UK Health Security Agency

Mpox incubation and infectious periods

A rapid evidence summary

Contents

Main messages

1. This rapid evidence summary (search up to 29 August 2024) identified and summarised evidence relating to the incubation and infectious periods of mpox infection in humans.

2. Twenty-eight studies were included (1 to 28), of which 15 were retrospective cohort studies (1 to 3, 6, 7, 9, 11 to 16, 21, 24, 27), 12 were prospective cohort studies (4, 5, 10, 17 to 20, 22, 23, 25, 26, 28), and one was a cross-sectional study (8).

3. One study reported on mpox clade I (1), 9 reported on mpox clade IIb (2 to 5, 18 to 22), and 18 studies did not report clade (6 to 17, 23 to 28). Most studies were conducted between May 2022 and November 2023, with the exception of 2 studies (one conducted between 2001 to 2021 (1), and one conducted between January 2015 and November 2022 (7)). One study was conducted in Africa (1), 16 in Europe (3 to 5, 11, 12, 14 to 17, 19 to 21, 23, 24, 26, 27), 2 in North America (13, 28), 2 in South America (8, 9), and 2 were multicentre studies (one in North America and Europe (6), and one in Africa, Europe, North America and South America (7)). It is likely that studies which did not report mpox clade were describing mpox clade IIb, given the countries and timeframes. However, as this was not confirmed the results have been reported separately in this review.

4. Seventeen studies estimated the incubation period of mpox (1 to 17). The median reported incubation period ranged from 5 to 9 days between studies. Incubation period was similar in studies which specified mpox clade I, IIb and studies where mpox clade was not reported. It should be noted that only one study reported incubation period of clade I (1). Although findings were consistent with other evidence, a single study is insufficient to make firm conclusions for the incubation period of mpox clade I.

5. In studies of incubation period where Human Immunodeficiency Virus (HIV) status was reported, people living with HIV ranged from 51% to 65% of cases. Treatment status and Cluster of Differentiation 4 (CD4) cell counts were not reported consistently between studies. Where median CD4 count was reported, it ranged from 516 cells per microlitre (µL) to 672 cells per µL. One study reported that the median incubation period was shorter in people living with HIV with CD4 counts of less than 200 cells per µL (median: 3 days), compared to people living with HIV with CD4 counts of equal to or more than 200 cells per µL (median: 6.5 days) (5). Other studies did not compare incubation periods between people living with HIV who have low CD4 counts and people living with HIV who have normal CD4 counts, or people with HIV negative status.

6. Fourteen studies reported outcomes that indicate likely infectious period of mpox, including viral clearance, viral load over time and viral positivity over time, as well as serial interval. These were all either mpox clade IIb or did not report clade (13, 16 to 28).

7. Viral clearance, viral load, and viral positivity varied between studies, and by where samples were taken from (17 to 28). The evidence suggested that most cases were infectious from baseline testing or symptom onset and remained infectious for at least 21 days, although some people may be infectious for longer. One study reported viral positivity more than 56 days after symptom onset in a single sample (21), and one reported viral positivity in single samples 31 and 71 days after symptom onset (19). However, evidence on longer term follow up was very limited and the HIV or immune status of the cases reporting viral positivity beyond 30 days was not reported. Serial interval was estimated to be a mean of 7 to 9 days in 2 studies (13, 16).

8. In the studies of infectious period where HIV status was reported, people living with HIV ranged from 11% to 65% of cases. Treatment status and CD4 counts were inconsistently reported between studies. Where median CD4 count was reported, it ranged from 450 to 777 cells per µL. No studies compared the infectious period of people living with HIV with low CD4 counts.

9. Critical appraisal was not performed, which restricts the interpretation of the findings, although important limitations of the evidence have been highlighted. Sample sizes were often small and the short length of follow up in most studies meant the evidence did not inform definitive conclusions about infectious period. Viral clearance, load, and positivity over time may be affected by differences in laboratory methods between studies. It was also not clear if samples were taken sequentially from the same cases over time, or if the measures of infectiousness were derived from different samples from different people. Some studies of incubation period also relied on the reported accuracy of known exposure time.

10. In summary, the median incubation period of mpox ranged from 5 to 9 days and may be shorter in people living with HIV with low CD4 counts. Measures of infectious period varied by where the sample was taken from, but evidence suggested that most cases were infectious from at least symptom onset and remained infectious for up to 21 days after symptom onset, although some people may be infectious for longer. However, evidence on longer term follow up was very limited. It was not possible to determine from the evidence whether infectious period was affected by HIV or immune status of the cases.

Purpose

The purpose of this rapid evidence summary was to identify and summarise the available evidence on the incubation period and infectious periods of mpox.

The review question was:

1. What are the incubation period and infectious periods of mpox virus in humans?

Methods

A rapid evidence summary was conducted, following streamlined systematic methods to accelerate the review process. A literature search was undertaken to look for relevant primary studies, published or available as preprint, up to 29 August 2024. A previous review on the incubation and infectious periods, and transmission of mpox was completed by UKHSA in 2022 (29). This was checked for relevant studies. Two additional reviews identified during screening were also checked for relevant studies (30, 31).

Incubation period was defined as the time between contracting mpox and symptom onset.

The infectious period was defined as the time period during which an individual may infect others. Studies on transmission provide the most direct evidence for the infectious period. Other studies provide evidence that indicate transmission and infectiousness, such as viral clearance (time from positive to negative test), viral load over time (amount of detectable virus), viral positivity over time (presence of detectable virus) and serial interval (the time between the onset of symptoms in the person who transmits the infection and the onset of symptoms in a secondary case).

A protocol was produced before the literature search was conducted, including the review question, the eligibility criteria, and all other methods. Full details of the methodology are provided in the protocol in Annexe A.

One clarification was made to the protocol to note that studies of viral load were only included if they measured viral load over time and therefore could inform the period of infectiousness, and not just likelihood of infectiousness at a single point in time.

One protocol deviation was made to amend the inclusion criteria to include evidence from laboratory confirmed mpox when clade was not reported (from any country), in addition to those specified as clade Ia, Ib, IIa or IIb. This was to ensure that all information which may inform incubation and infectious period of mpox was included in this review.

Screening on title and abstracts was undertaken in duplicate by 2 reviewers for 10% of eligible studies, with the remainder completed by one reviewer. Screening on full text was undertaken by one reviewer and excluded studies were checked by a second. Data extraction was performed by one reviewer and checked by a second.

Where available, smallpox vaccination history was reported, as well as whether cases were immunocompromised. For people living with Human Immunodeficiency Virus (HIV), Cluster of Differentiation 4 (CD4) cell counts, and antiretroviral treatment status was also reported.

Evidence

In total, 3,236 studies were screened at title and abstract and 104 studies were screened at full text. Of these, 26 studies met the inclusion criteria (2 to 22, 24 to 28). No additional relevant studies were identified from the previous mpox review completed by UKHSA in 2022 (29), or from 2 additional reviews that were identified during screening (30, 31).

Two additional studies were included, one (23) was identified from an mpox review on routes of transmission of mpox (32), also conducted by UKHSA at the same time as this review, and one was identified from a rapid report on mpox clade I research needs (33).

Overall, 28 studies were included (1 to 28). A PRISMA diagram showing the flow of studies through the review is shown in Annexe B, and studies excluded on full text screening are available with the reasons why in Annexe C. Study characteristics are available in Annexe D.

Fifteen studies were retrospective cohort studies (1 to 3, 6, 7, 9, 11 to 16, 21, 24, 27), 12 were prospective cohort studies (4, 5, 10, 17 to 20, 22, 23, 25, 26, 28), and one was a cross-sectional study (8).

All studies, apart from 2, were conducted between May 2022 and November 2023 (one study was conducted between 2001 to 2021 (1), and one was conducted between January 2015 and November 2022 (7)).

The studies were conducted in the following countries:

- Argentina, one study (9)
- Belgium, 2 studies (5, 24)
- Canada, one study (28)
- Central African Republic, one study (1)
- China, 4 studies (2, 10, 22, 25)
- Columbia, one study (8)
- Germany, 3 studies (12, 14, 20)
- Italy, 5 studies (3, 19, 21, 23, 27)

- Multiple locations, 2 studies (study one: Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Czech Republic, Egypt, France, Hungary, Italy, Mexico, Nigeria, Portugal, Puerto Rico, Romania, Sierra Leone, and Spain (7), study 2: USA and Netherlands (6))
- Netherlands, 2 studies (15, 16)
- Poland, one study (11)
- South Korea, one study (18)
- Spain, 3 studies (4, 17, 26)
- USA, one study (13)

Sixteen studies estimated incubation period of mpox from time of exposure and symptom onset (1 to 4, 6 to 17), and one study measured incubation period as time between contact with an individual infected with mpox to virus detection (rather than to symptom onset) (5).

Fourteen studies reported outcomes that can be used to indicate likely infectious period of mpox including serial interval as well as viral clearance, viral load and viral positivity (13, 16 to 28).

Infectious period was measured using a polymerase chain reaction (PCR) test or cell culture. When viral clearance, viral load and viral positivity were measured using PCR, results were reported as the number of PCR copies per millilitre (mL) or cycle threshold (Ct). Ct values are the number of PCR cycles required for viral detection; lower Ct values reflect a higher viral load. A higher viral load may indicate that a case was more infectious, and therefore greater likelihood of transmission occurring, although this may not be true for all cases.

One study reported on mpox clade I (1), 9 studies reported on mpox clade IIb (2 to 5, 18 to 22), and 18 did not report the clade (6 to 17, 23 to 28).

It is likely that studies which did not report mpox clade were mostly describing mpox clade II, given the countries and timeframes they were conducted in. However, this was not confirmed by the studies and therefore, where mpox clade was not reported, results have been presented separately.

Incubation period

Seventeen studies estimated the incubation period of mpox (1 to 17), of which one reported on mpox clade I (1), 4 reported on mpox clade IIb (5) (2 to 4), and 12 did not report mpox clade (6 to 17).

Incubation period of mpox clade I

Besombes and others conducted a retrospective analysis of national surveillance data, which included 99 cases with confirmed mpox clade I (53.1% female, median age: 15.5 years, interquartile range [IQR]: 5.5 to 28 years) and 61 cases with suspected mpox clade I (60.7% female, median age: 8 years, IQR: 2 to 23 years), between 2001 to 2021, in the Central African

Republic (1). The study defined suspected mpox cases as cases showing mpox symptoms but without any laboratory confirmation of the virus. One case was reported to be living with HIV (treatment status and CD4 counts not reported), but the study authors reported that HIV testing was not routinely performed in mpox cases in the Central African Republic, and HIV status was not known for the other cases. The study authors assumed that 7 cases born before 1980 had received smallpox vaccination. Twenty-nine cases had a known exposure date which was used to estimate incubation period (demographic information was not reported for this group). The study did not report if these 29 cases had confirmed or suspected mpox. The incubation period of these cases was reported estimated to be a median of 7 days (range: 0 to 17 days, IQR: one to 13 days).

Incubation period of mpox clade IIb

Four studies estimated incubation period of mpox clade IIb (2 to 5).

Dou and others conducted a retrospective study of 37 men with confirmed mpox (median age: 30 years, IQR: 26.5 to 34.5 years) between May to June 2023, in China (2). Nineteen cases (51.4%) were living with HIV, of which 11 were reported to be receiving regular antiretroviral treatment, one was receiving irregular antiretroviral treatment, one was reported to be newly diagnosed (treatment status not reported). No information on treatment status was available for the remaining 6 cases living with HIV. Three had CD4 counts between 300 to 400 per millimetre cubed [mm^3] and 6 had counts above 500 cells per mm^3 (CD4 counts not reported for the remaining cases living with HIV). Three cases (8.1%) had previously received smallpox vaccine. Nineteen cases with symptoms had a known exposure time which was used to estimate incubation period (demographic information was not reported for this group). The incubation period of these cases was a median of 9 days (IQR: 7 to 13 days). The study did not report whether these 19 cases were the same as the 19 cases living with HIV.

Guzzetta and others conducted a retrospective study of 255 cases with confirmed mpox (99.2% male, median age: 37 years, range: 20 to 71 years), between May to June 2022, in Italy (3). No further details on the study population such as HIV status or smallpox vaccination history were reported. Fifteen people had a known date of exposure to an individual infected with mpox and 15 had a history of travel to the Canary Islands (which was assumed to be where exposure to mpox occurred). These 30 cases were used to estimate incubation period, which was a median of 9.1 days (95% Confidence Interval [CI]: 6.5 to 10.9 days).

Tarin-Vicente and others conducted a prospective study of 181 cases with confirmed mpox (median age: 37 years, IQR: 31 to 42 years), between the beginning of an mpox outbreak (start date not reported) until July 2022, in Spain (4). Seventy-two cases (40%) were living with HIV, of which 71 (99%) were receiving antiretroviral treatment, and 8 (11%) had CD4 counts of less than 500 cells per µL (CD4 counts were not reported for the remaining cases living with HIV). Smallpox vaccination history was not reported. Incubation period was estimated from self-reported date of exposure to symptom onset to be a mean of 7 days (IQR: 5 to 10 days).

Brosius and others conducted a prospective cohort study of 25 cases with confirmed or suspected mpox, (median age: 43 years, IQR: 36 to 51 years) between 24 June and 31 July 2022, in Belgium (5). Five cases (20%) were living with HIV (treatment status and CD4 counts not reported), and one individual (HIV status not provided) was immunocompromised. Five cases had received smallpox vaccine post-exposure to an individual infected with mpox and 6 were vaccinated against smallpox in childhood.

Cases were followed up for a median of 16 days (IQR: 14 to 26 days) after their last contact with an individual infected with mpox. The study measured time between contact with an individual infected with mpox and detection of mpox virus (instead of symptom onset) by PCR in saliva, anorectal, genital, throat, serum, and skin samples. Detection was measured by Ct values. Cases were classed as follows:

- definitely infected: Ct value of less than 34
- possibly infected: Ct value of less than or equal to 34 to less than 37
- uninfected: Ct value of more than 37

Eight cases were classed as definitely infected (of which 6 [75%] developed typical mpox symptoms), and 5 cases were possibly infected (none developed typical mpox symptoms).

In both definitely and possibly infected cases, the median number of days between most recent contact with case infected with mpox and first positive viral load detection was 5 days (IQR for definitely infected: 4 to 9.5 days, IQR for possibly infected: 5 to 12 days). The study did not report how many of these cases were living with HIV.

Incubation period (mpox clade not reported)

Twelve studies reported mpox incubation period but did not report mpox (6 to 17). Most studies were conducted in Asia, Europe, and North or South America, between May 2022 and July 2023, (with one exception that was conducted in 16 countries including countries in Africa, between January 2015 and November 2022 (7)).

Charniga and others (published as a preprint) conducted a retrospective cohort study of 39 mpox cases reported in the USA, combined with cases reported in the Netherlands, between May to June 2022 (6). Patient data from the USA included one probable and 21 confirmed mpox cases attending healthcare departments (100% male, median age: 37 years, range: 28 to 61 years). These 22 cases were combined with 18 confirmed mpox cases from the Netherlands (100% male, age range: 23 to 64 years), also reported in Miura and others, which is discussed separately below (15). HIV status and smallpox vaccine history was not reported for either group.

Incubation period was estimated from the reported window of exposure and time of first symptom onset. This was reported as a median of 6.4 days (range: 5.1 to 7.9 days) and a mean of 7.6 days (range: 6.2 to 9.7 days, standard deviation [SD]: 4.9 days). Ninety-five percent of

cases showed symptoms within 17.1 days of exposure. The study also estimated time between exposure and rash onset in the USA cases, as many patients reported symptoms which may not have been specific to mpox (such as fever, diarrhoea, or sore throat). Median time to rash onset was estimated to be 7.8 days (range: 5.9 to 10 days), and the mean time to rash onset was estimated to be 8.7 days (range: 6.9 days to 11.7 days, SD: 4.3 days). Ninety-five percent of people developed a rash within 17.7 days of exposure. Rash onset data was not available for the cases from the Netherlands.

Eser-Karlidag and others conducted a retrospective cohort study of 647 confirmed mpox cases (98.6% male, mean age: 34.54 years, SD: 8.07 years) from 19 centres involved in the Infectious Diseases International Research Initiative, between January 2015 to November 2022 (7). The 19 research centres were in 16 countries: Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Czech Republic, Egypt, France, Hungary, Italy, Mexico, Nigeria, Portugal, Puerto Rico, Romania, Sierra Leone, and Spain. HIV status was reported in 409 cases (63%, treatment status not reported). CD4 count was known for 310 cases living with HIV, who had a median CD4 count of 516.5 cells per µL (IQR: 24 to 973 cells per µL). Thirty cases living with HIV had a CD4 count of less than 200 per µL. Of the total cohort, 22 had a history of smallpox vaccination, 577 had no history of smallpox, and smallpox vaccination history was unknown for 48 cases.

Incubation period was estimated from self-reported date of exposure to symptom onset to be a median of 7 days (IQR: 2 to 25 days). The median incubation period was shorter in cases living with HIV with CD4 counts of less than 200 per µL (30 cases, median: 3 days, IQR: 2 to 6 days), compared to cases living with HIV with CD4 counts of equal to or more than 200 per µL (280 cases, median: 6.5 days, IQR: 2 to 21 days, $p < 0.001$). The median incubation period was also lower in cases with no smallpox vaccination history (577 cases, median: 6.5 days, IQR: 2 to 25 days), compared to cases with a smallpox vaccination history (22 cases, 9.5 days, IQR: 2 to 16 days).

Estrada Alvarez and others conducted a cross-sectional study of 11 men with confirmed mpox (median age: 34 years, IQR: 27 to 41 years) in Columbia, between July and September 2022 (8). Nine cases (31%) were living with HIV (treatment status and CD4 counts not reported). Smallpox vaccination history was not reported. Incubation period was defined as self-reported exact exposure date when available, or the earliest possible exposure if the case identified multiple potential exposure times, to the time of symptom onset. Incubation period was estimated to be a median of 7.1 days (95% CI: 4.9 to 9.9 days).

Fernandez-Pardal and others conducted a retrospective cohort study of 124 confirmed mpox cases (99.2% male, median age: 31.5 years, IQR: 28 to 38 years) in Argentina, between July and October 2022 (9). Seventy-five cases were living with HIV (60%), of which 64 were receiving antiretroviral treatment (50 cases living with HIV had CD4 counts of equal to or greater than 350 cells per µL, 10 had CD4 counts of less than 350 cell per µL). Fifteen cases received smallpox vaccination in childhood. Of the total cohort, 32 cases had been exposed to people with confirmed mpox infection, 62 cases had been exposed to people with probable mpox

infection, and no confirmed or probable exposure was identified in 26 cases. Exposure information was not reported for the remaining 4 cases.

Incubation period, defined as date of contact with a confirmed or probable mpox case to symptom onset, was estimated to be a median of 7 days (IQR: 5 to 11 days) for the full cohort. No difference was seen in the incubation period of people exposed to confirmed mpox cases (median: 7 days, IQR: 4.0 to 9.5 days) compared to people exposed to probable mpox cases (median 7 days, IQR: 6.5 to 12.5 days, p value = 0.14).

Jia and others conducted a prospective cohort study of 20 men with confirmed mpox (median age: 29 years, IQR: 26 to 32 years), in China, between June to July (10). Thirteen cases were living with HIV (65%, 12 receiving antiretroviral treatment, median CD4 cell count: 667 cells per mm^3, IQR: 404 to 902 cells per mm^3). None of the cases had received smallpox vaccination. Incubation period was estimated to be a median of 8 days (IQR: 6 to 16 days). However, the reporting of information was poor in this study, including lack of detail of how incubation period was estimated.

