**Hepatitis C virus infection in EU/EEA and United Kingdom prisons: opportunities and challenges for action**

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**Abstract**

**Background:** Hepatitis C virus (HCV) transmission in the European Union, European Economic Area and United Kingdom is driven by injecting drug use (IDU), which contributes to the high burden of chronic infection among people in prisons. This study aimed to describe the context, epidemiology and response targeting HCV in prisons across the region.

**Methods:** We retrieved and collated HCV-related data from the World Health Organization’s Health in Prisons European Database and the European Centre for Disease Prevention and Control’s hepatitis C prevalence database. Prisons population data were obtained from the Council of Europe Annual Penal Statistics on prison populations (SPACE I).

**Results:** There were 12 to 93,266 people in prisons, with rates of 31·5 to 234·9 per 100,000 population. Median age was between 31 and 40 years, with up to 72% foreign nationals. Average detention time ranged from one to 31 months. Ministries of Health had sole authority over prisons health, budget administration and funding in 27, 31 and 8% of 26 reporting countries, respectively. Seroprevalence of HCV antibodies ranged from 2·3% to 82·6% while viraemic infections ranged from 5·7% to 82%, where reported. Up to 25·8 and 44% reported current and ever IDU, respectively. Eight countries routinely offered HCV screening on an opt-out basis. Needle and syringe programmes were available in three countries. Among the nine countries with data, the annual number of those who had completed HCV treatment ranged between one and 1215 people in prisons.

**Conclusions:** HCV burden in prisons remains high, amidst suboptimal levels of interventions. Systematic monitoring at both local and regional levels is warranted, to advance progress towards the elimination of HCV in the region.

**Keywords:** Hepatitis C virus, Prisons, Injecting drug use, European Union, European Economic Area

**Background**

The advent of highly effective direct-acting antivirals (DAAs) and the launch of the Global Health Sector Strategy (GHSS) on viral hepatitis 2016–2021 [1] have boosted worldwide efforts targeting hepatitis C virus (HCV) considerably in recent years. However, about 1·75 million people still continue to be newly infected annually, and deaths attributable to viral hepatitis are increasing [2]. The GHSS aspires for 90% case detection and 80% treatment by 2030 [1]. Of the 71 million people living with chronic HCV infection globally, only 14 million were estimated to have been diagnosed in 2015 and only 1 million had accessed DAAs [2]. This highlights the need to find the ‘missing’ millions of people living with HCV infection, particularly those who are disproportionately affected [3] yet largely remain undiagnosed and untreated.

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Injecting drug use (IDU) accounts for almost one quarter of the global HCV incidence, and 8% of those with chronic HCV infection currently inject drugs [2, 4]. Across the European Union, European Economic Area (EU/EEA) and United Kingdom, between 0.02 and 0.9% of the population are known to inject drugs and IDU is the key driver of the HCV epidemic [5]. While 3.9 million people across the EU/EEA and United Kingdom were estimated to be living with chronic HCV infection in 2015 [6], latest data indicate that where transmission was known, IDU was responsible for more than half of new cases [7]. The prevalence of antibodies against HCV (anti-HCV) across EU/EEA countries and United Kingdom ranges up to 5.9% [6] in the general population, but reaches 84% among people who inject drugs (PWID) [8]. Among the at-risk groups, similar estimates are observed among people in prisons as for PWID [8, 9].

Prior IDU is common among people in prisons, and a proportion continue to inject while in prison [10]. About 17% of the 590,000 people incarcerated in Europe on any single day are drug offenders [11]. Those convicted for drug-related crimes maybe disproportionately at risk of bloodborne infections like HCV [10]. In addition to IDU, transmission of blood-borne viruses (BBVs) in prison settings is facilitated by potentially high risk behaviours including sexual activity, tattooing and piercing [12] with needle-syringe and equipment sharing. Considering a median detention period of eight months coupled with high recidivism across European prisons [11], HCV acquisition and transmission is further exacerbated [13]. It is estimated that up to one in four people in prisons cross the EU/EEA has been exposed to HCV infection [14], and rises to over 60% among those with a history of IDU [15]. If untreated in prison, the persisting infection risk [13] remains a pertinent threat to public health as people in prisons return to communities upon release.

