Findings from a systematic review<sup>76</sup> of oral tenofovir-containing regimens administered as pre-exposure prophylaxis supports its role in primary HIV prevention in populations at substantial risk for HIV,76 including those who enter prison. However its role in prisons has yet to be studied and defined.

In view of advances in HCV treatment and the large burden of HCV in the community and in prisons (table 1), the concept of treatment as prevention, a public health strategy originally promoted for the treatment of people infected with HIV to improve their health and to reduce the risk of onward transmission, is now also being considered for HCV treatment.<sup>77</sup> Several high-income countries have indicated prisons to be an important setting to identify, test, and treat high-risk hard-to-reach groups and to reduce the prevalence of HCV both in prisons and in the wider community.<sup>78</sup> Unlike HIV and HCV, HBV infection can be prevented by use of an effective vaccine. Accelerated vaccination schedules that complete the three-part series in 3 weeks or 2 months hold promise for jail settings.<sup>79</sup> Although long-term efficacy studies are needed, its use is outweighed by the benefits of shorter schedules, particularly for prisoners whose incarceration is for a short duration.<sup>80.81</sup> Despite its effectiveness and availability, HBV vaccination coverage and uptake substantially varies by geographical region and prison category, even in high-income countries.<sup>82</sup>

# Prevention of tuberculosis transmission

WHO recommends a combination of active and passive case-finding for prisons including a diagnostic work-up for prisoners with a history of tuberculosis and several clinical symptoms or with a low body-mass index.10 The 2013 WHO guidelines<sup>83</sup> for tuberculosis screening, which include prisoners as a target group, recommend symptoms and, if available, chest radiograph as initial screening tools. If either screening test is positive then a sputum-smear microscopy or a rapid molecular test (Xpert MTB/RIF, Cepheid [Sunnyvale, CA, USA]) should be completed. Symptom-based approaches for tuberculosis screening are less useful in prison settings, such as in Africa where an overlap exists with symptoms related to HIV (where prevalence is high), malnutrition, and other infectious diseases. One the one hand, of 2514 participants screened for tuberculosis in a large Zambian prison, 1430 (62%) had one or more of WHO's recommended screening symptoms of cough, fever, weight loss, or night sweats, with the most recorded symptoms being cough (43%) and weight loss (31%).84 On the other hand, despite this high occurrence of symptoms, 33% of cases with bacteriologically confirmed tuberculosis did not report any of the typical screening symptoms.84 These findings<sup>84</sup> point to the need for an algorithm based on different criteria in different settings to facilitate more aggressive screening, diagnosis, and treatment of prisonbased cases. Preliminary work has shown that symptom screening to establish eligibility for isoniazid preventive therapy in resource-constrained settings with high tuberculosis and HIV burden might be less than optimal, due to its low specificity and low negative predictive value for tuberculosis.85

#### **Tuberculosis infection control**

Prisons face substantial environmental and logistical barriers to implement tuberculosis control activities. In many countries, especially in Africa, overcrowding and outdated or rundown infrastructure is common, leading to poor ventilation and unhygienic conditions, creating high-risk environments for airborne infection.<sup>86</sup> Environmental and infrastructure modifications that improve ventilation

and reduce overcrowding and provision of personal protective equipment for health staff and officers reduces tuberculosis transmission.<sup>87</sup> Prison-based peer educators can also play an active part in educating and identifying prisoners with signs and symptoms of tuberculosis and referring them to health services.<sup>88</sup>

#### Treatment of latent tuberculosis infection in prisons

Treatment of latent tuberculosis infection (LTBI)irrespective of tuberculin skin test status and in the absence of current cough, fever, weight loss, or night sweats-is one of the recommended tuberculosis prevention strategies in people living with HIV.89 LTBI treatment introduction in prison settings has been suboptimum. Exclusion of active tuberculosis in this population is essential for LTBI treatment strategies. In jails and pre-trial detention centres, treatment of LTBI has been fraught with many challenges, including inability to complete traditional isoniazid preventive therapy.42 Even less data are available for its effectiveness in prisons in low-income and middle-income countries.<sup>42</sup> The little evidence that does exist from the USA and Europe suggests that LTBI treatment in prisons is poorly provided or completed by inmates, resulting in variable effects on tuberculosis incidence.<sup>90</sup> Prospective trials of isoniazid plus rifapentine administered once a week for only 12 weeks holds promise for increased completion for LTBI treatment<sup>91</sup> with low toxicity, yet such strategies have not been used with prisoners. Additionally, fundamental questions remain about the most appropriate duration of preventive therapy in prisons, particularly in closed settings with a high prevalence of HIV and tuberculosis and the frequency of adverse events, including hepatotoxicity and peripheral neuropathy.

### ART for tuberculosis prevention

Several studies<sup>92,93</sup> document that ART effectively reduces tuberculosis incidence in people living with HIV as a result of immune recovery. On the basis of these and other data, universal test and treat strategies have been advocated as a way to simultaneously control generalised tuberculosis and HIV epidemics.<sup>94</sup> This strategy, however, has not been evaluated as an intervention for prisons. Successful implementation of this test and treat strategy will require strengthening of prison health systems, improvements in HIV testing and treatment (including investment in health-care worker and prison officer training), supply chain management, improved infrastructure, and to ensure that continuity of care is optimised for transferred and released cases.