Kowalski and others conducted a retrospective cohort study of 94 men with confirmed or probable mpox (median age: 33 years, IQR: 28 to 38 years), in Poland, between May to October 2022 (11). Eighty-one men had laboratory confirmed mpox, while 13 were classed as probable mpox cases (refused hospitalisation). Of the total cohort, 43 cases were living with HIV (46%, all receiving antiretroviral treatment, median CD4 count 672 cells per µL, IQR: 515 to 778 cells per µL). Four cases previously received smallpox vaccination. Incubation period was estimated, from self-reported date of exposure to symptom onset, to be a median of 7 days (IQR: 4 to 8 days).

Kroger and others conducted a retrospective cohort study of 368 confirmed mpox cases (99.7% male, mean age: 41 years, SD: 10 years), in Germany, between May to October 2022 (12). Date of exposure to contacts with suspected or confirmed mpox was known by 209 cases (56%). Of the total cohort, 143 cases (39%) were living with HIV (treatment status and CD4 counts not reported). Childhood smallpox vaccination was reported in 96 cases, while 33 cases received smallpox vaccination at the time of mpox diagnosis (19 cases received this as post-exposure vaccination and 14 received it as pre-exposure vaccination). Six cases received both childhood smallpox vaccination and smallpox vaccination at the time of mpox diagnosis.

Incubation period was estimated, by self-reported date of exposure to symptom onset, to be a median of 7 days (IQR: 5 to 10 days) and a mean 8.2 days (SD, 4.7 days), for the 209 cases with suspected or confirmed mpox. The mean was similar when the analysis was adjusted for uncertainty in the exposure date (mean: 8.3 days, SD: 5.2 days, 95% CI: 6.6 to 10.4 days, median not reported). When incubation period was estimated only from cases with exposure to people with confirmed mpox (73 cases), the mean incubation period was 7.6 days (SD: 4.1 days, median not reported).

Madewell and others conducted a retrospective cohort study which included 36 mpox cases taken from 2 cohorts, in the USA, between May to August 2022 (13). Sex and age was reported for 22 cases (cohort discussed above in Charniga and others (6), 100% male, median age: 37 years, range: 28 to 61 years). HIV status and smallpox vaccination history was not reported. The incubation period was estimated from the reported window of exposure and time of first symptom onset for the Charniga and others cohort. For the 14 new cases, 10 cases with known exposure dates to symptom onset were used. This was estimated to be a mean of 5.6 days (95% credible interval: 4.3 to 7.8 days). As for Charniga and others, the study authors also estimated the time between exposure and rash onset, which was a mean of 7.5 days (95% credible interval: 6.0 to 9.8 days).

McFarland and others conducted a retrospective cohort study of 122 confirmed mpox cases who attended one of 3 events in Germany where mpox outbreaks had been reported, between May to June 2022 (14). Age, HIV status, and smallpox vaccination history was not reported. The 3 events were a fetish festival in Belgium, a gay pride festival in Spain, and a club in Berlin.

The incubation period was estimated from assumed exposure window (time of events) and symptom onset. The most conservative estimate of incubation period was reported as a median of 7.7 days in cases with 4 days of exposure, 8.1 days for 5 and 6 days of exposure, and a median of 7.9 days for 8 and 10 days of exposure. The variation in medians is likely due to uncertainty about when the exact time of exposure was within the exposure period. Six cases had incubation periods longer than 21 days. For 5 of these cases, the upper limit of their incubation periods was less than 26 days, while one case had a longer incubation period of 30 to 35 days (no further detail was reported about these cases).

Miura and others conducted a retrospective study of 18 men with confirmed mpox (age range: 23 to 64 years) in the Netherlands, in May 2022 (15). HIV status, and smallpox vaccination history was not reported. The incubation period was estimated, from self-reported most likely date of exposure to symptom onset, to be a mean of 9.0 days (95% credible interval: 6.6 to 10.9 days).

A second study by Miura and others (published 2024) was a retrospective study of 109 mpox cases and confirmed contact pairs in the Netherlands, between May to September 2022 (16). Age, HIV status, and smallpox vaccination history was not reported. Incubation period was estimated from reported date of exposure to symptom onset for a subset of 18 case-contact pairs, which was estimated to be a mean of 8.1 days (SD: 4.4 days). The study did not report if these were the same 18 cases reported in the 2022 study by Miura and others, and the data has been presented separately as the estimated incubation periods were different.

Suner and others conducted a prospective cohort study of 77 confirmed mpox cases (97% male, median age: 35 years, IQR: 29 to 45 years), in Spain, between June to September 2022 (17). Thirty-nine cases were living with HIV (51%), 38 of which were receiving antiretroviral treatment, 2 cases had CD4 counts of less than 300 cells per µL, 9 cases had CD4 counts of less than 500 cells per µL, other CD4 counts not reported. Two cases had a recent smallpox

vaccination. The incubation period was estimated, from self-reported date of exposure to symptom onset, to be a median of 6 days (IQR: 4 to 8 days).

Infectious period

Fourteen studies reported outcomes that can be used to indicate likely infectious period of mpox (13, 16 to 28), of which 5 specified mpox clade (18 to 22), and 9 did not report mpox clade (13, 16, 17, 23 to 28).

Viral clearance, load, and positivity over time (mpox clade IIb)

In studies of mpox clade IIb, 2 studies measured time to viral clearance (19, 21), 3 measured viral load over time (20 to 22), and 4 studies measured viral positivity over time (18, 19, 21, 22).

Chin and others conducted a prospective cohort study of 18 people infected with mpox clade IIb (94.4% male, median age: 32.5 years, IQR: 24 to 51 years), between September 2022 to June 2023, in South Korea (18). Nine cases were living with HIV (50%), all receiving antiretroviral therapy (median CD4 count: 547 cells per µL, none with CD4 counts less than 200 per µL). No cases had received smallpox vaccination for mpox. Viral positivity was measured at less than 7 days, 7 to 10 days, 11 to 13 days, and 14 or more days after symptom onset (anogenital, skin lesion and throat samples, by PCR and culture).

PCR detection of mpox clade IIb occurred for a median of 12 days from symptom onset for anogenital samples (maximum: 23 days), 12.5 days for skin lesion samples (maximum: 19 days), and 11 days for throat samples (maximum: 15 days). Fourteen days after symptom onset, PCR viral positivity was still present in samples for 85.7% of anogenital samples and 77.8% of skin lesion samples. The results of PCR viral positivity in throat samples were unclear.

Culture detection of mpox clade IIb occurred for a median of 9.0 days after symptom onset for anogenital samples, 10.5 days for skin lesion samples, and 11.0 days for throat samples. The maximum duration for which culture was positive was 15.0 days for all samples. In anogenital samples, 53.8% were positive 10 days after symptom onset, decreasing to 28.6% positive 4 days after symptom onset. In skin lesion samples, 42.9% were positive at 10 days decreasing to 22.2% positive at 14 days after symptom onset. The results of culture viral positivity in throat samples were unclear.

Meschi and others conducted a prospective cohort study of 89 people infected with mpox clade IIb (age not reported), between May to December 2022, in Italy (19). HIV status was reported for 84 cases, of which 37 (44%) were living with HIV (treatment status not reported, median CD4 count: 560.5 per mm^3, IQR: 412 to 797.3 per mm^3). Four participants received smallpox vaccine during childhood. The study measured time to viral clearance and viral positivity over time by PCR, in samples taken one to 4 weeks after symptom onset.

Median time to mpox viral clearance and viral positivity varied by where the sample was taken from (Table 1). The longest median time to viral clearance was observed in throat samples where it was 21 days (95% CI: 18 to 26 days).

Viral positivity decreased between weeks one to 4 for all samples. One case still had a positive semen sample at 31 days (Ct value: 35.9) and one had a positive saliva sample at 71 days (Ct value: 39.2). The HIV status of the people these samples were taken from was not reported. The study did not report results of statistical comparisons where no significant difference was observed ($p > 0.05$).

Table 1. Meschi and others, viral positivity by week

Sample	Week, % positive (n positive samples / n total)				Comparisons (p < 0.05)	Time to viral clearance (median, 95% CI)
	Week 1	Week 2	Week 3	Week 4		
Skin	93% (39 /42)	88% (7 / 8)	Not reported	Not reported	None reported	Not reported
Throat	95% (40 / 42)	60% (12 / 20)	42% (5 / 12)	31% (5 / 16)	Week 1 vs 2: p < 0.0001 Week 1 vs 3: p < 0.0001 Week 1 vs 4: p < 0.0001	21 days (18 to 26 days)
Saliva	95% (20 / 21)	71% (15 / 21)	67% (4 / 6)	20% (1 / 5)	Week 1 vs 2: p < 0.05 Week 1 vs 3: p < 0.0005 Week 1 vs 4: p < 0.001	19 days (17 to 29 days)
Blood	77% (30 / 39)	63% (40 / 63)	18% (3 / 17)	0% (0 / 4)	Week 1 vs 2: p < 0.05 Week 1 vs 3: p < 0.0001 Week 1 vs 4: p < 0.005 Week 2 vs 3: p < 0.001	12 days (11 to 13 days)
Semen	64% (27 / 42)	74% (21 / 29)	38% (8 / 21)	32% (6 / 19)	Week 1 vs 4: p < 0.001 Week 2 vs 3: p < 0.05 Week 2 vs 4: p < 0.005	14 days (13 to 17 days)
Stool	67% (12 / 18)	69% (20 / 29)	19% (3 / 14)	15% (2 / 15)	Week 1 vs 3: p < 0.05 Week 1 vs 4: p < 0.005 Week 2 vs 3: p < 0.005 Week 2 vs 4: p < 0.001	18 days (15 to 22 days)
Urine	33% (7 / 21)	12% (3 / 27)	20% (5 / 25)	5% (1 / 20)	Week 1 vs 2: p < 0.05	16 days (13 to 19 days)

Norz and others conducted a prospective cohort study of 16 men infected with mpox (age range: 20 to 60 years), up to 30 June 2022 (start date not reported), in Germany (20). Two cases were living with HIV (13%) and receiving antiretroviral treatment (CD4 count: 360 per µL and 279 per µL). Smallpox vaccination history was not reported. Viral load was measured at the point of initial diagnosis and weekly for 3 weeks after symptom onset by PCR (copies per mL).

Median viral load varied by where the sample was taken from and by weeks after symptom onset, see Table 2. Viral load of throat samples reduced each week, but this was not seen in skin and blood samples. However, it was not clear if these samples were taken sequentially per case, or if these were different samples from different patients at weeks 1, 2 and 3.

The highest viral load for skin samples was recorded in week 3 (8.55 x 103 copies per mL, range not reported), whereas the highest viral load for blood samples was recorded in week 2

(7.8 x 103 copies per mL range: 0 to 1.2 x 103), but this decreased by week 3 (2.37 x 101 copies per mL, single sample). The number of samples analysed at each sample location was not reported.

Table 2. Norz and others, median viral load by week after symptom onset

Sample location	Week 1 median viral load copies per mL (range)	Week 2 median viral load copies per mL (range)	Week 3 median viral load copies per mL (range)
Skin	3.31×10^7 (2.19×10^7 to 3.95×10^7)	3.04×10^6 (2.11×10^5 to 5.48×10^5)	8.55×10^3 (range not reported)
Throat	8.44×10^4 (6.93×10^4 to 7.31×10^5)	4.04×10^3 (0 to 6.75×10^6)	0 (0 to 2×10^4)
Blood	5.85×10^2 (1.58×10^2 to 1.0×10^5)	7.8 (0 to 1.2×10^3)	2.37×10^1 (single sample)

Piralla and others conducted a retrospective cohort study of 353 people infected with mpox clade IIb (99.2% male, median age: 37 years, IQR: 32 to 43 years,) between May to September 2022, in Italy (21). HIV status was known for 54 cases (15.3%), of which 10.5% were living with HIV (treatment status and CD4 count not reported). Of 261 cases reporting vaccination history for smallpox, 231 (65.4%) cases were unvaccinated. The study measured viral clearance, viral load, and viral positivity by PCR.

Median time to mpox viral clearance and viral positivity varied by where the sample was taken from (Table 3). The longest reported time to viral clearance was 16 days in skin samples. Viral positivity decreased between the first week (0 to 7 days) to fourth week (29 days or more) after symptom onset.

This study also measured viral load using Ct values, over time from 0 to 7 days, 8 to 14 days, and 15 days or more after symptom onset. In samples collected within 0 to 7 days of symptom onset, the median Ct value was 19 compared to a median Ct value of 22 for samples collected within 8 to 14 days of symptom onset and 20 for samples collected 15 days or more after symptom onset.

Follow up samples were collected in a subset of cases to estimate persistent viral shedding (details of overlap with the above results are not provided by the study). Persistent viral shedding was defined as viral positivity detected for more than 21 days after symptom onset, which was observed for 10% of skin samples (11 out of 110 samples), 6.1% of throat samples (10 out of 165 samples), and 3.4% of anogenital samples (4 out of 116 samples). One throat sample tested positive 56 days after symptom onset. The reporting of sample numbers analysed was inconsistent throughout the study.

Table 3. Piralla and others, viral positivity by days post symptom onset

Sample	Days post symptom onset, % positive (n positive samples / n total)					Median time to viral clearance
	0 to 7 days	8 to 14 days	15 to 21 days	22 to 28 days	More than 29 days	
All*	41.1% (65 / 158)	31.5% (34 / 108)	11.9% (6 / 51)	19.1% (4 / 21)	4.8% (1 / 21)	Not reported
Anogenital	72.7% (24 / 33)	52.6% (10 / 19)	28.6% (2 / 7)	0% (0 / 1)	0% (0 / 0)	13 days (n = 116)
Blood	Not reported					8 days (n = 80)
Semen	Not reported					7 days (n = 24)
Skin	43% (22 / 51)	41% (14 / 34)	11.3% (2 / 18)	11.3% (1 / 9)	0% (0 / 8)	16 days (n = 110)
Throat	15.9% (7 / 44)	6% (2 / 34)	0% (0 / 17)	14.3% (1 / 7)	7.6% (1 / 13)	14 days (n = 167)
Urethral	68.6% (11 / 16)	59.9% (6 / 10)	20.0% (1 / 5)	0% (0 / 1)	0% (0 / 0)	13 days (n = 30)
Urine	Not reported					9 days (n = 14)

*There was a discrepancy between the total number of samples for each time period reported by the study and the total of the individual sample locations by time period. The results in the table have been presented as they are in the original study.

Yang and others conducted a prospective cohort study of 77 men infected with mpox clade IIb (median age: 30 years, range: 21 to 51 years), between June 2023 to November 2023, in China (22). Forty-two cases (54.5%) were living with HIV (treatment status not reported, median CD4 count: 450, IQR: 237 to 566, [units not reported]) and were compared to those without HIV. Five people had received smallpox vaccination during childhood. Viral load was measured by PCR up to 3 weeks after symptom onset.

Viral load and viral positivity varied by where the sample was taken (Table 4). Viral load decreased each week in saliva and skin samples, but this was not consistent across other samples. No difference in viral load was seen between cases with and without HIV.

Viral positivity decreased over time between one and 21 days after symptom onset, although some cases remained positive at day 21. No difference in viral positivity was seen between cases with and without HIV, except for a higher positivity rate of urine samples during 15 to 21 days after symptom onset in the non-HIV group ($p = 0.0228$).

It was not clear if these samples were taken sequentially per case, or if these were different samples from different cases at weeks one, 2 and 3. However, the evidence suggests cases could still be infectious up to at least 21 days after symptom onset across all samples.

Table 4. Yang and others, viral load and positivity over time

Sample	Viral load, log10 PCR copies per mL (range) and positivity % (n positive samples / total)	Days post-symptom onset		
		1 to 7 days	8 to 14 days	15 to 21 days
Throat	Viral Load	5.32 (4.77 to 5.88)	5.32 (4.73 to 6.15)	5.71 (5.16 to 6.49)
	Positivity (%)	71.21% (47 / 66)	56% (42 / 75)	25% (6 / 24)
Saliva	Viral Load	6.15 (5.05 to 6.98)	5.60 (4.77 to 6.71)	5.05 (4.49 to 6.48)
	Positivity (%)	74.58% (44 / 59)	69.86% (51 / 73)	56.52% (13 / 23)
Rectum	Viral Load	7.26 (5.88 to 8.37)	5.42 (4.77 to 7.26)	6.29 (4.49 to 6.84)
	Positivity (%)	75.41% (46 / 61)	72.73% (56 / 77)	58.33% (14 / 24)
Skin	Viral Load	7.82 (7.26 to 8.37)	7.26 (6.43 to 8.37)	6.71 (5.66 to 7.73)
	Positivity (%)	100% (74 / 74)	95.95% (71 / 74)	91.67% (22 / 24)
Urine	Viral Load	4.77 (4.22 to 6.24)	5.32 (5.05 to 6.04)	5.71 (4.77 to 6.04)
	Positivity (%)	47.37% (27 / 57)	39.19% (29 / 74)	39.13% (9 / 23)
Blood	Viral Load	4.82 (4.30 to 5.13)	4.30 (4.19 to 4.58)	5.57 (5.49 to 5.63)
	Positivity (%)	24.56% (14 / 57)	14.44% (13 / 90)	5.71% (2 / 35)

Viral clearance, load, and positivity over time (mpox clade not reported)

In studies which did not report mpox clade, 5 studies measured viral clearance (17, 23, 26 to 28), 3 measured viral load over time (17, 24, 25), and 3 measured viral positivity over time (17, 25, 28). All studies were conducted in Asia, Europe, and North America, between May 2022 and November 2023.

Candela and others conducted a prospective cohort study which included 43 men with confirmed mpox (median age: 36 years, IQR: 34 to 42 years), in Italy, between May and October 2022 (23). Of these 43 men, 12 cases (28%) were living with HIV (treatment status and CD4 counts not reported). Smallpox vaccination history was not reported. The study measured

viral clearance in semen samples by PCR up to 6 months after baseline testing from 32 men (11 cases did not provide follow up samples due to painful genital lesions and swelling and were excluded from the analysis):

Median time to viral clearance was 10.5 days (IQR: 7 to 33 days):

- 1 week after baseline: viral clearance observed in 19 out of 28 cases (68%)
- 2 weeks after baseline: viral clearance observed in 25 out of 28 cases (89%)
- 3 months after baseline: viral clearance observed in 26 out of 28 cases (90%)
- 6 months after baseline: viral clearance observed in all cases (32 cases tested, 100%)

De Baetselier and others conducted a retrospective cohort study which included 3 men with confirmed mpox (age range: 30 to 50 years), in Belgium, in May 2022 (24). All 3 cases (100%) were living with HIV, all receiving antiretroviral treatment, and all had CD4 cell counts of more than 350 per µL. Viral load was measured as Ct value at the point of initial diagnosis and in a second anorectal sample taken from each case at 21, 24 or 37 days after initial testing. Viral load ranged from 17.16 to 26.69 at initial testing and was not detectable in any of the 3 cases at the time of the second sample.