Although people in prison have been identified as a priority population, PWIDs are often excluded from conventional care as they sometimes face marginalisation and discrimination within communities [15, 16]. The European Centre for Disease Prevention and Control (ECDC) and the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) propose active case finding with early diagnosis of HCV infection in prisons as a strategy for prevention and entry into care pathways [17]. Harm reduction encompasses interventions aimed at preventing and reducing the negative outcomes caused by IDU: education and information; needle and syringe programmes (NSP); and opioid substitution therapy (OST) with methadone or buprenorphine for the management of opioid dependence; and have been found to be feasible for implementation in prisons. Further, DAA therapy is highly effective, even among PWID, those with human immune deficiency virus (HIV)/HCV co-infection and individuals on OST [15].

Overall, interventions in most countries have yet to be scaled up sufficiently to achieve the targets set in the Action plan for the health sector response to viral hepatitis in the World Health Organization (WHO) European Region (2017) [18] and hence the GHSS [19]. It is estimated that by reducing HCV transmission among PWID populations alone, more than 40% of new infections globally can be offset in the coming years [4], and specifically targeting those in prisons enables community dividends beyond this setting [20]. Because a proportion of people in prisons have experience with drug use, may continue or develop drug problems while incarcerated [21], interventions targeting IDU in prisons have the potential to improve both health and offending behaviours that lead to incarceration [22].

The potential impact of prisons-based interventions targeting HCV necessitates a better understanding of the opportunities and challenges in this setting, to advance progress towards elimination of HCV by 2030. This study aimed to describe the current context, epidemiological situation and responses targeting the prevention and control of HCV infection in prisons across the EU/EEA and United Kingdom.

**Methods**

**Study design**

A retrospective analysis of data submitted to the WHO’s Health in Prisons European Database (HIPED) [23] by EU/EEA countries and United Kingdom.

**Data and data sources**

Data collected through the national questionnaire for the minimum public health dataset for prisons in the WHO European Region in 2016/2017 for EU/EEA countries and United Kingdom were considered, and extracted from HIPED database on 4th March 2020. These data were provided by national focal points from the relevant public authority(ies) responsible for prison healthcare services in each participating Member State and included public health indicators ranging from prison population statistics, the prison healthcare system, prison risk factors, disease screening and treatment of communicable diseases, among others [24]. Seroprevalences were based on anti-HCV and HCV ribonucleic acid (HCV-RNA). Where not specified, the reference year for data collected was not available because the information was not requested in the original questionnaire. Data validation involved clarifying discrepancies and missing values with the national focal points [24].
Supplementary data on prisons populations were obtained from the SPACE 1-2018 – Council of Europe Annual Penal Statistics: Prison populations [11]. The term ‘prisons’ is widely used in Europe to refer to all penitentiary institutions including those for sentenced individuals and those awaiting sentence, as drawn from this project.

Other data on HCV prevalence in prisons were also obtained from ECDC’s online prevalence database of infectious diseases [25]. The database contains peer reviewed literature on studies reporting on the prevalence of HCV published between 2005 and 2017, collated and appraised through a systematic review [26]. HCV prevalence data was downloaded from the ECDC database on 4th March 2020 in CSV format, and only included measures of anti-HCV.

The detailed methodology of these three projects have been published elsewhere [11, 24, 25].

Data analysis
Data management and basic descriptive analyses were performed using Microsoft Excel (2016). Maps were constructed using the ECDC Map Maker, EMMa [27].

Results
The HIPED contained data from 26 countries including Germany which reported subnational data. There were no data for Austria, Greece, Hungary, Liechtenstein and Luxembourg.

Prisons healthcare oversight
Healthcare oversight was described in terms of state institutions charged with the prisons healthcare authority, budget administration and funding. Twenty-six countries reported on the three parameters (Table 1).

In 19 countries, a single institution had overall authority of the healthcare in prisons i.e. Ministries of Health (seven countries), Justice (eleven countries) or the healthcare department of prisons (one country); while joint authority was reported in the remaining seven countries. Eighteen reporting countries had their prison healthcare budget administered by a single institution, of which Ministries of Health were solely responsible in eight countries. In nine countries, it was administered by two or more institutions. On healthcare funding in prisons, the highest number (seven) had prisons health funded by the Ministry of Justice only and five through the state budget only. The Ministry of Health was the funding source in two countries, health insurance in one, while nine countries reported a combination of two or more funding sources. In Germany, the Ministry of Justice had overall authority across all 16 federal states, but varied between states for budget administration and funding.

