

TECHNICAL REPORT

Considerations for contact tracing during the monkeypox outbreak in Europe, 2022

28 June 2022

Key messages

Since 16 May 2022, cases of monkeypox (MPX) have been reported by several European Union/European Economic Area (EU/EEA) countries. Human-to-human transmission of monkeypox occurs through close contact with infectious material from skin lesions of an infected person, through respiratory droplets in prolonged face-to-face contact and through fomites (e.g. linens, bedding, sex toys, clothing). This outbreak in non-endemic countries is currently primarily spreading among groups of men who have sex with men (MSM) with multiple partners. However, the potential exists for spread in other population groups. The clinical manifestations of monkeypox are usually mild to moderate, as has been observed in most cases reported in the EU/EEA to date. Severity may be higher among young children, pregnant women, and immunocompromised individuals. Isolation of cases and contact tracing comprise the core of the current strategy to control the outbreak of MPX in most EU/EEA countries.

Contact tracing consists of the prompt identification of contacts of a MPX case to allow for management of those exposed and prompt diagnosis of potential secondary cases. It can also help identify settings or population groups where targeted interventions are needed. Collaboration between public health and clinical service providers, particularly sexual health professionals where they exist, who are already experienced and have established procedures for partner notification for STIs, is critical to ensure that as many close contacts as possible are identified.

For this report, we present novel mathematical model-based stochastic simulations of MPX outbreaks. The model has been developed collaboratively by ECDC and the European Health Emergency preparedness and Response Authority (HERA) to provide generalisable insights into MPX outbreaks. The modelling suggests that without any effective contact tracing, most simulated outbreaks continued beyond 12 weeks. In contrast, high rates of effective contact tracing can minimise the chance of new cases beyond 12 weeks. Our results also show larger outbreaks could likely occur if the initial number of undetected cases are higher than one, and in case of a higher value for the number of secondary cases arising on average per case (higher than 2.5). Larger outbreaks, of between 50 and at least 300 cases over an eight-week period, are also likely to occur if there is a delay (>3 days) until cases are isolated and in the case of an incubation period shorter than 10 days.

These findings emphasise that early diagnosis, isolation, and effective contact tracing are key for the effective control of this outbreak.

In this report, we offer considerations for the prioritisation of efforts to identify and manage close contacts, as well as indicators for public health authorities in the EU/EEA that can be used for monitoring the efficacy of their contact tracing activities. Close collaboration with civil society and community-based organisations is important to build trust in contact tracing strategies and to ensure these strategies and accompanying risk communication are adapted to the affected groups, while diminishing stigmatisation.

Background

Since 16 May 2022, cases of monkeypox (MPX) have been reported by countries within the European Union/European Economic Area (EU/EEA) and beyond [1]. These MPX cases have been identified primarily, but not exclusively, among men who have sex with men (MSM). Human-to-human transmission of monkeypox virus (MPXV) occurs through close contact with infectious material from skin lesions of an infected person, through respiratory droplets in prolonged face-to-face contact, and through fomites (e.g. linens, bedding, towels, sex toys, clothing [2]). Transmission of MPX during sexual contact was hypothesised as a plausible route of infection during a 2017 outbreak in Nigeria in relation to close skin-to-skin contact during sexual intercourse or transmission via genital secretions [3]. In 2022, MPXV DNA was identified in seminal fluid samples of young adult male patients in Italy who reported condomless sexual intercourse [4]. Human-to-human transmission through close physical contact in sexual networks is a significant factor in the current outbreak, but further research is needed to clarify whether MPXV can be sexually transmitted through genital fluids rather than through contact with skin lesions, droplets, or fomites, as the presence of MPXV nucleic acid alone cannot be considered definitive evidence of infectivity.

Priority actions for the control of the outbreak include the early identification and appropriate management of the MPX cases and prompt tracing of their contacts to break the chains of transmission [2]. In the current multicountry outbreak of MPX, the virus is spreading largely among groups of men who have sex with men (MSM) with multiple partners. However, the potential exists for spread to other population groups. Isolation of cases and contact tracing comprise the core of the outbreak control strategy aiming to minimise the onward spread of MPX.

Contact tracing for MPX requires the identification of close contacts of each case. The relatively long incubation period of MPX and a prodrome phase, during which the likelihood of onward transmission is likely to be low, increases the potential impact of contact tracing in controlling the outbreak [5,6]. Contact tracing facilitates the prompt identification of those with significant exposure, including new cases, among close contacts and can also help identify settings or population groups where targeted interventions are likely to be most effective. In addition, contact tracing is a prerequisite for implementing a vaccination strategy, either for post-exposure prophylaxis (PEP) or as part of a wider ring vaccination strategy (offering the vaccine to close contacts and their contacts as well).

