



European Monitoring Centre
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Systematic review on active case finding of communicable diseases in prison settings

Prevention and control of communicable diseases
in prison settings

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Appendices: The appendices can be found as a separate document here: <https://ecdc.europa.eu/en/publications-data/appendices-systematic-review-active-case-finding-communicable-diseases-prison>

Abbreviations

BBV	Blood-borne viruses
CXR	Chest X-ray
DAA	Directly Active Antivirals
DBST	Dried blood spot testing
EEA	European Economic Area
EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
EU	European Union
HAV	Hepatitis A virus
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
IGRA	Interferon-Gamma Release Assays
NICE	National Institute for Health and Clinical Excellence
PICO	Population-Intervention-Comparison-Outcome
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analyses
PWID	People who inject drugs
RCT	Randomised controlled trial
STI	Sexually transmitted infection
TB	Tuberculosis
TST	Tuberculin skin test
WHO	World Health Organization

Glossary

Acceptability	How acceptable a given intervention is to the target population in relation to the effect of the intervention
Accessibility	How accessible a given intervention is to the target population (availability of good health services within reasonable reach and when needed)
Active case finding	Interventions aimed at promoting early diagnosis by means of provider-initiated systematic offer for testing, at entrance and/or during stay (including at release)
Active TB	Active tuberculosis (TB) refers to disease that occurs in someone infected with <i>Mycobacterium tuberculosis</i> . It is characterized by signs or symptoms of active disease, or both, and is distinct from latent TB infection, which occurs without signs or symptoms of active disease
Client-initiated testing	Testing is voluntary and performed as the result of individual's health-seeking behaviour, triggered by symptoms development or other reasons (i.e. passive case finding)
Comparative study	A study designed to compare two or more groups (e.g. types of testing offers or testing timings), and a statistical measure is provided for that comparison
Descriptive study	A study concerned with and designed only to describe the existing distribution of variables, without regard to causal or other hypotheses
Evidence-based guideline	A guideline that is largely based on the scientific literature to generate a recommendation; good clinical practices or expert opinions could be used to supplement the scientific literature
Feasibility	Whether it is feasible to implement an intervention in terms of time, money, or other circumstances
Jail	Locally-operated, short term facilities that hold adults awaiting trial or sentencing or both, and people sentenced mostly to a term of less than one year
Mandatory testing	Testing is offered to all eligible individuals, and the person is obliged to be tested
Opt-in	Testing is voluntary and offered to all eligible individuals, often on the basis of identified risk factors, and the person chooses whether or not to have the test
Opt-out	All eligible individuals are informed the test will be performed unless they actively refuse; testing is voluntary.
People in prison	Adult individuals aged 18 and older detained in prison for custody, remand or awaiting trial. In certain instances, the term may include individuals visiting correctional facilities, intervening in various capacities or prison staff working also in various capacities. This population includes vulnerable groups, i.e. MSM, transgender, PWID, foreign-born persons, homeless, people with mental health and/or substance misuse needs (including alcohol), other.
Practice-based guideline	A guideline that reflects expert opinion or information derived from good clinical practices; some literature references (not systematic) may be included
Prison	All institutions where a state holds adults deprived of their liberty (e.g. prison or jail), either sentenced or on pre-trial detention (remand), excluding migrant centres, and police detention rooms, and other facilities such as juvenile prisons or secure training centres for children & young people.
Provider-initiated testing	Testing is voluntary and offered to eligible individuals by health-care providers. In this document we use the term provider-initiated to describe both opt-in and opt-out testing offers.

Executive summary

A higher prevalence of communicable diseases among people in prison compared with the general public is recognised as a public health issue as well as a major concern for the people affected, as the majority of incarcerated people return to their communities. Active case finding is a key prevention measure to promote early diagnosis, treatment and to prevent further disease transmission. The objective of this report is to systematically review the evidence on active case finding in prison settings, with a focus on the European Union (EU) and the European Economic Area (EEA) region. The communicable diseases targeted by this review were not selected *a priori*, but identified through the retrieved evidence.

A systematic literature review was performed in PubMed and Embase.com from 1990 onwards and in Cochrane Library from 1980 onwards. No language or geographical limits were applied. In addition, the following sources were searched through a pre-defined website list search and a call for papers from experts: conference abstracts (from 2010), unpublished research reports, protocols and guidelines (from 2005).

From the peer-reviewed literature, 63 primary articles and one systematic review were included. Furthermore, 24 conference abstracts/unpublished research reports, two other documents and 19 guidelines were included. The search of the literature revealed that most of the existing evidence on active case finding in prison settings is concentrated on just a few communicable diseases, such as hepatitis (A, B and C), human immunodeficiency virus (HIV), sexually transmitted infections (STIs; chlamydia, gonorrhoea, syphilis and trichomoniasis) and tuberculosis (TB). These findings may be consistent with the general notion that these diseases are on one hand causing a sizeable burden of infectious disease in the prison population, and on the other are at higher risk of transmission within prison settings. Against this background of infectious disease burden and transmission risk, people in prison are entitled to a medical assessment upon entry, which offers the opportunity to conduct active case finding for a number of relevant conditions, and not limited to communicable diseases.

The body of evidence retrieved through this systematic review was largely composed of studies conducted in non-EU/EEA countries, and primarily in the United States (US). A large part of the literature covering active case finding in EU/EEA prisons was retrieved from grey sources, thus revealing a substantial publication bias. In addition, very few studies, and even less EU/EEA ones, investigated interventions to increase the effectiveness of active case finding in prison settings; and even among those, statistical significance was hardly ever reported.

Altogether, based on the reported case detection rates, the retrieved studies showed a higher prevalence of infection in the prison population compared with general population estimates for the same disease, thus providing a valid argument to strengthen case finding initiatives in these settings. Based on the findings of the review, testing modalities emerged as a factor that influenced uptake. For viral hepatitis, HIV and STIs, testing proposed at entry was likely to be associated with a higher uptake rate when compared to testing during the course of the stay in prison and, even more so, than uptake at release. In general very few studies investigated testing before release, and these were characterised by a lower uptake and a lower case detection rate compared with other testing modalities. When comparing active case finding versus client-initiated testing, the latter invariably resulted in lower uptake and lower case detection, for all diseases of interest. Among active case finding modalities, opt-out was usually associated with higher uptake, although less studies investigated this approach. However, studies reporting on increasing uptake rate over time, are frequently associated with a corresponding decrease in yield, in terms of case detection rate. Nonetheless, studies comparing the case detection rate of routine testing approaches against seroprevalence estimates from serosurveys conducted in the same population, provided compelling evidence of a residual undiagnosed fraction.

Testing methods were also shown to be influential in ensuring a higher uptake, and rapid or less invasive approaches were preferred. At least for TB, the choice of the testing method and the need for multiple visits - i.e. Tuberculin skin test (TST) - had a direct impact on the proportion of individuals categorised as having incomplete screening or lost to follow up. On the other hand, the introduction of education and peer-education initiatives were shown to be successful, and the findings pointed at a substantial increase in testing uptake after the interventions irrespective of the disease.

In order to maximise public health and individual benefits of early diagnosis appropriate follow up interventions, such as prevention measures, treatment and care, need to be implemented. Nevertheless relevant health outcomes were not often presented in the included studies. Notification of testing results was seldom reported, with the notable exception of HIV testing. When reported, notification rates were very high at least for HIV-positive individuals. Conversely, treatment initiation was frequently described at least for STIs and TB, but less so for HIV and viral hepatitis. In general, treatment initiation rates showed important variability across studies.

Barriers to testing were investigated in a number of studies covering all target diseases. Sudden release and mobility within the prison system were cited by several studies as key factors hindering testing. This was of particular relevance for TB active case finding due to the turnaround time between test administration and reading of the results for the most common first line testing (i.e. TST).

Among personal barriers to testing, not perceiving oneself at risk and having being tested already/recently were the main reasons for refusal. Studies focusing on testing for blood-borne viruses (BBVs) also reported lack of awareness, fear of disease and of testing procedures, concern about confidentiality and stigma as important barriers. Finally a lack of trust in the institution was mentioned by some studies as a reason to refuse testing. Institutional barriers such as inconvenience of testing time, inadequate testing/counselling procedure, and a lack of staff were also reported by a few studies as relevant factors.

A limited number of cost-effectiveness studies were retrieved, related to active case finding for hepatitis C virus (HCV), HIV, chlamydia, gonorrhoea, and active TB, and with the majority performed in the USA. In these studies, different active case finding approaches, timings, offers, promotions and test methods were used, and the economic analyses were based on a diverse range of assumptions and cost data. Overall the results were difficult to compare, inconsistent at times and best interpreted in a disease-specific context.

On the whole, there was a substantial heterogeneity between studies in both the peer-reviewed and grey literature, making comparisons difficult. A considerable part of the findings derived from studies conducted in the USA, which may not be representative of the EU/EEA prison settings. Overall, the level of evidence resulting from the included studies was low; most studies had a descriptive and observational design, were conducted in single institutions among relatively small sample sizes, and study characteristics, interventions and outcomes were frequently poorly described.

In summary, the evidence on active case finding in correctional facilities is limited and results varied. It is hard to draw general conclusions about the effect of different testing approaches. More comparative studies are needed on the effectiveness and impact of the different active case finding strategies in correctional facilities in the EU/EEA. However, available reports of disease prevalence and/or case positivity rate when active case findings is conducted in prison setting highlight the potential added value of such public health interventions. Active case finding in EU/EEA correctional facilities could therefore contribute to reducing the undiagnosed fraction and to prevent further transmission of communicable diseases both in the prison setting and in the community at large.

Background

Introduction

More than 10 million people are held in correctional facilities throughout the world, either as pre-trial detainees/remand people in prison or having been convicted and sentenced. In 2014, 613 655 persons were being held in European Union (EU)/European Economic Area (EEA) correctional facilities, with considerable variation between countries [3]. The median imprisonment rate in this year was 108.6 per 100 000 population, varying from 21.5 per 100 000 in Liechtenstein to 305.0 per 100 000 in Lithuania [3].

Compared with the general public, people in prisonⁱ have a higher prevalence of infection with human immunodeficiency virus (HIV), hepatitis B, hepatitis C, syphilis, gonorrhoea, chlamydia and tuberculosis (TB) [4]. Those who are healthy on entry are at higher risk of exposure to communicable diseases such as HIV, TB; or to developing drug addiction problems or mental illnesses compared with the general population [5,6].

Most people in prisons in Europe are from poor communities and vulnerable social groups, with the proportion who are immigrants or from minority ethnic backgrounds on the increase [7]. Drug users form a large part of the imprisoned population, with studies showing that a majority of people in prisons have used illicit drugs at some point in their life and many have chronic and problematic drug use patterns. Because of the illegality of the drugs market and high cost of drug use, which is often funded by criminal activity, the more problematic forms of drug use are accompanied by an increased risk of imprisonment [8].

The increased prevalence of communicable diseases among people in prisons is recognised as a major risk for the health of both people living and working in prisons and for the general population, as the vast majority of people in prisons eventually return to their communities. The main risk factors linked with increased transmission rate in prison settings seem to be proximity – aggravated by overcrowding, which is common in EU/EEA correctional facilities, high-risk sexual behaviour, injecting drug use, tattooing and piercing [9]. Overcrowding, diet and hygiene are also important risk factors, at least for TB. In addition, a lack of awareness of infection status, and possibly substandard healthcare, have increasing implications for public health. In this framework, there may be a great opportunity for primary, secondary and tertiary prevention offered in prison settings if coupled with adequate linkage to healthcare [5,10].

Guidance on communicable diseases in prison settings

In 2015, the European Centre for Disease Prevention and Control (ECDC) launched a project to develop an evidence-based guidance on prevention and control of communicable diseases in prisons, jails and other custodial settings, with a special focus on the EU/EEA. Due to the importance of drug use as a risk factor for the transmission of communicable diseases in prison settings, and the high prevalence of people who inject drugs (PWID) among EU/EEA people in prisons, ECDC collaborated closely with the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). This collaborative ECDC/EMCDDA project represents the first effort of the two agencies to develop a common evidence-based guidance for the prevention and control of communicable diseases in prison settings in the EU. During a scoping phase, available evidence published from 2000 to 2014 on the burden of communicable diseases, preventive measures and associated costs in prison settings in the EU were assessed, and existing knowledge gaps on communicable diseases in prison settings were identified. An evidence mapping tool was developed, and findings were complemented with information from experts from the EU and the EEA, in order to define thematic areas to be addressed by the guidance document. The guidance was developed as a collection of specific thematic areas (macro areas) into guidance modules. The following macro areas were addressed during the overall project:

- Macro area 1: Active case finding for selected communicable diseases at admission and during prison stay
- Macro area 2: Vaccination strategy, including vaccination at entry and vaccination in outbreak situation
- Macro area 3: Diagnosis, treatment, care and prevention of TB, including throughcare
- Macro area 4: Prevention, care and treatment of HIV, including throughcare
- Macro area 5: Prevention, care and treatment of viral hepatitis, with a focus on treatment for hepatitis C, including throughcare
- Macro area 6: Prevention and control of injecting-related infections among current or former drug users, including throughcare

This systematic review report focuses on macro area 1 - active case finding (included communicable diseases were not selected *a priori*).

ⁱ People in prisons includes all people held in correctional facilities where a state holds people deprived of their liberty (e.g. jails, prisons)

Active case finding

Prevention of communicable disease transmission can be directed in two ways: 1) preventing transmission of disease from an infected person to their contacts, and 2) preventing the disease from developing once any contacts have become infected [7]. Active case finding is one of the key prevention measures targeted at the first pathway.

Active case finding is aimed at detecting and subsequently treating disease, as well as reducing communicable disease transmission [11]. The World Health Organization (WHO) defined active case finding as 'the systematic identification of people with a suspected disease, in a predetermined target group, using tests, examinations or other procedures that can be applied rapidly' [12]. Passive case finding on the other hand, occurs when people seek healthcare themselves because they develop symptoms [7]. Active case finding strategies can include mandatory testing or voluntary testing, with the latter divided into opt-in (where testing is offered to all persons in a predetermined group and the individual chooses whether or not to have the test) and opt-out (where the individual is informed the test will be performed unless he/she actively refuses) [2].

Prison settings may provide an opportunity to test for communicable diseases in high-risk and underserved groups [2,5]. Active case finding can be offered at different times in the prison setting, i.e. at entry, during imprisonment (for instance through yearly testing rounds), or at release. While active case finding at entry and during imprisonment is mostly targeted to prevent disease spread within the prison population, active case finding at release is a key measure to prevent disease spread into the community [13].

Diseases overview

This systematic review was conducted without pre-determining communicable diseases of interest. However the retrieved evidence reported findings on selected diseases only, namely viral hepatitis, HIV, STIs and TB. A brief background on each of these is presented below.

Viral hepatitis

Hepatitis A is an acute infectious disease of the liver caused by the hepatitis A virus (HAV). The disease is highly transmissible through the faecal-oral route. Hepatitis A is often asymptomatic or mild, but the severity increases with age [14]. Based on a systematic review of literature published between 1975 and 2014 [15], HAV seroprevalence in EU/EEA countries ranged between the intermediate and very low WHO seroprevalence endemicity categoriesⁱⁱ [16]. Annual notification rates of hepatitis A reported to ECDC during the period 2006–2013 also suggest incidences ranging from intermediate to very low. Among the 30 EU/EEA countries providing this information (no data available for Liechtenstein), 14 reported a very low incidence, 14 a low incidence and two an intermediate incidence level [15]. Data on the epidemiology and testing practices of hepatitis A among the prison population are not currently available at EU/EEA level.

Hepatitis B is a liver disease that results from infection with the hepatitis B virus (HBV) and is spread through contact with infected body fluids or blood products. The symptoms can vary greatly and many of those acutely infected are symptom-free. Those who become chronically infected with HBV (from >30% among children to <5% among adults) are at a higher risk of serious consequences: liver cirrhosis (25%) and cancer (5%). Moreover, they may act as a reservoir for continuing disease transmission [17]. In a recent systematic review of the literature by ECDC, chronic HBV prevalence estimates that were considered representative for people in prisons were available for 11 countries: Bulgaria, Croatia, Finland, France, Hungary, Ireland, Italy, Luxembourg, Portugal, Spain and the United Kingdom [18]. The prevalence among people in prisons ranged from 0.3% in Ireland to 25.2% in Bulgaria. Countries with the highest chronic HBV prevalence in prison settings were Bulgaria (25.2%), Portugal (10.8%), Luxembourg (7.0%) and Italy (6.7%). As a comparison, the prevalence in the general population ranged from 0.1% in Ireland to 4.4% in Romania [18]. According to a recent study in *The Lancet* assessing the global burden of infections among the prison population, HBV prevalence in Western Europe was estimated to be 2.4% (95%CI 1.6–3.3). However, data from the Eastern European sub-region, including non EU/EEA countries, were pooled with Asian data, thus limiting the generalisability of such estimates to the EU/EEA context [4].

ⁱⁱ Levels of endemicity have been classified on the basis of seroprevalence as: high ($\geq 90\%$ by age 10 years); intermediate ($\geq 50\%$ by age 15 years, with $< 90\%$ by age 10 years); low ($\geq 50\%$ by age 30 years, with $< 50\%$ by age 15 years); and very low ($< 50\%$ by age 30 years)

In a recent survey launched by ECDC in 2016 on HBV and HCV testing policies and practices in the EU/EEA, 21 countries provided information on testing practice for HBV in prison settings. The most frequently reported policy (9 countries [43%]) was HBV testing offered only on the basis of risk factors or medical reasons either at reception or during prison stay. Seven countries offered HBV/HCV testing to all people in prison at reception in at least some prisons (four countries on an opt-in basis, two countries on an opt-out basis, and one country on both an opt-in and opt-out basis). In two countries (10%) HBV testing was not conducted, and for three countries (14%) it was not known if testing was offered. Some countries reported different testing practices at different prisons [19].