Guo and others conducted a prospective cohort study of 39 men with confirmed mpox (median age: 33 years, IQR: 28 to 37 years), in China, from June to September 2023 (25). Twenty cases (51%) were living with HIV (treatment status not reported, median CD4 cell count 638 cells per mm^3, IQR: 484 to 854 cells per mm^3). Two cases had received smallpox vaccination. The study measured viral load and viral positivity by PCR at 7, 14, and 21 days after symptom onset. The reporting of Ct values and viral positivity in the text of the study was not consistent with the data presented in the figures of the study. However, measurement of viral load in skin samples suggested that cases remained infectious 15 to 21 days post symptom onset (median Ct value: 26.8, IQR: 23.7 to 34.5) and viral positivity of skin samples decreased from 92.9% at week one to 85.7% at 2 to 3 weeks after symptom onset.

Moraes-Cardoso and others conducted a prospective cohort study of 33 men with confirmed mpox (age range: 25 to 58 years), in Spain, between June to October (26). Fourteen cases (42%) were living with HIV (11 receiving antiretroviral treatment, median CD4 count: 777 cells per µL, IQR: 484 to 1,533 cells per µL). Smallpox vaccination history was not reported. Time to viral clearance was measured by PCR from skin samples taken weekly for 29 days after diagnosis. Results were reported separately for cases living with HIV and cases with HIV negative status. Time to viral clearance was 23 days in cases living with HIV (IQR: 16 to 29 days) and 28 days in HIV negative cases (IQR: 22 to 32 days). However, as cases living with HIV had high median CD4 cell counts, this difference in time to viral clearance was likely influenced by factors other than living with HIV.

Raccagni and others conducted a retrospective cohort study of 95 men with confirmed mpox (median age: 39.4 years, IQR: 35.4 to 44.7 years), in Italy, between May to November 2023

(27). Fifty cases (53%) were living with HIV (treatment status not reported, median CD4 count: 690 cells per µL, IQR: 559 to 1,005 cells per µL). Fifteen cases (16%) received childhood smallpox vaccination. Time to viral clearance was measured by weekly PCR tests, until the end of infection. Median time to viral clearance varied by where the sample was taken from:

- anal: 12 days (IQR: 7 to 18 days)
- blood: 9 days (IQR: 7 to 13 days)
- semen: 8 days (IQR: 7 to 15 days)
- skin: 16 days (IQR: 9 to 19 days)
- throat: 14 days (IQR: 9 to 18 days)

Overall median time to viral clearance was 19 days (IQR: 14 to 24 days).

Suner and others (discussed above in incubation period) conducted a prospective cohort study of 77 confirmed mpox cases (97% male, median age 35 years, 51% living with HIV), in Spain, between June to September 2022 (17). Self-collection devices were used to collect skin, throat, and blood samples on days 1, 8, 15, 22, 29 and 57 after initial testing at the point of diagnosis, as well as rectum, semen, and vagina samples on days 1, 15, 29 and 56 after initial testing. The study reported time to viral clearance, viral load over time and viral positivity.

Median time to viral clearance varied by where the sample was taken from, with highest time to viral clearance reported in skin samples (median: 25 days, 95% CI: 23 to 28 days, Table 5).

Median viral load decreased over time in all sample types but was still detectable in most sample types 15 to 21 days after symptom onset (Table 5).

Across all sample types, viral positivity was highest 6 to 10 days after symptom onset:

- 1 to 5 days: 67%
- 6 to 10 days:71%
- 11 to 15 days: 55%
- 16 to 20 days: 30%
- 21 to 25 days: 24%
- more than 25 days: 9%

Median time to viral clearance was longer in semen samples of cases who were living with HIV (18.7 days) compared to cases who were HIV negative (13.1 days, p = 0.0043). No difference was reported in other samples between cases who were living with HIV and cases with HIV negative status.

Table 5. Suner and others, median viral load over time

Sample	Viral load, log_{10} copies per mL [note 1] (IQR) Days post symptom onset				Time to viral clearance (median, 95% CI)
	1 to 7 days	8 to 14 days	15 to 21 days	22 days or more	
Skin	7.3 (6.5 to 8.18)	6.5 (5.3 to 7.5)	3.8 (2.9 to 5.4)	2.9 (2.9 to 3.5)	25 days (23 to 28 days)
Throat	4.6 (2.9 to 5.8)	3.74 (2.9 to 5.2)	2.9 (2.9 to 3.2)	Undetectable	16 days (13 to 19 days)
Rectal	5.0 (2.9 to 7.5)	5.6 (3.9 to 6.5)	2.9 (2.9 to 3)	Undetectable	16 days (13 to 23 days)
Semen	3.5 (2.9 to 4.7)	4.1 (2.9 to 5.2)	2.9 (2.9 to 3.18)	2.9 (2.9 to 3.6)	13 days (9 to 18 days)
Blood	All samples were at limit of detection (4)				1 day (0 to 5 days)

Note 1: Limit of detection was 4 log10 copies per mL for blood samples and 2.9 log10 copies per mL for the rest of the samples.

Tan and others conducted a cohort study of 64 men with confirmed mpox (median age: 39 years, IQR: 32.75 to 45.25 years), in Canada, between June to October 2022 (28). Thirty cases (47%) were living with HIV (treatment status not reported, median CD4 count: 467.5 cells per mm^3, IQR: 335.75 to 677.75 per mm^3). Twenty-five cases were part of the Mpox Prospective Observational Cohort Study (MPOCS), and 39 cases were diagnosed at the same study centre at the MPOCS cases but declined to participate in the prospective cohort study (although they agreed to retrospective extraction of data from clinical records). The 25 MPOCS cases provided samples over 4 weekly visits up to 72 days from initial testing and the remaining 39 cases provided samples over 2 visits up to 28 days from initial testing. Fourteen cases had a history of smallpox vaccination, 11 cases had unknown smallpox vaccination history. Twelve cases received mpox vaccination before baseline. The study measured time to viral clearance and viral positivity by PCR.

Time to viral clearance was defined as a Ct value of 35 or more. Twenty participants started tecovirimat treatment for mpox during the study. For these cases, results were only considered up until the start of treatment. Median time to viral clearance varied by where the sample was taken from but was reported to be up to 30 days after initial testing, (Table 6).

Viral positivity was measured by PCR at baseline and final visit, decreasing from baseline to final visit across all sample types (Table 6).

Table 6. Tan and others, viral positivity from baseline to final visit

Sample	Median time to viral clearance (95% CI)	Viral positivity (n positive samples / total)	
		Baseline visit	Final visit
Nasal	0 days (0 to 12.1 days)	26% (12 / 46)	18% (4 / 22)
Rectal	14.1 days (0 to 22.4 days)	44% (16 / 36)	9% (2 / 22)
Semen	0 days (0 to 0 days)	8% (2 / 25)	0% (0 / 21)
Skin (genital, buttock, perianal)	30 days (23 to 47.9 days)	74% (31 / 42)	33% (6 / 18)
Skin (other)	22.4 days (16.6 to 29.4 days)	56% (27 / 48)	26% (5 / 19)
Throat	12.8 days (0 to 24.9 days)	37% (13 / 35)	18% (4 / 22)
Urine	10.2 days (0 to 21.1 days)	27% (10 / 37)	5% (1 / 22)

Serial interval (mpox clade not reported)

Two studies estimated serial interval of mpox but did not specify mpox clade (13, 16).

Madewell and others (also discussed above in incubation period) conducted a retrospective cohort study which included 112 primary and secondary mpox cases compiled by 12 state and local health departments (94% male, mean age 35 years, range one to 76 years) (13). Serial interval was estimated from self-reported earliest symptom onset in a primary case to symptom onset in a secondary case and reported as a mean of 8.5 days (95% credible interval: 7.3 to 9.9 days). The study also calculated the time between onset of rash in the primary case to rash onset in the secondary case, which was estimated to be a mean of 7 days (95% credible interval: 5.8 to 8.4 days).

Miura and others (also discussed above in incubation period) conducted a retrospective study of 109 mpox cases and confirmed contact pairs in the Netherlands (demographic information not reported), between May to September 2022 (16). Thirty-four pairs had reliable self-reported symptom onset and likely transmission from a contact. For these cases, the mean serial interval was 9.4 days (SD: 6.2 days, range: one to 24 days, mode: 8 days). The study authors adjusted the analysis to account for differences in how public health services detected, classified, and reported data. The adjusted serial interval was estimated to be a mean of 10.3 days (95% credible interval: 7.6 to 14.1 days).

Health inequalities

Many of the studies included people who were living with HIV, however their antiretroviral treatment status or CD4 counts were not consistently reported, and it was unclear if they were immunocompromised. The studies also did not often compare incubation and infectious period between cases who were more likely to be immunocompromised (living with HIV, no treatment, and low CD4 count) to those who were less likely to be immunocompromised (people living with HIV but receiving treatment and with normal CD4 counts, or people with negative HIV status). However, one study suggested incubation period may be shorter in cases who were living with HIV.

No evidence was identified in pregnant people, in children, or other vulnerable groups pre-defined as being at high risk of health inequalities in the review protocol. This rapid evidence summary therefore does not provide further information on health inequalities with respect to this review question.

Limitations

This rapid summary used streamlined systematic methods to accelerate the review process. Sources of evidence searched included databases of peer-reviewed and preprint research, but an extensive search of other sources was not conducted and most article screening was completed without duplication, so it is possible relevant evidence may have been missed.

To ensure rapid completion of this work, critical appraisal was not performed. This limits the interpretation of the findings, although important limitations of the evidence have been highlighted in this report.

Sample sizes were small in many of the included studies which may affect generalisability of the conclusions.

To estimate incubation period, studies often relied on the accuracy of estimating when an individual was exposed to the person who infected them, which may be estimated incorrectly or subject to recall bias. One study measured incubation period as time between contact with an mpox infected case and detection of the virus in the second case, rather than onset of symptoms (the typical definition of incubation period). There was also some overlap of cases between studies of incubation period.

Measures of infectious period (viral clearance, viral load, and viral positivity over time) varied according to where samples were taken from. These measures can be affected by sampling handling and laboratory methods that may have differed between studies. All the available evidence for infectious period was from indirect measures of infectious period. Across all studies it was not clear if samples were sequentially taken from the same cases over time, or if

the measures of infectiousness were of different samples from different people, which limits interpretation.

The length of follow up in the included studies did not always cover the end of the period for the included cases and therefore did not allow definitive conclusions about the full length of infectious period to be made from the available evidence.

Across all studies it was not clear if samples were sequentially taken from the same cases over time, or if the measures of infectiousness were of different samples from different people.

The limitations identified in this review impact the level of confidence in its findings, potentially influencing the overall reliability and interpretation of the results.

Evidence gaps

No studies reported direct transmission evidence on infectious period, therefore conclusions were made from indirect measures of infectious period. Most studies did not have long term follow up and so evidence was lacking about the full length of the mpox infectious period.

No evidence was identified on other measures of infectious period listed in the protocol, such as generation time (the time between when a person is infected and when they infect another person).

No evidence was identified on the infectious period of mpox clade I (a or b) and only one study was identified that reported the incubation period of mpox clade I. This was not from the outbreak that started in 2023 and it is not clear whether it is clade Ia or Ib.

Conclusion

This rapid evidence summary identified 28 studies which provide evidence on the incubation and infectious periods of mpox.

One study reported on the incubation period of mpox clade I, no studies reported on infectious period of mpox clade I. Nine studies reported on the incubation and infectious periods of mpox clade IIb. Eighteen studies reported on the incubation and infectious periods of mpox but did not report clade (although most included cases are likely to also be studies of mpox clade II based on the countries studies were conducted in and study time periods). Estimates of incubation and infectious period were similar in studies of mpox clade I, clade IIb and studies where mpox clade was not reported, therefore the findings have been summarised in this conclusion together.

Overall, the median incubation period of mpox ranged from 5 to 9 days and may be shorter in cases who were living with HIV with low CD4 counts. Measures of infectious period varied by where the sample was taken from, but evidence suggested that most cases were infectious from at least symptom onset and remain infectious for up to 21 days after symptom onset, although some people may be infectious for longer. However, evidence on longer term follow up was very limited. It was not possible to determine from the evidence whether infectious period was affected by HIV or immune status of the cases.

Only one study was available for mpox clade I and it only provided information on the incubation period. Although the reported incubation period was consistent with the estimates from studies of mpox clade II or where clade wasn't specified, it should be noted that a single study is insufficient to make firm conclusions for the incubation period of mpox clade I. No evidence was identified for the infectious period of mpox clade I.

Sample sizes were often small and the short length of follow up in most studies meant the evidence did not inform definitive conclusions about infectious period. Studies also did not consistently report or separate results of cases who were living with HIV, nor provide full details of CD4 counts or numbers receiving antiretroviral treatment. Viral clearance, viral load, and sample positivity over time may be affected by different laboratory methods between studies. It was also not clear if samples were taken sequentially from the same cases over time, or if the measures of infectiousness were of different samples from different people. Studies of incubation period also rely on the reported accuracy of known exposure time to the person who infected them, and there was some overlap of cases between studies of incubation period.

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Annexe A. Protocol

Review question

The review question is:

1. What are the incubation period and infectious period of mpox infection (clade Ia, Ib, IIa, IIb) in humans?

A search for primary evidence to answer this review question will be conducted up to 29 August 2024.

Eligibility criteria

Table A.1 Inclusion and exclusion criteria

	Included	Excluded
Population	Humans (any age) Children (aged up to and including 16 years) Adults	Animals
Settings	Any	
Intervention or exposure	Laboratory-confirmed infection with any clade of mpox (clade Ia, Ib, IIa, IIb) Or: Clinically suspected or laboratory-confirmed infection with mpox (clade Ia, Ib, IIa, IIb, or unspecified) in clade I outbreak countries (DRC, Republic of Congo, Central African Republic, Burundi, Rwanda, Uganda, Kenya, Cameroon, Gabon) since 1 January 2023	
Outcomes	Any measure of incubation period Any measure of infectious period including: • transmission period • culture positivity over time • serial interval • generation time	

	Included	Excluded
	• time to viral clearance • viral load	
Language	English	Any other language
Date of publication	Up to 29 August 2024	
Study design	Observational studies: cross-sectional, case-control, and cohort studies	• experimental studies (randomised-controlled trials, quasi-experimental studies, cross-over designs, before-and-after studies) • systematic or narrative reviews • modelling studies • case reports • case series
Publication type	Peer-reviewed published research Preprints	• editorials • letters • news articles • grey literature • conference abstracts

Identification of studies

The following databases will be searched for studies published up to 29 August 2024: Ovid Medline, Embase, and Web of Science Preprint Citation Index. The search strategy is presented below.

A previous review on the infectious and incubation periods, and transmission of mpox was completed in 2022 (29). This will be checked for relevant studies.

Screening

Title and abstract screening will be undertaken in duplicate by 2 reviewers for at least 10% of the eligible studies, with the remainder completed by one reviewer. Disagreement will be resolved by discussion or with involvement of a third reviewer where necessary.

Screening on full text will be undertaken by one reviewer and checked by a second.

Data extraction

Summary information for each study will be extracted and reported in tabular form. Information to be extracted will include country, study period, study design, participants, results, and any relevant contextual data. This will be undertaken by one reviewer and checked by a second.

Risk of bias assessment

Risk of bias of included studies will not be assessed in this rapid evidence summary due to time constraints.

Synthesis

Where studies are similar enough to combine and present data in a consistent format, a narrative synthesis will be produced to interpret the findings. The number of studies, the number of participants in each study, effect size and variance and a summary of study limitations across studies reporting each outcome will be summarised and presented. Alternatively, if studies present methodological differences that would make synthesis inappropriate, a narrative summary of each study will be provided.

Health inequalities

Variations across the following populations and subgroups will be considered, where evidence is available: those who may be at high risk from mpox including pregnant women, children, and those who are immunocompromised.

Search strategy

Ovid MEDLINE(R) ALL (1946 to 29 August 2024)

1. "Mpox (monkeypox)"/ (2754)
2. Monkeypox virus/ (1420)
3. Poxviridae Infections/ or Poxviridae/ (3692)
4. monkeypox.tw,kf. (4185)
5. monkey pox.tw,kf. (124)
6. mpox*.tw,kf. (1730)
7. monkeypoxvir*.tw,kf. (13)
8. hMPXV*.tw,kf. (28)
9. MPXV*.tw,kf. (855)
10. MPX*.tw,kf. (1398)
11. chimpanzeepox.tw,kf. (1)
12. chimpanzee pox.tw,kf. (0)
13. or/1-12 (8882)
14. (Infect* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (77268)
15. (quarantine* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (1243)
16. (Contag* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (344)
17. (Isolation adj3 (duration* or time or timing or length* or period*)).tw,kf. (4024)
18. (spread* adj3 (duration* or time or timing or length* or period*)).tw,kf. (2610)
19. (shed* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (3972)
20. (symptom* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (76608)
21. Virus Shedding/ (4315)
22. (PCR positiv* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (491)
23. (culture* positiv* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (482)
24. (Viral proliferat* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (6)
25. cycl* threshold*.tw,kf. (3012)
26. CT value*.tw,kf. (5782)
27. Viral Load/ (40004)
28. transmi*.tw,kf. (677847)
29. incubat*.tw,kf. (351734)
30. Infectious Disease Incubation Period/ (412)
31. Time Factors/ (1238169)
32. (latent or latency).tw,kf. (201774)
33. Latent Infection/ (228)
34. (generation adj3 time).tw,kf. (5951)
35. ((viral or virus) adj load*).tw,kf. (46144)
36. ((viral or virus) adj concentration*).tw,kf. (1866)
37. ((viral or virus) adj burden).tw,kf. (1437)
38. ((viral or virus) adj level*).tw,kf. (1001)

39. (shed*1 or shedding).tw,kf. (142348)
40. exp Disease Transmission, Infectious/ (83190)
41. serial interval*.tw,kf. (462)
42. ((virus or viral) adj clearance).tw,kf. (5920)
43. or/14-42 (2759372)
44. 13 and 43 (2119)

Embase (1974 to 29 August 2024)

1. monkeypox/ (4620)
2. monkeypox virus/ (2351)
3. poxvirus infection/ (1435)
4. poxviridae/ (1156)
5. monkeypox.tw,kf. (4673)
6. monkey pox.tw,kf. (133)
7. mpox*.tw,kf. (1963)
8. monkeypoxvir*.tw,kf. (20)
9. hMPXV*.tw,kf. (36)
10. MPXV*.tw,kf. (969)
11. MPX*.tw,kf. (1867)
12. chimpanzeepox.tw,kf. (1)
13. chimpanzee pox.tw,kf. (0)
14. or/1-13 (9085)
15. (Infect* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (103324)
16. (quarantine* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (1398)
17. (Contag* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (353)
18. (Isolation adj3 (duration* or time or timing or length* or period*)).tw,kf. (5064)
19. (spread* adj3 (duration* or time or timing or length* or period*)).tw,kf. (3269)
20. (shed* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (4509)
21. (symptom* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (123936)
22. virus shedding/ (11231)
23. (PCR positiv* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (662)
24. (culture* positiv* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (747)
25. (Viral proliferat* adj5 (duration* or time* or timing or length* or period* or peak*)).tw,kf. (7)
26. cycl* threshold*.tw,kf. (4004)
27. CT value*.tw,kf. (9141)
28. exp virus load/ (117210)
29. transmi*.tw,kf. (766157)
30. incubat*.tw,kf. (433673)
31. incubation time/ (61078)
32. time factor/ (49834)
33. (latent or latency).tw,kf. (251764)
34. latent infection/ or latent virus infection/ (3820)