Collaboration between public health and clinical service providers, particularly sexual health professionals where they exist, who are already experienced and have established procedures for partner notification for sexually transmitted infections (STIs), is critical to ensure that as many close contacts as possible are identified and informed about their exposure and the necessary preventive measures they should take. Close collaboration with civil society and community-based organisations is recommended to build trust in contact tracing strategies and to ensure these strategies and accompanying risk communication are adapted to the affected groups, while minimising stigmatisation.

Aim

The aim of this document is to provide advice and considerations, based on currently available evidence, to public health authorities in EU/EEA countries conducting contact tracing in the context of the ongoing monkeypox outbreak.

Target audience

Public health authorities at national, regional, or local level in EU/EEA countries.

Mathematical modelling of the monkeypox outbreak

Model-based, stochastic simulations of MPX outbreaks starting with one case have been developed by ECDC and the European Health Emergency preparedness and Response Authority (HERA). These simulations can be interpreted as an MPX outbreak starting in any given country or setting. The model built on a previously published branching process model [7], and was substantially adapted and extended to reflect the current MPX situation.

We modelled two groups of contacts (regular versus non-regular contacts) to allow exploration of different parameter values (e.g. for the number of secondary cases generated by each case, and the total number of contacts) and interventions (e.g. contact tracing) for each group separately. The classification into regular and non-regular contacts reflects the general context within which exposures may occur, in distinction from the contact classification presented below under 'Categorisation of contacts', which reflects the likely risk of exposure within any context. The model does not require differentiating between how to interpret the regular and non-regular type of contacts among the groups, which increases the generalisability of the modelling results.

Different interpretations are possible, and for the baseline parametrisation one can consider regular contacts (such as household members and a small number of regular sex partners) versus non-regular contacts (such as sporadic contacts at events with a larger number of individuals who have had no or infrequent contact before).

For this report, we present novel modelling insights on two questions for which we run the stochastic model 1 000 times each for different scenarios:

- What are the key epidemiological parameters that can give rise to MPX outbreaks with a cumulative number of either at least 50 cases or at least 300 cases within the first eight weeks after the outbreak started with one case (unless specified otherwise)? and
- What is the required level of effectiveness of contact tracing to achieve outbreak control within 12 weeks (defined here as no new secondary cases)?

The number of cases and the timeframes were chosen for the modelling to provide generalisable insights into outbreaks after they started with one case, where the time at which the outbreak started will differ per outbreak. More technical details on the modelling approach have been summarised in the captions beneath Figures 1 and 2.

Our results show that the epidemiological parameters resulting in larger simulated outbreaks with sizes of either more than 50 or more than 300 cumulative cases over eight weeks (NB: all simulated outbreaks started with one case initially, unless specified otherwise) were:

- when the initial number of undetected cases is higher than one; and
- when on average more than one secondary case is generated by each case in the group of regular contacts, and more than 1.5 secondary cases is generated by each case in the non-regular contacts (for a combined total of more than 2.5 secondary cases arising on average per case; Figure 1).

In addition, a longer delay until cases are isolated and a shorter incubation period were influential in simulated outbreaks with 50 cases or more, but these results need to be interpreted with caution given stochasticity. Generally, simulated MPX outbreaks of 300 cases or more appear to be explained, or driven, by a more limited range of parameter scenarios than outbreaks of 50 or more cases, although all scenarios can result in such outbreak sizes.

These findings emphasise that just a few more undetected MPX cases at the start of an outbreak substantially increase the chance for larger outbreak sizes. Additionally, while the number of secondary cases generated by each case depends on viral parameters that cannot be altered (such as transmissibility), it also depends on the number (and spatial closeness) of contacts with potential for infection events happening between individuals, which can be decreased by voluntary changes in behaviour, for example through public health recommendations that promote awareness. In addition, modelling efforts (not presented here) focussed on different vaccination strategies to complement isolation and contact tracing for controlling the outbreak are ongoing.

Our simulations that explored the effect of tracing among the regular and non-regular groups of contacts to achieve outbreak control showed that most simulated outbreaks without any effective contact tracing (i.e. either relying on the isolation of cases alone, or if contact tracing activities were unsuccessful and not all (infected) contacts were identified) continued beyond 12 weeks. In contrast, high rates of contact identification through tracing can minimise the chance of outbreak durations beyond 12 weeks. These findings emphasise that using isolation and effective tracing (i.e. finding the infected individuals among contacts) is key when aiming to bring the outbreak under control much faster. The model reflects the substantial uncertainties regarding the MPX epidemiology in the EU/EEA in 2022, and the modelling framework needs to be updated if the outbreak progresses to large-scale community transmission.

