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# Public health and clinical response to an mpox outbreak in Slovenia: case study, 2022–2023

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## ABSTRACT

**Objectives** The emergence of mpox outbreaks in non-endemic areas, characterised by human-to-human transmission and unique clinical presentations, poses challenges in containment efforts. This study aimed to analyse the 2022 outbreak in Slovenia and characterise the country's response to the outbreak.

**Methods** A retrospective, observational study analysed all confirmed mpox cases in Slovenia between 1 January 2022 and 31 December 2023 and specific public health measures and responses in the country to contain the mpox outbreak. Data were collected from clinical facilities, public health institutions and civil society organisations and analysed accordingly.

**Results** Of 149 suspected cases tested, 49 were confirmed, all cisgender men, predominantly men who have sex with men (93%), exhibiting skin lesions, with 20% being HIV infected and 62% reporting recently having sex abroad. Hospitalisation was required in 14%, no specific treatment was needed, and no fatalities occurred. After the rapid spread of mpox from May to mid-July 2022, only occasional cases were detected afterwards until the outbreak's termination in early September. Slovenia's containment strategy started immediately after the first case detection, involving rapid diagnostics and active case search, centralised case management and targeted public health measures. The LGBTIQ+ (Lesbian, Gay, Bisexual, Trans, Intersex, Queer and other sexual identities) community civil society organisation Legebitra played a critical role by launching awareness campaigns and promoting easily accessible vaccination. Despite its late start in September 2022, by the end of 2023, the vaccination campaign achieved coverage of 309 individuals.

**Conclusions** Slovenia's response to the 2022 mpox outbreak highlights prompt multisectoral collaboration, community engagement and timely public health interventions. Rapid diagnostics, centralised case management and targeted outreach likely contributed to containment. While vaccination had limited impact during the outbreak, its importance for long-term prevention cannot be overstated. As the global threat of mpox persists, continuous surveillance, cross-border cooperation and proactive vaccination strategies are recommended activities to address future challenges.

## INTRODUCTION

Mpox is a zoonotic disease caused by an enveloped double-stranded DNA *Orthopoxvirus* virus—the

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ In 2022, mpox, originally a zoonotic disease endemic in Africa, spread globally to non-endemic regions and caused outbreaks through human-to-human transmission, disproportionately affecting men who have sex with men. The outbreaks present unique challenges in affected countries, including stigma, rapid containment and the need for tailored public health interventions.

## WHAT THIS STUDY ADDS

⇒ This study highlights the coordinated country response to the mpox outbreak in Slovenia during 2022, characterised by rapid diagnostics, centralised case management, active community engagement involving particularly civil society organisations and targeted vaccination campaigns.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The study underscores the importance of proactive, multisectoral strategies, including collaboration of the affected community, timely public health control measures and continuous surveillance, as essential components for managing outbreaks of infectious diseases. Slovenia's model may inform future mpox elimination efforts in Europe, emphasising the role of healthcare coordination, community trust and vaccination.

monkeypox virus (MPXV).<sup>1</sup> Mpox, initially endemic to Central and Western Africa (clades I and II), has originally caused periodic outbreaks in endemic areas, with rare human-to-human transmission via respiratory secretions, direct contact with infected mucosa or skin lesions or contaminated objects.<sup>2</sup>

The mpox outbreak reported in 2022 from Europe and the Americas deviated from prior patterns, with sustained human-to-human transmission disproportionately affecting men who have sex with men (MSM). Its rapid spread underscored the necessity of targeted public health interventions, particularly for high-risk groups.<sup>2</sup>

The outbreak control in Slovenia, a Central European country with a two million population, may



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offer some critical insights into managing such events in smaller countries, where a centralised healthcare system and cohesive community structures may present distinct opportunities and challenges. This study explores the epidemiological and clinical characteristics of the mpox outbreak in Slovenia, evaluates the country's public health and community response and, from the gained perspective, identifies some important lessons learnt for future outbreak management.