Hepatitis C is a liver disease caused by infection with the hepatitis C virus (HCV). HCV can cause both acute and chronic hepatitis infection. Most people with acute HCV infection do not have any symptoms. Those who develop chronic infection are often asymptomatic until decades after infection when symptoms develop secondary to serious liver damage. HCV is most commonly transmitted through blood contact, such as blood transfusion and needle sharing [7,20]. In many EU/EEA countries, more than half of those who inject drugs have been infected with HCV, and such individuals constitute the largest risk group for HCV infection in the region [21]. In a recent systematic review of the literature coordinated by ECDC, HCV prevalence estimates (using anti-HCV antibodies as a marker) that were considered representative for people in prisons were available for 11 countries: Bulgaria, Croatia, Finland, France, Hungary, Ireland, Italy, Luxembourg, Portugal, Spain and the United Kingdom. The prevalence among people in prisons ranged from 4.9% in Hungary to 86.3% in Luxembourg. As a comparison, the HCV prevalence in the general population reported ranged from 0.1% in Belgium, Ireland and the Netherlands to 5.9% in Italy [18]. According to the same study mentioned above, the estimated HCV prevalence among prison populations in Western Europe is 15.5% (12.2-19.1)[4]. However similar generalisability concerns apply.

The ECDC survey on HBV and HCV testing policies and practices in the EU/EEA yielded the same results for HCV as for HBV, with the largest fraction of countries (9 countries [43%]) reporting testing offered only on the basis of risk factors or medical reasons either at reception or during prison stay [19].

HIV

HIV is a virus with a long incubation period that attacks the immune system and when untreated causes a lifelong severe illness. The end-stage of the infection, acquired immunodeficiency syndrome (AIDS), results from the destruction of the immune system. HIV is transmitted when infected blood, semen, vaginal fluids or breast-milk enter another person's body [7,22].

According to a recent study assessing the global burden of HIV infection among the prison population, HIV prevalence in Western Europe is estimated to be 4.2% (95%CI 2.7–6.1) [4]. However, this estimate was developed pooling data from EU/EEA and non EU/EEA countries in the broader European region. In 2014, ECDC collected information on epidemiology and interventions against HIV among people in prison in the European region for the Dublin Declarationⁱⁱⁱ monitoring initiative. A total of 29 countries reported recent data on HIV prevalence in people in prison (17 EU/EEA and 12 non-EU/EEA countries). Reported prevalence estimates ranged from 0% to 12%. Three EU/EEA countries reported a prevalence above 5% among people in prison (Estonia, Latvia and Spain) [23].

According to the available data on HIV testing practices in correctional facilities, 28 EU/EEA countries reported that HIV testing is widely available in prisons. Twenty-two EU/EEA countries reported that voluntary testing is available in all prisons; while in six EU/EEA countries testing is available in some or most prisons. No EU/EEA countries reported that voluntary testing is not available at all. In 2014, government respondents in five countries (Bulgaria, Estonia, Latvia, Portugal and Romania) reported that they had discontinued a previous policy of mandatory HIV testing. However, in 2014, two EU/EEA countries (Cyprus and Slovakia) reported implementation of mandatory HIV testing [23].

Sexually transmitted infections

Of the eight most common sexually transmitted infections (STIs), four are amenable to relatively simple curative therapy: chlamydia, gonorrhoea, syphilis and trichomoniasis [24]. Chlamydia is an STI caused by the *Chlamydia trachomatis* bacterium. The disease often presents without symptoms. However, long-term complications can be caused by infection in women, which can lead to infertility [7,25]. Gonorrhoea is caused by infection with the Gram-negative bacterium *Neisseria gonorrhoeae*. Transmission occurs through sexual contact or by mother-to-child transmission at birth. Symptoms reflect localised inflammation of infected mucosal surfaces in the genital tract, resulting in urethral discharge and dysuria in men and altered vaginal discharge, lower abdominal pain and dysuria in women [26].

iii WHO Regional Office for Europe. Dublin Declaration on Partnership to Fight HIV/AIDS in Europe and Central Asia. [Internet]. 2004 [cited 1 June 2015]. Available from: <http://www.euro.who.int/en/health-topics/communicablediseases/hiv/aids/policy/guiding-policy-documents-and-frameworks-for-who-europes-work-on-hiv/dublin-declaration-on-partnership-to-fight-hiv-aids-in-europe-and-central-asia>

Syphilis is an STI caused by the bacterium *Treponema pallidum*. After a three-week incubation period on average, clinical symptoms appear: at first a primary lesion at the site of infection; secondary syphilis then appears as eruptions on mucous membranes and/or skin rashes, followed by long periods of latency (latent or tertiary syphilis). If untreated, many years after the initial infection, tertiary syphilis lesions might finally appear (visceral, multi-organ involvement, including serious vascular and neurological damage) [25]. Trichomoniasis is caused by infection with the parasite *Trichomonas vaginalis*. A large proportion of infected persons do not develop symptoms [27].

Data on the epidemiology of STIs among the prison population are currently unavailable at EU/EEA level. According to the 2016 round of the Dublin Declaration monitoring, 15 countries offered STI testing and clinical services in prison settings in the EU/EEA^{iv}

Tuberculosis

Tuberculosis is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*. Following the initial infection, the bacterium most often lies dormant without causing symptoms. This is called latent TB infection (LTBI). Active TB, where the bacterium is no longer controlled by the immune system, can occur at any time following infection and most commonly affects the lungs, causing a chronic cough, loss of weight, loss of appetite, and general malaise [28]. Transmission of TB occurs from a person with active TB by airborne droplets produced by coughing, sneezing or talking that are subsequently inhaled by another person [7]. For 2014, 16 EU/EEA countries reported 731 new and relapsed TB cases in prisons, resulting in a notification rate of 181.3 per 100 000 inmates, ranging from 0 in Iceland to 1 004 per 100 000 inmates in Latvia. The relative risk of contracting TB in the prison setting compared with the general population was 9.6. TB cases in prisons accounted for 1.9% of all new cases notified overall, however in Latvia this group accounted for 7.2% of the cases reported [29].

Data on testing practices for TB among the prison population are not currently available at EU/EEA level.

Scope and objectives

The objective of this report is to provide insights on the value of and implementation modalities for active case finding interventions conducted in prisons, jails and other custodial settings which function as prisons. This was done by performing a systematic review aimed at collating and synthesising all relevant evidence (peer-reviewed as well as grey literature) with regards to active case finding interventions for communicable diseases in prison settings (see specific research questions in the methodology section). No *a priori* selection of target communicable diseases was made, as included diseases were identified by the retrieved literature.

^{iv} European Centre for Disease Prevention and Control. Monitoring Implementation of the Dublin Declaration. Stockholm: ECDC; 2016. (Unpublished report).

Review methods

A rigorous high quality methodology of systematic reviews was applied following international methodology and reporting standards such as Cochrane [30] and Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) [31] and was built on the methodology used by ECDC during the scoping phase of the project.

The screening and selection phases of the systematic review were carried out jointly for the first three macro areas (i.e. active case finding, vaccination and TB prevention and care). Only the methodology relevant to macro area 1 is summarised below. However, to get a detailed overview of the overall process used for the three macro areas, please see Appendix 1 (the appendices can be found as a separate document <https://ecdc.europa.eu/en/publications-data/appendices-systematic-review-active-case-finding-communicable-diseases-prison>).

The following objective, questions, population and setting were defined for the systematic review on active case finding:

Review objective:

To gain insights on the value of implementation modalities for active case finding for communicable diseases in prisons, jails and other custodial settings which function as prisons.

The Population-Intervention-Comparison-Outcome (PICO) method was used to develop specific research questions from these review objectives (Table 1).

Table 1. PICO table

Active case finding for selected communicable diseases at entrance and during prison stay	
P	Adult individuals (≥ 18 years) in prison settings (i.e. those detained and those who work in prison settings ('going through the gate'))
I	Active case finding for communicable diseases at entrance and during prison stay (including at release)
C	<ul style="list-style-type: none"> • comparison with no intervention • comparison with alternative intervention • no comparison • comparison between populations in prison settings (e.g. between different prison types, risk groups, etc.) • comparison with community setting.
O	Qualitative outcomes: <ul style="list-style-type: none"> • accessibility • feasibility and acceptability of active case finding at entrance and during prison stay • qualitative description of interventions/modes of service delivery Quantitative outcomes: <ul style="list-style-type: none"> • uptake (number of persons screened) • positivity rate • measures of effectiveness (e.g. change in communicable disease incidence or prevalence) • cost-effectiveness
S	Prisons, jails and other custodial settings with a function as prison (excluding migrant centres and police detention rooms)

Review questions:

- What are the communicable diseases that are covered by active case finding?
- Which types of active case finding modalities are effective?
- Which service models for active case finding interventions are effective?
- Which types of active case finding modalities are cost-effective?
- Which service models for active case finding interventions are cost-effective?
- What is the acceptance of active case finding?
- How to improve the acceptance of active case finding testing?
- Who should be targeted for active case finding, when and how often?

Search and selection strategy

The search and selection phases were done jointly for the three macro areas; see Appendix 1 for a detailed description of this process. A brief description of the strategies and specific issues relevant for macro area 1 is described below.

Search strategies for peer-reviewed articles:

The peer-reviewed literature search was carried out on 4 February 2016 in PubMed, Embase.com and Cochrane databases. The search included the combination of search strings relevant for all three macro areas (search strings can be found in Appendix 1). The only search limit was a time limit whereby, for macro area 1, literature was searched from 1990 onwards in PubMed and Embase.com and from 1980 onwards in Cochrane.

Selection of peer-reviewed articles:

Articles were screened by title and abstract, and if deemed possibly relevant, in full text. Further scrutiny of the article during the extraction phase could have led to exclusion. Inclusion and exclusion criteria by study design/type, study quality, study population, geographical area, comparison and specific outcomes of interest are described in Appendix 1. High-quality meta-analyses or systematic reviews were included in case they matched the review objectives. If not, the relevant individual articles from these meta-analyses/systematic reviews were checked.

Critical appraisal for peer-reviewed articles:

During the selection of peer-reviewed articles, the methodological quality of the articles that appeared to present relevant data for the review were critically appraised. This was done using standard Evidence Based Medicine checklists, and aimed to identify quality limitations.

For this review, the National Institute for Health and Clinical Excellence (NICE) checklists were used for selection purposes, as they cover tools for both quantitative and qualitative checklists. NICE checklists are available for the following study designs: systematic reviews and meta-analyses, Randomised controlled trial (RCTs), cohort studies, case-control studies, diagnostic accuracy studies, economic evaluations and qualitative studies^v. Each study is awarded an overall study quality grading for internal validity and a separate one for external validity:

- ++ All or most of the checklist criteria have been fulfilled, where they have not been fulfilled the conclusions are very unlikely to alter
- + Some of the checklist criteria have been fulfilled, where they have not been fulfilled, or not adequately described, the conclusions are unlikely to alter
- – Few or no checklist criteria have been fulfilled and the conclusions are likely or very likely to alter.

In case of a score – for both the internal and external validity, the article was excluded (exclusion reason 'insufficient methodology', see Appendix 4). Only when methods and/or results were unclear, these articles were excluded. Otherwise, the articles were included and limitations, if present, were described in the data extraction tables.

Relevant publications in the field of infectious disease also include outbreak investigations, surveillance studies or other observational studies. For these types of studies no standard checklists are available, and therefore its quality was assessed based on relevant aspects of the existing NICE checklists, supplemented with relevant questions for a specific study design (e.g. for a cross-sectional study: the study population is a representative sample of the source population). See Appendix 2 for the complete list of questions per study design. In these checklists, predefined aspects of a study were qualitatively scored using - - or -, +/-, + or ++. The checklist was not designed to calculate a total quality score of summed + and - to assess differences in quality between studies. The final decision on whether the quality of a study was sufficient or not for inclusion was based on the expertise of the epidemiologist, keeping the results of the checklist and the objectives of the review in mind.

Search strategies for grey literature documents:

A grey literature search with a focus on EU/EEA countries was performed to complement the evidence from the peer-reviewed literature. Articles, abstracts, research reports, case studies, service models, guidelines and protocols, which focused on prisons and people in prisons were searched for. The search was done through a pre-defined list of websites and a call for papers/experts input. More details can be found in Appendix 1 and 6.

^v National Institute for Health and Care Excellence (NICE) The Guidelines manual: appendices B-1 <https://www.nice.org.uk/process/pmg6/resources/the-guidelines-manual-pdf-3304416006853>

Selection of grey literature documents:

Documents were included if the reported information was relevant and of sufficient quality. Inclusion and exclusion criteria by period of publication, type of document, document quality, document population, subject of the document, geographical area, specific outcomes of interest are described in Appendix 1. When relevant information coming from completely prison-focused guidelines was not sufficient, guidelines with a relevant section on people in prison were searched to complement the data. If these were lacking, general population guidelines were reviewed (i.e. without a section on people in prison).

Critical appraisal for grey literature:

Only grey literature documents with clear methods for compiling data and/or with clear data sources/references were included. The following documents were identified, by order of quality (highest quality first):

Conference abstracts and unpublished research reports

Conference abstracts were checked for duplication with included peer-reviewed literature; if duplication was found, the full text article from the peer-reviewed literature was preferred. Conference abstracts and unpublished research reports focusing on the prison setting were included when they contained information relevant for the review objectives, and screened using the same inclusion/exclusion criteria as the peer-reviewed literature.

Guidelines

The following types of guidelines were identified (highest quality first):

- *evidence-based*: largely based on the scientific literature. Good clinical practices or expert opinions could be used to supplement the scientific literature
- *practice-based*: reflects expert opinion or information derived from good clinical practices, some literature references (not systematic) might be included.

Relevant guidelines were critically appraised with a selection of criteria derived from the Appraisal of Guidelines for Research and Evaluation instrument:

- the overall objective/objectives of the guideline is/are specifically described
- systematic/clear methods were used to search for evidence for compiling the data and/or clear data sources/references
- the recommendations are specific and unambiguous.

Each of the three criteria were qualitatively scored separately using five scores: - -, -, 0, +, ++. The final decision whether the quality of a guideline was sufficient or not for inclusion in the evidence base was based on the expertise of the researcher, keeping the results of the checklist and the objectives of the review in mind.

Case studies/service models:

Case studies/service models were included to provide insights in the way specific interventions are implemented in a given setting. Case studies/service models were only included when at least both of the below criteria (a and b) were met:

- clearly described accounts of their intervention/service model related to the relevant macro area
- elements of monitoring or evidence of success (e.g. pre- and post- intervention testing positivity rate for case finding interventions).

Data extraction

Data extraction for peer-reviewed articles:

The included references were summarised by collecting, per individual article, all relevant information in a standardised evidence table. For articles concerning active case finding, the so-called evidence tables contain information on:

- *Reference*: author, year, journal, country
- *Study characteristics*: study design, study period, follow-up, prison setting, study objective
- *Study population*: population description, inclusion and exclusion criteria, sample description: sample size, gender, age, risk groups
- *Data sources and definitions*: description of data source/s and relevant definitions
- *Active case finding methods*: test method, test offer, consent, timing
- *Outcome results*: uptake, effectiveness, cost-effectiveness
- *Reviewer comments, limitations and level of evidence*: any additional information which was relevant for interpreting the study results, major issues with regard to the critical appraisal, and the final level of evidence based on these considerations.

Data extraction for grey literature documents:

Included documents were collated into evidence tables. The evidence tables contain information on the following:

- *Reference*: official reference. If not given: title, year, publication information
- *Source*: the source (institute/company, etc.) that prepared the document
- *Type of document*: e.g. conference abstract, guideline, etc.
- *Setting and population*: country, prison setting, risk groups, etc. to which the results apply
- *Active case finding methods*: type of active case finding, brief description
- *Results*: relevant results on the objectives given in the document, per objective
- *Comments*: any additional information which is relevant for interpreting the results.

Level of evidence peer-reviewed literature:

A large heterogeneity existed between the included studies so the strength of evidence was not assessed beyond individual studies. For the studies included in the review, the level of evidence per individual article was determined based on the study design and risk of bias, following Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria.

For RCTs, the following aspects were included to assess the risk of bias:

- randomisation
- allocation concealment
- blinding
- loss to follow-up
- intention to treat
- other limitations (e.g. non-validated method to assess the outcome).

For observational studies, the following aspects were included to assess the risk of bias:

- appropriateness of eligibility criteria (e.g. the study population is not a representative sample of the source population; selection of exposed and unexposed in cohort studies from different populations)
- Measurement of exposure and outcome (e.g. not measured in a standard, valid and reliable way or clearly described; differences in measurement in exposed and non-exposed population or measurement of the outcome while not blinded for/with knowledge of the exposure)
- Control for confounding (e.g. accurateness of measuring relevant confounders or adjustment in statistical analyses)
- Follow-up (e.g. no or short follow-up or different follow-up for the exposed and non-exposed population)
- Other limitations (e.g. participants and non-participants differ regarding relevant characteristics).