Figure 1. Key parameter scenarios that can explain MPXV outbreak sizes of either 50+ or 300+ cases over eight weeks, ordered by the proportion of such outbreak sizes per parameter scenario

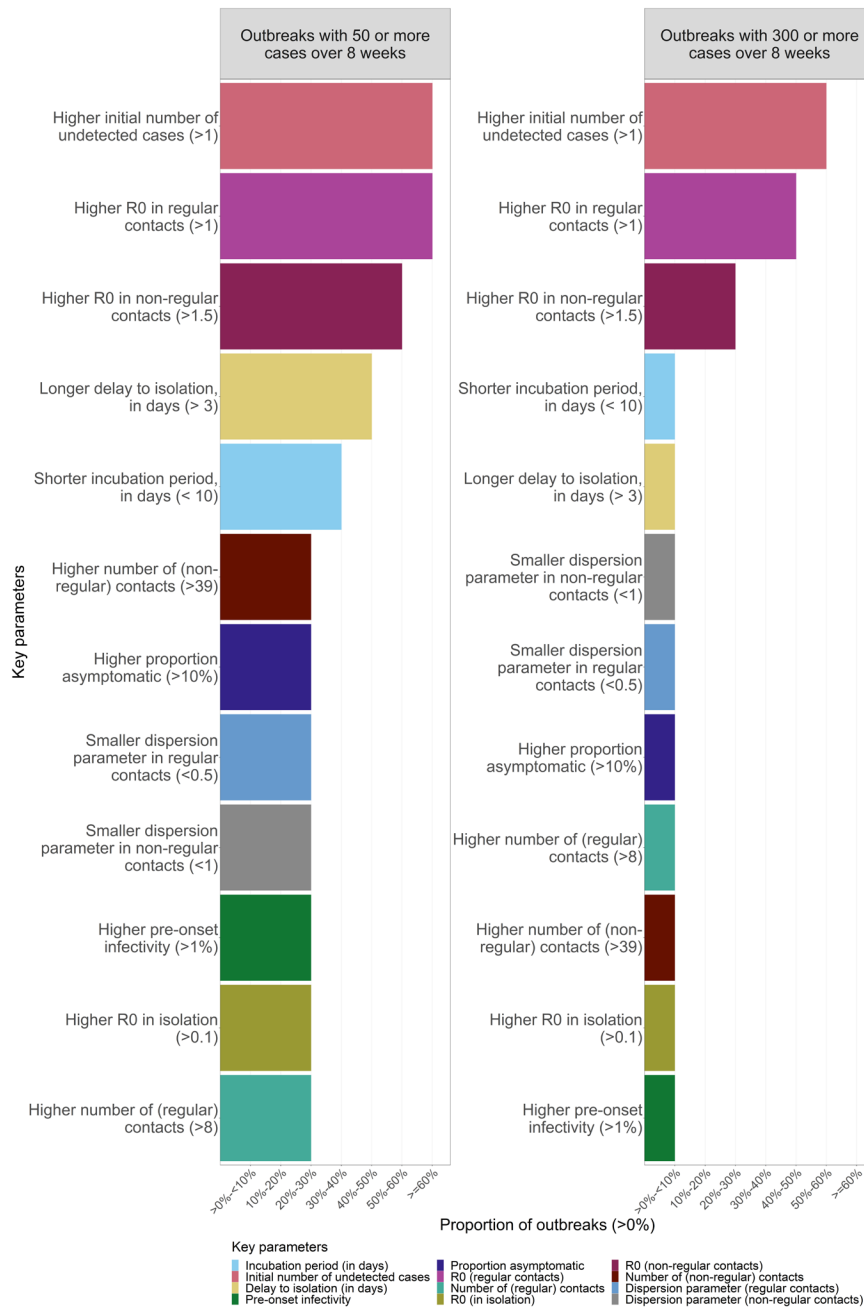


Figure 1 shows the results for the scenarios in which the simulated outbreak size exceeded 50 or 300 cases at eight weeks. We explored the uncertainty of key parameters (cf. legend of Figure 1), considering multiple scenarios per parameter (resulting in 36 scenarios in total). Each scenario was run 1 000 times, which can be interpreted as observing 1 000 individual MPX outbreaks per scenario. All simulations started with one initial case, and we sampled from relevant heavy-tailed probability distributions that reflected a mean incubation period of 10 days (range 5-21 days), a mean delay until case isolation of 2.5 days (range 1.5-3.5 days), and a combined value for R_0 of 2.5 (with a dispersion parameter of 0.5 for non-regular contacts and of 1.0 for regular contacts), which we separated in the baseline for the regular and non-regular contacts by assuming 60% of secondary cases to arise among non-regular contacts and 40% among regular contacts (note that this distinction is implicitly removed in scenarios that use a higher value for R_0). We used reasonable base-case (or in the absence of those, worst-case) parameter values in the baseline (e.g. we assumed a proportion of 10% of infections being asymptomatic or 'mild', which do not isolate but can be traced in the model). To reduce the effect of stochastic noise, we present the model results of the proportions in discrete categories. Stochastic models like the one used here are the most robust type of mathematical model in the early stages of infectious disease outbreaks where 'randomness' has a large effect. It is a desired property of stochastic models that by chance some outbreaks with $R_0 > 1.0$ can lead to stochastic extinction, and by chance $R_0 < 1.0$ can lead to outbreaks. In addition, note that these scenarios assume one sequential outbreak, and it is possible that countries may observe multiple cases being imported over time to cause separate outbreaks but that appear as one ongoing outbreak having started with one case initially. Our results could be interpreted for each such introduction separately.

