Cancer-preventing vaccination programs in prison: promoting health equity in Europe

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Summary

The most important human oncogenic viruses are hepatitis B virus (HBV) and human papillomavirus (HPV). The roll-out of vaccinations against HPV and HBV is a significant public health initiative with robust evidence of impact on the prevention of infection and neoplastic disease *sequelae*. Incarcerated individuals frequently have suboptimal immunisation levels for a wide variety of vaccine-preventable diseases, including HBV and HPV, and a high burden of disease for HBV/HPV-related cancers. In this Personal View, we analyse evidence regarding HBV and HPV vaccination in prison settings in 20 European countries and integrate it with existing scientific literature to discuss the rationale and possible strategies to expand cancer-preventing vaccination in prison populations. Enhancing HBV/HPV vaccination offer and uptake of HBV/HPV vaccination for this population would not only contribute to reducing the derived burden among the European population, but would also foster health equity and boost efforts towards the attainment of global and regional public health targets.

Keywords: Europe; Prison; Vaccination; HBV; HPV; Cancer prevention

Cancer prevention through vaccination in prison settings

Typically, vaccination is offered in prisons as per national schedule and in response to outbreaks of vaccine-preventable diseases (VPDs).[1] However, individuals entering prison often have suboptimal immunisation levels for a wide variety of VPDs, largely included in national routine immunisation programs across Europe.[2] This is coupled with a higher risk of acquiring diseases while in the community due to the high prevalence of at-risk behaviours, including substance use disorders and sexual behaviours.[3]

People living in prison (PLP) have a substantially higher prevalence of hepatitis B virus (HBV) infection compared to the general population, as demonstrated by a large body of evidence.[4] Chronic HBV infection triggers inflammatory reactions that result in hepatitis: among the most severe consequences for unvaccinated or unattended patients are liver cirrhosis and hepatocellular carcinoma. This last form of cancer represents one of the main causes of liver morbidity and mortality in prison in the European region of the World Health Organization (WHO).[5]

Except for the human immunodeficiency virus (HIV), prevalence of sexually-transmitted infections (STIs) is somewhat less explored in this population group. However available data indicate elevated prevalence of syphilis, chlamydia and gonorrhoea,[6] including among adolescents in detention.[7] Prevalence of human papillomavirus (HPV) infection is also higher than for the general population, as PLP are at an increased risk due to overcrowding, limited access to healthcare, and a higher prevalence of risky behaviours.[8] Among the *sequelae* of prolonged HPV infections, there are various precancerous and cancerous lesions, which affect both women and men, ranging from precancerous conditions of the cervix to cervical, oropharyngeal, anal, vaginal, vulvar and penile neoplasias. HPV-related neoplasms are among the main causes of morbidity and

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mortality in PLP in the WHO European Region,[5] and are substantially more prevalent as compared to the general population.[8]

Despite the prison population facing increased health challenges and potentially greater benefits from vaccination, access to these services remains limited during incarceration. A recent WHO report highlights this disparity in Europe: while HBV vaccinations were provided in prisons across 77% of the countries that reported data in 2020, HPV vaccines were offered in only 50% of these countries. In contrast, coronavirus disease 19 (COVID-19) vaccinations were available in nearly all prisons.[9]

It is also essential to distinguish between availability of vaccination services and coverage, as modality of offering vaccination is heterogeneous across the region. Although PLP are largely recognised as a target group for HBV vaccination, the offer may be active or passive and vary according to age or risk group.[10] Yet, where implemented systematically, HBV vaccination in prison has resulted in clear benefits for the community.[11] Furthermore, vaccination against HBV also prevents the increased risk of cirrhosis and hepatocellular carcinoma that result from possible superinfection with hepatitis D virus (HDV).[12]

Currently, no data are available on the implementation or benefits of HPV vaccination in prison settings. However, substantial evidence exists on the reductions of HPV infections, genital warts, and low-/high-grade cytological cervical abnormalities, including when the vaccine was administered to older women.[13]

Vaccinations against HBV and HPV have been identified as leading interventions for cancer prevention in the Europe Beating Cancer Plan,[14] and relaunched through the European Council Recommendation on vaccine-preventable cancer to support Member States in their efforts to boost the uptake of these vaccinations.[15]

Additionally, infections such as HIV and hepatitis C virus (HCV) can also cause cancer, further highlighting the critical need for effective therapies and vaccines and ensuring access to these measures for PLP, in light of the principle of "equivalence of care". From a public health perspective, the importance of ensuring adequate access and offering cancer-preventing vaccines is even greater for a population such as PLP, characterised by heightened prevalence of infection, burden of disease, and worse health outcomes.