35. (generation adj3 time).tw,kf. (6527)
36. ((viral or virus) adj load*).tw,kf. (71104)
37. ((viral or virus) adj concentration*).tw,kf. (2029)
38. ((viral or virus) adj burden).tw,kf. (1839)
39. ((viral or virus) adj level*).tw,kf. (1268)
40. (shed*1 or shedding).tw,kf. (164382)
41. exp disease transmission/ (256831)
42. serial interval*.tw,kf. (525)
43. ((virus or viral) adj clearance).tw,kf. (8251)
44. or/15-43 (2088041)
45. 14 and 44 (3397)

Web of Science Preprint Citation Index (1990 – current)

Date of search: 02/09/2024

TS=(monkeypox) OR TS=("monkey pox") OR TS=(mpox*) OR TS=(monkeypoxvir*) OR TS=(hMPXV*) OR TS=(MPXV*) OR TS=(MPX*) OR TS=(chimpanzeepox) OR TS=("chimpanzee pox")

And:

TS=((Infect* NEAR/4 (duration* or time* or timing or length* or period* or peak*))) OR TS=((quarantine* NEAR/4 (duration* or time* or timing or length* or period* or peak*))) OR TS=((Contag* NEAR/4 (duration* or time* or timing or length* or period* or peak*))) OR TS=((Isolation NEAR/2 (duration* or time or timing or length* or period*))) OR TS=((spread* NEAR/2 (duration* or time or timing or length* or period*))) OR TS=((shed* NEAR/4 (duration* or time* or timing or length* or period* or peak*))) OR TS=((symptom* NEAR/4 (duration* or time* or timing or length* or period* or peak*))) OR TS=(("PCR positiv*" NEAR/4 (duration* or time* or timing or length* or period* or peak*))) OR TS=(("culture* positiv*" NEAR/4 (duration* or time* or timing or length* or period* or peak*))) OR TS=(("Viral proliferat*" NEAR/4 (duration* or time* or timing or length* or period* or peak*))) OR TS=("cycl* threshold*") OR TS=("CT value*") OR TS=(transmi*) OR TS=(incubat*) OR TS=((latent or latency)) OR TS=((generation NEAR/2 time)) OR TS=(((viral or virus) NEAR/0 load*)) OR TS=(((viral or virus) NEAR/0 concentration*)) OR TS=(((viral or virus) NEAR/0 burden)) OR TS=(((viral or virus) NEAR/0 level*)) OR TS=((shed*1 or shedding)) OR TS=("serial interval*") OR TS=(((virus or viral) NEAR/0 clearance))

127 results

Protocol deviations

There was one protocol deviation:

The inclusion criteria for exposure was amended to include unspecified clade as follows: “Laboratory-confirmed infection with any clade of Mpox (Clade 1a, 1b, 2a, 2b **or unspecified clade)**

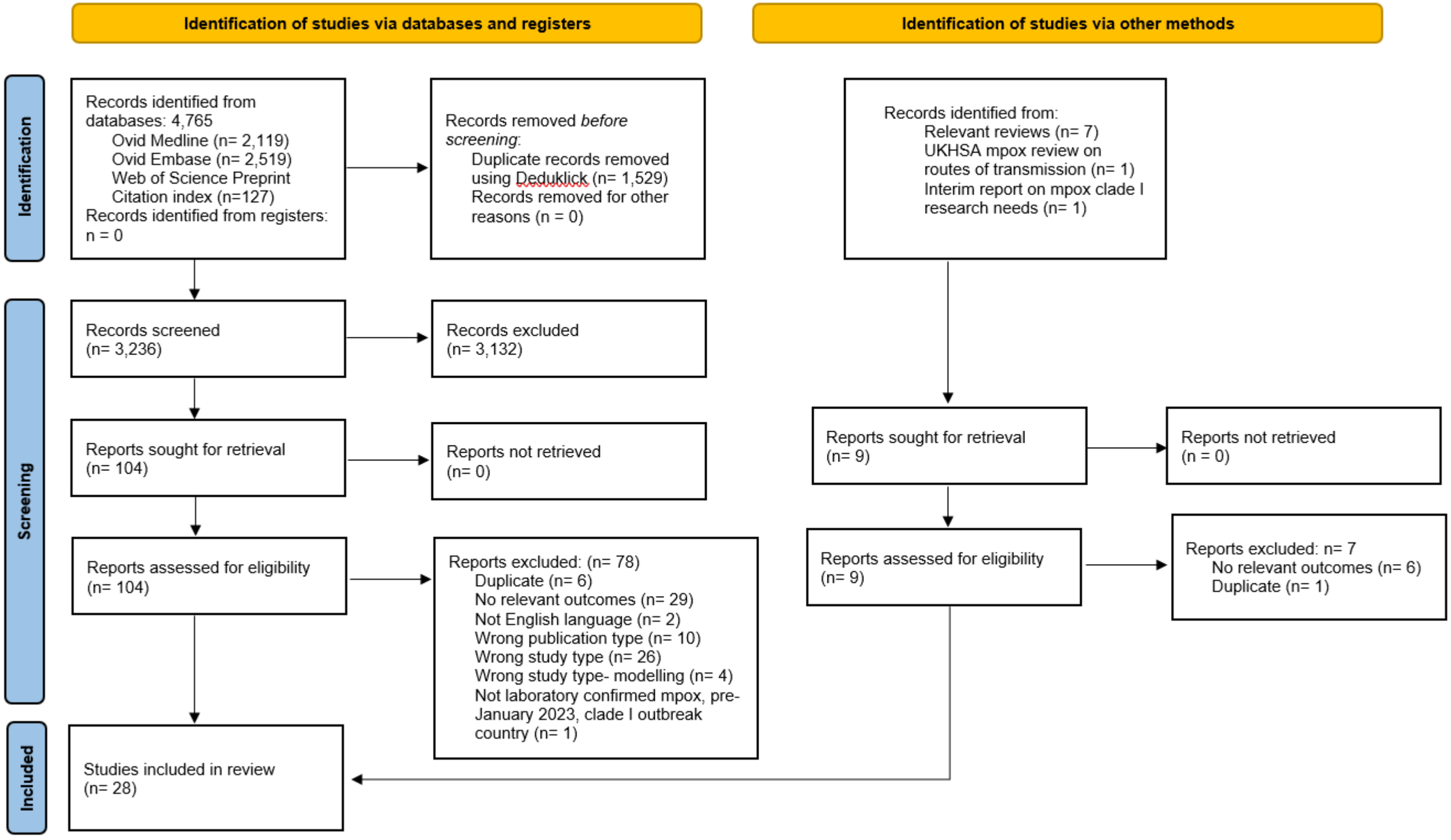
Or

Clinically-suspected or laboratory-confirmed infection with mpox (Clade 1a, 1b, 2a, 2b, or unspecified) in Clade 1 outbreak countries (DRC, Republic of Congo, Central African Republic, Burundi, Rwanda, Uganda, Kenya, Cameroon, Gabon) since 1 January 2023”

This is to ensure that all information that may inform incubation and infectious period of mpox was included in this review.

Annexe B. Study selection flowchart

Figure B.1. PRISMA diagram



Text version of Figure B.1. PRISMA diagram

A PRISMA diagram showing the flow of studies through this review, ultimately including 9 studies.

From identification of studies via databases and registers, n=4,765 records identified from databases:

- Ovid Medline (n=2,119)
- Ovid Embase (n=2,519)
- Web of Science Preprint citation index (n=127)

From these, records removed before screening:

- duplicate records removed using Deduklick (n=1 ,529)
- records removed for other reasons (n=0)

n= 3,236 records screened, of which n= 3,133 were excluded, leaving n= 104 papers sought for retrieval, of which n= 0 were not retrieved.

n= 7 additional studies were identified from 2 relevant reviews. One additional study was identified from a UKHSA mpox review on routes of transmission (32) and one from an interim rapid report on mpox clade I research needs (33). All n= 9 studies were retrieved, and 2 extra studies were included.

Of the n=104 papers assessed for eligibility; n= 84 reports were excluded:

- duplicate (n= 7)
- no relevant outcomes (n= 35)
- not English language (n= 2)
- wrong publication type (n= 10)
- wrong study type (n= 26)
- wrong study type- modelling (n= 4)
- not laboratory confirmed mpox, pre-January 2023, clade I outbreak country (n= 1)

n= 28 papers included in the review.

Annexe C. Excluded full texts

Duplicates (7 studies)

Agusti and others. 'Asymptomatic Monkey Pox Virus Infection: A Self-Sampling Screening Intervention Adressed to Gay, Bisexual and Other Men Who Have Sex with Men and Trans Women in Spain' medRxiv 2023: volume 22

Anonymous. 'Erratum: Estimated incubation period distributions of mpox using cases from two international European festivals and outbreaks in a club in Berlin, May to June 2022 (Euro Surveill. (2023) 28:27 DOI: 10.2807/1560-7917.ES.2023.28.27.2200806)' Eurosurveillance 2023: volume 28

Charniga K and others. 'Estimating the incubation period of monkeypox virus during the 2022 multi-national outbreak' medRxiv. 2022: volume 23

Madewell and others. 'Serial interval and incubation period estimates of monkeypox virus infection in 12 U.S. jurisdictions, May - August 2022' medRxiv. 2022: volume 30

Mazzotta and others. 'Effect of tecovirimat on healing time and viral clearance by emulation of a target trial in patients hospitalized for mpox' Journal of Medical Virology 2023: volume 95, issue 6, page e28868

Miura and others. 'Time Scales of Human Mpox Transmission in The Netherlands' Journal of Infectious Diseases 2024: volume 229, issue 3, pages 800 to 804

Miura and others. 'Estimated incubation period for monkeypox cases confirmed in the Netherlands, May 2022' Euro Surveillance: Bulletin Europeen sur les Maladies Transmissibles = European Communicable Disease Bulletin 2022: volume 27, issue 24, page 6

No relevant outcomes (35 studies)

Agusti and others. 'Self-sampling monkeypox virus testing in high-risk populations, asymptomatic or with unrecognized Mpox, in Spain' Nature communications 2023: volume 14, issue 1, page 5,998

Anonymous. 'From the Centers for Disease Control and Prevention. Multistate outbreak of monkeypox-- Illinois, Indiana, and Wisconsin, 2003' JAMA : the journal of the American Medical Association 2003: volume 290, pages 30 to 31

Bailey and others. 'Healthcare personnel with laboratory-confirmed mpox in California during the 2022 outbreak' Infection Control & Hospital Epidemiology 2024: pages 1 to 3

Brosnan and others. 'Epidemiologic Characteristics of Mpox among People Experiencing Homelessness, Los Angeles County, California, USA, 2022' Emerging Infectious Diseases 2023: volume 29, issue 6, pages 1,109 to 1,116

Charniga and others. 'Updating Reproduction Number Estimates for Mpox in the Democratic Republic of Congo Using Surveillance Data' American Journal of Tropical Medicine & Hygiene 2024: volume 110, issue 3, pages 561 to 568

Estevez and others. 'Epidemiological and Clinical Characteristics of Patients Admitted to a Secondary Hospital with Suspected MPOX Virus Infection: Is HIV Playing a Role?' Journal of Clinical Medicine 2023: volume 12, issue 12, page 18

Garneau and others. 'Risk Factors for Hospitalization and Effect of Immunosuppression on Clinical Outcomes Among an Urban Cohort of Patients With Mpox' Open Forum Infectious Diseases 2023: volume 10, issue 12, page ofad533

Girometti N and others. 'Demographic and clinical characteristics of confirmed human monkeypox virus cases in individuals attending a sexual health centre in London, UK: an observational analysis' The Lancet Infectious Diseases 2022: volume 22, issue 9, pages 1321-1328

Gould and others. 'Air and surface sampling for monkeypox virus in UK hospitals' medRxiv. 2022: volume 21

Guzzetta and others. 'The decline of the 2022 Italian mpox epidemic: Role of behavior changes and control strategies' Nature communications 2024: volume 15, issue 1, page 2283

Hernaez and others. 'Monitoring monkeypox virus in saliva and air samples in Spain: a cross-sectional study' The Lancet. Microbe 2023: volume 4, issue 1, pages e21 to e28

Huhn GD and others. 'Clinical characteristics of human monkeypox, and risk factors for severe disease' Clin Infect Dis 2005: volume 41, issue 12, pages 1742-1751

Laurenson-Schafer and others. 'Description of the first global outbreak of mpox: an analysis of global surveillance data' The Lancet Global Health 2023: volume 11, issue 7, pages e1012 to e1023

Lieberman and others. 'Clinical Performance and Trends during the First Two Months of Monkeypox Virus PCR Testing at Two United States Reference Labs' Journal of Clinical Microbiology 2022: volume 60, issue 12, page e0137122

Lira and others. 'Mpox outbreak in Rio de Janeiro, Brazil: A translational approach' Journal of Medical Virology 2024: volume 96, issue 5, page e2962

Ma and others. 'Clinical testing of pediatric mpox specimens: Unique features and challenges in a low prevalence population' Journal of Clinical Virology 2023: volume 163, page 105447

Ma and others. 'Characterization of the Cytopathic Effects of Monkeypox Virus Isolated from Clinical Specimens and Differentiation from Common Viral Exanthems' Journal of Clinical Microbiology 2022: volume 60, issue 12, page e0133622

Ma and others. ‘Clinical testing of pediatric mpox specimens: Unique features and challenges in a low prevalence population’ Journal of Clinical Virology 2023: volume 163, page 105447

Martins-Filho and others. 'Differences in cycle threshold values in RT-PCR tests between children and adults with monkeypox: Results from a community-based cross-sectional study' Travel Medicine & Infectious Disease 2023: volume 52, page 102560

Mazzotta and others. 'Clinical and laboratory predictors of mpox severity and duration: an Italian multicentre cohort study (mpox-Icona)' EBioMedicine 2024: volume 107, page 105289

Minhaj FS and others. 'Monkeypox Outbreak - Nine States, May 2022' MMWR - Morbidity & Mortality Weekly Report 2022: volume 71, issue 23, pages 764-769

Nolen and others. 'Extended Human-to-Human Transmission during a Monkeypox Outbreak in the Democratic Republic of the Congo' Emerging Infectious Diseases 2016: volume 22, issue 6, pages 1014 to 1021

Orviz E and others. 'Monkeypox outbreak in Madrid (Spain): Clinical and virological aspects' J Infect 2022: volume 85, issue 4, pages 412-417

Patalon and others. 'Mpox Patient Journey in Israel' Microorganisms 2023: volume 11, issue 4, page 16

Ramirez-Olivencia and others. 'Clinical and Epidemiological Characteristics of the 2022 Mpox Outbreak in Spain (CEME-22 Study)' Open Forum Infectious Diseases 2024: volume 11, issue 3, page ofae105

Seah and others. 'Applicability and benefits of telemedicine in the monitoring of monkeypox close contacts' Journal of Telemedicine & Telecare 2022: page 1357633X221130290

Taylor and others. 'Emergency department attendances and inpatient admissions due to mpox infection, England, 2022' Sexually Transmitted Infections 2024: volume 7, page 07

Thomas and others. 'Notes from the Field: Transmission of Mpox to Nonsexual Close Contacts - Two U.S. Jurisdictions, May 1-July 31, 2022' MMWR - Morbidity & Mortality Weekly Report 2023: volume 72, issue 50, pages 1351 to 1352

UKHSA 'Investigation into monkeypox outbreak in England: technical briefing 3' 2024

Vakaniaki and others. 'Sustained Human Outbreak of a New MPXV Clade I Lineage in Eastern Democratic Republic of the Congo' medRxiv. 2024: volume 14

Vallejo-Plaza and others. 'Mpox (formerly monkeypox) in women: epidemiological features and clinical characteristics of mpox cases in Spain, April to November 2022' Euro Surveillance: Bulletin Europeen sur les Maladies Transmissibles = European Communicable Disease Bulletin 2022: volume 27, issue 48, page 12

van Ewijk and others. 'Acceptance and timeliness of post-exposure vaccination against mpox in high-risk contacts, Amsterdam, the Netherlands, May-July 2022' Vaccine 2023: volume 41, issue 47, pages 6,952 to 6,959

Yang and others. 'Clinical characteristics, viral dynamics, and antibody response of monkeypox virus infections among men with and without HIV infection in Guangzhou, China' Frontiers in Cellular & Infection Microbiology 2024: volume 14, page 1412753

Yang and others. 'Dissemination and Symptoms of Monkeypox Virus Infection' Asia-Pacific Journal of Public Health 2023: volume 35, issue 2, pages 175 to 178

Yinka-Ogunleye and others. 'Mpox (monkeypox) risk and mortality associated with HIV infection: a national case-control study in Nigeria' BMJ Global Health 2023: volume 8, issue 11, page 30

World Health Organisation 'Multi-country outbreak of monkeypox, External situation report #4. Edition 4.' 2022

Not English language (2 studies)

Sterzing. 'Perianal monkeypox. [German]' Coloproctology 2022: volume 44, pages 349 to 352

Zhang and others. '[Epidemiological transmission characteristics of monkeypox infection in children and the research progress in prevention and treatment]' Zhonghua Erke Zazhi 2024: volume 62, issue 1, pages 87 to 90

Wrong publication type (10 studies)

Anonymous. 'Erratum: Estimated incubation period for monkeypox cases confirmed in the Netherlands, May 2022 (Euro Surveill. (2022) 27:24)' Eurosurveillance 2023: volume 28, issue 14

Dunning and others. 'An opportunity seized: rapid clinical research provides insights into monkeypox virus dynamics and durations of infectiousness' The Lancet Infectious Diseases 2023: volume 23, issue 4, pages 383 to 385

Katoto and others. 'Shifting transmission patterns of human mpox in South Kivu, DR Congo' The Lancet Infectious Diseases 2024: volume 24, issue 6, pages e354 to e355

Mai and others. 'Asymptomatic monkeypox infection: transmissibility and implications' Internal Medicine Journal 2022: volume 52, issue 12, pages 2,193 to 2,194

Pisano and others. 'The never-ending story of mpox epidemic: Tracing a new cluster in Florence, Italy' Travel Medicine & Infectious Disease 2024: volume 59, page 102704

Russell and others. 'Anorectal Mpox in men who have sex with men associated with sexually transmitted co-infections: a case series' Sexually Transmitted Infections 2024: volume 100, issue 1, pages 52 to 53

Venkatesan. 'Monkeypox transmission-what we know so far' The Lancet Respiratory Medicine 2022: volume 10, issue 11, page e101

Viedma-Martinez and others. 'MPXV Transmission at a Tattoo Parlor' New England Journal of Medicine 2023: volume 388, issue 1, pages 92 to 94

Yang and others. 'Transmission and detection of monkeypox virus in saliva (part II): Implications for sequential monitoring of viral load' Journal of Dental Sciences 2023: volume 18, issue 3, pages 1403 to 1405

Zheng and others. 'Disparities in transmission dynamics of the 2022 mpox outbreaks between Europe and Americas' New Microbes & New Infections 2023: volume 52, page 101111

Wrong study type (26 studies)

Adler and others. 'Clinical features and management of human monkeypox: a retrospective observational study in the UK' The Lancet Infectious Diseases 2022: volume 22, issue 8, pages 1,153 to 1,162

Alakunle and others. 'Monkeypox virus: a neglected zoonotic pathogen spreads globally' Nature Reviews Microbiology 2022: volume 20, pages 507 to 508

Al-Kuraishy and others. 'Monkeypox epidemic at the door: should we remain idly by or prepare strongly?' AMB Express 2023: volume 13, issue 1, page 5