## Implementation challenges with prevention: introduction and expansion of evidence-based prevention

Although evidence-based practices and programmes for prevention of HIV, HBV, HCV, and tuberculosis in prisons have been identified and several international guidelines have been formulated,<sup>995</sup> enormous gaps exist

in the implementation of these services in prisons in both low-income and high-income countries.<sup>56,96</sup> Ideally, these interventions should be implemented in a core package of basic primary health-care services for prisoners. Figure 2 illustrates the global provision for the six key interventions for HIV, HBV, and HCV prevention in prisons we have described in this Series paper-information (education and communication), counselling and testing, NSP, OAT, condom provision, and ART.<sup>59</sup> Only eight countries (Moldova, Armenia, Kyrgyzstan, Germany, Luxembourg, Portugal, Spain, and Switzerland) report providing all six interventions in their prisons, even if the actual coverage related to needs of prisoners remains mostly unclear or low.97 Only one or two of these services in prisons are provided in eastern Europe, central Asia, western and eastern Africa, and in most countries in central and South America. Of 28 European Union countries, almost all provided prison-based services to prevent and treat infectious diseases, including testing and treatment for HIV and tuberculosis; however, the distribution of condoms, and NSP were still rare.98 The challenge to provide these services in under-resourced low-income and middleincome settings is even greater where discriminatory attitudes, abuse, denial, and moral judgment about sex and drug use in prisons are common. Poor infrastructure and access to medical care and extreme overcrowding further worsens the situation.99 Nonetheless, several countries have proven that implementation of comprehensive evidence-based prevention and treatment services in prison is possible and can contribute to successful reduction in disease transmission and prevalence (see appendix for case studies of Spain and Iran). As illustrated by these few cases, to overcome the challenge to deliver prevention and treatment services in prison needs the recognition of the importance of the human rights of prisoners and their right to health care.

Additionally needed is the cooperation and coordination of two disparate cultures: the criminal justice system (organised to punish the offender and protect society) and the public health systems (organised to promote the health of individuals and society). Unfortunately these two systems are not aligned with different policies, funding, and personnel.<sup>100</sup>

Prison staff have a key role in the implementation of any prevention or treatment services in prisons. Adequate training of prison staff in infection control practices and reduction in stigma can help to facilitate prisoner access to services. Improvements in the knowledge of prison staff about the risks of disease transmission will increase their understanding of how prevention of HIV, HBV, HCV, and tuberculosis in prisons benefits them and their communities, and thus engages them more in enhancing access to services.

Findings from prison-based OAT studies<sup>14,66,101</sup> have documented low client motivation, inadequate knowledge, myths about addiction and the benefits of treatment, and an in-prison drug trade restricting OAT expansion. Negative attitudes toward OAT by prison staff can undermine both intervention initiation and expansion, but understanding the reason for scepticism of the intervention can provide useful information to overcome such barriers.<sup>14,67</sup>

The punitive justice approaches implemented in many, if not most, countries for drug use, drug possession for personal use, sex work, and homosexuality that particularly target vulnerable and marginalised people have led to mass incarcerations. As a result, many individuals are put at risk of acquiring these potentially life-threating infections.<sup>102</sup> Legislative reforms, including decriminalisation of these behaviours, have been widely recommended and would reduce prison populations and reduce related health and social problems. These reforms, including diversion to community-based programmes and

See Online for appendix



Figure 2: The global provision of key interventions for HIV, hepatitis B virus, and hepatitis C virus prevention in prisons, from 2008 to 2015 The interventions are information, education and communication, counselling and testing, needle and syringe programmes, opioid agonist therapies, condom provision, and antiretroviral therapy.

drug courts providing alternatives to incarceration, have been shown to have improved outcomes and are costeffective.<sup>103</sup> Key action is urgently needed to scale-up evidence-based interventions to prevent HIV, HBV, HCV, and tuberculosis in more prisoners by a broad range of stakeholders. Genuine partnership and collaboration will need to take place between a diverse group of people, including government departments, prison staff, healthcare workers, peer educators, prisoner representatives or ex-prisoners, academia, and finally the larger community.

#### Conclusions

Prisons present a high-risk environment for the transmission and amplification of several infections considered to be public health emergencies. The fluidity of people between prisons and the community-staff and prisoners-means that undiagnosed and untreated infections in prisons and ineffective transitional programmes to the community result in accelerated community-based infections after release of prisoners. Despite many evidence-based interventions documented to reduce the negative consequences of these infections and international guidelines calling for the implementation of these interventions, an enormous gap remains in the introduction and expansion of these services in prisons in both low-income and high-income countries. Only eight countries now report the provision of all six high impact interventions discussed in this Series paper. OAT is nominally available in just over 40 prisons worldwide, yet coverage does not meet the needs of even 1% of prisoners. Full-scale implementation of these interventions will first need recognition of the fundamental human rights of prisoners as members of society, with equitable access to prevention and treatment services during periods of incarceration. Additionally, needed is cooperation and coordination between the criminal justice and public health systems, which are often not aligned in their mission. Ultimately, reforms in laws and policies that criminalise drug use and sexual behaviours are crucial to reduce prison populations that put large numbers of individuals at risk of potentially life-threatening infections, which can be more effectively prevented and treated in community settings.

#### Contributors

AK, SER, AS, LW, NE-B, KD, ALW, AV, and FLA contributed to the writing and editing of the manuscript. BM and FLA contributed to the figures. AS and ALW provided the tables.

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