To identify priorities for action, we assessed policies, availability and practices regarding HBV and HPV vaccination in prison settings in European countries.

Vaccination services in 20 European countries: focus on cancer-preventing vaccination

This manuscript presents findings obtained through an integrated data collection approach: peer-reviewed and grey literature sources were searched and a questionnaire was administered as detailed in the text. Peer-reviewed literature was searched using keywords (natural language and MeSH terms) for the following concepts: vaccine; hepatitis B, human papilloma virus, prisons (database: PubMed). Scientific literature was searched on the 11 of December 2023 and monitored for updates until the 29th of February 2024. An additional search was performed limited to systematic reviews for the following concepts: vaccination in prison; HPV, HBV, vaccinations and adult population.[2,16] Grey literature was sourced from WHO, European Centre for Disease Control and EU Directorate-General Health and Food Safety for the European level.

We collected data on vaccination services from 20 European countries (Belgium, Croatia, Cyprus, United Kingdom (UK), Finland, France, Ireland, Italy, Latvia, Luxembourg, Malta, Moldova, the Netherlands, Norway, Portugal, Romania, Slovakia, Spain (Catalonia), Sweden and Ukraine) through an online questionnaire uploaded on the SurveyMonkey platform (https://it.surveymonkey.com) on 07/2023. The questionnaire was distributed to European countries through the European Organisation of Prison and Correctional Services (EuroPris) and institutional contacts. Data collection and validation ended in January 2024. Among 5/6 countries participating in the Reaching the hard-to-reach: Increasing access and vaccine uptake among prison population in Europe (RISE-Vac; https://wephren.tghn.org/rise-vac/) project (Cyprus, France, Italy, Moldova and the UK), additional information was acquired through a workshop (04/2023, Cyprus) followed by telephone semi-structured interviews to complement and validate data in June–July 2023.

In most of these countries, responsibility for delivering prison health care is shared between the Ministry of Health and the Ministry of Justice/Interior (10/20, Table 1).[9] Among the RISE-Vac countries, the Ministry of Health (4/5: Cyprus, France, Italy, UK) is responsible for financing prison vaccination programs, followed by the Ministry of Justice (1/5: Moldova). As shown in Table 1, HBV and HPV vaccinations are offered in 17/20 and 12/20 countries, respectively. In most countries (11/17), HBV vaccination is offered to all PLP, although no information was available in 4/17 countries. Where reported, HPV vaccination is offered to all PLP in only 2/12 countries. The 1st/only dose of vaccines is generally offered between a week and a month from prison entrance (10/20 countries, Table 1). Compared to HPV vaccination, the higher number of countries offering HBV vaccination may reflect the heterogeneity of national guidelines. Indeed, among the RISE-Vac countries, national documents/strategies explicitly identify PLP as the target group for HBV and not for HPV.

In line with the evidence that a rapid or very rapid HBV schedule may result in a higher vaccination completion rate in prison settings,[17] France, Italy and the UK adopt a very rapid schedule for HBV vaccination

	Authority responsible for prison health care			Vaccinations offered to PLP			Immunization information system (IIS)			
	Ministry of Health only	Ministry of Justice/the Interior only	Ministry of Health and Ministry of Justice/Interior	HBV	HPV	1st/only dose of vaccines: administration (days)	Paper-based	Digital	Mixed	Follow-up program
Belgium		✔		✔	▲	8–28		✔		✔
Croatia			✔	■▲▼		8–28				
Cyprus			✔	●		8–28		✔		✔
UK	✔			●	■	8–28		✔		
Finland	✔			●	■	≤7		✔		
France	✔			●	■▲	≤7			✔	
Ireland			✔	✔	●	8–28		✔		✔
Italy	✔			●	■▲▼	>29				
Latvia			✔			≤7				
Luxemburg	✔			●	■	8–28			✔	
Malta			✔	●		≤7			✔	✔
Moldova		✔		●		8–28				
Netherlands		✔		▲▼	■	8–28				
Norway	✔ (Nesset et al., 2011)			●	▲	8–28		✔		✔
Portugal			✔	✔	■▲	>29		✔		✔
Romania			✔			8–28	✔			
Slovakia			✔			Other				✔
Spain (Catalonia)			✔	●	▲	≤7		✔		✔
Sweden	Regional and local authorities			●	●	≤7	✔			
Ukraine			✔	✔		Other	✔			