Al-Tawfiq and others. 'International outbreaks of Monkeypox virus infection with no established travel: A public health concern with significant knowledge gap' Travel Medicine and Infectious Disease 2022: volume 49

Charatan. 'US doctors investigate more than 50 possible cases of monkeypox' BMJ (Clinical research ed.) 2003: volume 326, page 1350

Colavita and others. 'Kinetics of viral DNA in body fluids and antibody response in patients with acute Monkeypox virus infection' iScience 2023: volume 26, issue 3, page 106102

Desai and others. 'Implications of the 2023-2024 MPXV clade I outbreak in the Democratic Republic of Congo to global public health' Clinical Microbiology and Infection 2024: volume 30, pages 1092 to 1094

Evangelista and others. 'New variola (mpox) in Brazil: Epidemiological update and perspectives' Asian Pacific Journal of Tropical Medicine 2022: volume 15, pages 525 to 528

Fowotade and others. 'Re-emergence of monkeypox in Nigeria: A cause for concern and public enlightenment' African Journal of Clinical and Experimental Microbiology 2018: volume 19, pages 307 to 313

Gaspari and others. 'Monkeypox Outbreak 2022: Clinical and Virological Features of 30 Patients at the Sexually Transmitted Diseases Centre of Sant' Orsola Hospital, Bologna, Northeastern Italy' Journal of Clinical Microbiology 2023: volume 61, issue 1, page e0136522

Hornuss and others. 'Transmission characteristics, replication patterns and clinical manifestations of human monkeypox virus-an in-depth analysis of four cases from Germany' Clinical Microbiology & Infection 2023: volume 29, issue 1, pages 112.e115 to 112.e119

Kibungu and others. 'Clade I-Associated Mpox Cases Associated with Sexual Contact, the Democratic Republic of the Congo' Emerging Infectious Diseases 2024: volume 30, issue 1, pages 172 to 176

Lapa and others. 'Monkeypox virus isolation from a semen sample collected in the early phase of infection in a patient with prolonged seminal viral shedding' The Lancet Infectious Diseases 2022: volume 22, issue 9, pages 1267 to 1269

Learned and others. 'Extended interhuman transmission of monkeypox in a hospital community in the Republic of the Congo, 2003' American Journal of Tropical Medicine & Hygiene 2005: volume 73, issue 2, pages 428 to 434

Martinez-Fernandez and others. 'Human Monkeypox: A Comprehensive Overview of Epidemiology, Pathogenesis, Diagnosis, Treatment, and Prevention Strategies' Pathogens 2023: volume 12, issue 7, page 18

Mazzotta and others. 'Poor evidence for an effect of tecovirimat in shortening recovery time in hospitalized mpox cases from real-world data' medRxiv. 2023: volume 10

Meo and others. 'Impact of traveling on transmission trends of human monkeypox disease: worldwide data based observational analysis' Frontiers in Public Health 2023: volume 11, page 1029215

Mitsios and others. 'Monkeypox-related ophthalmic disease (MPXROD): Monitoring the antiviral effect of tecovirimat with monkeypox virus detection in tear samples' European Journal of Ophthalmology 2024: page 11206721241272199

Pfafflin and others. 'Monkeypox in-patients with severe anal pain' Infection 2023: volume 51, issue 2, pages 483 to 487

Ponce and others. 'Incubation Period and Serial Interval of Mpox in 2022 Global Outbreak Compared with Historical Estimates' Emerging Infectious Diseases 2024: volume 30, issue 6, pages 1173 to 1181

Ragan and others. 'Pathogen reduction of monkeypox virus in plasma and whole blood using riboflavin and UV light' PLoS ONE [Electronic Resource] 2023: volume 18, issue 1, page e0278862

Relhan and others. 'Clinical presentation, viral kinetics, and management of human monkeypox cases from New Delhi, India 2022' Journal of Medical Virology 2023: volume 95, issue 1, page e28249

Thornhill and others. 'Monkeypox Virus Infection in Humans across 16 Countries - April-June 2022' New England Journal of Medicine 2022: volume 387, issue 8, pages 679 to 691

Vivancos-Gallego and others. 'Human Monkeypox in People With HIV: Transmission, Clinical Features, and Outcome' Open Forum Infectious Diseases 2022: volume 9, issue 11, page ofac557

Vouga and others. 'The monkeypox outbreak: risks to children and pregnant women' The Lancet Child and Adolescent Health 2022: volume 6, pages 751 to 753

Wang and others. 'Serial intervals and incubation periods of the monkeypox virus clades' Journal of Travel Medicine 2022: volume 29, issue 8, page 27

Wrong study type- modelling (4 studies)

Guo and others. 'Estimation of the serial interval of monkeypox during the early outbreak in 2022' Journal of Medical Virology 2023: volume 95, issue 1, page e28248

Liu and others. 'Anticipating the transmissibility of the 2022 mpox outbreak' Journal of Medical Virology 2023: volume 95, issue 3, page e28683

Marziano and others. 'Incubation period, serial interval, generation time and reproduction number of mpox clade I' medRxiv. 2024: volume 10

Wei and others. 'Study and prediction of the 2022 global monkeypox epidemic' Journal of Biosafety and Biosecurity 2022: volume 4, issue 2, pages 158 to 162

Not laboratory confirmed mpox, pre-January 2023, clade I outbreak country (one study)

Besombes. 'Investigation of a mpox outbreak in Central African Republic, 2021-2022' One Health 2023: volume 16, page 100523

Annexe D. Data extraction tables

Abbreviations: ART: Anti-retroviral therapy, CD4: Cluster of Differentiation 4, CI: Confidence Interval, Ct: Cycle Threshold, Cq: Quantification Cycle, DNA: Deoxyribonucleic Acid, HR: Hazard Ratio, HIV: Human Immunodeficiency Virus, IQR: Interquartile Range, mL: Millilitre, mm^3: Cubic Millimetre, MSM: Men Who Have Sex with Men, PCR: Polymerase Chain Reaction, µL: Microlitre, PrEp: Pre- exposure prophylaxis, STI: Sexually Transmitted Infection, USA: United States of America

Table D.1. Summary of mpox infectious period (clade I)

Study	Country, time period, study type	Population	Outcomes

Besombes 2022 (1)	Central African Republic, 2001 to 2021
	
	Retrospective analysis of national surveillance data
		National surveillance data from 95 suspected mpox outbreaks (involving 468 people), of which 40 outbreaks were confirmed to be mpox outbreaks. Of the 40 confirmed mpox outbreaks (involving 327 people), 99 cases had confirmed mpox, 61 were suspected mpox cases and 167 people were classed as contacts.
		
		Confirmed cases (n= 99):
		• 51 (53.1%) were female, 45 were male (46.9%), sex unknown for 3 cases
		• median age: 15.5 years (IQR: 5.5 to 28 years, [note: the study reports 28 years in the text and 27 years in the table]), age unknown for 7 cases
		• born before 1980 (if yes, assumed vaccinated for smallpox):
		  • yes: 3 cases (3.3%)
		  • no: 89 cases (96.7%)
		  • unknown: 7 cases
		
		Suspected cases (n= 61):
		• 37 (60.7%) were female, 24 were male (39.3%)
		• median age: 8 years (IQR: 2 to 23 years)
		• born before 1980 (if yes, assumed vaccinated for smallpox):
		  • yes: 4 cases (6.8%)
		  • no: 55 cases (93.2%)
		  • unknown: 2 cases
		
		One case was reported to be living with HIV (but the study noted that HIV testing not routinely performed in mpox cases in the Central African Republic). No information on treatment status or CD4 counts was reported for the one case living with HIV.
			Incubation period was defined as the interval between exposure and symptom onset (data available for 29 people).
			
			Median incubation period: 7 days (range: 0 to 17 days, IQR: 1 to 13 days).
			
			The study did not report if these 29 people were confirmed or suspected cases.

Table D.2. Summary of mpox incubation period and infectious period (clade IIb)

Study	Country, time period, study type	Population	Outcomes
Brosius 2023 (5)	Belgium, June 24 to July 31 2022 Prospective cohort study	25 high risk contacts of 23 confirmed clade IIb mpox cases (median age: 43 years [IQR: 36 to 51 years], 20% were living with HIV). Treatment status and CD4 counts for cases living with HIV not reported. One case (HIV status not provided) was reported to be immunocompromised. 96% identified as MSM, 72% of cases reported having sexual contact with an index case and 28% had non-sexual contact with index cases including household contacts and prolonged skin to skin contact. 5 cases received post exposure vaccination and 6 were vaccinated against smallpox during childhood. Cases were followed up for a median of 16 days (IQR: 14 to 26 days) after their last high-risk contact. Definitely infected: at least one sample with PCR Ct value of less than 34 Possibly infected: at least one sample with PCR Ct value of less than or equal to 34 to less than 37. Uninfected: all PCR Ct values more than 37. Asymptomatic cases: • definitely infected: 0 (0%) • possibly infected: 2 (40%) • uninfected: 7 (58.3%) Symptomatic cases: • definitely infected: 8 (100%) showed symptoms (fever, night sweats, or other symptoms). Of these, 5 (83.3%) were pre-symptomatic • possibly infected: 3 (60%) showed symptoms (fever, night sweats, or other symptoms) Uninfected: 5 (41.7%) showed symptoms.	Definitely infected cases: • number of days between most recent contact with case infected with mpox and first positive viral load detection was 5 days (IQR: 4 to 9.5 days) Possibly infected cases: • number of days between the most recent contact and first positive viral load detection was 5 days (IQR: 5 to 12 days)

Study	Country, time period, study type	Population	Outcomes
Chin 2024 (18)	South Korea, September 2022 to June 2023 Prospective cohort study	18 cases (94.4% male, median age: 32.5 years [IQR: 24 to 51 years]) with clade IIb mpox 9 cases (50%) were living with HIV, median CD4 count was 547 cells per µL, none with CD4 counts less than 200 per µL. All cases living with HIV were receiving ART and were virologically suppressed (defined as having an HIV viral load of less than 20 copies per mL). No cases had received the smallpox vaccination for mpox All cases were symptomatic (symptoms included fever, myalgia, headache, anal, perianal, or genital lesions). During hospitalisation, 13 cases (72.2%) received tecovirimat, and 4 (22.2%) were treated with antibiotics for perilesional cellulitis. Numbers of each type of sample collected: • anogenital samples: 63 • throat samples: 44 • skin lesion samples: 81	Median duration of viral DNA detection by PCR: • anogenital samples: 12 days • skin lesion samples: 12.5 days • throat samples: 11 days Maximum duration of viral DNA detection by PCR: • anogenital samples: 23 days • skin lesion samples: 19 days • throat samples: 15 days PCR positivity 14 days after symptom onset: • anogenital samples: 85.7% • skin lesion samples: 77.8% • throat samples: Not clearly reported Median isolation of virus by culture: • anogenital samples: 9 days • skin lesion samples: 10.5 days • throat samples: 11 days Maximum isolation of virus by culture: • 15 days for all sample types Culture positivity decrease between 10 and 14 days after symptom onset: • anogenital samples: 53.8% to 28.6% • skin lesion samples: 42.9% to 22.2% • throat samples: Not clearly reported
Dou 2023 (2)	China, May 31 to June 21 2023 Retrospective cohort study	37 confirmed clade IIb mpox cases (aged between 24 to 51 years, median age: 30 years [IQR: 26.5 to 34.5 years], 16.2% aged over 40 years). Of the total cohort, 51.4% (19) were living with HIV. 11 were receiving regular antiretroviral therapy, one was newly diagnosed (treatment status not provided), one was receiving irregular treatment, and 6 did not provide this information. 9 participants had undetectable HIV levels, one had an HIV viral load of more than 20 copies per mL. 3 had CD4 counts between 300 and 500	19 cases had a known exposure time, with the incubation period ranging from 2 to 20 days (median: 9 days, IQR: 7 to 13 days). 2 cases had an incubation period of 2 days and presented with atypical symptoms (genital swelling and perianal mucosa rash).

Study	Country, time period, study type	Population	Outcomes
		per µL, 6 had counts of more than 500 per µL and CD4 counts were unknown for one individual. 3 cases (8.1%) had previously received the smallpox vaccine. 4 cases were asymptomatic (identified from close contacts of index cases). 33 were symptomatic (rash, fever, swollen and painful lymph nodes, skin lesions). 3 asymptomatic cases were HIV-positive, and one HIV-negative case was taking HIV pre-exposure prophylaxis. Of 28 cases diagnosed at outpatient clinics, median time from symptom onset to initial consultation was 4 days (IQR: 2.5 to 6.5 days, range: 0 to 15 days). The median time from symptom onset to diagnosis was 6 days (IQR: 5 to 8.5 days, range: 2 to 15 days). 6 cases identified through contact investigation and 3 were identified through source tracing (not defined).	
Guzzetta 2022 (3)	Italy, May to June 2022 Retrospective cohort study	255 PCR confirmed West African (assumed to be clade IIb) cases (99.2% male, median age: 37 years [range: 20 to 71 years]). Clinical symptoms included fever, rash and genital or perianal rash. For 228 cases, information about travel history was reported, with 86 cases (37.7%) having travelled abroad and 25 (29.1%) having travelled to the Canary Islands in the last 21 days. Of these, 15 people had known date of exposure to an individual infected with mpox and 15 had a history of travel to the Canary Islands. These 30 cases were used to estimate incubation time.	Mean incubation period of 30 cases with known exposure date or history of travel to the Canary Islands: 9.1 days (95% CI: 6.5 to 10.9 days; 5th and 95th percentiles of the distribution 2 to 20 days).
Meschi 2024 (19)	Italy, May to December 2022 Prospective cohort study	89 clade IIb mpox confirmed cases HIV status: 37 out of 84 mpox cases with available information were people living with HIV (most recent CD4 count more than 200 cells per mm^3, median CD4: 560.5 cells per mm^3, IQR: 412 to 797.3 cells per mm^3)	Positivity over time: Skin samples: • week 1 (42 samples): 93% • week 2 (8 samples): 88% p value for comparison: not reported (assumed $p > 0.05$)

Study	Country, time period, study type	Population	Outcomes
		Vaccination status: 4 (4.5%) cases reported smallpox vaccination during their childhood (median age: 62 years, IQR: 56 to 62 years)	Oropharyngeal samples: • week 1 (42 samples): 95% • week 2 (20 samples): 60% • week 3 (12 samples): 42% • week 4 (16 samples): 31% • week 1 vs week 2: p < 0.0001 • week 1 vs week 3: p < 0.0001 • week 1 vs week 4: p < 0.0001 Saliva samples: • week 1 (21 samples): 95% • week 2 (21 samples): 71% • week 3 (6 samples): 67% • week 4 (5 samples): 20% • week 1 vs week 2: p < 0.05 • week 2 vs week 4: p < 0.05 • week 1 vs week 3: p < 0.0005 • week 1 vs week 4: p < 0.001 Plasma samples: • week 1 (39 samples): 77% • week 2 (63 samples): 63% • week 3 (17 samples): 18% • week 4 (4 samples): 0% • week 1 vs week 2: p < 0.05 • week 1 vs week 3: p <0.0001 • week 2 vs week 3: p < 0.001 • week 1 vs week 4: p < 0.005 • week 2 vs week 4: p < 0.05 Semen samples: • week 1 (42 samples): 64% • week 2 (29 samples): 74% • week 3 (21 samples): 38% • week 4 (19 samples): 32% • week 1 vs week 4: p < 0.001

Study	Country, time period, study type	Population	Outcomes
			• week 1 vs week 2: not reported (assumed p > 0.05) • week 1 vs week 3: not reported (assumed p > 0.05) • week 1 vs week 4: not reported (assumed p > 0.05) • week 2 vs week 3: p < 0.05 • week 2 vs week 4: p < 0.005 Stool samples: • week 1 (18 samples): 67% • week 2 (29 samples): 69% • week 3 (14 samples): 19% • week 4 (15 samples): 15% • week 1 vs week 2: not reported (assumed p > 0.05) • week 1 vs week 3: p < 0.05 • week 1 vs week 4: p < 0.005 • week 2 vs week 3: p < 0.005 • week 2 vs week 4: p < 0.001 Urine samples: • week 1 (21 samples): 33% • week 2 (27 samples): 12% • week 3 (25 samples): 20% • week 4 (20 samples): 5% (Ct value: 36.1) • week 1 vs week 2: p < 0.05 • no other comparisons reported (assumed p > 0.05) Ct values (individual, average, or median) were not reported for other weeks or samples. Viral clearance: • median time to viral clearance by sample location • oropharyngeal: 21 days (95% CI: 18 to 26 days) • saliva: 19 days (95% CI: 17 to 29 days) • plasma: 12 days (95% CI: 11 to 13 days) • semen: 14 days (95% CI: 13 to 17 days) • stool: 18 days (95% CI: 15 to 22 days) • urine: 16 days (95% CI: 13 to 19 days)

Study	Country, time period, study type	Population	Outcomes
			Long term detection: • of all samples collected between 30 to 143 days from symptom onset, • viral DNA was only detectable in 2 samples: • semen sample at 31 days: Ct value = 35.9 • saliva sample at 71 days: Ct value = 39.2
Norz 2022 (20)	Germany, until 30 June 2022 (start date not specified) Prospective cohort study	16 male cases with clade IIb mpox (5 hospitalised and 11 outpatients). Age range: 20 to 60 years, 2 cases living with HIV under anti-retroviral therapy, 4 HIV negative cases taking pre-exposition prophylaxis and 4 HIV negative cases not taking any prophylaxis. Low CD4 counts reported for two cases: Patient 1: 22 HIV copies per ml, CD4: 360 per µL Patient 2: HIV copies not detectable, CD4: 279 per µL Vaccination status not reported.	Cutaneous lesion samples: • all lesion samples were positive throughout the entire study • first week median viral load: 3.31 x 10^7 copies per ml (range: 2.19 x 10^7 to 3.95 x 10^7 copies per ml) • second week median viral load: 3.04 x 10^6 copies per ml (range: 2.11 x 10^5 to 5.48 x 10^5 copies per ml) • third week median viral load: 8.55 x 10^3 copies per ml (range not reported) Oropharyngeal samples: • first week median viral load: 8.44 x 10^4 copies per ml (range: 6.93 x 10^4 to 7.31 x 10^5 copies per ml) • second week median viral load: 4.04 x 10^3 copies per ml (range: 0 to 6.75 x 10^6 copies per ml) • third week median viral load: undetectable, 0 copies per ml (range: 0 to 2 x 10^4 copies per ml) Plasma samples: • first week median viral load: 5.85 x 10^2 copies per ml (range: 1.58 x 10^2 to 1.05 x 10^3 copies per ml) • second week median viral load: 7.80 copies per ml (range: 0 to 1.2 x 10^3 copies per ml) • third week median viral load (single sample) 2.37 x 10^1 copies per ml
Piralla 2024 (21)	Italy, May 24 to September 1, 2022 Retrospective cohort study	353 cases with laboratory-diagnosed clade IIb mpox infection tested during the Regional Surveillance Program (median age: 37 years, range: 15 to 67 years [IQR: 32 to 43 years], 99.2% male, 10.5% living with HIV, 84.7% unknown HIV status) Vaccination status: Of 261 cases reporting vaccination history for smallpox, 231 (65.4%) cases were unvaccinated.	Percentage of all samples that tested positive categorised by the time between sample collection and symptom onset: • 0 to 7 days: 41.1% of 158 samples • 8 to 14 days: 31.5% of 108 samples • 15 to 21 days: 11.9% of 51 samples • 22 to 28 days: 19.1% of 21 samples • more than 29 days: 4.8% of 21 samples

Study	Country, time period, study type	Population	Outcomes
		Cases were sampled up to 56 days after presentation. Follow up period differed between sample locations as follows: • 34 days for skin samples • 56 days for oropharyngeal samples • 28 days for anogenital samples • 30 days for urethral samples • 21 days for urine samples • 21 days for semen samples • 18 days for blood samples Transmission occurred abroad in 85 (25.8%) of cases, in Spain, France, Germany and Great Britain.	Percentage of skin samples that tested positive categorised by the time between sample collection and symptom onset: • 0 to 7 days: 43% of 51 samples • 8 to 14 days: 41% of 34 samples • 15 to 21 days: 11.3% of 18 samples • 22 to 28 days: 11.3% of 9 samples • more than 29 days: 0% of 8 samples Percentage of oropharyngeal samples that tested positive categorised by the time between sample collection and symptom onset: • 0 to 7 days: 15.9% of 44 samples • 8 to 14 days: 6.0% of 34 samples • 15 to 21 days: 0% of 17 samples • 22 to 28 days: 14.3% of 7 samples • more than 29 days: 7.6% of 13 samples Percentage of anogenital samples that tested positive based on the time between sample collection and symptom onset: • 0 to 7 days: 72.7% of 33 samples • 8 to 14 days: 52.6% of 19 samples • 15 to 21 days: 28.6% of 7 samples • 22 to 28 days: 11.3% of 1 sample • more than 29 days: 0% of 0 samples Percentage of urethral samples that tested positive categorised by the time between sample collection and symptom onset: • 0 to 7 days: 68.6% of 16 samples • 8 to 14 days: 59.9% of 10 samples • 15 to 21 days: 20.0% of 5 samples • 22 to 28 days: 0% of 1 sample • more than 29 days: 0% of 0 samples Persistent shedding (defined as duration of more than 21 days) was observed in: • 10% (11 out of 110) skin samples • 6.1% (10 out of 165) oropharyngeal samples.