For cost-effectiveness studies, the following aspects were included to assess the risk of bias:

- nature of health condition reflected by the model
- time horizon
- perspective
- discount rate
- relevant health outcomes and costs
- sources used for model input
- incremental cost-effectiveness ratio
- sensitivity analyses
- other limitations.

In general, this led to the following levels of evidence of individual studies (based on the study design and its methodological quality (i.e. risk of bias criteria listed above)):

- high (i.e. high quality RCTs)
- moderate (i.e. less quality RCTs; high quality cohort/case-control studies and cost-effectiveness studies)
- low (i.e. less quality cohort/case-control studies and cost-effectiveness studies; cross-sectional studies with comparison, high quality surveillance studies)
- very low (i.e. low quality surveillance or other observational studies, outbreak studies, cross-sectional studies without comparison).

Evidence summary

Summary tables were created for each disease identified, and within each disease, separate tables were presented by type of testing offered (results are presented in summary tables in Appendices 8-11). These summary tables contain the following information:

- reference, country, study design
- prison setting (e.g. jail, prison), sample (size, age, gender, etc.)
- active case finding methods: testing method (e.g. chest X-ray for TB, or a rapid test for HIV), offer (e.g. mandatory, opt-in, opt-out), who, when (e.g. at entry), promotion (e.g. leaflets, education)
- results: uptake, positivity rate, effectiveness, treatment initiation
- level of evidence.

Cost-effectiveness results, qualitative outcomes (acceptability, feasibility and accessibility), guidelines, protocols and service models were summarised in text only.

Summaries of the peer-reviewed literature and grey literature were separately presented, as were results from the EU/EEA and from other high-income countries.

Quality control

During the review process, the following quality control measures were put in place for search and selection of peer-reviewed literature:

- Peer-review of the search strings by ECDC librarians and expert panel members.
- Selection based on title and abstract was performed by two independent researchers. All hits that could be excluded for clear reasons (based on the inclusion/exclusion criteria) were excluded. When in doubt, the title and abstract were assessed in duplicate and discussed. All references included by these two researchers (including the remaining doubt articles) were checked by another researcher with expertise in the field of prison health, who took the final decision on the articles in doubt.
- Duplicate screening and critical appraisal of 50% of the full text articles was performed by two independent reviewers to avoid incorrect selection of articles for data extraction. The results were compared and discussed early in the review process and any disagreements were adjudicated by a third reviewer if necessary. Any doubts arising during the screening of the remainder of the full text articles were discussed in the project team.
- Evidence tables were compiled by two researchers (not in duplicate) and all evidence tables were reviewed by an independent researcher.

The following quality control measures were put in place for search and selection of grey literature:

- Evidence tables were compiled by a researcher and reviewed by a second researcher of the project.
- A senior researcher also checked a sample of 10% of the included articles in the evidence tables early in the process to allow for refinement of data extraction.
- Critical appraisal of the guidelines was performed by a researcher and reviewed by a second researcher.

Role of the ad-hoc scientific panel:

As part of the project, a multi-disciplinary expert panel was consulted. The panel members were selected based on their expertise in prison health, prevention and control of communicable diseases and evidence-based public health. The experts came from a variety of constituencies, such as clinical professional associations, public health institutions, ministries, EU-funded initiatives, international agencies, and civil society organisations from various countries, namely Czech Republic, Estonia, France, Germany, Italy, Romania, Spain, Switzerland and the UK. ECDC staff members were also included in the expert panel, based on their specific competencies (e.g. disease specific, preparedness, social science, health determinants). See Appendix 3 for the complete list of expert panel members. The panel members were involved in prioritisation of the systematic review topics, methodology and evidence gathering.

Review results

The peer-reviewed literature search yielded 4 705 hits in PubMed, 5 867 in Embase.com and 59 in the Cochrane Library. After removal of duplicates and the addition of five hits identified through hand search, 7 041 unique hits remained. Based on the title and abstract screening, a total of 566 articles were selected. Main reasons for the exclusion of articles during the title and abstract screening were:

- incorrect setting (not in prison setting)
- ineligible health outcomes (cancer, mental disease, etc.)
- non-pertinent publication types (e.g. news, letter to the editor, editorial).

After reviewing the full text of the selected articles, 421 articles were excluded. Articles excluded and the reasons for exclusion during the full text selection step can be found in Appendix 4. Additionally, a total of 33 articles could not be retrieved, and therefore could not be assessed in full text (see Appendix 5).

In total, 112 articles were included, 64 of them were relevant for macro area 1 – active case finding. Of the 64 articles, 63 were primary articles and one was a systematic review by Rumble et al. [2]. Eighteen of these articles reported on hepatitis, 24 articles on HIV, 19 on STIs and 13 on TB. Seven of the articles reported on a combination of these communicable diseases. Figure 1 shows a flowchart of the selection process. Please note that the searches were conducted for the three macro areas combined, and therefore no complete macro area-specific flowchart can be given. The vast majority of these studies were conducted in the United States of America (USA), while only fourteen reported findings were from the EU/EEA region.

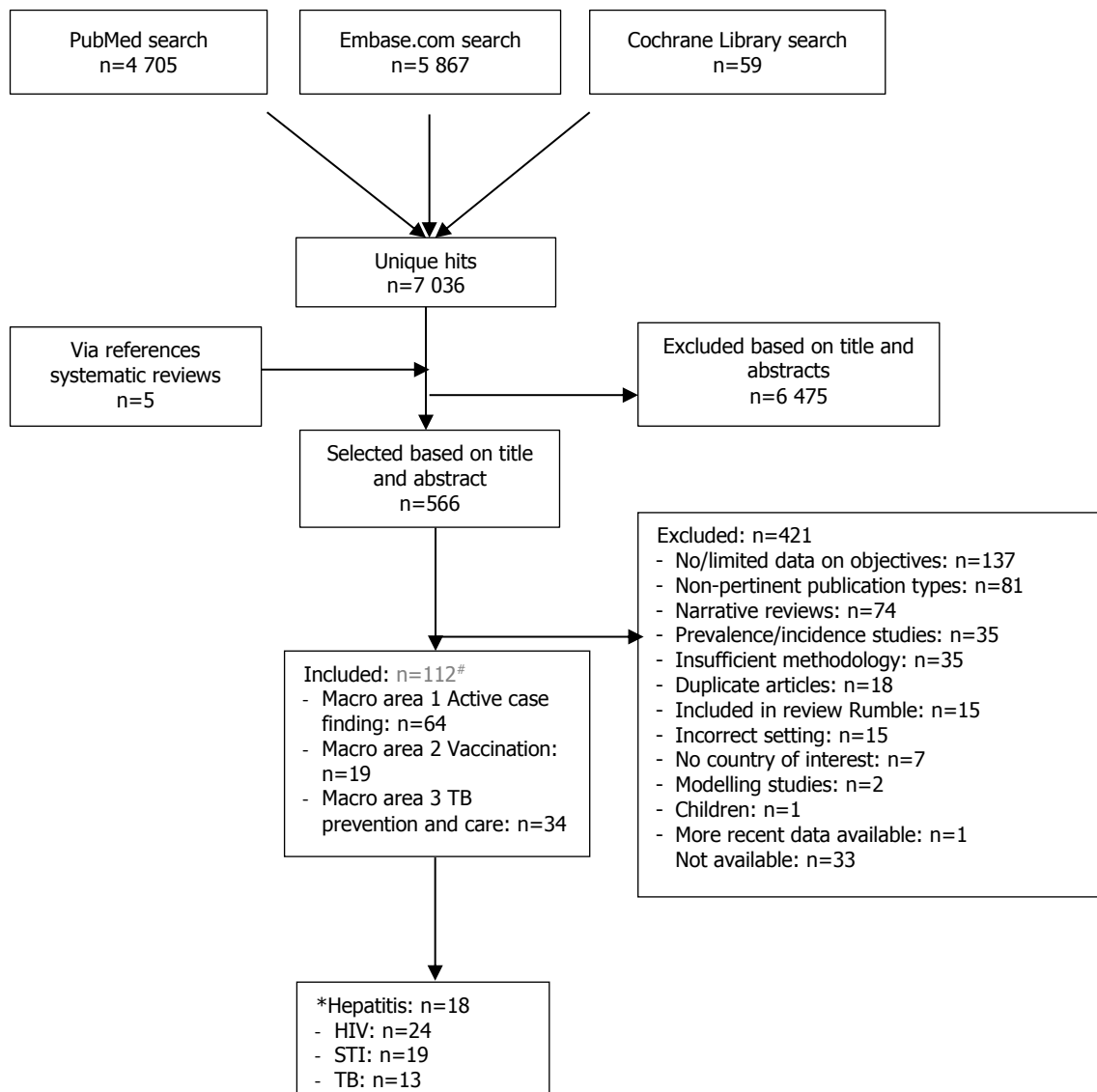
For the grey literature the search was focused solely on the EU/EEA and yielded 22 documents from the pre-defined websites search, and 127 documents from the call for papers.

Based on the title and full-text screening of the retrieved documents, a total of 80 articles were excluded. Reasons for exclusion were:

- outside date range (i.e. not published in the last five years)
- not relevant for the review objectives (mental disorders, addiction management etc.)
- prevalence/incidence studies
- no country of interest
- more recent documents available
- insufficient description of the methodology

The list of articles excluded during this selection step can be found in Appendix 7.

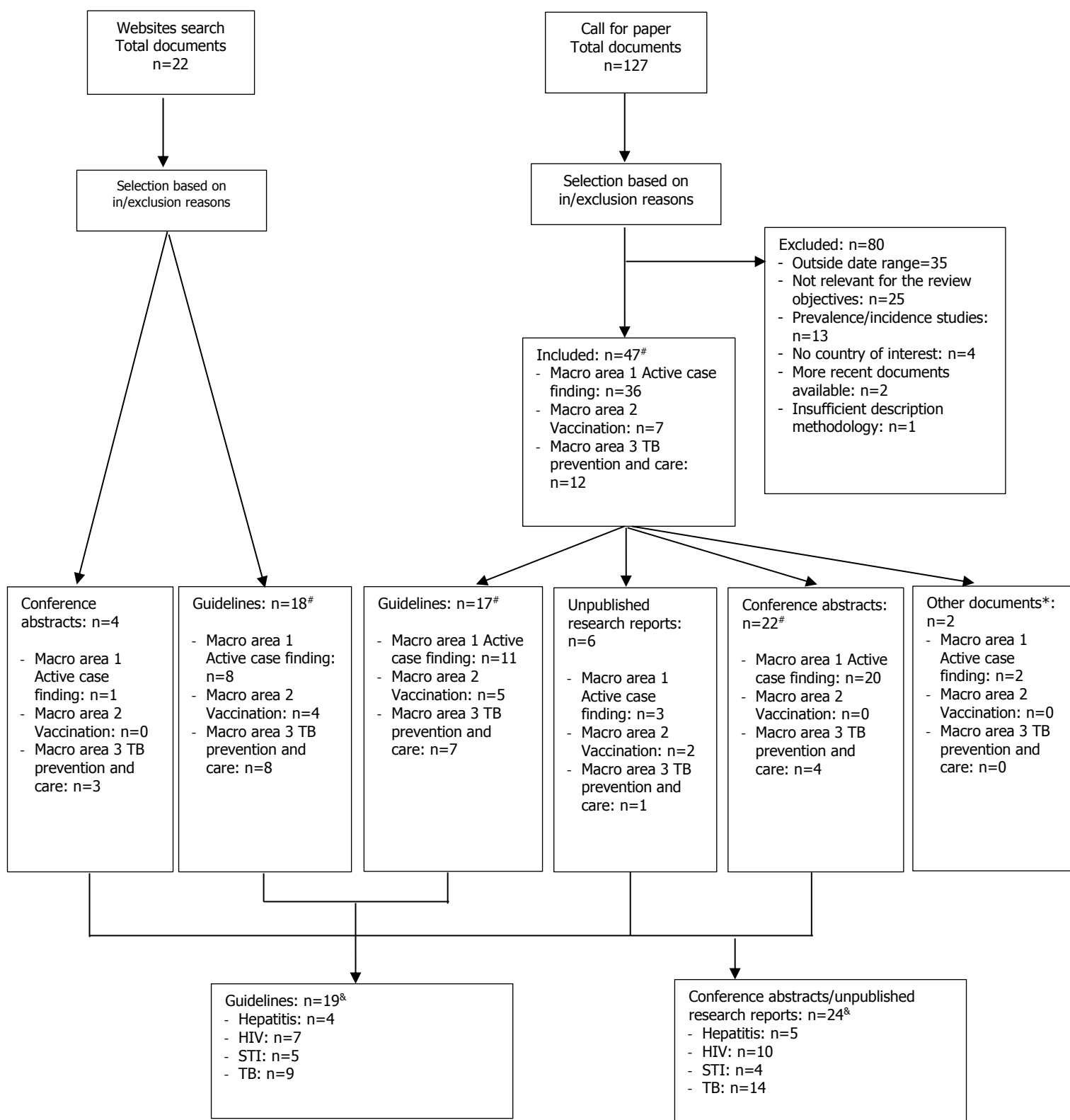
Overall, a total of 69 documents were included based on the pre-defined inclusion criteria, of which 45 were relevant to macro area 1 – active case finding. Of documents relevant to macro area 1, a total of 24 conference abstracts/unpublished research reports, two other documents and 19 guidelines were included. Five of these conference abstracts/unpublished research reports reported on hepatitis, ten on HIV, four on STIs, and 14 on TB. For the guidelines these numbers were four, seven, five and nine, respectively. Several conference abstracts and guidelines reported on active case finding for more than one disease. Figure 2 shows a flowchart of the selection process. Of note, the searches were conducted for the three macro areas combined, and therefore no complete macro area-specific flowchart could be developed.

Figure 1. Flowchart selection process peer-reviewed literature

Five articles contained relevant data for two macro areas

* Seven articles contained relevant data for more than one disease

Figure 2. Flowchart selection process for the grey literature



* Other documents include two scientific papers

Some documents included data on more than one macro area

& Some documents included data on more than one disease

Hepatitis

The results of the peer-reviewed and grey literature searches for hepatitis are presented below. The included studies are summarised to provide key information on study settings, countries, populations and active case finding strategies (type of offer, timing and promotion). To facilitate reading, active case finding offers and timings are underlined. See Appendix 8 for a more detailed summary of relevant information from included peer-reviewed and grey literature to guidelines.

Hepatitis A

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: no studies found.

Non-EU/EEA countries: only one study from the USA was found that reported a 0% positivity rate after mandatory HAV testing 4-6 weeks before scheduled release from a male prison (Sieck 2011 [32], (very low level of evidence)).

No studies were found on cost-effectiveness of hepatitis A testing or describing the acceptability, feasibility and accessibility of testing.

Hepatitis B

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: two peer-reviewed studies were found that reported on the uptake and/or positivity rate of HBV active case finding in an EU/EEA country, none were comparative studies. One study reported on universal opt-in HBV testing at entry into two French prisons (Jacomet 2016 [33], very low level of evidence). The uptake rate was 91.3%, and 0.6% HBV-positive cases were found (50% of those found positive had not been previously diagnosed). In another study from Italy, all individuals were offered opt-in testing during imprisonment after a presentation by peer-educators and receiving pamphlets on the advantages of active case finding (Sagnelli 2012 [34], very low level of evidence). Overall, 65.3% agreed to undergo testing, of which 4.4% were HBV-positive. The uptake was higher than in the nine correctional facilities evaluated in this study before peer-education (65.3% versus 10.0%, no significance reported). Information on subsequent case management was not reported in these studies.

In the grey literature, the uptake and positivity rate of HBV testing using a universal opt-in strategy was reported in five studies from Italy and Spain. When the offer was made during imprisonment, opt-in testing resulted in an uptake ranging from 56.3% to 83.8%, and a HBV positivity rate of 4.7% to 13.2% [35-37]. Opt-in testing at entry resulted in an uptake rate of up to >95%, reported in an unpublished research report [38], over a period of six years (2009-2014), with a positivity rate decreasing from 16.5% in 2009 to 8.1% in 2014. A conference abstract reported an uptake of 91.5% at entry, and a positivity rate of 6.6% [39]. Babudieri *et al*/reported an increase in testing uptake rates from 10.0% to 42.9% during imprisonment in a sample of 20 Italian prisons, after testing-promotion based on peer educators, leaflets, posters and staff training [35].

Non-EU/EEA countries: one study from the USA reported a 0.5% positivity rate after mandatory HBV testing 4-6 weeks before scheduled release from a male prison (Sieck 2011 [32], very low level of evidence). One Australian study from the systematic review of Rumble *et al.*, 2015 [2] (very low level of evidence) reported the positivity rate after universal opt-in testing at entry: 4.5% of tested inmates were HBV-positive. Information on subsequent case management was not reported in these studies.

No studies found on cost effectiveness of hepatitis B testing.

Acceptability, feasibility and accessibility

EU/EEA countries: the French study referred to above reported that sudden release from prison was the cause for 2.5% of all inmates not getting tested (Jacomet 2016 [33], very low level of evidence). An additional 6% refused the blood test for the following reasons: fear of needles, communication challenges, tiredness of medical concerns sounding like police harassment, and refusal to take part in a clinical research protocol.

Non-EU/EEA countries: no studies found.

Hepatitis C

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: three primary studies and one systematic review (including two relevant studies) were found in the peer-reviewed literature that reported on the uptake and positivity rate of HCV active case finding in prisons in an EU/EEA country.