Prisons population
Data on prisons population were available for 28 EU/EEA countries and United Kingdom (Table 2). Belgium, Hungary and Malta did not participate in the survey. The total number of people in prisons in these countries ranged from 12 in Liechtenstein to 93,266 in United Kingdom. The prison population rate was lowest in Liechtenstein (31.5 per 100,000) and highest in Lithuania (234.9 per 100,000). Across these countries, their median age was between 31 and 40 years, and were incarcerated for an average 1-2 months in Cyprus to 31-1 months in Portugal. Most countries (17) reported average lengths of imprisonment of less than one year with eight less than six months, but in nine of 28 countries the mean length of imprisonment was more than a year, and exceeded two years in two countries. The proportions of female and foreign people in prisons ranged from 0 to 9.8% and 1.1 to 72.1%, respectively. In three EU/EEA countries: Austria, Greece and Luxembourg, the proportion of foreign people in prisons was over 50%.

HCV prevalence
Sixteen countries had national and/or subnational data on anti-HCV or HCV-RNA seroprevalence in the HIPED or ECDC prevalence databases (Table 3). The reporting period covered was from 2001 to 2016, with seven countries reporting data after 2014. The prevalence of anti-HCV ranged from 2.3% in a maximum-security psychiatric prison in Broadmoor, United Kingdom to 82.8% from two prisons in Berlin, Germany. HCV-RNA positivity ranged from 5.7% in Malta to 82% in England. Spain reported national-level data for 2000-2009, during which period the anti-HCV prevalence declined from 44.9 to 25.3% and further to 18.7% (2016).

HCV infection screening
Twenty-five countries reported having HCV screening for people in prisons (Fig. 1). In 13 of these countries, testing was available but not mandatory and eight countries routinely offered testing to all people in prisons on an opt-out basis. In three countries: Latvia, Lithuania and Slovakia; testing was targeted at certain risk groups only. While such risk-based testing were offered on clinical suspicion in Lithuania, HCV screening was reported to be mandatory for those HIV positive in Latvia; and for drug users, sex offenders, drug dealers and foreign nationals in Slovakia. In the Czech Republic, testing was reported as mandatory for all people in prisons. Germany and United Kingdom reported on HCV screening at subnational level. HCV testing was not mandatory in 15 of the 16 German federal states. Of these, seven routinely offered screening to those eligible on an opt-out basis, was reported as ‘available’
in another seven and testing was done at the person’s request in one state. In Bavaria only, HCV testing was mandatory for all people in prisons. In the United Kingdom, England and Wales offered tests routinely to all on an opt-out basis, it was available but not mandatory in Northern Ireland, while Scotland offered when clinically appropriate. Cyprus did not report on HCV screening.

**Table 1** Prisons healthcare oversight: authority, budget administration and funding source, EU/EEA and United Kingdom (UK), 2016/2017