Authority responsible for prison health care: except for Norway (Nesset et al., BMC *Health Serv Res* 2011, 11:301) and Sweden (Council of Europe, Report to the Swedish Government on the visit to Sweden carried out by the European Committee for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment (CPT) from 18 to 29 January 2021), data are from the Status report on prison health in the WHO European Region 2022.[9] Vaccinations offered to PLP: the different symbols refer to whom the vaccinations are offered (✔: vaccination offered, without any specification to whom; ●: all PLP; ■: specific age groups; ▲: high-risk groups; ▼: PLP with comorbidities).

Table 1: **Vaccination services in 20 European countries.**

in prison (day 0-day 7-day 21- year 1). Although data on vaccine coverage are scarce, the doses of vaccine administered are usually recorded in the prison-based Immunization Information System (IIS), available in 14/20 countries (Table 1) and generally available in digital format (8/14, Table 1). Among the RISE-Vac partners, the prison-based IIS is inter-linked with national/regional health records, at least for some vaccines. Moreover, after release from prison, a follow-up program to ensure vaccination completion exists in 8/20 countries (Table 1).

Prison vaccination services are needed to achieve HBV and HPV immunisation for cancer prevention targets

During the recent pandemic, COVID-19 vaccination services in prison settings were virtually universal, providing extensive real-life evidence of the feasibility of the intervention and its public health relevance.[11,18]

Despite the longer period since HBV vaccine rollout and the solid rationale for its use in prison settings,[17] our data highlight persistent gaps in the availability of vaccination services, lack of an approach of standardised provision and almost no data on coverage and monitoring.

The HPV vaccine, a relatively recent addition to primary preventive health measures, is primarily aimed at young adolescents who are typically younger than the minimum age for incarceration. Currently, the availability of HPV vaccinations in prisons is inconsistent and based mainly on age-based targets rather than on a robust assessment of risks and potential benefits for individuals and the broader community. In order to improve public health outcomes, all countries should expand the HPV vaccination program to include detained youth, using a gender-neutral approach. This would enable those who missed earlier vaccinations to catch up.

These considerations make a strong case for investing in prison vaccination services (Box). This added value of vaccination in prison settings in promoting equality is well demonstrated for HBV, and is likely maximised for juveniles.[7,11] An expanded vaccination offer for PLP will contribute to achieving overarching health targets such as the Sustainable Development Goals (SDGs), particularly concerning SDG3-Good health and well-being, and to achieve regionally important Europe Beating Cancer plan targets through primary prevention.[14]

People living in prison to be explicitly included in national and international policy documents

In most European countries, prisons are not explicitly mentioned in national vaccination guidelines and policy. While in some countries, PLP are mentioned as target groups for HBV vaccination, the provision of HPV vaccine for PLP is not mentioned in any national document. Moreover, international strategic documents regarding vaccination do not mention PLP.[19] The gap is partially filled by prison-specific guidance documents, which, in most cases, have been developed by supranational agencies.[17]

According to the principle of equivalence of care, as stated by the Nelson Mandela Rules,[20] it is assumed that PLP shall receive the same level of care as individuals in the community, including preventive health interventions. Although evidence is scarce there is some indication that this is rarely the case both in terms of availability of and access to immunization and vaccination services, among others.[9]

Evidence accumulated during the pandemic shows that explicit inclusion of PLP in national/sub-national vaccination strategy documents correlates with improved coverage level and vaccination service availability.[21] To promote equality and achieve equitable output and health outcomes, PLP must be identified as a

Box.

Key actions to improve cancer-preventing immunization programs in prison settings.