One study reported on opt-in HCV testing at entry in two French prisons, where posters and personalised information letters were used to promote testing (Jacomet 2016 [33], very low level of evidence). The uptake rate was 89.9%, and 4.7% HCV-positive cases were found (42% of those found positive had not been previously diagnosed). In addition, two UK studies from the systematic review of Rumble, 2015 [2] (very low level of evidence) reported on universal opt-in testing at entry. The uptake rate was 9% and 12% in these studies, the corresponding positivity rates were 29.9% and 12.0%. In a study from Italy, all inmates were offered opt-in testing during imprisonment after a presentation by peer-educators and the distribution of pamphlets on the advantages of active case finding (Sagnelli 2012 [34], very low level of evidence). Overall, 64.6% agreed to undergo testing, of which 22.8% were HCV-positive. Lastly, a study reported an uptake of 63.3% and HCV positivity of 36.8% among 30 inmates of three English prisons (testing offer and timing not reported) (Khaw 2007 [40], very low level of evidence).

Uptake of HCV testing was reported in four grey literature studies from Italy. HCV testing was offered on an opt-in basis to all individuals. In a 2012 conference abstract by Babudieri et al., the uptake rate during imprisonment in a sample of twenty Italian prisons was 56.3% with a positivity rate of 32.8% [35], whereas in a more recent abstract (2015) by the same author the uptake rate during imprisonment was 83.8% with a positivity of 17.6% in four prisons [36]. Foschi et al. reported an uptake rate of 91.5% and a positivity rate of 9.8% at entry in a single prison in Milan [39]. Finally, Gabbuti et al. reported an increasing uptake rate at entry from 2010 (23.7%) to 2013 (82.3%) (no explanation reported), with a reduction in positivity rates from 71.1% to 28.2% over the same period of time [41].

Interventions to improve HCV case finding effectiveness in prison settings were investigated in two UK studies and one Italian study. One of the UK studies compared universal HCV testing at entry (testing offer not reported) using dried blood spot testing (DBST) (intervention) with testing using venepuncture (control; standard practice) (Craine 2015 [42], low level of evidence). After 18 months, higher HCV testing rates were found during intervention months. However, there was insufficient evidence of an effect of the intervention on testing rate (not significant). Another study from the UK compared an intervention of staff training on pre- and post-test counselling and HCV testing using DBST (testing offer and timing not reported) with the control of regular practice (client-initiated testing) in six prisons throughout England and Wales (Hickman 2008 [43], moderate level of evidence). The mean proportion of inmates tested for HCV after six months increased by 10-50% (significance not reported). The Italian study described above reported on the effectiveness of a peer-led opt-in active case finding programme during imprisonment; the uptake was higher than in the nine correctional facilities evaluated in this study before peer-education (64.6% versus 20.5%, no significance reported) (Sagnelli 2012 [34], very low level of evidence). Another Italian study from the grey literature reported an increase in testing uptake rates from 20.5% to 42.0% after testing promotion based on peer educators, leaflets, posters and staff training [35].

Non-EU/EEA countries: five primary studies and one systematic review (including one relevant study) were found that reported on the uptake of and positivity rate after HCV active case finding.

One study from the USA reported a 1.7% positivity rate after mandatory HCV testing 4-6 weeks before scheduled release from a male prison (Sieck 2011 [32], very low level of evidence). One primary study and one systematic review (including one relevant study) reported on the uptake and/or positivity rate of opt-in HCV active case finding at entry in correctional facilities. In one USA study, inmates entering a correctional institute underwent a risk assessment using a dynamic virologic model at entry, after which only high-risk inmates were tested (opt-in); staff received an educational seminar on benefits of identifying acute HCV. (Kim 2013 [44], very low level of evidence). The uptake rate was 80.7% among high-risk inmates, of which 25.4% were HCV-positive. One Australian study from the systematic review of Rumble, 2015 [2] (very low level of evidence) reported the positivity rate after opt-in testing at entry: 24.8% of tested inmates were HCV-positive.

In an additional USA study, inmates were offered opt-in testing during imprisonment using a rapid HCV test after watching an eight-minute informational video (Beckwith 2015 [45], very low level of evidence). Of those, 26% agreed to undergo rapid HCV testing, leading to 10% of inmates with a positive reactive HCV test and 6% with confirmed hepatitis C. Of these, 26.7% were linked to care after release. In another USA study, inmates were offered opt-in testing at entry after a mandatory education session as well as during imprisonment during regular 'sick calls' (Cocoros 2014 [46], very low level of evidence). The uptake rate among inmates was 21.9%, and 20.5% of inmates tested were found to be HCV-positive (both timings combined). In another study from the USA, HCV testing was offered to high-risk inmates, who were identified during medical examination at entry based on HIV infection or self-reported injecting drug use (Kuncio 2015 [47], very low level of evidence).

The uptake rate was not reported, 57% of high-risk inmates were HCV-positive. The same study investigated the effectiveness in detecting HCV cases compared with a blinded serosurvey of blood remaining from mandatory syphilis screening among all entrants during an 8-day period. Risk-based active case finding failed to capture 76% of the predicted HCV positive inmates incarcerated during 2011-2012.

Interventions to improve HCV case finding effectiveness in prison settings were investigated in one USA study. Opt-in HCV testing of high-risk inmates at entry was compared with the historical control period when client-initiated testing was performed (Kim 2013 [44], very low level of evidence). During risk-based active case finding, 1.94 cases/month were identified, compared to 0.7 cases/month during the historical control period (significance not reported). Acute cases identified through risk-based active case finding were twice as likely to be asymptomatic compared with the historical control period (RR 2.0; $p=0.09$).

Cost-effectiveness

Four cost-effectiveness studies investigated HCV testing in correctional facilities in the UK from a healthcare provider perspective. Two similar studies compared opt-in HCV testing versus client-initiated testing producing different conclusions. According to Castelnuovo *et al.*, HCV opt-in active case-finding at entry for people who inject drugs (PWID) is likely to be cost-effective compared to client-initiated testing. The likelihood of being cost-effective increased if individuals were offered a lecture on injecting-drug use associated risks versus a scenario in which a general lecture on BBVs was provided before the test (Castelnuovo 2006 [48], moderate level of evidence). Sutton *et al.* reported that HCV opt-in active case finding at entry after a lecture for current/former injecting drug users is probably not cost-effective compared to client-initiated testing (Sutton 2008 [49], moderate level of evidence). A UK study showed that opt-in HCV case finding among inmates who inject drugs using dry blood spot (timing not reported) is likely not cost-effective compared to venepuncture (UK, Martin 2013 [50], moderate level of evidence). Another UK study compared no active case finding, with four opt-in HCV active case finding scenarios at entry after a health awareness lecture:

- verbally screening for past positive HCV test and ever having injected illicit drugs
- verbally screening for past positive HCV test only
- verbally screening for ever having injected illicit drugs only
- no verbal screening (lecture only).

The incremental cost-effectiveness analysis revealed that verbally screening for past positive HCV test and ever having injected illicit drugs prior to opt-in HCV testing at entry is the most cost-effective option (UK, Sutton 2006 [51], low level of evidence). A study conducted in the USA found that universal opt-out active case finding for HCV of all currently incarcerated inmates (one time) and those at entry is likely to be highly cost-effective compared with risk-based testing (USA, He 2016 [52], moderate level of evidence).

Acceptability, feasibility and accessibility

EU/EEA countries: one study reported on opt-in HCV testing at entry in two French prisons (Jacomet 2016 [33], very low level of evidence). Sudden release from prison resulted in 2.5% of all inmates not getting tested. An additional 6% refused the blood test due to fear of needles, communication challenges, tiredness of medical concerns sounding like police harassment, and refusal to take part in a clinical research protocol. One UK study reported on the existence of institutional barriers for HCV testing (offer and timing not reported), such as: barriers related to application to request a test, inadequate pre- and post-test discussion, inappropriate times of testing opportunities, and lack of continuity of care in the event of discharge or transfer from prison. Personal barriers were also identified such as: lack of knowledge (transmission, risks) and fear of disease, lack of awareness about testing procedures, disease prognosis, treatment and outcome, and concern about confidentiality and stigma. Individual motivation was identified as facilitator for uptake of testing. (Khaw 2007 [40], very low level of evidence).

Non-EU/EEA countries: according to Kim *et al.*, providers' barriers to risk-based opt-in HCV testing implementation at entry were understaffing, provider turnover and unavailable forms during medical intake (Kim 2013 [44], very low level of evidence). In a USA survey study, 153 inmates were asked if they were willing to be tested for HCV (offer and timing not reported) (Vallabhaneni 2006 [53], very low level of evidence). Reasons for refusal ($n=10$ inmates) were: knowing not to be at risk ($n=3$), knowing to be HCV positive ($n=2$), already tested with negative result ($n=2$), no trust in the government ($n=2$), and not wanting to know disease status ($n=1$). In another USA study, 59% of inmates declined participation in a study on HCV testing during imprisonment because of already being HCV positive (24%), logistical reasons (e.g. inmates were off-site at court appearances, 15%), and being non-English speaking (2%) (Beckwith 2015 [45], very low level of evidence). In the last US study, incarcerated adult women were asked about HCV testing history and willingness to be offered a test. The large majority (70%) had been tested already at least once; among those not tested, or tested negative, 45% wanted to be tested for HCV (Nijhawan 2010 [54], very low level of evidence).

Guidelines hepatitis

Three practice-based guidelines [7,55,56] and one evidence-based guideline [57] were included that reported on hepatitis B and C active case finding, all were specific to the prison setting (one supranational guideline and three national guidelines). No guidelines were found on hepatitis A active case finding in correctional facilities. In short, these guidelines formulated the following recommendations of interest:

Table 2. Summary of guidelines on hepatitis active case finding

Guideline	Hepatitis B	Hepatitis C
Specific to prison setting – supranational guidelines		
WHO, 2014 [7]	The assessment of newly diagnosed HIV cases should include testing for hepatitis B and C. It should be accompanied by pre- and post-counselling for both positive and negative test results. Testing for hepatitis cannot be mandatory.	
	Hepatitis B surface antigen testing is the primary tool for screening and diagnosis. A second test a few weeks later is needed to confirm a first positive test.	The diagnosis of HCV infection is based on detection of anti-HCV antibodies by enzyme immunoassay. A positive test must be confirmed with an HCV RNA qualitative assay or, ideally, with a real-time polymerase chain reaction assay
Specific to prison setting – national guidelines		
Public Health England, 2014 [56]	Opt-out testing for blood-borne viruses (BBVs) was identified as a joint developmental priority. Recommend all eligible patients a test for hepatitis B and hepatitis C (HCV antibody, HBsAg and HIV Ab and Ag P24 test) within 72 hours of arrival using dried blood spot testing or venous sampling. People in prison who refuse a test should be re-offered throughout their stay at regular intervals	
National AIDS Trust, 2011 [55]	For those with custody period less than one week only information about BBV transmission and healthcare services should be provided, whereas for those staying more than one week BBV testing should be offered	
NICE, 2016 [57]	Prison healthcare services should ensure that all people in prison are offered access to confidential testing for hepatitis B and C when entering prison and during their detention. People in prison who test for hepatitis B or C receive the results of the test, regardless of their location when the test results become available. Results from hepatitis B and C testing are provided to the patient's community-based general practitioner, if consent is given	

HIV

Results of the peer-reviewed and grey literature searches for HIV are presented below. The included studies are summarised to provide key information on study settings, countries, populations and active case finding strategies (type of offer, timing and promotion). To facilitate reading, active case finding offers and timings are underlined>. See Appendix 9 for a more detailed summary of relevant information from included peer-reviewed and grey literature, and guidelines.

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: three studies were found that reported on the *uptake and positivity rate* of HIV active case finding in an EU/EEA country.

One study reported on HIV testing at entry and at release in two French prisons, where posters and personalised information letters were used to promote testing (Jacomet 2016 [33], very low level of evidence). The uptake rate was 91.3% at entry and was 4.2% at release. At entry, 0.3% HIV-positive cases were found (no newly diagnosed cases), and none during testing at release. Another study was conducted in all four prisons in Estonia, and investigated testing at entry, and at once a year or more during imprisonment for those testing negative at entry (Kivimets 2014 [58], very low level of evidence). The uptake rates at entry and during imprisonment were 97.3% and 96%, respectively. The positivity rate was 12.5% at entry (1.8% of all tested were newly diagnosed with HIV); in total, including testing during imprisonment, where the positivity rate was 11.8%. In a study from Italy, inmates were offered testing during imprisonment after a presentation by peer-educators and distribution of pamphlets on the advantages of active case finding (Sagnelli 2012 [34], very low level of evidence). Overall, 67.4% agreed to undergo testing, of which 3.8% were HIV-positive.

The uptake and positivity rate of HIV testing were reported in five conference abstracts, four from Italy [35,36,39,59], and one from Spain [60]. One study from 2008 reported an uptake rate of 63.5% and a positivity rate of 10.8% at entry and during stay in 28 European prisons (Germany, Italy, Scotland and Spain, test offer not reported) [59]. Babudieri et al. performed a study in 2012 in twenty Italian prisons (test offer opt-in) and reported an uptake rate of 56.3% and a positivity rate of 5.6% at entry and during stay [35], whereas the study from 2015 published by the same author in four Italian prisons showed an uptake rate of 83.8% and a positivity rate of 3.9% using the same testing strategy [36]. Foschi et al. showed an uptake rate of 91.5% and a positivity rate of 3.2% after opt-in testing at entry in a single prison in Milan [39]. Gallego et al. reported an uptake rate of 82.5% and a positivity rate of 9.9% in a study conducted in a prison in Catalonia (test offer and timing not reported) [60].

Positivity rates were reported in four other conference abstracts, two from Spain [61,62] and two from Italy [63,64]. Marco et al. reported a positivity rate of 0.97% after opt-in testing at entry and during stay in two prisons in Barcelona [62], and Lugo et al. (test offer not reported, at entry and during stay) a positivity rate of 10.9% in three penitentiary institutions in Catalonia [61]. Monarca et al. and Prestileo et al. reported a positivity rate after opt-in testing of 26.6% and 20.8% in an Italian prison sample (timing not reported) and in three western Sicily prisons (at entry and during stay), respectively [63,64].

Interventions to improve the effectiveness of active case finding initiatives were reported by two Italian studies. The testing uptake was higher following the introduction of a peer-led opt in active case finding programme compared with the baseline in the nine correctional facilities evaluated in this study (67.4% versus 14.1%, no significance reported) (Sagnelli 2012 [34], very low level of evidence). One conference abstract reported an increase in testing rates following the introduction of peer-educators and infectious disease specialist-led counselling from 14.1% to 56.3% (no significance reported) [35].

Finally, three conference abstracts reported the antiretroviral therapy initiation rate after HIV diagnosis in prison. One study from 2006 reported a rate of 35.2% in one prison in Italy [64]. In a study from 2008 conducted in 28 prisons across Italy, Germany, Scotland, Spain and Ukraine treatment initiation rate was 59.1% [59]. A Spanish study reported a treatment initiation rate of 78% in 2010 [60].

Non EU/EEA countries: in total, thirteen primary studies and one systematic review (including eleven relevant studies) investigating HIV active case finding were included.

The uptake and positivity rate results are summarised per active case finding strategy:

1. mandatory,
2. opt-in at entry,
3. opt-in at entry and during imprisonment,
4. opt-in at release,
5. opt-out at entry.

1) One study from the USA reported a 0.1% positivity rate after mandatory HIV testing 4-6 weeks before scheduled release from a male prison (Sieck 2011 [32], very low level of evidence).

2) Six primary studies and a systematic review (including eight relevant studies) reported on the uptake and positivity rate of opt-in testing at entry in the correctional facility. Overall, the uptake rate ranged from 6% to 73%, the HIV positivity rate from 0% to 5.4%, and 0.1% to 1.3% of new HIV cases were identified. The uptake rate of the rapid HIV test at entry was 38.4% among adult new entrants not known as/previously diagnosed as HIV positive or mentally incompetent in a USA jail (Spaulding 2015 [65], very low level of evidence) with a positivity rate and rate of new diagnoses of 1.1% and 0.3%, respectively. In another study among new entrants of jails in four US states (MacGowan 2009 [66], very low level of evidence) the uptake and positivity rate were 6% and 1.3%, with a rate of new diagnoses of 1.8%. Active referral for positive testers was in place and 99.9% of inmates tested received their test result. Another study also conducted in four USA states in jails did not report the uptake rate of the rapid HIV test, but reported a positivity rate ranging from 0.3% to 2.4% and a rate of new confirmed HIV cases ranging from 0.2% to 1.3% (Shrestha 2009 [67], very low level of evidence). Rosen et al. reported an uptake rate of 34% at entry in eight prisons in the USA after inmates received a presentation on BBVs, however the positivity rate was not reported (Rosen 2009 [68], very low level of evidence). Kassira et al. found an uptake rate of 39% and a positivity rate of 3.3% in 28 correctional facilities in one USA state (Kassira 2001 [69], very low level of evidence). In another study, new entrants to one USA county jail had to consent at entry to rapid fingerprick testing, but were mostly tested 1-3 days later (Tartaro 2013 [70], very low level of evidence). Consent was given by 50% of entrants, of which 56% were actually tested. In total, 0.3% HIV positive inmates were identified, 0.1% were newly diagnosed HIV cases. In total eight USA studies from the systematic review of Rumble, 2015 [2] (very low level of evidence) reported the uptake and/or positivity rate of opt-in testing at entry. The uptake rate ranged from 40% to 73% in these studies, the case identification rates ranged from 0% to 5.4%. Two of these studies reported the percentage of inmates that received their test results. This was 100% for all inmates in one study, and 100% for HIV-positive inmates and not reported for HIV-negative inmates in the other study.