## METHODS

We conducted a retrospective, observational study of confirmed mpox cases in Slovenia from January 2022 to December 2023. Data sources included patients' medical records from two University Medical Centres (UMC) (Ljubljana and Maribor), one General Hospital (Celje) and public health surveillance records from the National Institute of Public Health (NIPH) that include also the data for vaccination. Additionally, information on awareness activities within the community was obtained from the major LGBTIQ+ community civil society organisation (CSO) Legebitra.

All suspected cases, defined by typical skin lesions with or without epidemiological links (eg, contact with confirmed cases, travel to affected areas, unprotected sexual contact), were tested via RT-PCR at the Institute of Microbiology and Immunology, Medical Faculty, University of Ljubljana. Laboratory confirmation relied on assays targeting Orthopoxvirus and MPXV-specific genetic sequences.

## RESULTS

The complex characteristics of the mpox outbreak in Slovenia and the country's response are presented in [figure 1](#).

### Epidemiological characteristics

Between January 2022 and December 2023, 149 suspected cases were tested for mpox, with 49 cases confirmed. The outbreak in Slovenia started on 23 May 2022, with an infected MSM having high-risk sexual contact in the Canary Islands, peaked in July with 28 cases, and with occasional cases detected later in the summer ended by 11 September 2022. Despite an active search, no mpox cases were detected afterwards. All confirmed cases were cisgender men, with a median age of 37 years (IQR: 31–42), the vast majority (93%) identifying as MSM, and 62% reporting recent sexual contact abroad. Among the confirmed cases, 20% were HIV positive, all receiving antiretroviral therapy and presenting undetectable viral load. Pre-exposure prophylaxis (PrEP) for HIV infection was documented in 29% of HIV-negative individuals. Additional patients' epidemiological characteristics are listed in online supplemental 1.

### Clinical presentations

Skin lesions were present in all confirmed cases. Specific clinical data are listed in online supplemental 1. Hospitalisation due to complications was needed in two cases, however, no specific treatments such as tecovirimat were used due to the absence of severe complications or systemic dissemination of the disease. No fatalities occurred.

### Public health and community response

The Slovenian healthcare system resources to address the outbreak started a systematic mobilisation 1 day after the first mpox case confirmation ([figure 1](#)). Diagnostic and treatment centres were centralised at two major hospitals, facilitating prompt case identification and standardised care. National

guidelines for healthcare workers were issued 3 days after confirming the first case to ensure consistent management of suspected cases. An active search for mpox cases was introduced at clinical level by adding mpox testing to the battery of routinely performed testing for sexually transmitted infections (STI). Home isolation of individuals with confirmed mpox was introduced as an outbreak control measure, with no hospital-based isolation implemented.