Figure 2. Probability of successful outbreak control through tracing cases among the regular and non-regular groups of contacts

Panel a) shows the simulation results of successful outbreak control over time, up to 12 weeks, where cases among the regular and non-regular contacts are assumed to be traced with the same success rate. Panel b) shows the results of unsuccessful outbreak control at week 12, for which contact tracing of regular and non-regular contacts occurs at different success rates

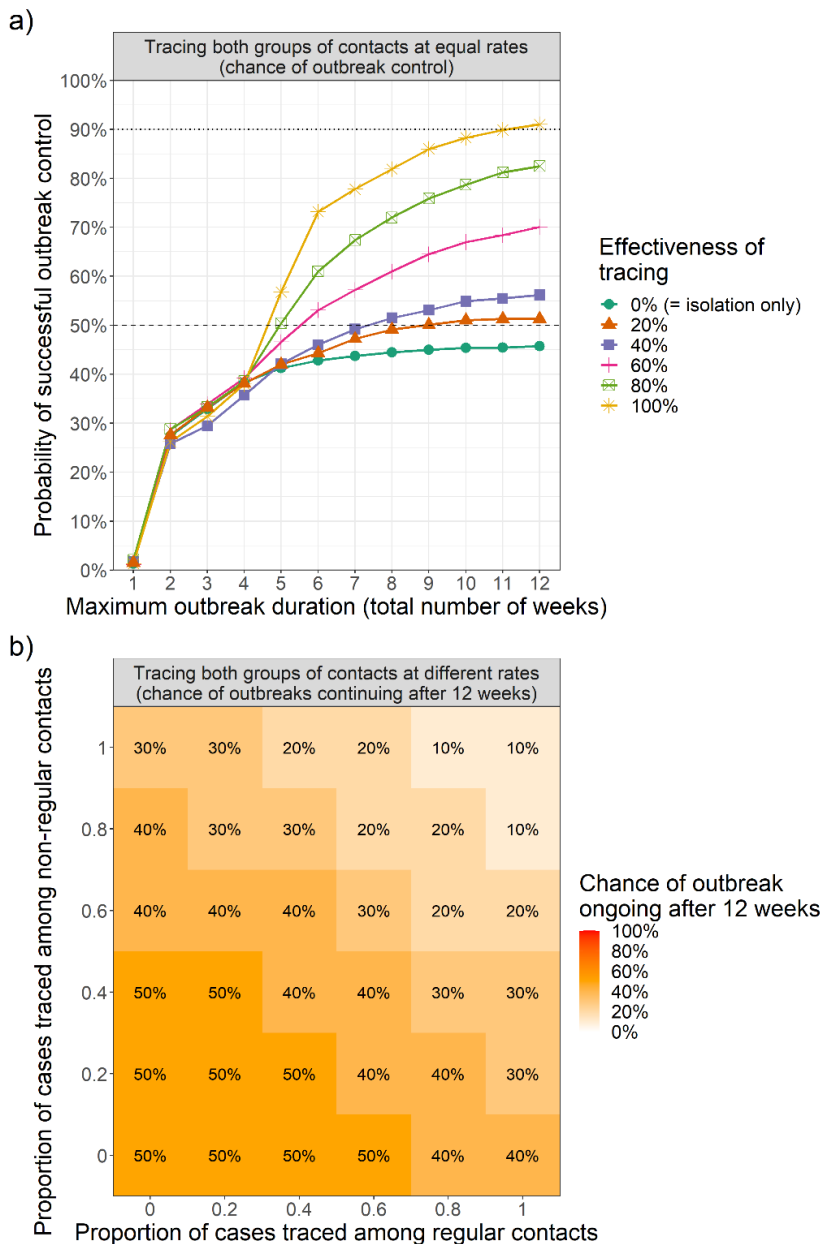


Figure 2 shows the results of 36 different scenarios of contact tracing. Each scenario was run 1 000 times, which can be interpreted as observing 1 000 individual MPX outbreaks per scenario starting with one initial case. A value for the effectiveness of contact tracing of 0% corresponds to a scenario that relies solely on isolation (at symptom onset, with some delay; or contact tracing activities were unsuccessful), and we assumed near-perfect isolation (i.e. in the model just by chance, or due to imperfect adherence, a few cases in isolation may generate secondary cases, too, based on $R_0 = 0.1$ and a dispersion parameter of 1.0 that were used to inform the number of secondary cases from a negative binomial distribution). These scenarios assume 60% of secondary cases arising among non-regular contacts and 40% among regular contacts, and the effectiveness is expected to change if cases would arise in different proportions among the two groups of contacts (as also implied by the non-symmetric ranges of values). We present maximum outbreak durations of up to 12 weeks, as the modelling framework may need to be updated for longer durations (e.g. with more evidence or large-scale community transmission). To reduce the effect of stochastic noise, we present the model results of the proportions in discrete categories (where appropriate).