| Country     | Prisons healthcare authority       | Prisons healthcare budget administration       | Prisons healthcare funding source       |
|-------------|-----------------------------------|------------------------------------------------|----------------------------------------|
| Belgium     | Ministry of Justice               | Ministry of Justice                             | Ministry of Justice                    |
| Bulgaria    | Ministry of Justice               | Ministry of Justice                             | Ministry of Justice                    |
| Croatia     | Ministry of Justice               | Ministry of Justice                             | Health insurance and State budget      |
| Cyprus      | Ministry of Health                | Ministry of Health                              | ..                                     |
| Czech Republic | Ministries of Health, Justice, Interior and Healthcare department of prisons systems | Ministry of Justice | Health insurance |
| Denmark     | Ministry of Health and Healthcare Department of prisons systems | Healthcare department of prisons systems | Ministries of Health and Justice |
| Estonia     | Ministry of Justice*              | Ministry of Justice                             | Ministry of Justice                    |
| Finland     | Ministry of Health                | Ministry of Health                              | Ministry of Health and State budget    |
| France      | Ministry of Health                | Ministry of Health                              | Ministry of Health and State budget    |
| Germany     | Ministry of Justice**             | **                                             | **                                     |
| Iceland     | Ministries of Health, Justice, Interior and Healthcare department of prisons systems | Ministry of Health and Healthcare department of prisons systems | State budget |
| Ireland     | Ministry of Justice               | Healthcare department of prisons systems        | Ministry of Justice                    |
| Italy       | Ministry of Health                | Ministry of Health                              | Ministry of Health and State budget    |
| Latvia      | Ministry of Justice               | Ministry of Justice                             | State budget                           |
| Lithuania   | Ministries of Health and Justice  | Ministries of Health and Justice                | State budget                           |
| Malta       | Ministries of Health and Interior | Ministry of Interior and Healthcare department of prisons systems | Ministry of Health |
| Netherlands | Ministry of Justice               | Ministry of Justice                             | Ministry of Justice                    |
| Norway      | Ministry of Health                | Ministry of Health                              | State budget                           |
| Poland      | Ministry of Justice               | Ministry of Justice                             | Ministry of Justice                    |
| Portugal    | Ministry of Justice               | Ministry of Justice                             | Ministry of Justice                    |
| Romania     | Healthcare department of prisons  | Healthcare department of prisons system and Health insurance | Ministries of Justice, Interior and Health insurance |
| Slovakia    | Ministries of Health and Justice  | Ministry of Justice and Health insurance         | Ministry of Justice and Health insurance |
| Slovenia    | Ministry of Health                | Ministry of Health                              | State budget                           |
| Spain       | Ministry of Health***             | Ministry of Health***                           | Ministry of Health***                  |
| Sweden      | Ministry of Justice               | Ministry of Justice                             | Ministries of Health and Justice       |
| UK          | Ministry of Health                | Ministry of Health                              | Ministry of Justice and State budget   |

Source: HIPED

* Authority reported to be Ministry of Health in EMCDDA database [28]

**Prisons healthcare budget administration: Ministry of Justice and health insurance of individuals: 2 (North Rhine-Westphalia and Hesse), Ministry of Justice: 6 (Lower Saxony, Rhineland-Palatinate, Saarland, Berlin, Hamburg, Schleswig-Holstein), Ministry of Justice and state budget: 7 (Saxony, Saxony-Anhalt, Thuringia, Mecklenburg-Western Pomerania, Brandenburg, Bremen, Bavaria), State budget: 1 (Baden-Württemberg); Prisons healthcare funding source: Ministry of Justice: 15; Other: 1 (Brandenburg – Prisons)

***Ministry of Health in Catalonia and Ministry of Interior in rest of Spain

IDU

Of the 26 reporting countries, seven had data relating to numbers of current and ever injecting drug users in prisons (Table 4). Only Italy, Romania, Slovakia and Spain had national-level data relating to all people in prisons. The prevalence of current injectors ranged from 0.06% in Northern Ireland (United Kingdom) prisons to 25.8% in Italy. Among countries with data on the proportion of
people in prisons who had ever injected drugs, this ranged between 0.7% and 44.0%.

**Needles/syringe exchange programmes and opioid substitution treatment**

Among the 26 countries with data on the availability of NSPs in prisons, only Spain reported it was available in all prisons (Table 5). Germany reported NSP exclusively in one wing of Berlin’s women’s prison.

Twenty-three of the 26 reporting countries had national-level data on OST. For the United Kingdom, eligibility for OST was only reported for England (Table 5). In 20 countries including all federal states of Germany, both sentenced and those in pre-trial detention were eligible for OST. In four countries, only sentenced individuals were eligible. The number of people on OST ranged from four in Iceland (year missing) to 29,146 in England (2015). There was no data relating to the number of people in prisons who were eligible for OST in the HIPED.