3) One USA study offered opt-in testing at entry as well as during imprisonment during regular 'sick calls' and inmates followed a mandatory HIV education session before choosing to be tested (Cocoros 2014 [46], very low level of evidence). The uptake rate among inmates was 24.6%, and 0.8% of inmates tested were found to be HIV-positive. Another study reported a positivity rate of 17% (7% newly diagnosed cases) in three jails, of which two jails offered testing also during imprisonment (Arriola 2001 [71], very low level of evidence).

4) A further study from the US reported on opt-in testing at release from one jail facility using a rapid HIV test (Simonsen 2015 [72], very low level of evidence). The uptake rate was 60% and 0.3% were found to be HIV-positive. Educational materials were handed out, and positive testers were actively referred to community-based care. All inmates received their test result and all positive ones initiated treatment.

5) In total seven US studies from the systematic review of Rumble, 2015 [2] (very low level of evidence) reported the uptake and/or positivity rate of opt-out testing at entry. The uptake rate ranged from 22% to 91% in these studies. In two of these studies the overall positivity rate was reported, this was 0% in one study and ranged from 0.6% to 2.0% in the other study. The new case identification rates ranged from 0.1% to 0.8%. Four of these studies reported on the percentage of HIV-positive inmates receiving their test results; this was 100% in all studies. This percentage was 0% and 99% for HIV-negative inmates in two of these studies; the other two studies did not report this percentage for HIV-negative inmates.

Although several studies performed within-study comparisons to measure the effectiveness of active case finding interventions, only two reported on associated measures of significance (see below). One primary study and three studies from the review of Rumble, 2015 [2] estimated the total number of HIV infections through anonymous serosurvey and compared them to those obtained through opt-in testing at entry (no significance given). In the first study from the US, 28.1% of the HIV infected inmates were not diagnosed before based on a HIV/AIDS reporting system (Begier 2010 [73], very low level of evidence). Of these, only 11.5% were effectively diagnosed by jail HIV testing at entry (offer not reported), the remainder did not choose to be tested. The authors estimated that 820 persons (95% CI 619–1 021) may be entering the New York City jail system each year with a previously undiagnosed HIV infection. Of these, 743 (95% CI 552–934) would potentially remain undiagnosed if testing conditions remain unchanged. In one study included by Rumble et al. [2], routine testing, with a reported uptake rate of 47% failed to detect 56% of the HIV cases identified through a serosurvey study reaching 91.5% of the inmates. In two similar studies, 50% and 28% of the HIV positive cases went undetected with an uptake rate of routine testing of 65% and 55% respectively. However these studies were all conducted before 2000.

An additional three other studies from the review of Rumble, 2015 [2] (very low level of evidence) reported on the change in uptake rates with different testing approaches (no significance reported). One compared the implementation of opt-in testing at entry with a historical period when testing was on request, and test uptake increased from 18 to 73%. In the second study, there was an increase from 43% uptake during opt-in testing at entry to 64% under opt-out at entry, while in the third study an increase from 5% (testing on request) to 72% (opt-in at entry) to 90% uptake (opt-out at entry) was reported.

Three US studies reported on the implementation of different testing promotion initiatives. In the study by Pearson et al., no significant difference in the uptake rate was found between correctional facilities using the Network for the Improvement of Addiction Treatment (NIATx) model to improve HIV testing compared to control facilities (Pearson 2014 [74], moderate level of evidence). The second study compared a peer-education program (Project Wall Talk) to improve HIV testing in five correctional facility units with five matched non-participating units (Ross 2006 [75], low level of evidence). At 12 months and 18 months, follow-up on the uptake rate was significantly higher in the participating units compared to the non-participating units. In another study the number of inmates tested using opt-in at entry and during imprisonment rose compared to the baseline following the introduction of education activities (numbers or significance not given) (Arriola 2001 [71], very low level of evidence).

Finally one US study compared the impact of different testing methods in ten local detention and juvenile justice facilities in one state. Compared to the historical period when only blood specimens were used, a 63% increase in testing uptake was observed (no significance reported) after the introduction of testing using blood or oral specimens (Bauserman 2001 [76], very low level of evidence).

Two additional studies were included in this review. One of which was a study from the US, which summarised data from HIV counselling and testing sites in prison settings from 1992 to 1998 (Sabin 2001 [77], very low level of evidence). The type of test offered was not specified other than that it was voluntary, therefore it was assumed that this could include both provider-initiated (opt-in or opt-out) and client-/clinician-initiated testing. The number of HIV tests increased by 194% from 1992 to 1998. In total, 3.4% of tests were HIV-positive and 1.9% were newly identified HIV-positive. The percentage of all tests that were HIV-positive decreased nearly 50% from 1992 to 1998. Another study from the US assessed Centers for Disease Control and Prevention (CDC)-funded HIV testing policies and outcomes among adult inmates (Seth 2015 [78], very low level of evidence). Although in the introduction of this article it is stated that CDC recommends opt-out testing, this is not specifically reported for the CDC-funded correctional facilities included in this study (offer and timing not reported).

The number of HIV testing events increased from 2009 to 2012 and decreased slightly in 2013, resulting in an estimated annual percent change of +2.7%. In the same period, the estimated annual percent change for total HIV-positive cases diagnosed was 4.4%. The percentage of HIV-positive inmates linked to medical care significantly increased by 27 over the period.

Cost-effectiveness

Four studies examined the cost-effectiveness of HIV active case finding in correctional facilities in the US (Resch 2005 [79]; Varghese 2001 [80]; Spaulding 2015 [65] and Shrestha 2009 [67]). The first study found that mandatory newborn active case finding directly after birth is cost-saving, and this scenario combined with opt-out prenatal active case finding among pregnant inmates is cost-effective compared to other scenarios (opt-in prenatal, mandatory new-born + opt-in prenatal, opt-out prenatal) (USA, Resch 2005 [79], moderate level of evidence). According to another study, offering counselling and testing at or near time of prison release (offer not reported), from a societal perspective, may prevent up to four new HIV cases and be cost-saving compared with not offering counselling and HIV testing (USA, Varghese 2001 [80], low level of evidence). Two cross-sectional studies estimated the cost per new HIV diagnosis of opt-in HIV testing offered at entry in prison. In one study (Spaulding 2015 [65], very low level of evidence), HIV testing including pre- and post-test counselling resulted in an average cost per newly diagnosed HIV infection of 6 688 USD, while this was estimated to be 2 451 USD–5 288 USD in the other study (counselling included, but not further specified; Shrestha 2009 [67], very low level of evidence). While a rapid HIV test followed by Western blot confirmatory testing was used in the first study, rapid HIV test only was used in the latter.

Acceptability, feasibility and accessibility

EU/EEA countries: one study reported on opt-in hepatitis and HIV testing at entry in two French prisons (Jacomet 2016 [33], very low level of evidence). Sudden release from prison resulted in 2.5% of all inmates not getting tested at entry, while 6% refused (see previous section for more details).

Non EU/EEA countries: In three US studies, the acceptability of an opt-in policy at entry was described (Spaulding 2015 [65], Tartaro 2013 [70], Burchell 2003[81], all very low level of evidence). In the study by Spaulding et al., 21% declined the test, while 41% were not offered testing. In the study by Tartaro et al., in which USA inmates had to consent at entry but were tested 1–3 days later, approximately 37% of inmates initially consenting were released from jail before testing and 4.4% of inmates declined the test after initially consenting. Reasons for declining HIV testing were fear of consequences, being discouraged by other inmates, belief that too much blood had been already taken, or that the test/testing facility was inconvenient, were watching a favourite television show/sleeping. In a Canadian survey study by Burchell et al., the main reasons for never been tested were no perceived risk (70%), being careful (63%), never thought about HIV testing (60%), and feeling healthy (46%). Among those inmates that were tested outside prison, but did not want to be tested inside prison, additional reasons were concern about confidentiality (24%), fear of other inmates' reaction (18%) and prison is hard enough (18%). Reasons for getting tested while incarcerated in the past year were: wanting to know their status (28%), sexual risk behaviour (17%), injecting drug use (16%), follow-up test (12%), accident/fight (8%), being a regular tester (7%), medical check-up (5%), and illness (4%).

In the only study that reported on opt-in testing at release, the major reasons for non-participation were recently tested (60%), already known status (6%), do not wish to know (7%), and fear for potential delay of jail exit proceedings (17%) (Simonsen 2015 [72], very low level of evidence, USA).

One survey study from the US investigated inmates' understanding of the HIV testing opt-out policy shortly after entry in a state prison system (Grodensky 2016 [82], very low level of evidence). In about half of the prison system facilities, inmates attended an HIV education class, but sometimes this did not occur until after they had been offered HIV testing. In the same study, 56.5% inaccurately reported that HIV testing in prison was mandatory, while 11.8% perceived they had not been tested, and 10.8% of inmates reported that they had not wanted an HIV test.

In total, five US studies from the systematic review of Rumble, 2015 [2] (very low level of evidence) reported common reasons for declining a HIV test (studies on opt-in and opt-out testing combined, all at entry): having had a recent test and not perceiving themselves to be at risk were the most frequent ones. Additional reasons included fear of a positive result; dislike of venepuncture/fear of testing; concern over confidentiality; not being comfortable with the tester or the test environment, in addition to fear of negative consequences such as being isolated if HIV-positive.

Finally, in a USA study by Bauserman et al. (very low level of evidence), the majority of inmates agreed that the availability of the oral test increased their willingness to be tested [76].

Grey literature: guidelines

Four evidence-based guidelines [57,83-85] and three practice-based guidelines [7,55,56] were included that reported on HIV active case finding. Five were specific to the prison setting (two supranational guidelines and three national guidelines), and two were other guidelines (both supranational). In short, these guidelines formulated the following recommendations which are of interest for this project:

Table 3. Summary of guidelines on HIV active case finding

Guideline	
Specific to prison setting – supranational guidelines	
WHO, 2014 [7]	Healthcare providers should offer confidential HIV testing and counselling to all detainees during medical examinations, especially when people in prison ask for it and if the previous test was more than 12 months earlier. The test should be recommended to all people in prison with symptom markers of HIV infection, those with TB, and female people in prison who are pregnant
UNODC, 2009 [83]	WHO and the United Nations Office on Drugs and Crime (UNODC) do not support mandatory or compulsory HIV testing of people in prison. Prison systems should ensure that all people in prison have easy access to client-initiated testing and counselling programmes on request and at any time during their imprisonment. People in prison should be informed about the availability of the service, both at the time of their admission and regularly thereafter. In order to ensure that people in prison can give informed consent, prison systems should adopt policies according to which people in prison will be offered or recommended HIV testing and counselling, but will not be tested unless they specifically state that they want the test. Prison systems should ensure that personnel performing HIV testing and counselling receive training, particularly on obtaining informed consent, confidentiality, counselling and how to offer or recommend the test
Specific to prison setting – national guidelines	
NICE, 2016 [57]	Primary care providers should ensure annual HIV testing is part of the integrated healthcare offered to men who are known to have sex with men. Information on HIV testing should be provided and why it is recommended should be discussed (including to those who indicate that they may wish to decline the test). Post-test discussions should be conducted, including giving positive test results and delivering post-test and general health promotion interventions
Public Health England, 2014 [56]	Opt-out testing for blood-borne viruses was identified as a joint developmental priority. Recommend all eligible patients a test for HIV within 72 hours of arrival using DBST or venous sampling. People in prison who refuse a test should be re-offered throughout their stay at regular intervals
National AIDS Trust, 2011 [55]	For those with custody period less than one week only information about BBV transmission and healthcare services should be provided whereas for those staying more than one week BBV testing should be offered
Other guidelines – supranational guidelines	
WHO, 2015 [85]	Offering voluntary HIV testing as part of a package of care is a critical approach, rapid diagnostic tests may have the most benefit. Accurate information should be provided, informed consent obtained and confidentiality maintained. Retesting at least annually is recommended for all people from key populations. More frequent voluntary retesting may be beneficial, depending on risk behaviours
WHO, 2014 [84]	HIV testing services should be routinely offered to all key populations in the community, in closed settings such as prisons and in facility-based settings

Sexually transmitted infections

Results of the peer-reviewed and grey literature searches for STIs are presented below. The included studies are summarised to provide key information on study settings, countries, populations and active case finding strategies (type of offer, timing and promotion). To facilitate reading, active case finding offers and timings are underlined>. See Appendix 10 for a more detailed summary of relevant information from included peer-reviewed and grey literature, and guidelines.

Chlamydia and gonorrhoea

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: Two conference abstracts from Spain were retrieved. The first one reported an uptake rate of 98.4% (test offer not reported) and a positivity rate of 6% for chlamydia and 0.2% for gonorrhoea among 425 young (<25 years of age) inmates during imprisonment in a single prison in Barcelona [86]. A more recent study (test offer not reported) reported a positivity rate of 11% for chlamydia in 430 young (age not specified) detainees during imprisonment in three prisons in Barcelona [87].

Non-EU/EEA countries: In total, ten studies were included investigating chlamydia and gonorrhoea active case finding.

Three studies reported the uptake rate and positivity rate of opt-in active case finding at entry. In one study all inmates agreed to undergo testing with a nucleic acid amplification technology (NAAT) combination assay within 24 hours of admission, which resulted in 6.4% chlamydia cases and 0.9% gonorrhoea cases being diagnosed. Of those positive, 63% initiated treatment while in the detention (Franklin 2012 [88], very low level of evidence). In another study, the uptake rate of testing varied from 85.1% in a county jail offering testing within 8 hours of admission to 100% in a detention centre that offered testing at a median 11 days after admission (Mertz 2002 [89], very low level of evidence). No positivity rate was provided, but treatment initiation varied from 61% to 85%. In an additional study in which disease education and post-test counselling took place and the testing methods were not stated, a positivity rate for chlamydia and gonorrhoea of 6.5% and 3.1%, respectively, were found (Arriola 2001 [71], very low level of evidence). Treatment was initiated in 79% of chlamydia cases and 66% of gonorrhoea cases.

Two other studies reported on opt-in active case finding during imprisonment. In one study all inmates were offered testing using a polymerase chain reaction (PCR) and DNA probe protocol using urine samples after education on STIs, and positivity rates of 5.3% for chlamydia and 0.8% for gonorrhoea were found (Brown 2014 [90], low level of evidence) (no uptake rate reported).

One study from the USA reported the positivity rate of opt-in testing 4–6 weeks before scheduled release from a male prison (Sieck 2011 [32], very low level of evidence), 37.6% of inmates agreeing to undergo the genital swab test with 0.6% of them found to have chlamydia and none gonorrhoea.

Finally, in one study, chlamydia and gonorrhoea testing was offered at entry using an opt-out method (Cole 2014 [91], low level of evidence). The overall uptake rate was 78.1%, with 28.3% opting out in the first year of the programme and 16.8% in the second year. In total, the case detection rate was 2.5% for gonorrhoea and 7.6% for chlamydia, and 69.5% initiated treatment.

The effectiveness of chlamydia/gonorrhoea active case finding compared to client-initiated testing was investigated in three studies from the US. Statistical comparisons were not performed in any of these studies. One study that compared opt-in active case finding at entry with client-initiated screening (both using the NAAT combination assay), found a substantial decrease in chlamydia and gonorrhoea cases when changing from opt-in to client-initiated screening, especially among males (Broad 2009 [92], very low level of evidence). One US study that compared opt-out active case finding at entry with client-initiated screening (both using the NAAT combination assay) reported higher average test rates per month (455 versus 155) and STI diagnoses per month (40.8 versus 9.3) using active case-finding (Cole 2014 [91], low level of evidence). An additional study compared an active case finding program offered to males aged ≤ 35 years within 72 hours of admission using a dual NAAT assay (testing offer not reported) with client-initiated screening for all male inmates (testing method not specified) (Pathela 2009 [93], very low level of evidence). In jails, the detection of chlamydia and gonorrhoea increased by 1 636% and 885% after active case finding, respectively. One additional study compared the positivity rate of opt-in active case finding during imprisonment after STI education with opt-out active case finding at entry without education (Shaikh 2015 [94], low level of evidence). The positivity rate of chlamydia was significantly different when using opt-in (5.6%) compared to opt-out (9.7%), but no significant difference was found regarding gonorrhoea (0.9% versus 1.3%, respectively). In both instances a DNA amplification probe protocol using urine specimens was applied. The uptake rate was not reported.

Cost-effectiveness

Three cost-effectiveness studies were included, and all studies were conducted in the US (Gift 2006 [95], Gopalappa 2013 [96], Kraut-Becher 2004 [97]). One study showed that an age-based active case finding programme for chlamydia and gonorrhoea at intake for men restricted to those < 30 years of age is nearly as effective as universal active case finding and is substantially less costly, from both the healthcare and the prison perspective (USA, Gift 2006 [95], low level of evidence). Another study found that active case finding for chlamydia and gonorrhoea among male inmates ≤ 35 years on days 2 or 3 of entry to jail has the least cost per infection averted compared with symptom-based testing, from both the healthcare and the prison perspective (USA, Gopalappa 2013 [96], low level of evidence). One study from US found that universal active case finding for chlamydia at entry only is cost-saving at least for female detainees, compared to chlamydia and gonorrhoea combined or no active case finding, from the healthcare perspective (USA, Kraut-Becher 2004 [97], low level of evidence).

Acceptability, feasibility and accessibility

EU/EEA countries: no studies found.