Considerations for public health authorities

Categorisation of contacts

Close contacts

Contact tracing should start as soon as possible after an MPX case is confirmed. If laboratory confirmation is not available rapidly, contact tracing should also be considered for probable MPX cases. Infectiousness of MPX is primarily connected to the presence of the rash, even if there are very few lesions; however, patients with prodrome symptoms (such as fever, myalgia, fatigue, and headache) may also transmit the virus [5]. Therefore, the infectious period should be considered as beginning with the appearance of prodromal symptoms and ending when the lesion scabs have fallen off and new skin has formed. If no prodromal symptoms are reported, as is frequently the case in this outbreak [8], one day before the onset of the rash may be used as the onset of the infectious period of MPX.

Table 1. Close contacts of a monkeypox case and their definition

Type of contact	Description	Definition
Close contact	Sexual partner	<ul style="list-style-type: none"> Persons having any type of sexual contact with the MPX case from the onset of their rash (and/or prodrome symptoms)
	Household contact	<ul style="list-style-type: none"> Person(s) living in the same household as the MPX case, or similar setting (e.g. camping, overnight sleeping, etc.). Person(s) sharing clothing, bedding, utensils, etc. with the diagnosed case. Caregivers of the MPX case, from the onset of their rash (and/or prodrome symptoms).
	Health professionals	<ul style="list-style-type: none"> HCWs who came into contact with the MPX case (lesions or prolonged face-to-face contact (>3 hours and < 2m distance) without appropriate personal protective equipment (PPE) [9]. HCWs who suffered a sharps injury or was exposed to MPX case body fluids or aerosol-generating procedure without PPE. Laboratory staff suffering occupational accident with virus-containing sample (splash, sharps injury, aerosol exposure, etc).
	Other prolonged physical or high-risk contact	<ul style="list-style-type: none"> To be assessed on a case-by-case basis, but may include, among others, sitting adjacent to a confirmed case during prolonged travel (e.g. when physical contact with the case or with fomites may have occurred), sharing utensils or other equipment, or sharps injury linked to an MPX case occurring in a non-HCW.

A sexual contact of an MPX case is a person who has been in contact during intimate sexual activity with an infected person during the infectious period. Beside sexual contacts, other close contacts of an MPX case are also at risk of infection from contact with infected bodily fluids, lesion fluid, droplets, and infected skin squames or scabs (Table 1). Other close contacts include people living in the same household, caregivers or anyone sharing the same bedding or clothing with an MPX case, or with other forms of prolonged physical contact with an MPX case, while they have the characteristic rash and/or prodrome symptoms [6]. Both these types of contact are considered high-risk and, as mentioned below, should be prioritised for tracing.

Observations from MPX and other orthopoxvirus outbreaks indicate that transmission can also occur through respiratory droplets when there is prolonged face-to-face contact, as well as through fomites. According to recent studies, patients can have upper respiratory PCR-positive samples for monkeypox virus for a significant period of time [10], corroborating the droplet route of transmission, although it is not yet clear how much this route contributes to transmission in this outbreak. Currently, no data exist to assist in defining the level of risk in prolonged exposure (i.e. how many hours of exposure may result in higher risk) and no cases have been identified in this outbreak that were clearly infected through these routes of transmission. Individuals who have been in contact with an MPX case for a prolonged time (e.g. at a workplace sharing the same closed space or the same equipment, or in conveyances seated next to the case) may also qualify as a close contact, but this would require a case-by-case risk assessment. Factors to consider in this assessment include duration and exact type of contact, timing of contact as regards onset of rash, whether clothing covered the skin area with lesions, etc [2].

Close contacts should be identified as soon as possible and informed of their exposure and their risk of developing infection, the symptoms of MPX, and when symptoms may appear. Contacts should follow the recommendations of their national public health authorities. Countries should consider advising contacts to:

- practice careful hand hygiene and respiratory etiquette;
- self-monitor for symptoms compatible with MPX (e.g. fever, rash, lymphadenopathy) and inform their healthcare provider or the public health professionals responsible for monitoring (see below);
- abstain from sexual activities for 21 days after last exposure;
- avoid contact with immunocompromised people, young children, and pregnant women for 21 days after last exposure; and
- avoid close direct contact with animals for 21 days after last exposure.

Quarantine of close contacts is not warranted at this point, as there is no evidence of pre-symptomatic transmission, and it may disincentivise diagnosed cases to provide information on their contacts [11].