**Hepatitis C treatment**

Nine of the 26 reporting countries had national-level data on HCV treatment completion in prisons (Table 6).
| Year | Geographical coverage | Reference group | anti-HCV Tested % | Tested N | Positive % | HCV-RNA Tested % | Positive % |
|------|-----------------------|-----------------|------------------|---------|------------|----------------|------------|
| 2009 | Bulgaria (One prison and juvenile institution) | Adults +children | NA | 498 | 24.7 | .. | .. |
| 2010 | Bulgaria (2 juvenile institutions) | Children only | NA | 258 | 20.5 | .. | .. |
| 2007 | National (All prisons) | Adults only | NA | 3348 | 12.5 | .. | .. |
| 2007 | National (All juvenile institutions) | Children only | NA | 140 | 4.3 | .. | .. |
| 2006 | Unspecified (Multicentre) | Adults only | NA | 3348 | 14.2 | .. | .. |
| 2015* | National | All (including those in remand prison/jail) | 863 | NA | 41.1 | .. | .. |
| 2006* | National (All prisons and juvenile institutions) | Adults +children | NA | 384 | 45.8 | .. | .. |
| 2003 | Caen | Adults only | NA | 442 | 3.9 | .. | .. |
| 2000 | Berlin (2 prisons) | Unspecified | NA | 174 | 82.8 | .. | .. |
| 2001 | National | Unspecified | NA | 31,215 | 68 | .. | .. |
| 2010 | Southeastern France (3 prisons) | Adults only | NA | 5957 | 5.2 | .. | .. |
| 2013 | Unspecified (5 prisons) | Adults only | NA | 1720 | 65 | .. | .. |
| 2013 | Clermont-Ferrand and Riom (2 prisons) | Adults only | NA | 342 | 4.7 | .. | .. |
| 2003 | Naples | Adults only | NA | 442 | 86 | .. | .. |
| 2012 | National | Adults only | NA | 777 | 12.0 | .. | .. |
| 2002 | Naples | Adults only | NA | 524 | 37.4 | .. | .. |
| 2002 | Unspecified (1 young offenders institution) | Adults only | NA | 973 | 38.0 | .. | .. |
| 2017* | National | All (including those in remand prison/jail) | .. | .. | 75 | 5.7 | .. |
| 2008 | Coimbra (1 regional prison) | Adults only | NA | 151 | 34.4 | .. | .. |
| 2005 | Unspecified (2 prisons) | Adults only | NA | 445 | 10.78 | .. | .. |
| 2015* | National | All (including those in remand prison/jail) | 100 | NA | 14.4 | .. | .. |
| 2015* | National | All (including those in remand prison/jail) | 175 | NA | 14.2 | .. | .. |
| 2000 | National | Adults +children | .. | .. | 44.9 | .. | .. |
| 2001 | National | Adults +children | .. | .. | 42.9 | .. | .. |
| 2002 | National | Adults +children | .. | .. | 38.9 | .. | .. |
| 2003 | National | Adults +children | .. | .. | 37.8 | .. | .. |
| 2004 | National | Adults +children | .. | .. | 37.2 | .. | .. |
| 2005 | National | Adults +children | .. | .. | 33.0 | .. | .. |
| 2006 | National | Adults +children | .. | .. | 30.0 | .. | .. |
| 2007 | National | Adults +children | .. | .. | 29.0 | .. | .. |
| 2008 | National | Adults +children | .. | .. | 27.0 | .. | .. |
| 2009 | National | Adults +children | .. | .. | 25.3 | .. | .. |
| 2008 | 18 prisons across Asturias, Cantabria, Lerida, Salamanca, Barcelona, La Coruna, Alicante. | Adults only | .. | .. | 22.7 | .. | .. |
| 2009 | Valencia | Adults only | NA | 2332 | 14.7 | .. | .. |
| Year | Geographical coverage | Reference group | anti-HCV | HCV-RNA |
|------|-----------------------|-----------------|----------|----------|
|      |                       |                 | Tested % | Tested N | Positive % | Tested % | Positive % |
| 2001 | Alicante Adults only  | NA              | 730      | 38.2     | ..         | ..       |
| 2016*| National All (including those in remand prison/jail) | 80 S | NA | 18.7 | 66 | 60 |
| Sweden | 2015* National All (including those in remand prison/jail) | 90 | NA | 35.0 | 90 | 35 |
| UK   | 2011 Scotland (All prisons including juvenile institutions) Adults +children | NA | 4810 | 19.2 | .. | .. |
|      | Oxfordshire (1 prison) Unspecified | NA | 118 | 11.0 | .. | .. |
|      | Broadmoor (1 maximum security psychiatric hospital/prison) Unspecified | NA | 129 | 2.3 | .. | .. |
|      | London (1 prison) Unspecified | NA | 511 | 4.3 | .. | .. |
| 2016*| England All (including those in remand prison/jail) | 24 | NA | 18.0 | 33 | 82 |
|      | Northern Ireland All (including those in remand prison/jail) | .. | .. | 12 | .. | .. |
| 2015*| Wales All (including those in remand prison/jail) | 13 | .. | 6 | .. | .. |

Sources: ECDC Prevalence database for infectious diseases (Year denotes final year of sampling in study) and HIPED*

Fig. 1 HCV screening in prisons, EU/EEA and United Kingdom (UK), 2016/2017.
Source: HIPED
During the 2015–2017 period, the number of people in prisons who had completed treatment ranged from 1 in Croatia to 1215 in Spain.