1. PLP should be explicitly included in national vaccination strategies.
2. All PLP eligible for HBV vaccination should be offered it as soon as possible after admission and an accelerated schedule used for those who consent to vaccination.
3. Adolescents and young adults housed in youth detention centres should be routinely offered HBV and HPV vaccination.
4. Eligibility for HPV vaccination should be extended to include adult PLP with no stringent age limit in consideration of the heightened risk for HPV infection and clinical *sequelae*.
5. Completion of vaccination schedule should be ensured after release by building connectedness with community services.
6. Prison information systems should support the capturing of immunization administration and data sharing with community-based services to ensure quality of care and enhance the accuracy of regional/national monitoring activities.
7. Tailored training to enhance knowledge about cancer-preventing vaccines should be offered for staff and PLP.
8. HBV and HPV as cancer-preventing vaccination should be part of a comprehensive package of sexual health prevention and care interventions, including screening for STIs and HIV, pregnancy test, and HPV-related cancer screening for women and men.
9. Linkage to appropriate care should be ensured for individuals diagnosed with HPV, HBV infection or any other STIs.
10. More evidence is needed on the effectiveness of HPV immunization and optimal schedule to prevent HPV-related cancers among adult people living in prison and other populations in a situation of vulnerability.

target group for cancer-preventing vaccines according to international and national guidelines. A substantial step in this direction has been made by the recent European Union (EU) Council Resolution, which, for the first time, explicitly identifies PLP, among other vulnerable groups, as a priority target for cancer-preventing vaccines.[15]

Extending target groups and adapting vaccination schedules to maximize impact

Prison architecture and living conditions and the nature of prison populations mean adaptation and tailoring of vaccination schedules is required. Studies have shown that completion of the classic 3-dose HBV immunization schedule is challenging, with the uptake rate decreasing at each subsequent dose.[22] Although HBV immunization coverage in PLP varies by geographic region and prison category, studies in the UK and Denmark have shown increased uptake and schedule completion with the introduction of accelerated or 2-dose schedules.[17] Expanding the use of rapid schedules in European prisons is one of the factors that could lead to increased coverage.

As for HPV vaccination, the current recommendation includes delivering two doses six months apart for both women and men younger than 15 years as vaccine effectiveness in preventing cervical pre-cancer lesions, other HPV-related cancers and anogenital warts is maximized when administered prior to sexual debut (i.e., HPV-naïve). In 2022, WHO recommended one-dose HPV regimens in selected contexts to expand programmatic feasibility, promote flexibility and reduce logistic challenges.[23] The proposed shift towards a one-dose schedule is supported by a growing body of evidence showing effectiveness and immunogenicity for at least eight years.[24] A simplified schedule option is very relevant in prison, considering population mobility (rapid turnover, unplanned release or transfer between prisons), particularly in remand homes and juvenile prisons.

A 3-dose schedule is currently recommended for older individuals. Quadrivalent or nonavalent vaccines provide high-level protection against anogenital warts, cervical and anogenital precancerous lesions in men and women aged 16–26.[23] Although most studies have focused on the effectiveness of HPV vaccination under the age of 26,[25] there is growing evidence of the effectiveness and benefits of vaccination for preventing cancerous lesions even at older ages,[13] however in European countries vaccination is seldomly recommended beyond 24–25 years of age.

Yet, the burden of infection and diseases among PLP and suboptimal access to prevention measures before incarceration may well justify extending the current age limit to include older women.[8,26] As for men, recent evidence indicates a high prevalence of HPV infection, particularly among younger individuals.[27] However, evidence on the prevalence of HPV infection and clinical *sequelae* among men in detention is extremely limited. Currently, the main public health rationale and recommendations for HPV vaccination administration are related to increased risk of sexual transmission due to, for example, anal intercourse or sex work. Altogether these considerations suggest vaccination against HPV should be considered universally and with a gender-neutral approach in prison, taking into account the greater risk of STIs, the overrepresentation of population subgroups widely identified as target groups for this intervention (e.g., sex workers, men who have sex with men (MSM), transgender people), and the prevalence of high-risk sexual behaviours (e.g., consensual/non-consensual anal intercourse).

In fact, HBV and HPV vaccinations should be introduced in prison as part of integrated sexual health and harm reduction services, to provide a comprehensive prevention package against STIs, and blood-borne viruses including HIV and HCV.[17]

Enhancing vaccine acceptance in prison

Currently, just over half of the prison population agrees to be vaccinated for HBV, and of these, less than half manage to finish the 3-dose cycle.[17,22] According to very limited data on HPV vaccination uptake in prison, the main barrier is represented by the lack of information regarding the vaccine, its safety and effectiveness.[28] In a recent study from Italy, 70% of the women sampled were unaware of the vaccine.[29] It is particularly important to overcome cultural and social barriers for adolescents in juvenile prisons.[30]

PLP are interested in vaccinations and keen to learn more. Recent work undertaken as part of RISE-Vac, and led by people with past experience of imprisonment, demonstrated that PLP held generally positive views of vaccination and wanted to understand how vaccines were developed, their side effects and how they might obtain a vaccination when in prison. Many felt that they did not have access to reliable information while in prison.[31] This highlights the importance of engaging with PLP and providing them with appropriate educational materials to enable informed choices about vaccination. This is likely to improve vaccination uptake rates where vaccination services are available.