Information on where to be examined, tested and what to do while awaiting test results and if test results are positive should also be provided to all identified contacts (i.e. isolation, measures to prevent transmission to others). If patient/non-professional referral is used (see below), information that needs to be provided to contacts (see above) should be provided to the person notifying the contact. To avoid misinterpretation, the authorities should consider providing recommendations in written form (e.g. leaflets, links to websites, QR codes).

Close contacts should be followed up and monitored for the development of MPX-compatible symptoms (e.g. fever, rash, etc) for 21 days after their last exposure to the index case. Monitoring can be organised according to national guidelines and recommendations made either actively (e.g. by public health personnel) or passively (by asking the contacts to call local health authorities/contact tracers). Quarantine or exclusion from work are not necessary during the contact tracing period as long as no symptoms develop. The frequency of active follow-up of contacts depends on the availability of human resources, but optimally follow-up calls should be undertaken on a daily basis.

In addition, contacts may need to be assessed regarding their risk of severe disease and the criteria for post-exposure prophylaxis with the smallpox vaccine according to the national vaccination strategy.

Other contacts

Other categories of contacts of an MPX case (i.e. non-close contact) include lower risk exposures (e.g. social encounters with a case, being present at the same social or other event, working in the same company or sharing the same transportation (but not sitting next to the case)). Public health authorities can liaise with organisers of events, companies or other venues to provide relevant information to all participants about potential exposure and guidance, as needed [12]. Passive monitoring can be used for contacts with lower risk exposures, where the contacts can be asked to self-monitor and inform their health provider and/or their local health authorities only if they develop symptoms compatible with MPX.

Countries could also consider issuing general public health information or non-individualised messages for individuals who are aware that they have had other forms of contact (i.e. not fulfilling the definition of 'close contact') with a case of MPX, informing them to:

- practice careful hand hygiene and respiratory etiquette;
- self-monitor for symptoms compatible with MPX (e.g. fever, rash, lymphadenopathy) for 21 days after their exposure; and
- call their healthcare provider for medical advice or their public health services if they develop any symptoms (passive monitoring).

Contacts of contacts may also need to be identified, referring to close contacts of the initial close contacts of the index case, if the country is considering the implementation of a ring vaccination strategy.

General considerations for contact tracing and partner notification

Contact tracing of newly identified MPX cases should be undertaken with sensitivity and discretion, building on longstanding good practices implemented for the contact management of STIs and in the HIV epidemic, as well as in the ongoing COVID-19 pandemic.

Contact tracing in the context of STIs is often referred to as partner notification, a process whereby the sexual partners of a case (such as a patient diagnosed with an STI who presents for care) are identified and informed of their exposure and invited to attend for counselling, and where necessary, for testing and/or treatment [13,14].

Partner notification should be performed along the lines of relevant national guidelines and should be based on a voluntary process in which a trained health professional asks the index case about their sexual contacts. If the interviewed case consents, the health professional may provide advice on testing for relevant infections to these partners and contacts, as well as facilitating linkage to preventive interventions such as vaccination, post-

exposure prophylaxis (PEP), or treatment. The identity of the index case is not revealed to the contact unless consent is given to do so. Approaches to partner notification may include patient referral (when patients notify their contacts on their own), provider referral (contacts are notified by a healthcare worker (by telephone, by letter, email or text, by visit to the partner's home, by notification sent to the partner's general practitioner), and anonymous partner notification (contacts are notified through the use of information and communication technologies, such as apps, websites sending anonymous emails or SMS, without disclosing information on the case [15]). Approaches of patient referral may include simple patient referral, enhanced patient referral (written information, video, leaflets, internet links, reminders by phone) and healthcare-assisted partner notification (patient is assisted by healthcare providers or peers to notify contacts) [14,16].

Regardless of approach, it is important to respect the core principle of confidentiality. It should be noted that legal circumstances pertaining to partner notification vary from country to country and can impact the way it is implemented.

Guidance on partner notification for STIs/HIV is available from the International Union against Sexually Transmitted Infections (IUSTI) [14] and WHO [16]. ECDC previously reviewed the public health benefits of partner notification for STIs and HIV [13].

Options for partner notification in the context of the ongoing monkeypox outbreak

Partner notification methodology, as used for STIs, can support contact tracing in the context of the MPX outbreak. In general, its objectives in this outbreak include to interrupt chains of transmission within sexual networks, to identify contacts at higher risk of disease acquisition and severe disease, and to allow for early referral to care including, if necessary, post-exposure prophylaxis by vaccination, or treatment if already unwell.