Study	Country, time period, study type	Population	Outcomes
			• longest shedding period was observed in 56 days from one oropharyngeal sample • 3.4% (4 out of 116) anogenital samples Median clearance time of mpox DNA by sample location was: Kaplan-Meier curves comparing viral shedding in skin and oropharyngeal samples showed that the median time for viral clearance was 16 days for skin samples and 14 days for oropharyngeal samples. The hazard ratio was 0.56 (95% CI: 0.41 to 0.77, p < 0.001), indicating that the likelihood of clearing the virus was slower for skin samples compared to oropharyngeal samples. Cq values indicate the amount of virus in a sample, with lower Cq values meaning more virus is present (assumed to mean the same as Ct value) • in samples collected within 0 to 7 days of symptom onset: median Cq values where mpox virus was isolated was 19 and 30 where mpox was not isolated (p < 0.001) • in samples collected within 8 to 14 days of symptom onset: where mpox virus was isolated was 22 and 29 where mpox was not isolated (p < 0.001) • in samples collected more than 15 days after the onset of symptoms: median Cq values were mpox virus was isolated was 20 and 31 where not isolated (p < 0.001)
Tarin-Vicente 2022 (4)	Spain, May 11 to June 29 2022 Prospective cohort study	181 cases with confirmed West African (clade IIb) mpox from 3 sexual health clinics in Madrid and Barcelona (median age: 37 years, [IQR: 31 to 42 years]), 44% were Spanish, 45% were South and central American, 10% other and 1% were missing data). 166 (92%) identified as gay men, bisexual men or as MSM, while 15 (8%) identified as heterosexual. 72 cases (40%) were living with HIV. Among these, 71 (99%) were on antiretroviral therapy, and 8 (11%) had a CD4 cell count of less than 500 cells per µL. 17% were diagnosed with a concurrent sexually transmitted disease, most commonly chlamydia and syphilis. 32 cases (18%) reported previous smallpox vaccination.	For the total cohort (n = 181) the median incubation period was 7 days (IQR: 5 to 10 days, range 1 to 19 days). For MSM engaging in receptive anal contact (n = 108) the median incubation period was 8 days (IQR: 5 to 10 days). For MSM without receptive anal contact (n = 58) the median incubation period was 7 days (IQR: 5 to 9 days). Absolute difference of incubation periods between the MSM groups was 1 day (95% CI: 1.4 to 1.2, p value = 0.88). For non-MSM (n = 15) the median incubation period was 6.0 days (IQR: 5 to 6 days).

Study	Country, time period, study type	Population	Outcomes
Yang 2024 (22)	China, June 11 2023 to 13 November 2023 Prospective cohort study	77 laboratory-confirmed hospitalised clade IIb mpox men admitted to Shenzen Third People's Hospital between June 9, 2023, to Nov 5, 2023 (median age: 30 years, range: 21 to 51 years), 72 were MSM and 5 were bisexual 42 were living with HIV, with a median CD4 count of 450 cells per µL (IQR: 237 to 566 cells per µL) and the rest were described by study authors as immunocompetent. 5 received a smallpox vaccination during childhood. All cases were followed up to discharge. Serial samples were collected every 2 to 3 days while in hospital. Samples were collected from the oropharynx, skin lesions and rectum, and samples of saliva (about 0.3 to 0.5 mL), urine (3 to 5 mL) and plasma (2 to 3 mL). Samples were processed by PCR and were considered positive if the Ct value was less than 40, and negative if the results were undetermined.	Skin samples showed the highest positivity rates over all time periods, followed by rectal, saliva, oropharyngeal, and urine and plasma samples. No differences for positivity rate between HIV and non-HIV groups, except a higher positivity rate of urine samples 15 to 21 days after symptom onset in the non-HIV group (p = 0.0228) Oropharynx samples positive rate: 1 to 7 days after symptom onset • total cohort: 71.21% (47 out of 66 samples) • HIV-positive: 65.85% (27 out of 41 samples) • HIV-negative: 80.00% (20 out of 25 samples) • p value = 0.2703 8 to 14 days after symptom onset • total cohort: 56.00% (42 out of 75 samples) • HIV-positive: 52.38% (22 out of 42 samples) • HIV-negative: 60.61% (20 out of 33 samples) • p value = 0.4936 15 to 21 days after symptom onset • total cohort: 25.00% (6 out of 24 samples) • HIV-positive: 26.67% (4 out of 15 samples) • HIV-negative: 22.22% (2 out of 9 samples) • p value: >0.9999 Saliva samples positive rate: 1 to 7 days after symptom onset • total cohort: 74.58% (44 out of 59 samples) • HIV-positive: 74.29% (26 out of 35 samples) • HIV-negative: 75.00% (18 out of 24 samples) • p value: >0.9999 8 to 14 days after symptom onset • total cohort: 69.86% (51 out of 73 samples) • HIV-positive: 76.92% (30 out of 39 samples)

Study	Country, time period, study type	Population	Outcomes
			• HIV-negative: 61.76% (21 out of 34 samples) • p value = 0.2040 15 to 21 days after symptom onset • total cohort: 56.52% (13 out of 23 samples) • HIV-positive: 57.14% (8 out of 14 samples) • HIV-negative: 55.56% (5 out of 9 samples) • p value: >0.9999 Rectum samples positive rate: 1 to 7 days after symptom onset • total cohort: 75.41% (46 out of 61 samples) • HIV-positive: 78.38% (29 out of 37 samples) • HIV-negative: 70.83% (17 out of 24 samples) • p value = 0.5527 8 to 14 days after symptom onset • total cohort: 72.73% (56 out of 77 samples) • HIV-positive: 76.74% (33 out of 43 samples) • HIV-negative: 67.65% (23 out of 34 samples) • p value = 0.4438 15 to 21 days after symptom onset • total cohort: 58.33% (14 out of 24 samples) • HIV-positive: 60.00% (9 out of 15 samples) • HIV-negative: 55.56% (5 out of 9 samples) • p value: >0.9999 Skin lesion samples positive rate: 1 to 7 days after symptom onset • total cohort: 100 % (74 out of 74 samples) • HIV-positive: 100% (49 out of 49 samples) • HIV-negative: 100% (25 out of 25 samples) • p value: >0.9999

Study	Country, time period, study type	Population	Outcomes
			8 to 14 days after symptom onset • total cohort: 95.95% (71 out of 74 samples) • HIV-positive: 95.24% (40 out of 42 samples) • HIV-negative: 96.88% (31 out of 32 samples) • p value: >0.9999 15 to 21 days after symptom onset • total cohort: 91.67% (22 out of 24 samples) • HIV-positive: 93.33% (14 out of 15 samples) • HIV-negative: 88.89% (8 out of 9 samples) • p value: >0.9999 Urine sample positive rate: 1 to 7 days after symptom onset • total cohort: 47.37% (27 out of 57 samples) • HIV-positive: 42.42% (14 out of 33 samples) • HIV-negative: 54.17% (13 out of 24 samples) • p-value = 0.4295 8 to 14 days after symptom onset • total cohort: 39.19% (29 out of 74 samples) • HIV-positive: 43.90% (18 out of 41 samples) • HIV-negative: 33.33% (11 out of 33 samples) • p value: 0.4731 15 to 21 after post symptom onset • total cohort: 39.13% (9 out of 23 samples) • HIV-positive: 20.00% (3 out of 15 samples) • HIV-negative: 75.00% (6 out of 8 samples) • p value = 0.0228 Plasma sample positive rate: 1 to 7 days after symptom onset • total cohort: 24.56% (14 out of 57 samples)

Study	Country, time period, study type	Population	Outcomes
			• HIV-positive: 33.33% (11 out of 33 samples) • HIV-negative: 12.50% (3 out of 24 samples) • p value = 0.1183 8 to 14 days after symptom onset • total cohort: 14.44% (13 out of 90 samples) • HIV-positive: 13.21% (7 out of 53 samples) • HIV-negative: 16.22% (6 out of 37 samples) • p value = 0.7649 15 to 21 days after symptom onset • total cohort: 5.71% (2 out of 35 samples) • HIV-positive: 10.53% (2 out of 19 samples) • HIV-negative: 0% (0 out of 16 samples) • p value = 0.4891 The viral loads (indicated as log10 copies per mL) showed the highest viral loads were found in skin lesions, followed by rectal samples, saliva, and oropharyngeal samples. There were no statistical differences in viral loads between HIV and non-HIV groups, except higher viral loads between one to 7 days after onset of symptoms in the rectal sample in the HIV group (p = 0.0150). Oropharynx samples viral load (log10 copies per mL) 1 to 7 days after symptom onset • total cohort: 5.32 (range: 4.77 to 5.88 copies per mL) • HIV-positive: 5.32 (range: 4.77 to 6.29 copies per mL) • HIV-negative: 5.35 (range: 4.77 to 5.88 copies per mL) • p value = 0.2563 8 to 14 days after symptom onset • total cohort: 5.32 (range: 4.73 to 6.15 copies per mL) • HIV-positive: 5.30 (range: 4.71 to 6.13 copies per mL) • HIV-negative: 5.46 (range: 4.69 to 6.29 copies per mL) • p value = 0.84

Study	Country, time period, study type	Population	Outcomes
			15 to 21 days symptom onset • total cohort: 5.71 (range: 5.16 to 6.49 copies per mL) • HIV-positive: 6.13 (range: 5.41 to 7.07 copies per mL) • HIV-negative: 5.46 (range: 5.24 to 5.66 copies per mL) • p value = 0.4456 Saliva samples viral load (log10 copies per mL) 1 to 7 days after symptom onset • total cohort: 6.15 (range: 5.05 to 6.98 copies per mL) • HIV-positive: 6.02 (range: 5.10 to 7.18 copies per mL) • HIV-negative: 6.35 (range: 5.18 to 6.65 copies per mL) • p value = 0.7185 8 to 14 days after symptom onset • total cohort: 5.60 (range: 4.77 to 6.71 copies per mL) • HIV-positive: 6.02 (range: 4.49 to 6.92 copies per mL) • HIV-negative: 5.60 (range: 5.05 to 5.88 copies per mL) • p value = 0.5962 15 to 21 days after symptom onset • total cohort: 5.05 (range: 4.49 to 6.98 copies per mL) • HIV-positive: 5.85 (range: 4.49 to 7.12 copies per mL) • HIV-negative: 5.05 (range: 4.22 to 5.05 copies per mL) • p value = 0.8951 Rectum samples viral load (log10 copies per mL) 1 to 7 days after symptom onset • total cohort: 7.26 (range: 5.88 to 8.37 copies per mL) • HIV-positive: 7.82 (range: 6.98 to 8.65 copies per mL) • HIV-negative: 5.32 (range: 5.05 to 7.82 copies per mL) • p value = 0.015 8 to 14 days after symptom onset • total cohort: 5.42 (range: 4.77 to 7.26 copies per mL)

Study	Country, time period, study type	Population	Outcomes
			• HIV-positive: 5.60 (range: 4.55 to 7.26 copies per mL) • HIV-negative: 5.32 (range: 4.77 to 6.57 copies per mL) • p value = 0.2525 15 to 21 days after symptom onset • total cohort: 6.29 (range: 4.49 to 6.98 copies per mL) • HIV-positive: 6.71 (range: 6.10 to 6.98 copies per mL) • HIV-negative: 4.22 (range: 3.94 to 6.15 copies per mL) • p value = 0.1088 Skin lesion samples viral load (log10 copies per mL) 1 to 7 days after symptom onset • total cohort: 7.82 (range: 7.26 to 8.37 copies per mL) • HIV-positive: 7.82 (range: 7.26 to 8.09 copies per mL) • HIV-negative: 8.09 (range: 7.68 to 8.65 copies per mL) • p value = 0.3717 8 to 14 days after symptom onset • total cohort: 7.26 (range: 6.43 to 8.37 copies per mL) • HIV-positive: 7.12 (range: 6.26 to 8.37 copies per mL) • HIV-negative: 7.26 (range: 6.57 to 8.29 copies per mL) • p value = 0.7125 15 to 21 days after symptom onset • total cohort: 6.71 (range: 5.66 to 7.73 copies per mL) • HIV-positive: 6.71 (range: 5.43 to 7.73 copies per mL) • HIV-negative: 6.71 (range: 5.74 to 7.47 copies per mL) • p value = 0.3914 Urine viral load (log10 copies per mL) 1 to 7 days after symptom onset • total cohort: 4.77 (range: 4.22 to 6.24 copies per mL) • HIV-positive: 4.80 (range: 4.22 to 6.29 copies per mL) • HIV-negative: 4.49 (range: 4.22 to 6.04 copies per mL) • p value = 0.7418

Study	Country, time period, study type	Population	Outcomes
			8 to 14 days after symptom onset • total cohort: 5.32 (range: 5.05 to 6.04 copies per mL) • HIV-positive: 5.32 (range: 4.66 to 5.93 copies per mL) • HIV-negative: 5.32 (range: 5.05 to 6.33 copies per mL) • p value = 0.1999 15 to 21 days after symptom onset • total cohort: 4.77 (range: 4.49 to 6.43 copies per mL) • HIV-positive: 4.49 (range: 4.22 to 5.77 copies per mL) • HIV-negative: 4.91 (range: 4.55 to 6.07 copies per mL) • p value = 0.7896 Plasma viral load (log10 copies per mL) 1 to 7 days after symptom onset • total cohort: 4.82 (range: 4.30 to 5.13 copies per mL) • HIV-positive: 4.91 (range: 4.30 to 5.07 copies per mL) • HIV-negative: 4.74 (range: 4.33 to 4.96 copies per mL) • p value = 0.7012 8 to 14 days after symptom onset • total cohort: 4.30 (range: 4.19 to 4.58 copies per mL) • HIV-positive: 4.38 (range: 4.30 to 4.69 copies per mL) • HIV-negative: 4.22 (range: 4.10 to 4.41 copies per mL) • p value = 0.1353 15 to 21 days after symptom onset • total cohort: 5.57 (range: 5.49 to 5.63 copies per mL) • HIV-positive: 5.57 (range: 5.49 to 5.63 copies per mL) • HIV-negative: NA • p value = NA

Table D.3. Summary of mpox incubation period and infectious period (clade not reported)

Study	Country, time period, study type	Population	Outcomes
Candela 2023 (23)	Italy, May to October 2022 Prospective cohort study	140 mpox cases diagnosed at sexual health clinic. Over 6 months semen samples were collected from 64 men at baseline, of which 43 had DNA in seminal fluid. Of the 43 with seminal samples positive for mpox, the median age was 36 years (IQR: 34 to 42 years), 42 (98%) were MSM, 12 (28%) were living with HIV and 23% had also were diagnosed with an STI. CD4 counts and HIV treatment status not reported. Smallpox vaccination history not reported.	Viral DNA was detected in semen from 43 (67%) cases at baseline. Median Ct of viral DNA at baseline (43 participants): 34 (IQR: 31 to 36). During the follow-up, mpox viral load in semen was reassessed for 32 out of 43 participants (74%) who had previously tested positive. The other 11 participants (26%) did not submit additional samples due to painful genital lesions or penile oedema, and one individual was lost to follow-up. Viral DNA clearance at timepoints from baseline: • 1 week: 19 (68%) out of 28 men tested negative for viral DNA • 2 weeks: 25 (89%) 28 seminal samples tested negative • 3 months: 26 (90%) out of 28 seminal samples tested negative • 6 months: 32 out of 32 (100%) Median time to viral clearance was 10.5 days (IQR: 7 to 33 days)
Charniga 2022 (Preprint) (6)	USA and Netherlands, May 17 to June 6 2022 Retrospective cohort study	Total cohort of 40 mpox patients using pooled data from 2 groups • United States: 22 cases with mpox (100% male), median age 37 years (range: 28 to 61 years), all patients identified as MSM. Sixteen out of 22 (73%) were likely exposed during international travel, one patient was likely exposed during travel to another US state, 5 patients had no history of travel and were linked to local patients • Netherlands: 18 patients confirmed with mpox (100% male, all identified as MSM, age range: 23 to 64 years). This patient data was extracted from Miura and others (2024) (15) HIV information and vaccination status not reported for either group.	USA cases (n= 22) • range of exposure windows: 1 to 27 days • range of days to first symptom onset: 0 to 29 days Netherland cases (n= 18) • range of exposure windows: 1 to 11 days • range of days to first symptom onset: 0 to 20 days Where possible, the study used the exact timing of self-reported exposure to estimate incubation period. If an exact time was not available, information such as length of stay in a country reporting case was used to bound the window of exposure (earliest and latest possible windows of exposure). The study constructed a doubly censored dataset for the incubation period and fitted a log-normal distribution. Incubation period for 22 cases (1 probable and 21 laboratory confirmed) in the USA and 18 laboratory confirmed cases in the Netherlands: Incubation period (exposure to onset of first symptom): • median incubation period: 6.4 days (95% credible interval: 5.1 to 7.9 days)

Study	Country, time period, study type	Population	Outcomes
			• mean incubation period: 7.6 days (95% credible interval: 6.2 to 9.7 days, SD: 4.9 days) • 95th percentile: 17.1 days (95% credible interval: 12.7 to 24.3 days) after exposure Incubation period (Exposure to Rash Onset) - USA cohort only: • median time to rash onset: 7.8 days (95% credible interval: 5.9 to 10.0 days) • mean time to rash onset: 8.7 days (95% credible interval: 6.9 to 11.7 days, SD: 4.3 days) • 95th percentile: 17.7 days (95% credible interval: 12.4 to 28.1 days) after exposure The study estimated the above incubation period as initial symptoms in some patients were non-specific (such as fever, diarrhoea, headache, sore throat) and may not have been related to mpox. Rash onset was not available for the 18 patients from the Netherlands, so this was only calculated for patients from the USA cohort.