Non-EU/EEA countries: three studies from the US reported on the acceptability of chlamydia and gonorrhoea active case finding in correctional facilities. One study investigated opt-in testing during imprisonment after education on STIs, using a PCR and DNA probe protocol (Brown 2014 [90], low level of evidence). Non-Hispanic and younger inmates were less likely to participate in active case finding. Reasons for choosing not to be screened were: recently tested (45.2%), only one monogamous partner (19.4%), no symptoms (19.4%), not sexually active (4.8%), challenge in collecting urine sample (1.6%), and other reasons (9.7%). The other study was a survey study set up to compare female inmates' preferences for opt-in self-collected vaginal swab specimens, urine collection, or pelvic examination for detection of chlamydia and gonorrhoea (timing not reported) (Newman 2003 [98], very low level of evidence). When the inmates were asked regarding preferences for a test in the future, nearly half of the women said that it made no difference to them, 31% would prefer the swabbing, and 21% would prefer the urine collection. Reasons for preferring vaginal swabs were: easier and cleaner to do (41%), can't always urinate on demand (18%), seems like a better method (16%), urine messy/swab clean (11%), more comfortable (5%), and quicker (4%). Reasons for preferring urine collection were: easier/swab difficult (46%), don't like to insert things in vagina (17%), swab uncomfortable (13%), more 'normal' (8%), afraid of doing swabbing wrong (5%), and seems like a better method (2%). When asked whether they would prefer undergoing a pelvic examination or providing a self-collected vaginal swab in the future, most women reported they would prefer to collect vaginal swab specimens themselves, 23% to have a pelvic examination, and 17% said that it did not matter to them.

In a US survey study reporting on acceptability of STI testing (not stated which STIs), adult women were asked if they were willing to be tested for STIs (Nijhawan 2010 [54], very low level of evidence). Of the inmates surveyed (40% response rate), 39% wanted to be tested for STIs while incarcerated (timing and offer not reported).

Syphilis

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: in one study from Italy, inmates were offered opt-in testing during imprisonment after a presentation by peer-educators and receiving pamphlets on the advantages of active case finding (Sagnelli 2012 [34], very low level of evidence). Overall, 55.7% agreed to undergo testing, of which 2.1% had syphilis. Two conference abstracts, both from Italy [35,39] reported on uptake and positivity rates of syphilis active case finding. The study by Babudieri et al. reported an uptake rate of 56.3% and a positivity rate of 2.3% in a screening programme during imprisonment involving twenty prisons in Italy (test offer not reported) [35]. Foschi et al. reported an uptake rate of 91.5% and a positivity rate of 3.6% after opt-in testing at entry in a single prison in Milan [39].

The study from Sagnelli et al. [34] reported a higher testing uptake following the introduction of a peer-educators-lead initiative in nine correctional facilities (55.7% versus 10.0%, no significance reported).

Non EU/EEA countries: one study from the US reported a 0.1% positivity rate after mandatory syphilis testing 4–6 weeks before scheduled release from a male prison (Sieck 2011 [32], very low level of evidence).

Two US studies investigated opt-in testing at entry to a single jail. In one study, a 76% uptake rate was found, resulting in 6% confirmed syphilis cases and 1.3% new syphilis cases (Kahn 2002 [99], very low level of evidence). After four years of the opt-in program, the percentage of syphilis cases in jail decreased by around 65% and in the community by 79% (no significance reported). In the other study in which disease education and post-test counselling took place, a positivity rate of 2.0% was found and all cases initiated treatment (Arriola 2001 [71], very low level of evidence).

Two studies were found from the US in which all inmates entering one jail were offered syphilis testing at entry (within 24 hours after admission) (Silberstein 2000 [100] and Heimberger 1993 [101], both very low level of evidence). In the study by Silberstein et al., an uptake rate of 68.7% resulted in 1.4% confirmed syphilis cases. Of those in need, 56.7% started treatment. In the study by Heimberger et al., an uptake rate of 77% was found, and 2.6% confirmed syphilis cases were detected, while 83.5% of those in need started treatment.

Cost-effectiveness

One study from the US was retrieved reporting on the cost-effectiveness of syphilis active case finding (USA, Silberstein 2000 [100], very low level of evidence). Enhanced syphilis testing at entry within 24 hours (offer not reported) was considered cost-effective compared with routine practice.

Acceptability, feasibility and accessibility

EU/EEA countries: no studies found.

Non-EU/EEA countries: one USA study reported the primary reasons for not being tested for syphilis in a universal opt-in program at entry (Kahn 2002 [99], very low level of evidence) to be individual refusal, and early release.

Trichomoniasis

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: no studies found.

Non-EU/EEA countries: only two studies from the US were found on trichomoniasis active case finding in correctional facilities. In one study opt-in universal testing at entry was compared with targeted screening for women with symptoms only (Roth 2011 [102], very low level of evidence). The positivity rate, using all inmates at entry as denominator, was higher when using universal testing compared to targeted testing (44% versus 14%, respectively, no significance reported). The other study reported the positivity rate of opt-in testing 4–6 weeks before scheduled release from a male prison (Sieck 2011 [32], very low level of evidence), where 37.6% of the inmates agreed to undergo the genital swab test and 5.5% of them were found to have trichomoniasis.

No studies were found on the cost-effectiveness, acceptability, feasibility or accessibility of trichomoniasis active case finding in correctional facilities.

Guidelines STI

Four evidence-based guidelines [26,103-105] and one practice-based guideline [7] were included that reported on STI active case finding. One was specific to the prison setting (supranational), and four were other guidelines (all supranational). Guidelines covered active case finding for chlamydia, gonorrhoea or syphilis, and no guidelines were found on trichomoniasis active case finding in correctional facilities. In short, these guidelines formulated the following recommendations which are of interest for this project.

Table 4. Summary of guidelines on STI active case finding

Guideline	Chlamydia	Gonorrhoea	Syphilis
Specific to prison setting – supranational guidelines			
WHO, 2014 [7]	Apart from screening for HIV, HBV and HCV, voluntary screening for other STIs (chlamydia, gonorrhoea, syphilis) should be offered to all people in prison with risky behaviour		
Other guidelines – supranational guidelines			
Lanjouw, 2015 [103]	Indications for chlamydia testing are listed, including risk factors for chlamydia and/or other STIs (age <25 years, new sexual contact in the last year, more than one partner in the last year), symptoms or signs of urethritis in men, and cervical or vaginal discharge with risk factor for STI. See Appendix 10 for the complete list		
Bignell, 2012 [26]		Indications for gonorrhoea testing are listed, including symptoms or signs of urethritis in men, vaginal discharge with risk factor for STI (age <30 years, new sexual partner), and mucopurulent cervicitis. See Appendix 10 for the complete list	
Unemo, 2014 [104]			Routine tests for syphilis should be taken in all pregnant women, people donating blood, blood products or solid organs and the following groups at higher risk of syphilis: those newly diagnosed with STI; persons with HIV, hepatitis B, hepatitis C or suspected early neurosyphilis (i.e. unexplained sudden visual loss, unexplained sudden deafness or meningitis), and those who engage in sexual behaviour that puts them at higher risk (e.g. MSM, sex workers and all those individuals at higher risk of acquiring STIs). Screening tests should also be offered to all attendees at dermatovenereology/ genitourinary medicine/STI clinics
CDC, 2015 [105]	Women ≤35 and men <30 years in correctional facilities should be screened for chlamydia and gonorrhoea at intake		Universal screening for syphilis should be conducted on the basis of the local area and institutional prevalence of early (primary, secondary, and early latent) infectious syphilis. Correctional facilities should stay apprised of syphilis prevalence as it changes over time

Tuberculosis

Results of the peer-reviewed and grey literature searches for TB are presented below. The included studies are summarised to provide key information on study settings, countries, populations and active case finding strategies (type of offer, timing and promotion). To facilitate reading, active case finding offers and timings are underlined. See Appendix 11 for a more detailed summary of relevant information from included peer-reviewed and grey literature, and guidelines.

Active TB

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: in one Spanish study, the results of TB active case finding at entry and during imprisonment were reported (test offer not reported) (Martin 2001 [106], very low level of evidence). 82.5% of inmates agreed to undergo a tuberculin skin test, followed by chest x-ray (CXR) and sputum examination (uptake not reported), and 0.24% of inmates screened at entry were found to have active TB. After entry, 1 044 inmates with LTBI were monitored, of whom 2.2% developed active TB during imprisonment. Inmates who did not accept LTBI treatment showed a significantly greater probability of developing TB compared to those that received LTBI treatment. No effectiveness measures of active case finding were reported. In a conference abstract from Bulgaria, the results of an opt-in active TB screening program at entry and during imprisonment was described [107]. Inmates filled in a symptom questionnaire, and underwent bacteriologic tests and chest radiography. A positivity rate of 0.3% was found. An unpublished research report by Bös et al. reported on research conducted in all Berlin prisons from 2007 to 2010 [108]. The screening test used was chest radiography offered opt-in at entry (inmates refusing CXR screening were transferred into isolation). A positivity rate of 0.12% was identified. Interestingly, 22.6% of TB affected inmates were asymptomatic at entry to prison and 25% reported only dry or productive cough. Among the cases, a higher proportion of MDR-TB (11.8%) and resistant TB (32.4%) were found in comparison to cases in the general population (1.7% and 15.3%, respectively).

One survey evaluated TB control (test offer NR) in pre-trial detention centres and prisons in the WHO European region, including 16 EU/EEA countries (Aerts 2006 [109], very low level of evidence). Active case finding for TB was performed at entry in 94% of responding EU/EEA countries, and for one country this information was not available (Portugal). Uptake at entry ranged from 63% in Latvia to 100% in Slovakia and Spain. TB detection rates ranged from 41.7 per 100 000 in Spain to 1 255 per 100 000 inmates screened in Latvia. These data on active case finding at entry were unavailable for nine countries. Periodic active case finding during imprisonment was performed in 56% of responding EU/EEA countries, and for one country this information was not available (Portugal). Uptake during imprisonment ranged from 5.5% in Cyprus to 100% in Malta. TB detection rates ranged from 0 per 100 000 in Cyprus, Malta and Romania to 918.5 per 100 000 screened in Latvia. Prison staff were screened annually for TB or latent TB infection (not separately reported) in 11 of 22 (50%) WHO European region countries (not reported for EU/EEA countries only), occasionally in 5 of 22 (22.7%) countries and not at all in 3 of 22 (13.6%) countries.

Non-EU/EEA countries: in total, five studies conducted outside the EU/EEA region were included. Two studies from non-EU/EEA countries in the European region reported on TB active case finding in correctional settings. In the first study inmates in a remand prison in Switzerland were offered TST (followed by CXR and culture test) within 7 days of admission using opt-in (Ritter 2012 [110], very low level of evidence). Of inmates entering the prison, 77.3% agreed to undergo the TST, and 67.1% of TST-positive inmates agreed to undergo the CXR. This resulted in a TST positivity rate of 46.9% and a confirmed active TB detection rate of 2.3%. The other study was conducted in a Turkish district prison, where prison inmates were yearly tested during imprisonment (opt-in), using miniature CXR, followed by standard CXR, ≥ 3 sputum smears for acid-fast bacilli and culture for *M. tuberculosis* (Kiter 2003 [111], very low level of evidence). Inmates were informed about TB and its control, and reluctant people in prison were encouraged by other inmates or staff to participate. The uptake rate was 99.8%, resulting in 3.2% abnormal miniature CXRs and/or symptoms. In total, 0.4% of screened people in prison were found with confirmed active TB cases, of which 72.7% were newly diagnosed. All identified active TB cases initiated treatment.

In study from US, mandatory TB active case finding was evaluated among county jail inmates (timing not reported). Tuberculin skin test (TST) positivity was 1.4%, and 0.03% of inmates tested were confirmed TB cases, all of which initiated treatment (Miller 2006 [112], very low level of evidence).

Two USA studies reported on intra-study comparisons of active TB case detection rates using different testing methods. In one study, a period of TST testing at entry with routine screening of symptoms was compared with a period in which also CXR at intake was offered (test offer not reported) (Saunders 2001 [113], very low level of evidence). An eightfold increase in suspected pulmonary TB cases was found in the latter period, while the time from admission to isolation decreased (significance not reported). Another study compared a period of TST at intake (followed by CXR and culture test) with a period where miniature CXR was only offered at intake (test offer not reported) (Puisis 1996 [114], very low level of evidence). In the first period, 11.6% TST-positive inmates were found, with a confirmed TB detection rate of 0.06% in screened people in prison. In the latter period, 0.3% of inmates had suspicious radiographs, resulting in a confirmed TB detection rate of 0.05% in screened people in prison. The results of the two periods were not statistically compared.

Cost-effectiveness

A summary of the findings from the literature review is presented here. In a study from Latvia, annual screening of the general inmate population with sputum PCR was the most cost-effective screening method (offer not reported) (Winetsky 2012 [115], moderate level of evidence). Adding sputum PCR to the currently used strategy of annual mass miniature radiography (MMR) screening was cost-saving compared to MMR screening alone, but resulted only in minor reductions in (MDR-)TB prevalence. Symptom-based strategies were less effective and more expensive than MMR-based strategies. In a US study, screening for active TB at entry with miniature chest radiography seemed to be more sensitive and more cost-effective than screening at entry with either TST or based on symptoms (offer not reported) (Jones 2001 [116], low level of evidence). In another US study, a state-law mandated active TB screening program in jail (timing not reported) costs 34 761 USD per active TB case prevented, and 35 035 USD and 1 163 USD per active TB and LTBI case diagnosed, respectively (Miller 2006[112], very low level of evidence) .

Acceptability, feasibility and accessibility

Findings on the acceptability, feasibility and accessibility of active case finding for active TB were mainly reported for TST and presented in section 3.4.2. While TST is mainly used for LTBI diagnosis, this test is also frequently used as the first step in the active TB screening/diagnostic algorithm.

LTBI

Uptake, positivity rate, effectiveness and treatment initiation

EU/EEA countries: in one Spanish study, the results of LTBI active case finding at entry were reported (test offer not reported) (Martin 2001 [106], very low level of evidence), with 82.5% of inmates who agreed to undergo a TST, 41.3% of whom were found to be infected with *M. tuberculosis*. Nearly a fourth (23%) of LTBI inmates initiated treatment. In another study from Italy, inmates were offered opt-in testing during imprisonment after a presentation by peer-educators and receiving pamphlets on the advantages of active case finding (Sagnelli 2012 [34], very low level of evidence). Overall, 42.8% agreed to undergo testing, of which 17.2% had a positive TST test. The uptake rate was higher than in the nine correctional facilities evaluated in this study before peer-education (42.8% versus 11.3%, no significance reported).

In addition, twelve grey literature studies on LTBI active case finding were retrieved from Spain (ten) and Italy (three). LTBI active case finding at entry was investigated in five studies. Foschi et al. reported an uptake rate of 81.4% (opt-in) and a positivity rate of 9.8% in a single prison in Milan [39]. The uptake rate and positivity rate were 100% and 49.3% in a single prison in Catalonia (test offer not reported) [117]. Garcia-Guerrero et al. reported an uptake rate of 90.2% and a positivity rate of 50.4% (test offer not reported) [118]. Rùiz-Rodríguez et al. reported an uptake rate of 11.6% in the Spanish Penitentiary system (opt-in) and that 0.53% of LTBI-positives initiated prophylactic treatment [119]. Martín et al. conducted a study on LTBI in a single prison in Spain [120]. Among inmates with negative TST at entry (test offer not reported) the test was repeated after 7–10 days. Among 478 inmates, 11.7% were positive at the second TST. In a multivariate analysis, inmates with older age and those showing signs of induration at the first TST had higher positivity rates at the second test.

LTBI active case finding both at entry and during imprisonment was investigated in two conference abstracts (test offer not reported). Vera-Remartinez et al. reported a TST uptake rate of 100% in a single Spanish prison with a positivity rate of 44.9% [121]. TST conversion was studied among inmates with an initial negative TST test in whom the test was repeated every six months. Newly incarcerated people showed a progressive increase in TST positivity rates from 7.3% at 6 months to 12.5% at 18 months, whereas people who had been in prison before showed an increase from 10.6% at 6 to 18% at 18 months (no significance reported). Rùiz-Rodríguez et al. reported an uptake rate of 99.4% and a positivity rate of 43.9% among female people in prison in a Spanish prison [122].

Testing offered only during imprisonment was investigated in five conference abstracts. Rùiz-Rodriguez et al. reported an uptake rate of 100% and a TST positivity of 19.3% (test offer not reported) in a single Spanish prison [123]. Two other Spanish studies in which the offer was not reported found uptake rates of 90.2% and 92.6% and positivity rates of 50.4% and 21.8%, respectively [124,125]. Gabbuti et al. reported a low TST uptake rate (15.4%) in a single prison in Italy with a TST positivity of 11% (opt-in) [126]. LTBI treatment was initiated for 100% of TST positive people in prison, of which 60% completed the prophylaxis. Babudieri et al. conducted a study in twenty Italian prisons, in which a group of peer educators and infectious diseases specialists were engaged in the attempt to increase people in prison' knowledge about TB [35]. The proportion of tested (opt-in) people in prison during imprisonment rose from 11.3% pre-intervention to 26.3% post-intervention (no significance reported) with a LTBI positivity of 21.8%.

One survey evaluated TB control (test offer not reported) in pre-trial detention centres and prisons in the WHO European region, including 16 EU/EEA countries (Aerts 2006 [109], very low level of evidence). Prison staff were screened annually for TB or latent TB infection (not separately reported) in 11 of 22 (50.0%) WHO European region countries (not reported for EU/EEA countries only), occasionally in 5 of 22 (22.7%) countries and not at all in 3 of 22 (13.6%) countries.