**Discussion**

Prisons across the EU/EEA and United Kingdom have a disproportionately high prevalence of chronic HCV infection, owing to specific environmental, socioeconomic and healthcare associated risk factors within and outside of prison settings. This study aimed to collate and describe relevant context, epidemiology and response across EU/EEA prisons based on publicly available data, to better understand the opportunities and challenges in this setting as the region seeks to accelerate progress towards the GHSS targets and thus elimination of HCV by 2030.

The data highlighted significant variations between the administrative structures of prisons. Only Italy reported having a single centralised system with authority, budget administration and funding instituted by the Ministry of Health only. Similarly, six countries: Belgium, Bulgaria, Estonia, Netherlands, Poland and Portugal, had these functions solely overseen by the Ministry of Justice. Combined, the majority of EU/EEA countries (>70%) have at least two institutions responsible for the oversight of healthcare in prisons. Although the WHO recommends prison healthcare to be under the remit of the Ministry of Health [30], these findings emphasise the need for multisectoral collaborations at the high level to scaling up any interventions in this setting, owing to the multisectoral governance of prisons healthcare.

We also found that people in prisons across the EU/EEA are diverse, with marked inter-country differences. Migrants and PWID comprise a notable proportion of the prison population in some countries, providing an opportunity in prisons to reach them with interventions that may not otherwise be as accessible in the community. In a few countries, the average detention period is long, extending over two years, which increases the risk of HCV acquisition and transmission among people in prisons engaged in high risk activities whilst imprisoned. At the same time, a longer detention period accommodates the care pathway for chronic HCV disease as the standard DAA treatment duration is now around 8–12 weeks. Such duration also allows for the uptake of OST.

There is still a lack of recent data, or even any data on HCV prevalence from about half of EU/EEA countries. Data from the ECDC database originated from an updated systematic review [8], complemented by more recent HIPED data. Owing to the lack of consistent data over the years, it was not possible to look into temporal trends for most countries, although national-level data from Spain showed a decline in anti-HCV seroprevalence from 45% in 2000 to 25% in 2009. However, the data presented clearly indicate that the burden of chronic HCV infection remains disproportionately high in prisons, compared to the general population [6]. These findings were similar to those of a more recent systematic review [9], in which updated prevalence estimates were lower than previously reported in most countries but still remained largely high [8, 9]. Notably, we also observed that the prevalence of anti-HCV in two Bulgarian juvenile institutions was as high as 20-5% and higher (24-7%) among studies with both adults and children. This suggests unaddressed risks and needs among younger people in prisons.

Only eight EU/EEA countries were found to have implemented the recommended universal active offer of HCV screening on an opt-out basis [17, 31], although all 26 reporting countries reported availability of HCV screening in prisons through different modalities and to varying extents. The Ministry of Health was the public authority largely responsible for prisons health in half of the countries with opt-out screening, indicating no apparent dependence on the Ministry of Health for implementation. Opt-out testing is a provider initiated service where testing is conducted unless an individual explicitly declines [32], and has been widely documented to have higher uptake than other modalities for communicable disease testing in prisons [33]. Universal active case finding, which is recommended in this setting, is known to ensure timely diagnosis and treatment to prevent the risk of further disease transmission both in and out of the prisons [17, 31]. Active case finding can be offered on a voluntary or mandatory basis, and although this was reflected in the present analysis mandatory testing is not recommended [31]. For countries reporting availability of non-mandatory testing, we assumed this implied both opt-out and opt-in modalities, where the

| Source: HIPED |
| ------------ |
| Reference population: *All people in prisons including those in remand prison/jail, °Sentenced people only, Missing |