De Baetselier 2022 (24)	Belgium, May 2022
	
	Retrospective cohort study
		237 men underwent sampling for gonorrhea/chlamydia testing, including MSM living with HIV, MSM using HIV PrEP and men who were notified by a recent sex partner with gonorrhea or chlamydia. Men who denied having symptoms were not clinically examined at the time of sampling.
		
		From a sample of 224 men, leftover DNA extracts from 2 oropharyngeal swabs, 60 anorectal swabs and 162 pooled samples (combinations of first-void urine, oropharyngeal swab, and anorectal swab) were available for mpox PCR testing.
		
		Out of these, 4 men tested positive for mpox (mpox PCR was positive on 4 DNA extracts: 3 from anorectal swabs and one from a pooled sample).
		
		3 men were between age range 30 to 50 years and had a well-controlled HIV infection under ART (viral load less than 20 µl and CD4 counts more than 350 per µl). None of the 3 men living with HIV were previously vaccinated against smallpox.
		The 3 asymptomatic cases had a repeat anorectal swab at either 21, 24, or 37 days.
		
		Vaccination status not reported.
			Ct values over time for mpox positive patients:
			
			Asymptomatic case 1
			• original sample (day 0):
			  ○ Anorectal swab: Ct-value: 26.69
			  ○ Oropharyngeal swab: Negative
			• second DNA test (day 37): Negative
			
			Asymptomatic case 2
			• original sample (day 0): Ct-value: 20.05 (Anorectal swab)
			• second DNA test (day 21): Negative (Anorectal swab)
			
			Asymptomatic case 3
			• original sample (day 0): Ct-value: 17.16 (Anorectal swab)
			• second DNA test (day 24): Negative (Anorectal swab)
			
			Symptomatic case 4:
			• original sample (day 0): Ct-value: 27.38 (Anorectal swab)
			• second DNA test: Not performed

Study	Country, time period, study type	Population	Outcomes
Eser-Karlidag 2023 (7)	Multi-center study (Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Czech Republic, Egypt, France, Hungary, Italy, Mexico, Nigeria, Portugal, Puerto Rico, Romania, Sierra Leone, Spain) January 1 2015, to November 31 2022 Retrospective cohort study	647 confirmed mpox cases from 19 centers collaborating with Infectious Diseases International Research Initiative in 16 countries out of which 638 participants were male (98.6%) and 9 were female (1.4%). Three cases were children, mean age of participants: 34.54 years, SD: 8.07 years. Total with co-morbidities: 436 out of 647 (67.4%) HIV status: • infected with HIV: 409 out of 436 (93.8%) • not infected with HIV: 27 out of 436 (6.2%) Out of the 409 HIV infected patients, CD4 cell count was determined for 310 patients (75.8%) in the past 6 months: • median CD4 cell count: 516.5 cells per µL (IQR: 24 to 973 cells per µL) • patients with CD4 count less than 200 per µL: 30 (9.7%) • mean age CD4 equal to or more than 200 per µl patients living with HIV: 35.11 years (SD: 7.26) • mean age CD4 less than 200 per µl patients living with HIV: 37.36 years (SD: 8.99) Vaccination status: • history of smallpox vaccination: vaccinated: 22 out of 647 (3.4%) • not vaccinated: 577 out of 647 (89.2%) • unknown vaccination status: 48 out of 647 (7.4%) • mean age for smallpox vaccinated patients: 45.68 years (SD: 7.37) • mean age for unvaccinated patients: 33.56 years (SD: 7.89)	Median incubation period: 7.0 days (IQR: 2.0 to 25.0 days) Median incubation periods for HIV-infected patients with mpox: • CD4 equal to or more than 200 per µl HIV-infected patients (n= 280): 6.5 days (IQR: 2.0 to 21.0 days) • CD4 less than 200 per µl HIV-infected patients (n= 30): 3.0 days (IQR: 2.0 to 6.0 days) p < 0.001 For smallpox vaccinated patients (n= 22): 9.5 days (IQR: 2.0 to 16.0 days) unvaccinated patients (n= 577): 6.5 days (IQR: 2.0 to 25.0 days) reported to be a not significant difference (assumed p > 0.05)
Estrada Alvarez 2024 (8)	Columbia, July to September 2022 Cross-sectional study	11 confirmed mpox case patients, all patients were MSM, median age: 34 years (range: 22 to 53 years, IQR: 27 to 41 years) 9 out of 11 (81.8%) had previous HIV diagnosis Vaccination status not reported Where an exact exposure date was reported in interview of case,	Three parametric distributions (Weibull, gamma, log-normal) were evaluated using corrected Akaike information criterion to determine the best fit. The Weibull distribution provided the best fit for the data. Weibull parametric distribution: Mean incubation period: 7.1 days (95% CI: 4.9 to 9.9 days)

Study	Country, time period, study type	Population	Outcomes
		that was recorded as the probable date of exposure. Where the case reported multiple potential exposure times, the longest period of exposure time was used as the date for potential transmission.	Gamma parametric distribution: Mean incubation period: 6.7 days (95% CI: 4.6 to 9.5 days) Log-normal parametric distribution: Mean incubation period: 6.4 days (95% CI: 4.3 to 9.2 days)
Fernandez Pardal 2024 (9)	Argentina, July 1 to October 31 2022 Retrospective cohort study	124 cases, median age: 31.5 years (IQR: 28 to 38 years) out of which 123 cases (99.2%) were male, and one case (0.8%) was female. Gender: • 122 cases (98.4%) were cisgender men • one (0.8%) was a cisgender woman • one (0.8%) was a transgender woman • no non-binary participants Sexual orientation: • 107 (86.3%) identified as homosexual • 5 (4.0%) identified as heterosexual • 5 (4.0%) identified as bisexual • 5 (4.0%) unknown HIV status: • 75 cases (60.5%) were living with HIV • 50 out of 75 (66.7%) had CD4 T lymphocytes ≥ 350 cells per µL • 10 out of 75 (13.3%) had CD4 T lymphocytes < 350 cells per µL • 64 out of 75 (85.3%) were receiving antiretroviral treatment • 6 cases (4.8%) reported using PrEP Vaccination status: • Smallpox vaccine in childhood: 15 out of 124 (12.1%) • Mpox vaccine: 0 out of 124 (0.0%)	Of 124 patients, 32 (25.6%) had exposure with a confirmed mpox cases (87.5% sexual contact), 62 (50%) had exposure with a probably mpox cases, and in 26 (20.9%) no link was found. In 4 cases (3.2%), this information was not available. Median incubation period: 7 days (IQR: 5 to 11 days). No difference in incubation period between patients with exposure to a confirmed mpox cases (median: 7 days, IQR: 4.0 to 9.5 days) compared to exposure to a probable mpox case (median: 7 days, IQR: 6.5 to 12.5, p value = 0.14).
Guo 2024 (25)	China, June 2 to September 23 2023	39 laboratory confirmed mpox cases, median age: 33 years (IQR: 28 to 37 years), 100% male	Viral positivity over time Skin: • 1 to 7 days after symptom onset: 13 out of 14 samples (92.9%)

Study	Country, time period, study type	Population	Outcomes
	Prospective cohort study	HIV status: • participants living with HIV: 20 (51.3%) • participants living without HIV: 19 (48.7%) • median CD4 cell count: 638 cells per mm³ (IQR: 484 to 854) Vaccination status: • 2 patients received smallpox vaccination A total of 510 specimens were collected from patients who were recruited for this study. Numbers of each type of swab collected: • skin lesion: 75 • oropharyngeal: 79 • saliva: 74 • faecal: 47 • urine: 73 • plasma: 87 • serum: 75	• 15 to 21 days after symptom onset: 12 out of 14 samples (85.7%) Viral load (median Ct values) Skin: • 0 to 7 days after symptom onset: 27.4 (IQR: 23.5 to 30.8) • 8 to 14 days after symptom onset: 26.4 (IQR: 22.9 to 32.6) • 15 to 21 days after symptom onset: 26.8 (IQR: 23.7 to 34.5) Data reported in the text did not match the data presented in the figures of the report, data from the text was reported in this review.
Jia 2023 (10)	China, June 10 to July 15 2023 Prospective cohort study	20 confirmed mpox patients, median age: 29 years (IQR: 26 to 32 years), 100% cisgender, MSM HIV status: • 13 out of 20 (65%) were co-infected with HIV, out of which 12 (92%) were on antiretroviral therapy • 11 (85%) patients showed HIV suppression with undetectable viremia (less than 40 copies per mL), median CD4 cell count: 667 cells per mm³ (IQR: 404 to 902 cells per mm³) • 7 out of 20 (35%) were not infected with HIV • 3 participants (15%) who were HIV-negative reported using PrEP • 4 participants (20%) did not utilise PrEP Vaccination status: • none of the participants had a history of smallpox vaccination	Median incubation period: 8 days (IQR: 6 to 16 days)

Study	Country, time period, study type	Population	Outcomes
Kowalski 2023 (11)	Poland, May 16 to October 30 2022 Retrospective cohort study	Out of a total cohort of 94 men, 81 men were laboratory confirmed cases of mpox, 13 patients met the criteria for probable mpox but refused hospitalisation (median age: 33 years [range: 20 to 61 years, IQR: 28 to 38 years]) 83 cases were originally from Poland, 4 were originally from the Ukraine, 2 were originally from Belarus, 2 were originally from Colombia, one was originally from Georgia, one was originally from Mexico, and one was originally from Moldova. However, all cases had been resident in Poland for at least 6 months. 98.9% identified as MSM, one reported case of probable heterosexual transmission 55 out of 81 (67.9%) hospitalised patients reported having more than one sexual partner 2 weeks prior the diagnosis HIV status: • 43 out of 94 (45.7%) patients were HIV-positive, 51 (54.3%) were HIV-negative • median CD4 cell count (for all patients living with HIV except one newly diagnosed patient): 672 cells per µL (IQR: 515 to 778 cells per µL) • no patients had CD4 cell counts of less than 350 cells per µL. • all patients were receiving stable ART • median age of patients living with HIV: 34 years (range: 20 to 61 years, IQR: 29 to 38 years) • median age of patients without HIV: 32 years (range 18 to 43 years, IQR: 26 to 37 years) • p value for comparison of median age = 0.189 • among the HIV-negative individuals, 16 (19.8%) were receiving PrEP Vaccination status: • 4 out of 94 (4.21%) had been vaccinated against smallpox during childhood	Median incubation period: 7 days (IQR: 4 to 8 days)
Kroger 2023 (12)	Germany, May 24 to October 30 2022	368 participants, age range: 12 to 80 years, mean age: 41 years (SD= 10), 367 (99.73%) males, one female (0.3%)	Out of the 368 confirmed cases, 209 (56%) participants were able to specify the date of exposure to a suspected or confirmed source of infection.

Study	Country, time period, study type	Population	Outcomes
	Retrospective cohort study	247 out of 368 (67.1%) identified as MSM HIV status: • 143 cases (39%) reported a known HIV infection, while 225 cases (61%) did not treatment status and CD4 counts not reported Vaccination status: • 96 individuals (26%) received smallpox vaccination in childhood • 33 individuals (9%) had been vaccinated with Imvanex at the time of diagnosis, with 19 (5.2%) receiving it as post-exposure vaccination and 14 (3.8%) as pre-exposure prophylaxis • 6 (1.6%) individuals had both childhood and current vaccinations, while 66% were either denied prior vaccination or could not provide reliable information about their vaccination status	Mean incubation period: 8.2 days (SD = 4.7 days), median: 7 days (IQR: 5 to 10 days, range: 1 to 31 days). In 78% of cases, incubation period was 10 days or fewer. For cases with confirmed source of infection (73 cases), mean incubation period: 7.6 days (SD = 4.1 days) incubation period range: 12 to 20 days Lognormal distribution: mean incubation period: 8.3 days (95% CI: 6.6 to 10.4 days), estimated SD: 5.2 days.
Madewell 2023 (13)	USA, May to August 2022 Retrospective cohort study	112 case pairs with confirmed mpox from 12 USA health departments (California, Chicago, Colorado, District of Columbia, Florida, Illinois, Michigan, New York City, North Carolina, Rhode Island, South Carolina, Tennessee). Incubation period was estimated by pooling data on 22 USA cases reported in Charniga and others (6) (median), with 14 cases from this study's dataset (36 cases total). 57 case pairs were used for serial interval estimation and 36 cases were used for incubation period estimation. For the 112 cases used to estimate serial interval, mean age: 35 years (range: one to 76 years). 5 cases had female sex assigned at birth, 106 cases had male sex assigned at birth, one case had missing information on gender at birth. 4 cases identified as female, 105 identified as male, one identified as a transgender male, and 2 selected another gender identity. HIV and vaccination status not reported.	Incubation period (log-normal distribution) From exposure to symptom onset (36 cases) mean: 5.6 days (95% credible interval: 4.3 to 7.8 days) SD: 4.4 days (95% credible interval 2.8 to 8.7 days) From exposure to rash onset (35 cases) mean: 7.5 days (95% credible interval: 6 to 9.8 days) SD: 4.9 days (95% credible interval: 3.2 to 8.8 days) Serial Interval (gamma distribution) For symptom onset (57 case pairs) mean: 8.5 days (95% credible interval: 7.3 to 9.9 days) SD: 5 days (95% credible interval: 4 to 6.4 days) For rash onset (40 case pairs) mean: 7 days (95% credible interval: 5.8 to 8.4 days) SD: 4.2 days (95% credible interval: 3.2 days to 5.6 days)

Study	Country, time period, study type	Population	Outcomes
McFarland 2023 (14)	Germany, May to June 2022 Retrospective cohort study	Mpox cases were recruited from 2 European festivals and a club in Berlin associated with an mpox outbreak. This included: • a fetish festival in Antwerp, Belgium (May 4 to May 9 2022) • a gay pride festival in Gran Canaria, Spain (May 5 to May 15 2022) • a club in Berlin (referred to as club C), Germany (May 10 to June 11 2022) Cases were included if they were exposed for 5 days or less at festivals. For club C, cases had to be a part of a cluster of 5 or more cases who visited club C within a time frame of 5 days. Cases were excluded if their exposure dates or symptom onset dates were incomplete, if they visited more than one of the events above, if their dates of exposure did not overlap with the known time frame of the events, or if the local health authority considered it unlikely the exposure was associated with the infection. Out of a total cohort of 222 reported cases of mpox (140 from European countries other than Germany, 66 from Berlin and 16 from 3 other unspecified German states), 122 laboratory confirmed mpox cases were included. Of the 100 cases excluded, 25 had incomplete exposure data, 17 had exposure dates that did not overlap with festival or events, 7 had visited multiple events and 51 had an exposure interval of more than 5 days. HIV and vaccination status not reported.	To account for uncertainty in estimating incubation period, 0.5 days were subtracted from the lower limit and 0.5 days were added to the upper limit of each incubation period (as events often started early in the night and lasted until the morning of the next day). Incubation period was assumed to have been a minimum of one day. As exposure may have occurred for several hours, the data was double censored in the model (the model works with a window of time when the exposure might have taken place, rather than specific timestamps). A bootstrapping method was used to provide an empirical non-parametric estimate of the incubation period (where the data was not assumed to follow a specific distribution) as all cases had a range of probably incubation periods (10,000 re-samplings). The study also estimated a parametric incubation period distribution (log-normal distribution, Weibull distribution and gamma distribution). Credible intervals were calculated to show the most likely ranges for the incubation periods, with the highest density intervals showing where the data is most concentrated. A sensitivity analysis was done to check how their results would change if they considered different lengths of exposure, excluded the case with the longest incubation period, or only focused on cases from specific events. Incubation periods: • 5% of cases had an incubation period of 2 days or less • 6 cases had incubation periods longer than 21 days. For 5 of these cases, the upper limit of their incubation periods was less than 26 days, while 1 case had a longer incubation period of 30 to 35 days Data patterns: The histogram showed that the incubation period was most likely between 3 and 11 days, with a 64.2% chance of falling within that range. Each day in this interval had more than a 5% probability of being when symptoms started. The 50% highest density interval (where half of the most probable incubation times fall) was from 3.7 to 11.2 days. There was a spike in cases with an incubation period of 10 days. Percentiles of incubation period across distributions: • 5th percentile: estimated at 2.1 to 2.9 days, 5% of cases had an incubation period of 2 days or less • median incubation period (50th percentile): estimated between 8.1 and 9.0 days

Study	Country, time period, study type	Population	Outcomes
			• 95th percentile: estimated at 20.1 to 23.1 days, 5% of cases having incubation periods longer than 21 days Exclusion of the case with the longest incubation period interval (30 to 35 days): • 95% quantile shortened by 0.6 to 0.9 days • changes in the median and the 5% quantiles were within acceptable rounding error (0.2 days) Sensitivity analysis: Across the Lognormal, Weibull, and Gamma distributions, a consistent trend is observed: as the length of exposure increases, the estimated incubation periods also increase. 5th percentile: • Lognormal: Ranges from 2.8 days for 4 days of exposure to 2.9 days for 5 to 6 days and remains at 2.6 days for 8 and 10 days • Weibull: Starts at 2.1 days for 4 days of exposure and remains stable at 2.1 days for 5 and 6 days, dropping slightly to 2.0 days for 8 and 10 days • Gamma: Varies from 2.5 days for 4 days of exposure to 2.6 days for 6 days and remains at 2.3 days for 8 and 10 days 50th percentile (median): • Lognormal: Ranges from 7.7 days for 4 days of exposure to 8.1 days for 5 and 6 days, then slightly decreasing to 7.9 days for 8 and 10 days • Weibull: Starts at 8.5 days for 4 days of exposure, rising to 9.0 days for 5 days, and remaining stable at approximately 8.9 days for 6 to 10 days • Gamma: Varies from 8.1 days for 4 days of exposure to 8.6 days for 5 days, staying consistent around 8.5 days for 6 to 10 days 95th percentile: • Lognormal: Increases from 21.5 days for 4 days of exposure to 23.9 days for both 8 and 10 days • Weibull: Ranges from 18.7 days for 4 days of exposure to 20.3 days for 10 days • Gamma: Varies from 19.2 days for 4 days of exposure to 21.0 days for 10 days