In terms of implementation, the presence of staff whose responsibilities include vaccinations and previous collaboration experiences between penitentiary institutions and local health departments were identified as positive factors for the implementation of HPV vaccination services in the United States of America (USA).[32] Key challenges identified were human resources constraints and rapid turnover of PLP hampering the ability to complete the HBV and HPV vaccination schedules.[32] To ensure completion of the

immunisation course, it is essential to ensure a vaccination continuum of care post-release with community services through structured and standardised referral systems.

Evidence shows that some countries worldwide have implemented interventions to increase prison vaccine uptake. Although the interventions implemented have primarily been focused on increasing knowledge and awareness, organizational interventions have been implemented and found to be effective in increasing the rates of vaccination in prisons as well. These interventions comprise the administration of vaccines by external healthcare providers; the adoption of accelerated vaccination schedules; the revision of existing vaccination protocols; and the prioritization of prisons in national vaccination programs.[16] The aforementioned interventions can be adapted or adopted to increase the acceptance of cancer-preventable vaccines in prison settings.

Deployment of interoperable digital immunization system

Digital IISs interlinking prison facilities and community health services are fundamental to enhancing data management and individuals' health data sharing among healthcare professionals at the point of prison entry and release. This would be especially important in facilitating follow-up care and immunization schedule completion by allowing the exchange of information between the prison system and the community system.[33] However, our data and other existing evidence suggest that this comprehensive approach to vaccination is not the norm in most European countries. In many cases, it may be limited to certain vaccines, such as COVID-19, rather than applied broadly to all relevant vaccinations.[9,18]

Where interoperable digital systems are unavailable, prisons typically maintain health records in paper format. However, retrieving data from these records can be difficult. This hampers the ability to monitor the volume of immunization performed and the resulting impact. Consequently, understanding the health needs of PLP and ensuring continuity of care both during their incarceration and after their release becomes challenging. Inconsistent and poorly available data on PLP immunization compromise the ability to identify, assess and respond to existing pockets of under-immunized individuals, impeding tailored planning and programming.

Monitoring the results of improved vaccination uptake on cancer incidence and prevalence is desirable but likely to prove difficult. Imprisonment is a short period of time for many, and long-term follow-up is resource-intensive and logistically demanding. Monitoring at the population level is difficult, and there is a dearth of research on the incidence and prevalence of cancer in prisons across Europe and beyond.[5] However, recent research in England and Wales demonstrates, for example, the high prevalence of cervical cancer in imprisoned women; the age-standardised incidence rate for cervical cancer *in situ* was 2·13 (95% confidence interval: 1·91–2·36).[26] Easily accessible national cancer registries that provide data on imprisoned populations will be essential for monitoring trends and the impact of improved vaccination uptake.

As noted by other authors, the omission of PLP from national and supranational immunization targets monitoring may not only result in overestimating achieved results, including at the SDG level, but also in an inaccurate assessment of population health equity.[34]

Conclusions

HBV and HPV vaccines are critical not only to control virus transmission but also to prevent cancer. PLP are disproportionately at risk of acquiring the infections and of suffering serious health consequences, including neoplastic diseases. While some progress has been made in explicitly recognising PLP as a priority group for HBV vaccination and in the coverage of service provision, much work remains to be done to ensure the availability of HPV vaccination in prison settings, starting from youth and individuals at increased risk for sexual transmission. Schedule adaptation and expanded vaccination offer to PLP are powerful tools to close the immunization gaps between PLP and the general population and to maximise community health benefits. Finally, upscaling of and investment in prison-community interlinked immunization information systems are fundamental to ensure a better continuum of care and the inclusion of PLP in monitoring efforts to accurately assess progress towards European and global targets and health equity.

Contributors

LT and NC conceived the study. MPTF, JNI, EdV, BM developed the study protocol. All authors contributed to data collection. MPTF and EdV performed data management and analysis. All authors contributed to data interpretation. LT, NC, MPTF and JNI prepared the first draft. All authors contributed to manuscript finalisation and approved the final version.

Declaration of interests

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Other authors declare no competing interests.

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