Partner notification optimally requires dedicated and trained staff, able to take a sexual history. Depending on national recommendations, data that should be obtained from the case can include the number of contacts in the relevant period, names of contacts, addresses, phone numbers and email addresses of contacts, insights into sexual contacts and networks, explicit details about relationship with contacts, where the contacts took place, sexual practices, and the use of condoms. Partner notification in the context of this MPX outbreak may also provide an opportunity for assessing risks of transmission of other infections, in which case experience shared by countries indicates that the following additional information that may be considered of value: history of STIs in the previous year, number of sexual partners in the last three months, type of sexual contacts during the incubation period (new, one-off, occasional, established), use of geospatial applications to meet new partners, attending cruising grounds, attending sex on premises venues, having sex with men only or men and women, HIV status and use of anti-retroviral treatment (ARV) or pre-exposure prophylaxis for HIV (PrEP).

No currently available evidence suggests that there is pre-symptomatic transmission of MPXV. Therefore, for forward contact tracing, individuals who were exposed to the case in the interval between the onset of their symptoms and the healing/resolution of their rash (i.e. until no new lesions appear and all scabs fall off) should be considered. Should backward contact tracing of sexual contacts also be performed to identify the index case or the place of infection, the lookback period should cover the 21 days before onset of symptoms. Twenty-one days has been estimated as the 97.5th percentile of monkeypox incubation period in this outbreak [17,18]. These recommendations will be revised if evidence of pre-symptomatic or asymptomatic transmission emerges.

If the contacts cannot be identified, non-individualised messages can be sent to participants of events or venues informing about possible exposure to the MPX virus and the relevant precautionary measures and advice on testing [12]. The messages should include all relevant information regarding symptoms, testing, and prevention of further transmission if symptomatic or tested positive. Such messages can be sent by the event organiser/venue owner, for example through event apps, email lists, and lists of registered participants to events. Post-event messages on the website of an event or venue are also a possibility [19]. Using alternative tools for notifying and locating contacts (such as internet-locating information) could be useful when traditional contact information is missing [20], provided they respect GDPR and national data protection legislation.

Several countries have developed guidance documents on contact tracing in the context of the current monkeypox outbreak. Contact tracing guidance is publicly available from the United Kingdom [21], Ireland [22], Germany [23], Spain [24], and Portugal [25].

Challenges for contact tracing in the context of the current monkeypox outbreak

There are several challenges for contact tracing during the ongoing MPX outbreak in non-endemic countries. Some of the issues that have been discussed in ECDC-organised webinars and other interactions with EU/EEA countries include:

- Multiple anonymous sexual contacts are reported in this outbreak.
- Limited human resources for contact tracing (due to COVID-19 resource needs and the resource-intensive MPX tracing needs).
- Lack of experience of health personnel in contact tracing of sexual contacts in settings other than sexual health clinics or those implementing such activities on a regular basis.
- Timeliness of contact tracing.
- Stigma associated with MPX and MSM, who are currently the most affected population group.
- Stigma associated with MPX and sex practices (e.g. sex between men, group sex, sexualised drug use, sex in commercial venues), which may inhibit disclosure and sharing of information relevant to contact tracing.
- Stigma associated with sexuality and identifying as LGBT+, particularly in countries in which human rights may not be fully protected.
- Varying levels of trust in public health authorities in different countries, which can affect compliance with contact tracing.

MPX contact tracing activities need to be timely and effective to be able to interrupt transmission chains (see results from mathematical modelling above). The time available for effective contact tracing in the context of MPX (three weeks compared to longer time periods for some STIs) is a challenge, as assessment, recording of the sexual history, and reaching contacts may take a relatively long time. Nevertheless, this same aspect may increase the likelihood of cases remembering their contacts and being able to provide valid contact details. Based on the modelling presented in this document, efforts should be made to trace as many contacts as possible in order for the strategy of isolation and tracing of contacts to contribute to reducing transmission. Case and contact interviews may also help identify risk factors and settings for targeted public health interventions. Applications such as Go.Data developed by WHO can assist in outbreak investigation, contact tracing and visualisation of chains of transmission. The Go.Data MPX outbreak module can be obtained upon request by emailing godata@who.int [26].

Limited human resources, either due to re-allocation of staff to the COVID-19 pandemic or due to a limited number of sexual health professionals, is a challenge for successful contact tracing. Expanding the workforce to be able to cover MPX contact tracing activities and, in addition, adequately training them in partner notification methodology in the context of the ongoing MPX outbreak can contribute to effective contact tracing. Collaboration between STI clinicians and other personnel in STI clinics or services and public health authorities should be promoted, as such staff are more experienced in communicating on sexual health issues and with MSM in general. Countries should consider placing staff who have been trained in partner notification in settings seeing high numbers of MPX cases to assist with partner notification activities. Depending on the country context, practices, and available resources in STI clinics, they may also carry out some or all the contact tracing activities themselves or provide advice to public health authorities in this regard.