Only eight EU/EEA countries were found to have implemented the recommended universal active offer of HCV screening on an opt-out basis [17, 31], although all 26 reporting countries reported availability of HCV screening in prisons through different modalities and to varying extents. The Ministry of Health was the public authority largely responsible for prisons health in half of the countries with opt-out screening, indicating no apparent dependence on the Ministry of Health for implementation. Opt-out testing is a provider initiated service where testing is conducted unless an individual explicitly declines [32], and has been widely documented to have higher uptake than other modalities for communicable disease testing in prisons [33]. Universal active case finding, which is recommended in this setting, is known to ensure timely diagnosis and treatment to prevent the risk of further disease transmission both in and out of the prisons [17, 31]. Active case finding can be offered on a voluntary or mandatory basis, and although this was reflected in the present analysis mandatory testing is not recommended [31]. For countries reporting availability of non-mandatory testing, we assumed this implied both opt-out and opt-in modalities, where the
latter refers to voluntary testing that is offered to all eligible people and the person chooses whether to have the test [31]. There was no report of on-demand screening, as this could be available within the context of active test offer, which is the recommended standard of care. Our findings differ from those of a previous survey undertaken by ECDC in 2016 [34] and the European Liver Patients’ Association (ELPA) commissioned Hep-CORE study in 2016/2017 [35]. Some plausible explanations in the conflicting findings could be changes in testing policies and practices between the surveys, different target groups and hence responses from the surveys, as well as differences between policy and actual implementation considering that patient groups in the Hep-CORE study reported absence of interventions in presence of policies. Though modest, the available data indicated very high prevalence of IDU in prisons compared to the general population in the region. For England (United

| NSPs                        | Eligibility for OST                                      | Year | People on OST, n |
|-----------------------------|---------------------------------------------------------|------|------------------|
| Belgium                     | Unavailable                                             | 2016 | 686              |
| Bulgaria                    | Unavailable                                             | 2016 | 14               |
| Croatia                     | Unavailable                                             | 2016 | 414              |
| Cyprus                      | Unavailable                                             | 2016 | 8                |
| Czech Republic              | Unavailable                                             | 2015 | 53               |
| Denmark                     | Unavailable                                             | NA   |                  |
| Estonia                     | Unavailable                                             | 2016 | 71               |
| Finland                     | Unavailable                                             | 2015 | 411              |
| France                      | Unavailable                                             | 2015 | 5325             |
| Germany                     | Available*                                              | NA   | 2780             |
| Iceland                     | Unavailable                                             |      | 4                |
| Ireland                     | Unavailable                                             | 2014 | 1647             |
| Latvia                      | Unavailable                                             | 2015 | 50               |
| Lithuania                   | Unavailable                                             | NA   |                  |
| Malta                       | Unavailable                                             | NA   |                  |
| Netherlands                 | Unavailable                                             | NA   |                  |
| Norway                      | Unavailable                                             | 2015 | 409              |
| Poland                      | Unavailable                                             | 2015 | 140              |
| Portugal                    | Unavailable**                                           | 2015 | 1137             |
| Romania                     | Available**                                             | 2016 | 42               |
| Slovakia                    | Unavailable                                             | NA   |                  |
| Slovenia                    | Unavailable                                             | NA   |                  |
| Spain                       | Available**                                             | 2016 | 3532             |
| Sweden                      | Unavailable                                             | 2016 | 50               |
| UK-England                  | Unavailable                                             | 2015 | 29,146           |
| UK-Northern Ireland         | Unavailable                                             | 2016 | 38               |
| UK-Scotland                 | Unavailable                                             | 2016 | 1711             |
| UK-Wales                    | Unavailable                                             | NA   |                  |

Source: HIPED

- No data, NA Not applicable
* Reports to EMCDDA indicate NSP available in one female prison [28, 29]
** Reports to EMCDDA indicate that projects to introduce NSP in Portugal and Romania formally approved but never fully implemented and not routinely available [28, 29]
1 Availability of OST in Lithuania is based on 2018 data [28, 29] not available in the HIPED
2 Sum of numbers of inmates on OST in each federal state: 14 (North Rhine-Westphalia, reference date 30/04/2016); 318 (Hesse, 01/10/2016); 1 (Saxony 18/01/2017); 40 (Saxony-Anhalt 31/03/2016), 37 (Saxony-Anhalt 31/03/2016). The figures collected refer to the total number of substitution treatments, not to a specific opioid addiction; 31 (Thuringia 31/12/2016); 60 (Rhineland-Palatinate 31/03/2016), 2 (Mecklenburg-Western Pomerania 26/01/2017); 800 (Baden-Württemberg 2016); 100 (Bremen 28/01/2017); 2 (Saarland 20/01/2017); 35 (Bavaria 31/01/2016); 1068 (Berlin 2016); 150 (Hamburg 31/01/2017); 122 (Schleswig-Holstein 01/02/2017).
Table 6 People in prisons on HCV treatment, EU/EEA