Non-EU/EEA countries: in one US longitudinal study, all inmates were offered tuberculin skin test (TST) at entry (testing offer not reported) (Bock 2001 [127], very low level of evidence), with 75% of inmates agreeing to undergo the test, and 7.2% of them testing positive for TST. In another study from the US, inmates in a pre-trial detention centre (timing and test offer not reported) could be tested for LTBI using TST, followed by CXR (Bock 1999 [128], very low level of evidence). TST positivity was 18% among those tested, and 58% started LTBI treatment. In an additional study, mandatory TB active case finding (timing not reported) was evaluated among county jail inmates (Miller 2006 [112], very low level of evidence). LTBI treatment was prescribed in 0.9% of those screened, of which 57% initiated treatment.

One survey evaluated active case finding of LTBI (test offer not reported) among jail correctional officers in 1 174 USA jail facilities from the American Jail Association (67% of all jails) (Binswanger 2010 [129], very low level of evidence). In 61.9% of responding jails, officers were tested at the start of employment, while in 74.5% of responding jails officers were tested after an exposure episode. The frequency of LTBI testing of officers among the 1 174 jails was: only on hire 10.6%; every six months 2.0%; every year 49.4%; every two years 5.9%; never 12.4%; other frequency 14.2%; and unknown 4.4%. Of all 81 610 officers tested, 0.39% had LTBI test conversions, 0.38% among jails that test once or more a year, and 0.43% among jails that do not test once or more a year.

No peer-reviewed studies were found on the cost-effectiveness of LTBI active case finding in correctional facilities.

Acceptability, feasibility and accessibility

EU/EEA countries: the most common reason for 17.5% of inmates in a Spanish study not to be tested at entry (test offer not reported) was release before 48 hours after admission (Martin 2001 [106], very low level of evidence).

Non EU/EEA countries: one study from Switzerland reported on opt-in testing at entry to prison using TST, followed by CXR (Ritter 2012 [110], very low level of evidence). TST results were unknown for 8.8% of tested inmates due to early release, while CXR results were unknown for 30% of tested inmates, with no reported reason. In a study from the US reporting on a state-law mandated TB screening program in jail (timing not reported), 31% did not have their TST read due to release from jail (Miller 2006 [112], very low level of evidence). The authors projected that with a more rapid test available, an additional two (12% more) TB cases and 62 (30% more) suspected/latent TB infections would have been discovered.

Three studies from the US investigated active case finding at entry. In one study, TST performed within 48 hours of admission next to CXR directly at intake, was compared with TST only (Saunders 2001 [113], very low level of evidence). In 9.5% of inmates with CXR, no TST was done or read for the following reasons: release from custody before the test could be read (3.2%), entering the jail facility with a recently documented TST reading (2.4%), documented history of a positive TST reading from a transferring institution (1.6%), an unrecorded TST reading measured in a community hospital (1.3%), or unknown reasons (1.0%). In another US study, while 68% of TSTs were read within 48 to 72 hours, 28% of inmates were released each month before their skin test was read, and 4% of tests were not read for other reasons, although the inmates were still incarcerated (Bock 2001 [127], very low level of evidence). In an additional US study, 34% of TSTs performed at intake were not read, the reasons were not reported (Puisis 1996 [114], very low level of evidence).

Guidelines TB

Two evidence-based guidelines [130,131] and seven practice-based guidelines [7,13,132-136] were included that reported on active TB and/or LTBI active case finding. Six were specific to the prison setting (two supranational, four national), and three were other guidelines (all supranational). In short, these guidelines formulated the following recommendations which are of interest for this project.

Table 5. Summary of guidelines on TB active case finding

Guideline	Active TB	LTBI
Specific to prison setting – supranational guidelines		
WHO, 2014 [7]	Medical screening on entry into the prison system is essential, as many people in prison come from communities with a high prevalence of TB. People in prison should not enter the body of the prison population until it has been verified that they do not have infectious TB. In the prison system, two massive screening rounds a year are ideal. This strategy is very useful to find previously undetected cases missed by passive case-finding. Mass screening is not, however, recommended as the sole method of case-finding in prisons	
USAID, 2009 [13]	In prisons, passive and active case finding should be implemented simultaneously and systematically. A combination of these two approaches will increase case detection substantially	
Specific to prison setting – national guidelines		
NICE, 2016 [130]	Healthcare professionals in prisons and immigration removal centres should ensure people in prison and detainees are screened for TB within 48 hours of arrival. Prisons with Department of Health-funded static digital X-ray facilities for TB screening should X-ray all new people in prison and detainees (including those being transferred from other establishments) if they have not had a chest X-ray in the past 6 months	In high-incidence areas and at prisons that receive people from high-incidence areas, prison health services should offer an Interferon-Gamma Release Assays (IGRA) test for TB to inmates younger than 65 years who are in regular contact with substance misuse services or other support services. Prison health services should incorporate IGRA testing with screening for hepatitis B and C, and HIV testing
Public Health England, 2013 [135]	All new people in prison should be assessed for their TB risk by symptom screening (and, if facilities are available in the prison for this, digital chest x-ray) and appropriate action should then be taken. These symptoms are a history of a cough lasting three weeks or longer, unexplained weight loss, and any cough with other TB symptoms – weight loss, fever, night sweats, haemoptysis, anorexia	
Italian Ministry of Justice, 2008 [133]	Tuberculosis screening should be performed in all new people in prison with a symptom questionnaire and, if positive, with chest X-ray at entry and in residents with risk factors or predisposing conditions during annual check-up visits	Prevention of the development of active disease in cases with LTBI could be obtained with screening and treatment of LTBI in close contacts of active TB cases. Furthermore, if sufficient resources are available, screening of high risk subjects for TB reactivation and their treatment is recommended
Dutch Ministry of Safety and Justice, 2010 [132]	The following policy change is recommended: 1) Discontinuation of active case finding for TB among people in prison born in the Netherlands, 2) Continuation of active case finding for TB among people in prison born in the Netherlands that belong to one of the risk groups for TB, 3) Continuation of active case finding for TB among people in prison born outside the Netherlands. Active case finding should be performed at entry, using chest X-ray	
Other guidelines – supranational guidelines		
WHO, 2015 [136]	People living with HIV should be systematically screened for active TB at each visit to a health facility. Systematic screening for active TB should be considered in prisons and other penitentiary institutions	
WHO, 2015 [131]		Systematic testing and treatment of LTBI should be considered for people in prison, healthcare workers, immigrants from high TB burden countries, homeless persons and illicit drug users (conditional recommendation). Systematic testing and treatment

Guideline	Active TB	LTBI
		of LTBI should be performed in people living with HIV, adult and child contacts of pulmonary TB cases, patients initiating anti-tumour necrosis factor treatment, patients receiving dialysis, patients preparing for organ or haematologic transplantation, and patients with silicosis (strong recommendation). In both, either IGRA or TST should be used to test for LTBI
Migliori, 2012 [134]	All persons presenting with signs, symptoms, history or risk factors compatible with TB should be evaluated for pulmonary and/or extrapulmonary TB	

Increasing testing uptake

A relatively small number of studies investigated interventions to increase testing uptake in prison settings. Of these, fourteen were peer reviewed articles, one was a conference abstract and one a systematic review (including three relevant studies). The majority of the studies (nine studies) were focussed on HIV active case finding [2,34,35,71,74-76], five on viral hepatitis [34,35,42-44], four on chlamydia and gonorrhoea [91-94], one on syphilis [34], two on TB [113,114], and two involved a multi-disease approach [34,35].

Five studies investigated the impact of educational interventions, including peer-education programmes, on test uptake for HIV [34,35,71,74,75], two included HBV and HCV [34,35] and two also STIs [34,71] and one TB [34]. Four studies reported an increase in testing uptake for all covered diseases after the introduction of the education intervention, two were performed in the EU/EEA (Italy) and two in the US. Statistical analysis was performed in one single study, resulting in a significant increase of testing uptake [75]. The other study, also conducted in the US described an intervention targeting staff rather than inmates, and reported no statistically significant difference in the uptake of testing for HIV after the implementation of the initiative [74].

Five studies, two from the (UK and three from the US, investigated the impact of different testing methods on the testing uptake for HCV [42,43], HIV [76], and TB [113,114]. In general, an increased uptake of testing for BBVs was observed when venepuncture sample collection was complemented by other approaches such as DBS and an oral test. However no statistical significance was reported. Similarly for TB, the introduction of rapid diagnostic tools such as CXR, increased the diagnosis rate and decreased the time to isolation.

In total, eight studies investigated the impact on testing uptake of different test modalities, however no statistical significance was reported for any of the studies. Three studies addressed HIV [2], one HCV [44] and four chlamydia and gonorrhoea [91-94]. None of these was performed in the EU/EEA.

Six studies investigated opt-in testing at entry as compared with client-initiated testing. In all cases, opt-in testing modality resulted in higher uptake rate across diseases [2,44,91-93]. Three studies reported on the impact of opt-out strategies compared with opt-in. The findings were convergent and opt-out resulted in an increased uptake rate irrespective of the target disease [2,94]. However a recent survey from the US [82] on inmates' perception of opt-out testing program for HIV revealed that more than half of the respondents inaccurately reported that HIV testing in prison was mandatory.

Indirect evidence on the effectiveness of BBVs case finding was reported in two studies [47,73] and in one systematic review contributing with three studies [2], all conducted in the US. The studies compared case detection rate for HCV or HIV obtained with targeted or universal routine testing at entry against the prevalence of infection resulting from seroprevalence study on the same population. Convergent findings showed a high percentage of missed diagnoses for both diseases, up to more than 70%. The authors attributed such high proportion of undiagnosed infections to under-reporting coupled with the challenge to assess risk among inmates and to the asymptomatic nature of the diseases.

Discussion

Main findings

This systematic review provides an overview of the best available evidence in the peer-reviewed and grey literature on active case finding of communicable diseases in correctional facilities. The main findings are summarised below.

The search of the literature revealed that most of the existing evidence on active case finding in prison settings is concentrated on just a few communicable diseases, such as BBVs, STIs and TB. These findings may be consistent with the general notion that these diseases are on one hand causing a sizeable burden in the prison population, and on the other are at higher risk of transmission within prison settings [4,5]. Against this background of infectious disease burden and transmission risk, people in prison are entitled to a medical assessment upon entry, which offers the opportunity to conduct active case finding for a number of relevant conditions, and not limited to communicable diseases [137] [138].

The body of evidence retrieved through this systematic review was largely composed of studies conducted in non-EU/EEA countries, and primarily in the US. A large part of the literature covering active case finding in EU/EEA prisons was retrieved from grey sources thus revealing a substantial publication bias. In addition, very few studies, and even fewer ones from the EU/EEA, investigated interventions to increase the effectiveness of active case finding in prison settings; and even among those, statistical significance was hardly ever reported.

Altogether, based on the reported case detection rates, the retrieved studies showed a higher prevalence of infection in the prison population compared with the general population estimates for the same disease, thus providing a valid argument to strengthen case finding initiatives in these settings. Based on the findings of the review, testing modalities emerged as a factor that influenced uptake. For viral hepatitis, HIV and STIs testing proposed at entry was likely to be associated with a higher uptake rate when compared to testing during the course of the stay in prison and, even more so, than uptake at release. In general, very few studies investigated testing before release, and these were characterised by a lower uptake and a lower case detection rate compared with other testing modalities. When comparing active case finding versus client-initiated testing, the latter invariably resulted in lower uptake and lower case detection, for all diseases of interest. Among active case finding modalities, opt-out was usually associated with higher uptake, although less studies investigated this approach. However, studies reporting on increasing uptake rate over time are frequently associated with a corresponding decrease in yield, in terms of case detection rate. Nonetheless, studies comparing case detection rate of routine testing approaches against seroprevalence estimates from serosurveys conducted in the same population, provided compelling evidence of a residual undiagnosed fraction.

Testing methods were also shown to be influential in ensuring a higher uptake, and rapid or less invasive approaches were preferred. At least for TB, the choice of the testing method and the need for multiple visits (i.e. TST) had a direct impact on the proportion of individuals categorised as having incomplete screening or lost to follow up. On the other hand, the introduction of education and peer-education initiatives were shown to be successful, and the findings pointed to a substantial increase in testing uptake after the interventions irrespective of the disease.

In order to maximise public health and individual benefits of early diagnosis, appropriate follow up interventions, such as prevention measures, treatment and care, need to be implemented. Nevertheless relevant health outcomes were not often presented in the included studies. Notification of testing results were seldom reported, with the notable exception of HIV testing. When reported, notification rates were very high at least for HIV-positive individuals. Conversely, treatment initiation was frequently described for STIs and TB, but less so for HIV and viral hepatitis. In general, treatment initiation rates showed important variability across studies.

Barriers to testing were investigated in a number of studies covering all target diseases. Sudden release and mobility within the prison system were cited by several studies as key factors hindering testing. This was of particular relevance for TB active case finding due to the turnaround time between test administration and reading of the result for the most common first line testing (i.e. TST). Among personal barriers to testing, not perceiving oneself at risk and having being tested already/recently were the main reasons for refusal. Studies focusing on testing for BBVs also reported lack of awareness, fear of disease and of testing procedures, concern about confidentiality and stigma as important barriers. Finally lack of trust in the institution was mentioned by some studies as reason to refuse testing. Institutional barriers such as inconvenience of testing time, inadequate testing/counselling procedure, lack of staff were also reported by few studies as relevant factors.

Finally, a limited number of cost-effectiveness studies were retrieved, related to active case finding on HCV, HIV, chlamydia, gonorrhoea, and active TB, and with the majority performed in the US. In these studies, different active case finding approaches, timings, offers, promotions and test methods were used, and the economic analyses were based on a diverse range of assumptions and cost data. Overall the results were difficult to compare, inconsistent at times and best interpreted in a disease-specific context.

Hepatitis

Hepatitis A

Only one study from the US was included from the peer-reviewed literature (very low level of evidence), that found a 0% HAV positivity rate after mandatory HAV testing 4–6 weeks before scheduled release from a male prison. No other results were reported. Based on one study, no conclusions can be drawn about hepatitis A active case finding.

Hepatitis B and C

In total, three primary studies and one systematic review (including one relevant study) were included from the peer-reviewed literature investigating active case finding for hepatitis B (all very low level of evidence), and five abstracts/research reports from the grey literature, with a total of seven studies from the EU/EEA region. Ten primary studies and one systematic review (including three relevant studies) were found that reported on HCV active case finding in the peer-reviewed literature, and four from grey sources; a total of eleven studies were performed in the EU/EEA region.

Overall, regardless of active case finding modalities, applying active case finding for hepatitis B and C in correctional facilities in the EU/EEA resulted in an HBV positivity rate of 0.6% to 16.5% and a HCV positivity rate of 4.7% to 36.8% with variations across countries and studies, possibly resulting from different underlying epidemiological patterns and demographic set-up of prison populations. When comparing testing modalities, no study conducted in the EU/EEA reported on opt-out testing for viral hepatitis. However, with the exception of two UK studies included by Rumble et al. [2] reporting on routine testing in two UK prisons, uptake rates for opt-in testing at entry ranged from 82.3% to more than 95% for both diseases. Conversely, the uptake rate of opt-in testing during imprisonment ranged from 56.3% to 83.8%. Only one study from the US explored mandatory testing at release, resulting in low level of uptake on comparably lower case detection rates.

Client-initiated testing as a case finding modality for PWID was investigated in two cost-effectiveness studies performed in the UK. The studies generated somewhat divergent results on whether opt-in testing at entry in prison was to be considered cost-effective when targeting PWID. Similarly, inconsistent results on the cost-effectiveness of targeted testing for PWID versus universal testing were obtained by one UK study and one US study. The latter, a very recent study [52] on the impact of HCV screening and Directly Active Antivirals (DAA) treatment in prison on the HCV epidemic in the community, concluded that universal opt-out screening of inmates is likely to be highly cost-effective and that most of the benefits resulting from the necessary financial investments would accrue in the community. This findings are further corroborated by another recent study from the US [47] which reported that risk-based active case finding failed to capture as many as 76% of the HCV infected individuals, compared with the outcome of a blinded serosurvey.

According to the studies investigating acceptance, previous testing/diagnosis or low self-perception of risk were the most reported reasons to refuse testing. However fear of needles and lack of awareness about testing and procedure and disease were among the cited personal barriers. Consistently with this findings, two studies from the UK comparing testing uptake after the introduction of capillary blood sample collection through finger prick (using DBS), showed increasing proportion of inmates being tested. However the findings were not supported by statistical evidence.

In conclusion, due to the heterogeneity of the included studies no definitive generalisable conclusions can be drawn based on the available evidence on timing, offer or which testing method should best be implemented in correctional facilities. However, according to identified relevant guidelines, testing for viral hepatitis should be offered at least to those with a HIV diagnosis. Recent guidelines from the UK recommend to offer a test for viral hepatitis to all those in prison at entry and during their stay.

HIV

In total, sixteen primary studies and one systematic review (including eleven relevant studies) investigating HIV active case finding were included from the peer-reviewed literature and nine conference abstracts from grey sources. In total eleven studies were performed in the EU/EEA.