If contact tracing services are overwhelmed with the number of contacts to be followed, a pragmatic approach could be adopted whereby close contacts could be prioritised over others. For example, sexual contacts, household contacts, and healthcare workers who have experienced a high-risk occupational exposure (e.g. attending an aerosol-generating procedure without appropriate PPE, suffering a sharps injury or an accident with their PPE) could be considered as top priority for tracing and monitoring. In addition, any identified contact at higher risk of severe disease should be prioritised for active monitoring.

Community trust, particularly as regards the affected groups, is essential for contact tracing. Given the existing COVID-19 pandemic fatigue, varying levels of trust in health authorities, and stigma, collaboration between public health authorities and civil society organisations can increase the effectiveness of contact tracing. Strategies implementing strict rules (such as mandatory quarantine) for identified close contacts may further deter the disclosure of contacts. Community organisations are often trusted and accepted by the affected group, and communication about the need to identify contacts may be more effective if it comes from these organisations. These organisations could also identify the best ways to reach specific risk groups and advise on the development of materials provided to cases and contacts [27]. Community organisations can help identify and design community-based solutions to contact tracing integrating community perspectives, building understanding of the importance of contact tracing and acceptance of the strategy.

The challenge of anonymous contacts can be addressed through risk communication activities targeting those groups with anonymous sexual contacts. At-risk people should be encouraged to keep contact details of sexual contacts. This will facilitate contact tracing for the ongoing MPX outbreak and for STIs. Organisers of events where anonymous sexual activities may take place should be aware of the need to inform participants (if the organiser has contact details of the participants) after the event if an infection is detected among the

participants. Maintaining and using contact details of event participants should respect GDPR and national legislation that ensures data protection.

Stigma or fear of stigma can hamper public health responses, including contact tracing. With most cases of MPX currently occurring in sexual networks and among MSM, the potential for stigmatisation of MSM and LGBT+, and those engaging in particular sex behaviours linked to transmission (e.g. sex parties) is high. As such, it is essential to prioritise engaging with civil society and trusted community-based organisations during contact tracing. If possible, members of the affected group or those with a shared identity with them should be trained and used as contact tracers. For example, collaborating with civil society organisations specialised in HIV testing and access to care for LGBT+ could be considered. It is important to ensure that in addition to using respectful and inclusive language that does not link disease transmission to sexual orientation or sex practices, contact tracers are honest and transparent about confidentiality and privacy rights. The benefits of contact tracing should be highlighted for MSM and LGBT+, for people who are immunocompromised (and may be unaware) and for preventing transmission in other groups through close contact, including sexual contact, while also highlighting the risks of partial or incomplete contact tracing. Clear advice on preventative behaviour should be provided to close contacts at the same time. Working with civil society and community-based organisations on language and communication used in contact tracing can also help to reduce stigma.

For more detailed advice and examples on engaging with communities, see the ECDC/WHO guidance document 'Interim advice on Risk Communication and Community Engagement during the monkeypox outbreak in Europe, 2022' [28].

Indicators for monitoring contact tracing activities

ECDC encourages countries to monitor the effectiveness of their contact tracing operations using quality standards and indicators to identify where coverage or timeliness needs to be improved. It is currently not clear which indicators will be most useful for monitoring contact tracing activities in the context of the MPX outbreak. A set of indicators are proposed below, and each could be assessed for adoption considering the national context.

Proposed indicators for MPX contact tracing activities to be monitored by countries include:

- proportion of cases where contact tracing is initiated (can also consider narrowing this down to within 24 hours after diagnosis of the index case);
- number of contacts (and their risk classification) identified per index case;
- proportion of contacts traced (i.e. contacted and advised to follow relevant recommendations) per index case;
- proportion of contacts who test positive for MPX (i.e. secondary attack rate, including the attack rates for each category of contacts);
- number of contacts monitored (actively (e.g. daily or according to national recommendations) or passively (instructed to call if symptoms arise));
- proportion of close contacts which complete follow-up (including reasons for loss to follow-up if known);
- proportion of newly diagnosed cases who were previously in contact lists; and
- proportion of contacts traced within x days from identification of index case/onset of rash (or symptoms) of index case.

International collaboration

When contact tracing investigations identify contacts or a potential source in another EU/EEA country, public health authorities could consider collaborating across borders and exchanging data in a secure way (through, for example, the selective exchange messaging function of the Early Warning and Response System (EWRS) of the European Union). For contact tracing involving non-EU countries, countries can use the International Health Regulations (IHR) through the World Health Organization.

Limitations

There are currently several unknowns that may lead to updating this document. Such gaps include whether MPXV can be sexually transmitted (i.e. transmission through genital secretions rather than through close contact during sexual activities) and the clinical and public health relevance of detection of MPXV DNA in seminal fluid, duration of viral shedding, investigation on infectivity of genital secretions and other body fluids through virus culture, the precise infectious period and the documentation of pre-symptomatic transmission if it exists, the relative importance of various transmission routes (e.g. skin contact vs. droplets), as well as the secondary attack rates in various settings or by types of contact.

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