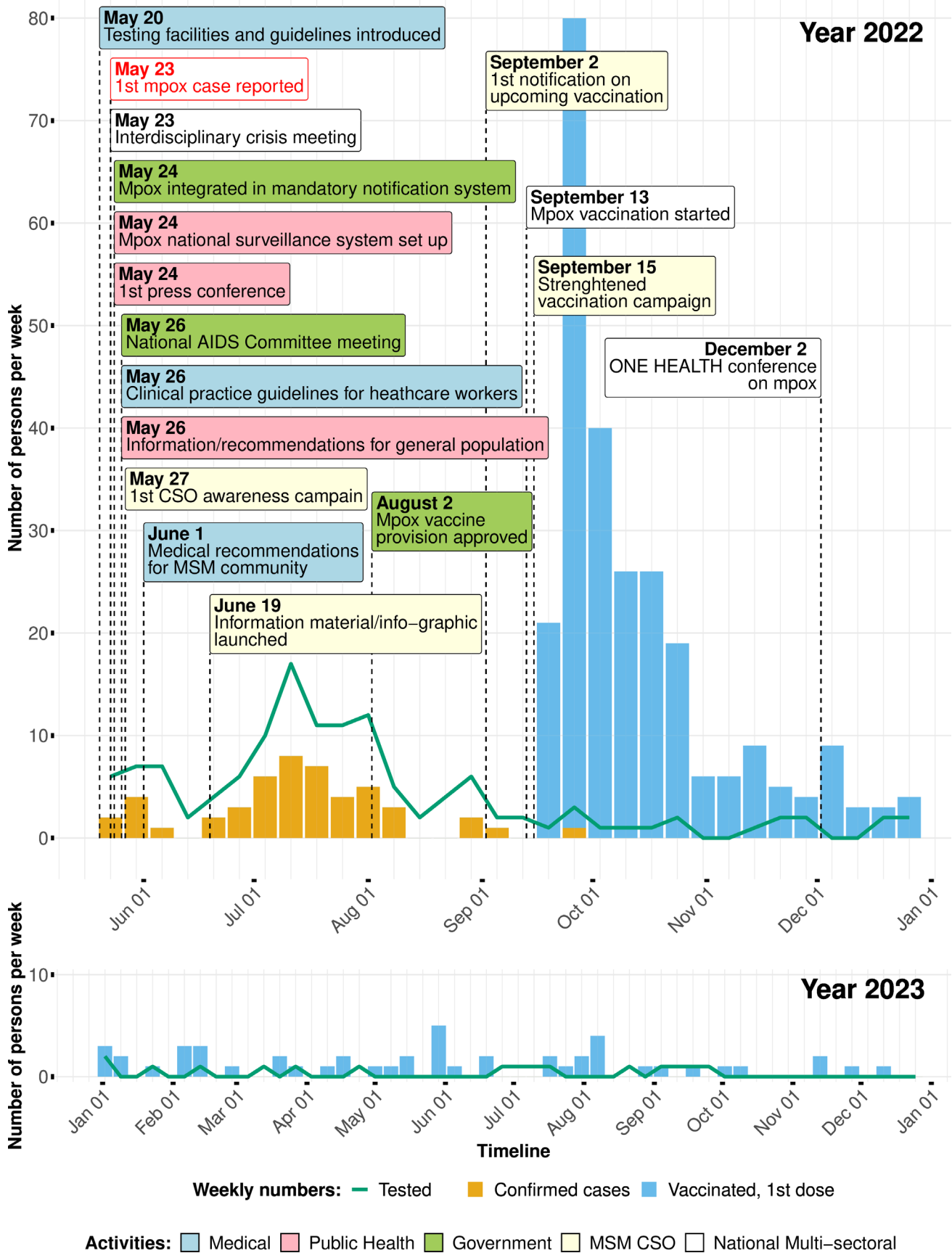
Contact tracing was conducted by the NIPH and via newly established tele-ambulance at the Clinic for Infectious Diseases, UMC Ljubljana, where 30 contacts were identified. Among those, 8 (27%) later developed mpox, reflecting secondary attack rates. According to the law, individuals diagnosed with certain infectious diseases, including mpox, are obliged to inform their contacts; therefore, mpox patients were encouraged by treating specialists to urge their contacts for mpox testing. Following the governmental approval of the vaccine on 2 August 2022, a nationwide primary preventive vaccination programme with Modified Vaccinia Ankara-Bavarian Nordic, a third-generation smallpox vaccine, started on 9 September 2022. Besides the usual NIPH vaccination settings, an additional setting has been offered at the UMC Ljubljana since 19 September 2022. The vaccination programme prioritised high-risk groups, including MSM and healthcare workers. By the end of December 2023, 309 individuals had received pre-exposure vaccination, 65% at the UMC. The national vaccination strategy did not include a postexposure vaccination for contacts of individuals diagnosed with mpox.

The communication of the NIPH with the general public started 3 days after confirming the first mpox case, and a targeted campaign was initiated on 1 June 2022, alerting MSM of high-risk behaviours for acquiring mpox and advising adjacent preventive measures to mitigate the risk.