Overall, regardless of active case finding modalities, applying active case finding for HIV in correctional facilities in the EU/EEA resulted in a positivity rate of 0.3%–26.6% with variations across countries and studies, possibly resulting from different underlying epidemiological patterns and demographic set-up of single prison populations. When comparing testing modalities, no study conducted in the EU/EEA reported on opt-out or mandatory testing for HIV. Testing uptake rates ranged from 91.3%–97.3% at entry, to 56.3%–82.5% when testing was offered at entry and during stay, to 67.45–96% during stay, to 4.2% at release. One study from the US explored mandatory testing at release, resulting in a comparatively low case detection rate of 0.1%. Opt-out testing was investigated in seven US studies, with an uptake ranging from 22% to 91% and a positivity rate of 0.6%–2%. Importantly, according to a few studies from overseas, the residual undiagnosed fraction among the prison population could be sizeable when routine HIV testing does not achieve sufficient coverage.

While no comparative studies were identified from the EU/EEA reporting on the effect on uptake of different testing modalities, three studies performed in the US showed substantial increase in the proportion of people in prison receiving a test when client-initiated testing was substituted with opt-in, and even more so when opt-out testing was introduced. However a recent survey performed in the US to assess how people in prison perceived an opt-out testing program, revealed that more than half of the respondents inaccurately reported that HIV testing in prison was mandatory and over 10% that they have not been tested [82].

The impact of testing method on acceptance and uptake was reported by one study from the US, showing how the introduction of a rapid oral test increased the willingness to be tested [76]. These findings are in line with other more recent studies, reporting fear of needles as one of the personal barriers which hinders testing. However, as reported for viral hepatitis, the primary reasons behind test refusal among people in prison were having been tested recently/already diagnosed or low self-perception of risk. Still, according to a study from the US, sudden release from prison accounted for up to 36% of individuals not being tested [70].

Few studies, and hardly any conducted in the EU/EEA, presented findings on other relevant health outcomes, such as proportion of newly diagnosed HIV infection, test notification rate and treatment initiation rate. Although early diagnosis may bring about substantial benefits for the individual and for the community at large, it is challenging to assess the impact of active case finding interventions with such limited evidence on distal health outcomes. As a result, no clear trends could be identified regarding uptake, positivity rate, effectiveness or treatment initiation (remaining studies all very low level of evidence). It is challenging to determine the effect of different testing modalities (timing, offer, method, etc.) due to the fact that they were often investigated in combination, and were applied to different populations and in different settings.

Few cost-effectiveness studies were retrieved, and all performed in the US. Of interest, one study investigated the prevention of mother-to-child infection in prison setting and concluded that mandatory testing of newborns was cost-saving, while this scenario combined with opt-out testing of pregnant woman was cost-effective.

Finally, identified guidelines span over almost a decade and, while the older ones advocate for client-initiated testing or risk-based testing, more recent ones promote universal testing at entry and during stay, provided confidentiality and voluntary uptake are guaranteed.

STI

Chlamydia and gonorrhoea

In total, ten studies from the peer-reviewed literature and two conference abstracts were included investigating chlamydia and gonorrhoea active case finding (three low and seven very low level of evidence). Only grey literature studies were identified for the EU/EEA region.

The positivity rate for chlamydia and gonorrhoea was 6–11% and 0.2%, respectively, among young adults in Spain. As a comparison, the positivity rate ranged from 0.6%–7.6% for chlamydia and 0%–3.1% for gonorrhoea in the US. Testing uptake at entry and during stay was generally high when reported (74.8–100%), with the exception of one study reporting uptake rate for opt-in testing at release to be 37.6%.

Few studies from the US compared different active case finding modalities. Convergent findings showed that client-initiated testing resulted in a lower number of infections detected compared with opt-in testing at entry or during stay, at least for chlamydia. In several studies, including those from the EU/EEA, active case finding initiatives were targeted at young adults only, variously defined as <25, <30 or <35. Although universal testing was associated with higher positivity rates, cost-effectiveness studies indicated that testing age-specific groups using an opt-in approach was more likely to be cost-effective. Gender was also considered as a potentially relevant factors, and one study from the US found that universal active case finding for chlamydia was likely to be cost-saving for female detainees only.

Treatment initiation was often reported, both in EU/EEA and non-EU/EEA studies. The rates varied but were above 60% in all studies.

Overall, due to the heterogeneity of the studies, and the limited evidence from the EU/EEA, it is challenging to interpret these findings and to identify what testing modality should best be implemented in correctional facilities. In addition, coverage of chlamydia and gonorrhoea testing in existing guidelines is limited. Overall, targeted active case finding is recommended, based either on risk behaviour or on age.

Syphilis

One study and three conference abstracts from the EU/EEA region and five studies from other regions were included that reported on syphilis active case finding

Despite a few studies being included from the EU/EEA, the geographical representativeness was limited, as they were all conducted in Italy. The resulting positivity rate ranged from 2.1% to 3.6%, compared with 0.1% to 6% in non-EU/EEA studies. Overall, when comparing uptake rates, opt-in testing at entry was associated with a higher uptake ranging from 68.7% to 91.5%, compared with testing offered during imprisonment (55.7–56.3%). According to a US study, the introduction of universal active case finding for syphilis at entrance is likely to be cost-effective, as compared to targeted testing [100]. Only one study from the US explored mandatory testing before release, resulting in a comparatively low positivity rate of 0.1% [32].

Treatment initiation was reported in a limited number of studies, none of which were from the EU/EEA, and varied from 56.7% to as high as 100% of diagnosed individuals.

Similarly to what was reported for BBVs, testing acceptance was largely influenced by perceived risk, and prison release [99].

Due to the heterogeneity of the studies and the lack of good between-study comparisons, no conclusions can be drawn based on the included studies on which timing, offer or method should best be implemented in correctional facilities. A limited number of guidelines were identified that cover testing for syphilis in prison settings. However testing for syphilis is recommended for all pregnant women, for high risk individuals, and for persons with HIV, HBV or HCV infection. Recently released US guidelines advise to consider universal syphilis testing in prisons based on local prevalence.

Trichomoniasis

Only two studies from the US were included from the peer-reviewed literature. Trichomoniasis positivity rates ranged from 6% after opt-in testing before release, to 14% and 44% after client-initiated testing and opt-in testing at entry, respectively.

Based on the very limited evidence, no conclusions can be drawn about trichomoniasis active case finding.

TB

Active TB

In total, one peer-reviewed article and two conference abstracts from the EU/EEA region and five non-EU/EEA articles were included from the peer-reviewed literature investigating active case finding for active TB.

The positivity rate for active TB in the EU/EEA ranged between 0.12% to 0.3%, with a generally high uptake rate across the different studies and testing modalities. As confirmed by a survey on TB control in the European area, active case finding for TB was performed at entry in 94% or responding EU/EEA countries, with high reported uptake rate [109]. Period case finding initiatives was also standard practice in over half of the EU/EEA reporting countries. Detection rates were considerably high, especially in the Baltic countries. With these premises, a cost-effectiveness analysis performed in Latvia showed that annual testing of the prison population with sputum PCR was most effective method [115].

Of note, according to an unpublished German study presenting the result of an opt-in testing program at entry with CXR, as many as 22.6% of TB affected inmates were asymptomatic. Also, the proportion of MDR-TB and resistant TB cases among people in prison was higher compared with the general population [108].

A 100% treatment initiation was found in the two studies reporting this outcome. However, due to the heterogeneity of the studies no conclusions can be drawn based on the included studies on which timing, offer or method works best.

LTBI

Two peer-reviewed articles and eleven abstracts/research reports from the EU/EEA region and three articles from the US were found that reported on LTBI active case finding in correctional facilities.

All studies used TST as a first screening method, for which the uptake was extremely variable, irrespective of testing modalities, ranging from 11.6% to 100%. Overall, applying LTBI active case finding in EU/EEA correctional facilities resulted in a TST positivity ranging from 9.8% to 50.4%, and a treatment initiation of 0.5% to 100%. Early release was the main reason why TST was not read, and loss to follow up occurred. Such logistical issues should be taken into account when considering alternative testing method such as IGRA.

A few studies from Spain investigated TST seroconversions over time in the prison population. The findings showed a progressive increase in TST positivity over time and higher baseline positivity among people with previous history of incarceration [120,121]. Another study reported that 2.2% of individuals diagnosed with LTBI at entrance, developed active TB during imprisonment [106].

Finally, one survey performed in the US, explored LTBI testing practices among prison staff. The large majority of the responding prison institutions reported testing at entry and/or after an exposure event. Seroconversions were reported in 0.39% of the officers, with no significant difference with respect to testing practices [129].

Available guidelines recommend implementing universal active case finding for active TB at entrance and during stay, supplemented by passive case finding. LTBI testing in prison settings was recommended for high risk individuals, such as HIV-positive people, or based on local epidemiological context and available resources.

Increasing testing uptake

A relatively small number of studies investigated interventions to increase testing uptake in prison settings. Of these, three peer-reviewed articles and one conference abstract were retrieved from the EU/EEA and eleven articles and one systematic review (contributing with three studies) were from non-EU/EEA countries.

Converging findings indicated that education and peer-education initiatives as well as the introduction of rapid diagnostic tools or testing methods not requiring venous blood increased the willingness to be tested among people in prison.

Testing modalities such as timing and offer of testing were investigated in several studies, none from the EU/EEA. The findings showed that opt-in testing modality resulted in a higher uptake rate when compared with client-initiated testing, with opt-out increasing further, irrespective of the disease. Although missed diagnoses are a challenge in prison settings, as reported in a few studies, opt-out testing may present some elements of concerns, such as adequate confidentiality, lack of coercion, alongside the necessary level of understanding and self-agency of the single individual.

Knowledge gaps

General gaps

Unfortunately, no literature was found on active case finding in correctional facilities for several communicable diseases, e.g. measles, diphtheria, etc. Despite the lack of literature on these communicable diseases in correctional facilities, active case finding for these diseases might still be relevant.

Overall this review highlighted a large heterogeneity between studies in both the peer-reviewed and grey literature, making comparisons and conclusions hard to make. More comparative studies are needed on the effectiveness and impact of the different active case finding strategies in the EU/EEA. Additionally, when comparisons are made, often interventions differ, and it is hard to pinpoint what is responsible for the change in effectiveness. Finally a substantial part of the research has been performed in the US, which raises concerns on the applicability of the findings to the EU/EEA situation.

Overall, the level of evidence available in the included peer-reviewed literature studies is quite low. Studies of higher quality and with conclusive evidence are needed as a basis for guidance development.

Below, disease-specific knowledge gaps are outlined per disease for which data on active case finding in correctional facilities was retrieved.

Disease-specific gaps

Hepatitis

The benefit of hepatitis A active case finding in prison settings was scarcely investigated. Moreover, no cost-effectiveness data of hepatitis A and B active case finding in prison settings was found.

HIV

Robust cost-effectiveness studies about HIV testing in prison settings is lacking. There is no hard evidence on the effectiveness of HIV active case finding.

STI

No peer-reviewed literature was found on STI active case finding in the EU/EEA region, except for one Italian study. Scarce evidence is available to conclude on the effect of different testing approaches (offer, timing, etc.). Moreover, cost-effectiveness results are lacking for syphilis active case finding, and hardly any data was found on trichomoniasis active case finding.

TB

Few studies were captured on TB active case finding in the prison setting, especially from the EU/EEA region. Hardly any data are available on the effectiveness of active TB and LTBI active case finding, including case-detection rates for active TB and LTBI prevalence. Moreover, no cost-effectiveness data are available for LTBI screening. Lastly, long-term follow-up data would be needed to assess the benefit of LTBI screening in terms of adherence to preventive treatment and reactivation rate.

Strengths and limitations

The strengths of this systematic review include the use of three large peer-reviewed literature databases, in which a broad search over a long period of time was conducted that was not limited by outcome or language, and which was supplemented by extensive grey literature searches. These included searches for guidelines, protocols, conference abstracts and unpublished research reports. A search in the grey literature was necessary due to the fact that research on the topic of prison and health is generally underreported in peer-reviewed literature databases. Multiple grey literature sources were searched, which was supplemented by the retrieval of relevant documents from experts (including non-English documents). Four field researchers performed extensive literature searches in their country.

A rigorous methodology was applied to identify, critically appraise, analyse and summarise the relevant evidence in order to minimise selection and confirmation bias due to preconceived opinions. The high-quality methodology of this systematic review followed international methodology and reporting standards such as Cochrane [30] and PRISMA [31] and was built on the methodology used by ECDC during the scoping phase of the project. A multi-sectorial expert panel in the field of prison health, prevention and control of communicable diseases and guidance development was closely involved during all steps of the review process.

This systematic review is mainly limited due to limitations of the literature found. Studies mostly had a descriptive and observational design, which cannot be used to assess effectiveness or causality because of the lack of control groups. Moreover, this type of study design is subject to certain biases, such as risk of confounding, poor sampling procedures, and loss to follow-up. Only few direct comparative studies were found. Drawing conclusions based on indirect comparisons between studies has serious limitations, as differences in population characteristics, settings, countries, active case finding factors, etc. can all influence study outcomes. Most studies did not take confounding or modifying factors, such as the above stated population characteristics, into account. Correction for such factors can have a large impact on the study outcomes. Moreover, these study characteristics as well as interventions and outcomes were frequently poorly described, hampering these comparisons in any case. For instance, the type of offer was not always clearly stated. Although in most studies it could be assumed that the offer was voluntary (based on the choice of wording and a certain percentage of persons refusing), it was frequently not stated whether this offer was on an opt-in or opt-out basis. The same goes for the timing; although mostly it was stated whether it was at intake, during imprisonment or at release, the exact timing was not always mentioned. Lastly, there was a general lack of information regarding consent and counselling used. All these active case finding factors have a large impact on the outcomes. Many studies were also conducted in single institutions, among relatively small sample sizes, which limits their generalisability. All these limitations resulted in mostly low or very low quality studies being included. Limitations of each study were added to the evidence tables.

The focus of this report was on the EU/EEA region. Unfortunately, few retrieved studies were conducted in these countries, and a more sizeable proportion were conducted in the US. While studies from non-EU/EEA countries may be a valuable source of data on active case finding interventions, their findings cannot be simply extrapolated to the EU/EEA context due to differences in population set-up, healthcare delivery and the correctional system.

Although this review was focused on adult people in prisons only, persons below 18 years of age were included in some studies. However, studies focusing solely on young populations were not included.

It was often difficult to determine the active case finding factors responsible for the observed effects due to the fact that interventions were often part of a bundle of measures and could therefore not be examined in isolation (i.e. different test methods, offers, timings, and promotion measures).

Lastly, some studies did not clearly describe whether the focus of the study was on active TB or on LTBI, or did not give clear descriptions of the two types of TB disease. This meant that sometimes it was not clear to which type of the disease active case finding was targeted.

Study settings varied widely between included studies. In jails, in which persons are generally incarcerated for shorter periods, active case finding participation and consequent treatment initiation is often hampered by the fact that inmates are released or transferred soon after entry. This is less of a problem in prisons, where inmates are incarcerated for longer periods of time. Moreover, a jail or prison in one country can be very different from a jail or prison in another country, both regarding the setting itself as well as the composition of the population (nationalities, minorities, etc.). Similar settings are therefore not directly comparable between countries. This also applies to healthcare settings, which can differ largely between countries, even within the EU/EEA region.

Outcome definitions varied between studies, and some studies did not clearly define the relevant outcomes used. This mostly concerned the denominators used for various rates, such as the uptake rate. Although we have recalculated several outcome values to prevent incorrect comparisons, this was not always possible due to lacking outcome definitions.

Conclusions

The overall objective of this project is to develop a series of evidence-based guidance on prevention and control of communicable diseases in prisons. This specific systematic review focused on the subject of active case finding and is meant to inform the guidance on active case finding in prison settings. In this systematic review we have retrieved evidence on active case findings for blood-borne viruses, namely HIV, HBV and HCV, as well as STI, TB and HAV. While the number of studies was sizeable for some of these diseases, we have found a weak evidence base with very few comparative studies and a wide variation between studies. In addition, a sizeable fraction of the identified evidence derived from non EU/EEA countries, posing concerns regarding the generalisability of the findings to the region. Thus, collating and comparing the studies is extremely challenging and providing clear conclusions on what interventions are more effective in prison settings in the EU/EEA is not possible. However, through this systematic review we identified a wide variety of interventions that use a range of testing methods, offers, timings and promotion methods directed at different sub-populations within the prison setting. We also identified reasons for not being tested or completing testing, and why some people refused testing. These reasons are important in order to devise public health interventions that would increase uptake and help in making decisions regarding procedures and strategies for active case finding implementation in the EU/EEA.

This systematic review highlighted important knowledge gaps. More operational research is needed to assess the effectiveness and cost effectiveness of interventions to increase testing offer and uptake in prison settings. At the same time this review revealed the value of grey literature as a source of evidence on active case finding in prison settings in the EU/EEA. Sharing of knowledge and experiences between EU/EEA countries may be a useful approach to stimulate research on this specific topic and to promote spreading of good practices in the region.

In this perspective, the findings from this systematic review will inform the development of a public health guidance on active case finding in prison settings.

Next steps

The findings from this systematic review will serve as the evidence base for the development of an ECDC public health guidance on active case finding of communicable diseases in prison settings. This guidance will be part of a broader set of guidance documents on prevention and control of communicable diseases in prison settings, which will encompass other specific interventions such as vaccination, and specific disease prevention and control methods.

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**European Centre for Disease
Prevention and Control (ECDC)**

Postal address:
Granits väg 8, SE-171 65 Solna, Sweden

Visiting address:
Tomtebodavägen 11A, SE-171 65 Solna, Sweden

Tel. +46 858601000
Fax +46 858601001
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