Study	Country, time period, study type	Population	Outcomes
Miura 2024 (16)	Netherlands, May 20 to September 6 2022 Retrospective cohort study	109 pairs of confirmed mpox cases (total 218 participants consisting of cases and contacts), all paired cases self-identified as MSM. HIV and vaccination status not reported.	The regional public health services that collected the data rated the reliability of self-reported symptom onset dates into 3 categories: unreliable, plausible, or reliable. Median incubation period (calculated from self-reported data for a subset of 18 pairs): 8.1 days (SD = 4.4 days) Serial intervals: Transmission likely with a single contact • reliable symptom onset (n = 34) mean interval: 9.4 days SD: 6.2 days) • plausible symptom onset (n = 12) mean interval: 7.9 days (SD: 6.3 days) • unreliable symptom onset (n = 1) mean interval: 9 days (SD: NA) • total (n = 47) mean interval: 9 days (SD: 6.1 days) Transmission likely with multiple contacts • reliable symptom onset (n = 21) mean interval: 5.5 days (SD: 3.7 days) • plausible symptom onset (n = 4) mean interval: 3.8 days (SD: 6.4 days) • unreliable symptom onset (n = 2) mean interval: 6.0 days (SD: 2.8 days) • total (n =27) mean interval: 5.3 days (SD: 4.0 days) Unlikely transmission • reliable symptom onset (n = 14) mean interval: 2.1 days (SD: 5.2 days) • plausible symptom onset (n = 3) mean interval: -0.7 days (SD: 8.3 days) • unreliable symptom onset (n = 18) mean interval: 5.4 days (SD: 6.3 days) • total (n = 35) mean interval: 3.6 days (SD: 6.2 days) Overall statistics • reliable symptom onset (n = 69) mean interval: 6.7 days (SD: 6.0 days) • plausible symptom onset (n = 19) mean interval: 5.7 days (SD: 7.0 days) • unreliable symptom onset (n = 21) mean interval: 5.7 days (SD: 5.9 days) • total (n = 109) mean interval: 6.3 days (SD: 6.1 days), Range: −10 to 24 days

Study	Country, time period, study type	Population	Outcomes
			Mean serial interval for all 109 paired cases: 6.3 days (SD: 6.1 days), range: −10 to 24 days, Modes: 0, 4, and 8 days 34 pairs with reliable symptom onset reporting and 1 infector were identified. Serial interval was 9.4 days (SD: 6.2 days, range 1 to 24 days). Pooled Serial Interval Using Hierarchical Bayesian Framework (across all public health services): • mean serial interval: 10.1 days (95% credible interval: 6.6 to 14.7 days), SD: 6.1 days • 95% credible interval for SD: 4.6 to 8.0 days • using gamma distribution for analysis: • mean serial interval: 10.3 days (95% credible interval: 7.6 to 14.1 days), SD: 6.3 days • 95% credible interval for SD: 4.5 to 9.0 days Time between symptom onset and onward transmission Based on a subset of 18 pairs from a single public health service: • from 4 days before to 8 days after symptom onset of the infector • mean time from symptom onset to onward transmission: 2.2 days (SD: 3.9 days) Incubation period Mean incubation period: 8.1 days (SD: 4.4 days)
Miura 2022 (15)	Netherlands, 21 to 31 May 2022 Retrospective cohort study	18 laboratory confirmed mpox cases, 100% male, all identified as MSM, age range: 23 to 64 years. HIV and vaccination status not reported.	At data collection, all 18 cases reported the symptom onset date and the most likely date of exposure as a single date or a limited number of consecutive dates, related to the attendance of an event where exposure was considered most likely. Three parametric distributions (Lognormal, Gamma, and Weibull) were used to estimate the incubation period of monkeypox (n = 18) where exposure was a single time point or time interval Lognormal Distribution: • mean incubation period: 9 days (95% credible interval = 6.6 to 10.9 days) • Gamma Distribution: • mean incubation period: 9.1 days (95% credible interval = 7.5 to 11.3 days) • Weibull Distribution:

Study	Country, time period, study type	Population	Outcomes
			• mean incubation period: 9.6 days (95% credible interval = 7.4 to 12.4 days) The authors reported that the lognormal distribution best described the data, therefore the results from this distribution has been reported in the text.
Moraes-Cardoso 2024 (26)	Spain, June 28 to October 6 2022 Prospective cohort study	33 laboratory confirmed mpox cases, 100% male, age range: 25 to 58 years HIV status: • 14 out of 33 (42%) were living with HIV and 19 (58%) were HIV-negative • median age of HIV-positive cases: 40 years (IQR: 34 to 53 years) • median age of HIV-negative cases: 33 years (IQR: 28 to 43 years) • CD4 cell count for cases living with HIV: 777 cells per µL (IQR: 484 to 1,533 cells per µL) • 11 of the 14 participants (78%) were on antiretroviral treatment and had suppressed viral loads defined as having an HIV-1 plasma viral load of less than 20 copies per mL	**Median viral load** of the skin lesion (at onset of symptoms): • for cases living with HIV: 6.83 log10 DNA copies per mL (IQR: 6.54 to 7.59 log10 DNA copies per mL) • for HIV negative cases: 7.03 log10 DNA copies per mL (IQR: 6.74 to 7.63 log10 DNA copies per mL) **Time to viral clearance** (measured for 29 days after diagnosis using weekly skin swabs) • for cases living with HIV: 23 days (IQR: 16 to 29 days) • for HIV negative cases: 28 days (IQR: 22 to 32 days)
Raccagni 2024 (27)	Italy, May to November 2023 Retrospective cohort study	95 laboratory confirmed mpox cases, median age: 39.4 years (IQR: 35.4 to 44.7 years). All were MSM. HIV status: • people living with HIV: 50 out of 95 (52.6%) • people using PrEP: 33 out of 95 (34.7%) • 44 out of 50 (89.8%) had an HIV-RNA level less than 50 copies per mL • median CD4 cell count at the time of mpox infection: 690 cells per µL (IQR: 559 to 1,005 cells per µL) Vaccination status: • 16 out of 95 (16.84%) reported having received smallpox vaccination during their youth Samples were taken every 7 days and tested with PCR until the end of infection	Median number of days from the onset of symptoms of mpox to viral clearance: 18 days (IQR: 13 to 24 days) Median number of days with detectable mpox virus in various sample types: • cutaneous swabs: 16 days (IQR: 9 to 19 days) • anal swabs: 12 days (IQR: 7 to 18 days) • oropharyngeal swabs: 14 days (IQR: 9 to 18 days) • plasma: 9 days (IQR: 7 to 13 days) • seminal fluids: 8 days (IQR: 7 to 15 days) Overall median time to viral clearance: 19 days (IQR: 14 to 24 days)

Study	Country, time period, study type	Population	Outcomes
Suner 2023 (17)	Spain, June 28 to September 22 2022 Prospective cohort study	77 laboratory confirmed mpox cases, median age: 35 years (IQR: 29 to 46 years), 75 (97%) were males, one (1%) was female and one (1%) was a transgender woman. Sexual orientation: • MSM: 70 out of 77 cases (91%) • Bisexual men: 3 out of 77 cases (4%) • heterosexual men: 2 out of 77 cases (3%) • heterosexual women: 2 out of 77 cases (3%) HIV status: • people living with HIV: 39 out of 77 cases (51%) Among the 39 participants living with HIV: • CD4 cell count less than 500 cells per µL: 9 out of 39 (23%) • CD4 cell count less than 300 cells per µL: 2 out of 39 (5%) • CD4 cell count less than 100 cells per µL: none • other CD4 cell counts not reported • taking antiretroviral medication: 38 out of 39 (97%) Vaccination status: • recent smallpox vaccination: 2 out of 77 cases(3%) 1,663 clinical samples collected at 6 time points from mpox confirmed cases. Numbers of each type of swab collected: • skin lesion: 367 • oropharyngeal: 425 • rectal: 258 • blood: 391 • semen: 219 • vaginal: 3 Participants were tested on day 0 by a STI specialist. Patients underwent STI screening, including for HIV, Chlamydia trachomatis, Neisseria gonorrhoea, Treponema pallidum, and	Median incubation period: 6 days (IQR: 4 to 8 days) Median time to viral clearance: Time to viral clearance in 50% of patients • skin lesions: 25 days (95% CI: 23 to 28 days) • oropharyngeal samples: 16 days (95% CI: 13 to 19 days) • rectal samples: 16 days (95% CI: 13 to 23 days) • semen samples: 13 days (95% CI: 9 to 18 days) • blood samples: one day (95% CI: 0 to 5 days) Time to viral clearance in 90% of patients • skin lesions: 41 days (95% CI: 34 to 47 days) • oropharyngeal samples: 34 days (95% CI: 27 to 42 days) • rectal samples: 27 days (95% CI: 21 to 38 days) • semen samples: 39 days (95% CI: 27 to 56 days) • blood samples: 13 days (95% CI: 6 to 23 days) Time to viral clearance in 95% of patients • skin lesions: 47 days (95% CI: 38 to 56 days) • oropharyngeal samples: 42 days (95% CI: 32 to 53 days) • rectal samples: 31 days (95% CI: 23 to 42 days) • semen samples: 53 days (95% CI: 34 to 84 days) • blood samples: 20 days (95% CI: 10 to 39 days) Age (either less or higher than 35) was not associated with time to viral clearance in any sample type ($p > 0.05$). Viral clearance associated with faster clearance in individuals living with HIV compared to those living without HIV ($p = 0.0043$). Median time to viral clearance in cases living with HIV and HIV negative cases: Extracted from graph, not reported in text. Semen: • HIV negative: 18.7 days • living with HIV: 13.1 days

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		Herpes simplex virus. A symptom diary card was provided, and participants were asked to report their list of symptoms over time, along with symptom onset and resolution dates. On day 29, the research team interviewed participants by telephone to assess the clinical evolution of symptoms and lesions. Participants were provided with 6 packs of 5 sample self-collection devices, one for each day the participant was required to self-collect samples. Participants were asked to collect samples from their skin lesions (vesicle fluid or dry scraping of scabs or scars), oropharynx (swab), and blood (dried blood spot) on days 1, 8, 15, 22, 29, and 57 after the screening visit, and samples from their rectum (swab), semen (collection container), and vagina (swab) on days 1, 15, 29, and 57.	• p = 0.0043 Rectum: • HIV negative: 17.5 days • living with HIV: 16 days • p = 0.40 Oropharynx: • HIV negative: 19.2 days • living with HIV: 17.2 days • p = 0.43 Skin lesion: • HIV negative: 26.4 days • living with HIV: 24.5 days • p = 0.13 Blood: • HIV negative: 3 days • living with HIV: 2.1 days • p = 0.72 Time until the viral load below 6.5 log10 copies per mL Time to viral load below 6.5 log10 copies per mL in 50% of patients • skin lesions: 9 days (95% CI: 8 to 10 days) • oropharyngeal samples: 0 days (95% CI: 0 to 0 days) • rectal samples: 0 days (95% CI: 0 to 5 days) • semen samples: 0 days (95% CI: 0 to 0 days) • blood samples: 0 days (95% CI: 0 to 0 days) Time to viral load below 6.5 log10 copies per mL in 90% of patients • skin lesions: 14 days (95% CI: 11 to 17 days) • oropharyngeal samples: 5 days (95% CI: 0 to 10 days) • rectal samples: 10 days (95% CI: 8 to 14 days) • semen samples: 2 days (95% CI: 0 to 11 days) • blood samples: 0 days (95% CI: 0 to 0 days)

Study	Country, time period, study type	Population	Outcomes
			Time to viral load below 6.5 log10 copies per mL in 95% of patients • skin lesion samples: 16 days (95% CI: 13 to 20 days) • oropharyngeal samples: 9 days (95% CI: 2 to 16) • rectal samples: 12 days (95% CI: 9 to 17) • semen samples: 8 days (95% CI: 0 to 19) • blood samples: 0 days (95% CI: 0 to 1) Median viral load over time (data extracted from figure) Limit of detection was 4.0 log10 copies per mL for blood samples and 2.9 log10 copies per mL all other samples. Skin lesions: • 1 to 7 days: 7.3 copies per mL (IQR: 6.5 to 8.18 copies per mL) • 8 to 14 days: 6.5 copies per mL (IQR: 5.3 to 7.5 copies per mL) • 15 to 21 days: 3.8 copies per mL (IQR: 2.9 [lower limit of detection] to 5.4 copies per mL) • 22 to 28 days: 2.9 (2.9 [lower limit of detection] to 3.5 copies per mL) • 29 to 35 days: less than 2.9 log10 copies per mL • 36 to 42 days: less than 2.9 log10 copies per mL • more than 42 days: less than 2.9 log10 copies per mL Oropharynx: • 1 to 7 days: 4.6 copies per mL (IQR: 2.9 to 5.8 copies per mL) • 8 to 14 days: 3.74 copies per mL (2.9 to 5.2 copies per mL) • 15 to 21 days: 2.9 (2.9 [limit of detection] to 3.2 copies per mL) • 22 to 28 days: less than 2.9 log10 copies per mL (below limit of detection) • 29 to 35 days: less than 2.9 log10 copies per mL (below limit of detection) • 36 to 42 days: less than 2.9 log10 copies per mL (below limit of detection) • more than 42 days: less than 2.9 log10 copies per mL (below limit of detection) Rectum: • 1 to 7 days: 5.0 copies per mL (2.9 to 7.5 copies per mL)

Study	Country, time period, study type	Population	Outcomes
			• 8 to 14 days: 5.6 copies per mL (3.9 to 6.5 copies per mL) • 15 to 21 days: 2.9 (2.9 [limit of detection] to 3 copies per mL) • 22 to 28 days: less than 2.9 log10 copies per mL (below limit of detection) • 29 to 35 days: less than 2.9 log10 copies per mL (below limit of detection) • 36 to 42 days: less than 2.9 log10 copies per mL (below limit of detection) • more than 42 days: less than 2.9 log10 copies per mL (below limit of detection) Semen: • 1 to 7 days: 3.5 copies per mL (2.9 to 4.7 copies per mL) • 8 to 14 days: 4.1 copies per mL (2.9 [limit of detection] to 5.2 copies per mL) • 15 to 21 days: 2.9 (2.9 [limit of detection] to 3.18 copies per mL) • 22 to 28 days: 2.9 (2.9 [limit of detection] to 3.6 copies per mL) • 29 to 35 days: less than 2.9 log10 copies per mL (below limit of detection) • 36 to 42 days: less than 2.9 log10 copies per mL (below limit of detection) • more than 42 days: less than 2.9 log10 copies per mL (below limit of detection) Blood: • 1 to 7 days: 4.0 log10 copies per mL • 8 to 14 days: 4.0 log10 copies per mL • 15 to 21 days: 4.0 log10 copies per mL • 22 to 28 days: 4.0 log10 copies per mL • 29 to 35 days: 4.0 log10 copies per mL • 36 to 42 days: 4.0 log10 copies per mL • more than 42 days: 4.0 log10 copies per mL Viral positivity (data extracted from figure): Blood: • 1 to 5 days: 24%

Study	Country, time period, study type	Population	Outcomes
			• 6 to 10 days: 23% • 11 to 15 days: 23% • 16 to 20 days: 4% • 21 to 25 days: 2% • more than 25 days: 3% Skin: • 1 to 5 days: 99% • 6 to 10 days: 99% • 11 to 15 days: 89% • 16 to 20 days: 64% • 21 to 25 days: 48% • more than 25 days: 26% Throat: • 1 to 5 days: 71% • 6 to 10 days: 79% • 11 to 15 days: 59% • 16 to 20 days: 31% • 21 to 25 days: 19% • more than 25 days: 11% Rectum: • 1 to 5 days: 70% • 6 to 10 days: 82% • 11 to 15 days: 33% • 16 to 20 days: 21.5% • 21 to 25 days: 21% • more than 25 days: 4% Semen: • 1 to 5 days: 63% • 6 to 10 days: 70% • 11 to 15 days: 44% • 16 to 20 days: 23% • 21 to 25 days: 32% • more than 25 days: 4%

Study	Country, time period, study type	Population	Outcomes
			Overall: • 1 to 5 days: 67% • 6 to 10 days:71% • 11 to 15 days: 55% • 16 to 20 days: 30% • 21 to 25 days: 24% • more than 25 days: 9%
Tan 2024 (28)	Canada, June to October 2022 Prospective and retrospective cohort study	Out of a total cohort of 64 patients. Data were pooled from the Mpox Prospective Observational Cohort Study (MPOCS) and 39 case series participants (median age: 39 years, IQR: 32.75 to 45.25 years). All participants identified as gay or bisexual men. 20 out of 64 participants (31%) received tecovirimat during mpox illness HIV status: • living with HIV: 30 out of 64 (49%) • HIV negative, on PrEP: 20 out of 64 (33%) • HIV negative, not on PrEP: 11 out of 64 (18%) • median CD4 cell count per mm^3: 467.5 (IQR: 335.75 to 677.75 per mm^3) Smallpox vaccine: • none: 39 out of 64 (61%) • yes: 14 out of 64 (22%) • unknown: 11 out of 64 (17%) Mpox vaccine before baseline: • none: 44 out of 64 (79%) • one dose: 10 out of 64 (18%) • 2 doses: 2 out of 64 (4%) MPOCS participants (n = 25): • median age: 37 years (IQR: 33 to 42 years), all identified as cis-gender male. MPOCS participants provided a total of 666 samples over a median of 4 weekly visits (range: one to 7), over a median of 25 days (range: one to 72 days), with 22 out of 25 (88%) completing the study one week after	Estimated time to viral clearance (Symptom onset to resolution of mpox DNA detectability[A] [Ct value equal to or more than35]) Base-case analysis • genital, buttock, or perianal skin swabs (n= 38): 30 days (95% CI: 23 to 47.9 days) • all other skin sites (n= 42): 22.4 days (95% CI: 16.6 to 29.4 days) • nasopharyngeal swab (n= 42): 0 days (95% CI: 0 to 12.1 days) • pharyngeal swab (n= 31): 12.8 days (95% CI: 0 to 24.9 days) • rectal swab (n= 32): 14.1 days (95% CI: 0 to 22.4 days) • urine (n= 32): 10.2 days (95% CI: 0 to 21.1 days) • semen (n= 21): 0 days (95% CI: 0 to 0 days) [A]Data was censored at first use of tecovirimat where applicable (outcomes were only considered up until the first time they started tecovirimat), no difference was observed in participants never receiving tecovirimat and participants receiving tecovirimat (p > 0.05 for all sample types). Sensitivity Analysis (excluding participants contributing data on only a single date for a given specimen type): • genital, buttock, or perianal skin swabs (n= 14): 30 days (95% CI= 23.6 to 41.5 days) • all other skin site swabs (n= 18): 12.1 days (95% CI= 0 to 19.2 days) • nasopharyngeal swabs (n= 21): 0 days (95% CI= 0 to 8.3 days) • pharyngeal swabs (n= 21): 7.0 days (95% CI= 0 to 25.6 days) • rectal swabs (n= 21): 0 days (95% CI= 0 to 12.8 days) • urine (n= 21): 1.3 days (95% CI= 0 to 17.3 days) • semen (n= 19): 0 days (95% CI= 0 days) Mpox DNA detectability findings by sample type at baseline and final visit: Genital, buttock, or perianal skin swabs:

Study	Country, time period, study type	Population	Outcomes
		resolution of symptoms per protocol, and 3 out of 25 (12%) lost to follow-up before that point. Case series participants (n= 39): Median age: 40 years (IQR: 32.5 to 46 years), all identified as cis-gender male. Case series participants contributed 204 specimens collected over a median of 2 (range: one to 4) visits, or 2 (range: one to 26) days.	• at baseline visit: 31 out of 42 (74%) • at final visit: 6 out of 18 (33%) All other skin site swabs: • at baseline visit: 27 out of 48 (56%) • at final visit: 5 out of 19 (26%) Nasopharyngeal swabs: • at baseline visit: 12 out of 46 (26%) • at final visit: 4 out of 22 (18%) Pharyngeal swabs: • at baseline visit: 13 out of 35 (37%) • at final visit: 4 out of 22 (18%) Rectal swabs: at baseline visit: 16 out of 36 (44%) at final visit: 2 out of 22 (9%) Urine: at baseline visit: 10 out of 37 (27%) at final visit: 1 out of 22 (5%) Semen: at baseline visit: 2 out of 25 (8%) at final visit: 0 out of 21 (0%)

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