| Year  | People who completed HCV treatment, n |
|-------|-------------------------------------|
| Bulgaria 2017 4 |
| Croatia 2015 1 |
| Czech Republic 2015 555 |
| Estonia 2016 66 |
| Latvia 2016 5 |
| Portugal 2015 99 |
| Romania 2015 71 |
| Slovakia 2016 57 |
| Spain 2017 1215 |

Source: HIPED

Although the HIPED database did not contain data on the availability of HCV treatment in prisons, the Hep-CORE survey conducted in 2017 found universal access in all prisons among five of the 20 EU countries included in the study: Slovakia, Slovenia, Spain, Sweden and United Kingdom; while no HCV treatment was reported to be available in Croatia and Poland [35]. In the other 13 countries, the extent of HCV treatment was reported as available in more than half of all prisons, less than half of all prisons or unknown. Another study estimated the prison population in need of treatment in France, Germany, Italy, Spain and United Kingdom (England and Wales) to be between 6000 and 9000 in 2015 [39], representing 9.3 to 11.5% of the total prisons population in these countries highlighting a large treatment gap. More recent information from the EMCDDA indicate that HCV treatment in prisons is now available in 24 European countries, but data on coverage are lacking [28]. More robust data encompassing the number of people in prisons eligible for treatment, proportion who initiate treatment, complete it and achieve viral suppression, would be central to evaluating the progress and shortfalls within the care cascade.

Despite the gaps and suboptimal coverage of key interventions in Europe, HCV elimination or near-elimination in prison is possible, as shown by few but accumulating experiences in some countries. In Iceland, the Treatment as Prevention for Hepatitis C (TraPHePc) programme, that rapidly scaled up HCV screening, access to DAAs and harm reduction services for PWID and people in prisons [3] could see the country eliminate HCV by the end of 2020 [40]. In Australia, the adoption of the ‘micro-elimination’ approach through unrestricted access to DAAs has already achieved near elimination of HCV in a prison setting [41]. This government funded project saw a remarkable reduction in viraemic prevalence of HCV from 12 to 1% in a correctional facility over 22 months, by providing
Conclusions

The current study reiterates the importance of a regional system to facilitate the collection and aggregation of data using standard indicators [45]. Prisons and national level monitoring could be enhanced with additional data and integrated into the European-wide monitoring system for viral hepatitis that has been rolled out by the ECDC and WHO [46]. Beyond the existing critical data gaps, our findings support previous research that the burden of IDU and HCV in prisons across the EU/EEA remains high, amidst suboptimal levels of harm reduction services, screening and treatment coverage. The population demographics, the period of detention and the DAA treatment regimen present opportunities for scaling up prison-based HCV interventions and achieving elimination goals. To realise this, a multisectoral approach and collaborations between ministries and prison departments should be adopted to intensify public health response. Engaging with the civil society will also go far in increasing awareness of the issues at hand through the effective dissemination of information.

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Authors’ contributions

AON contributed to study conceptualisation, conducted the data management, analyses, interpreted the results and wrote the original draft of the manuscript. ED conceptualised the study, interpreted the results and was involved in critical revision of the manuscript. LT, LM and AM contributed to study conceptualisation, interpreted the results and were involved in critical revision of the manuscript. All authors reviewed and approved the final text.

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Availability of data and materials

The datasets analysed during the current study are available in the SPACE I - 2018 – Council of Europe Annual Penal Statistics: Prison populations report, http://www.unil.ch/space/files/2019/06/FinalReportSPACE2018_190611-1.pdf; the HIPED, https://apps.who.int/gho/data/node.prisons. All_Countries?lang=en; and the ECDC Hepatitis C prevalence database, https://www.ecdc.europa.eu/en/all-topics-z/hepatitis-c/tools/hepatitis-c-prevalence-database.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

All authors have nothing to declare. The opinions expressed herein are the authors’ own and do not necessarily represent the views, decisions or policies of the institutions with which they are affiliated.

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