The communication of the largest LGBTIQ+ community CSO Legebitra with the MSM community started 4 days after the first mpox case emerged. First, they launched awareness campaigns, utilising social media platforms, community networks and in-person events. Personalised messages and paid advertising campaigns on platforms popular among MSM (Grindr and Planet Romeo) with information on mpox, and since September 2022 also on pre-exposure vaccination, reached every user in Slovenia. Legebitra actively collaborated with the NIPH to distribute 3000 informational leaflets at community locations such as gay saunas and clubs, and with the UMC Ljubljana, which enabled easily accessible vaccination. Furthermore, informative articles published on their website were seen by 10 000 people and associated social platforms, for example, Facebook and Instagram interacted with 7300 users.

## DISCUSSION

Slovenia's successful containment of the mpox outbreak included several key factors, most notably the centralised diagnostic and clinical facilities, enabling rapid identification and management of mpox cases, strong medical intersectoral collaboration and active involvement of the targeted community CSO Legebitra. The epidemiological profile of Slovenia's mpox outbreak differs slightly from several Western and Central European countries, with a lower proportion of patients reporting a history of STIs (39% vs 52%–75%) and HIV PrEP use (29% vs 37%–71%), likely due to late adoption of HIV PrEP (January 2022).<sup>3–7</sup> Furthermore, the Slovenian cohort consists of a significantly lower proportion of previously HIV-infected mpox patients (22% vs 37%), probably reflecting the country's very low annual rate of



**Figure 1** A timeline of the number of reported mpox cases, tested for MPXV infection and vaccinated against mpox in the years 2022 and 2023, and a country response including clinical, public health, governmental and community interventions. CSO, civil society organisation; MSM, men who have sex with men.

newly diagnosed HIV infections (1.5 per 100 000), attributed to effective, long-standing HIV prevention measures, including widespread testing, a test-and-treat strategy and centralised HIV healthcare services, with MSM representing most cases.<sup>8 9</sup>

In Slovenia, the LGBTIQ+CSOs have been traditionally active in promoting activities to prevent HIV infection. Indeed, during the mpox outbreak, they presented one of the crucial components in successfully overcoming the spread of this new disease in Slovenia. Legebitra, which instantly responded to the mpox threat, played a pivotal role in reaching at-risk populations, reducing stigma and promoting preventive measures. Legebitra's established trust within the MSM community allowed for targeted outreach, particularly through digital platforms dedicated to MSM. This enabled the dissemination of accurate information about mpox, preventive practices and available testing, contributing to widespread awareness and engagement. Besides, after spreading the information on the importance of pre-exposure vaccination and its easy accessibility, the number of vaccinated has significantly increased.

However, while Slovenia's response to mpox was largely successful, a 1-month delay in the initiation of vaccination remains a critical limitation. Vaccination is essential for long-term infection-preventing and future outbreak control; fortunately, its late rollout had minimal impact on the initial outbreak containment efforts. Namely, the rapid spread of mpox until mid-July 2022, followed by only occasional cases detected afterwards and ended even before a larger vaccination campaign started, most probably indicates that in Slovenia, mpox did not penetrate densely into local MSM sexual networks but was rather imported in most of the cases. So, this relatively rapid containment of the outbreak most probably reflects not only the prompt and effective introduction of healthcare control measures but also the highly important prevention role of the community CSOs. It remained persistently active during the outbreak and promoted mpox vaccination even afterwards.

The May–September 2022 outbreak ended with no resurgence afterwards, a notable contrast to other European countries. In contrast to larger countries with complex healthcare systems, Slovenia's small population size and cohesive healthcare infrastructure likely facilitated a swift and coordinated response to the mpox outbreak. The experiences from Slovenia suggest that a smaller, more integrated healthcare system can allow for a more agile response, especially when combined with strong intersectoral coordination and community engagement. Community trust is essential for effective outreach, particularly among stigmatised populations. Tailored communication strategies, combined with timely vaccination, active case search and cross-border cooperation, are important components of mpox outbreak control.

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