Rapid Response Brief
Date: September 2024

What can research evidence tell us about the Current epidemiological profile of the Mpox virus in Africa?

Key messages

- The Mpox virus has currently spread to non-endemic countries, including four East African countries.
- Mpox could spread through multiple routes during contact with infected animals and/ or humans, including:
  - Sexual encounters
  - Non-sexual encounters, such as skin contact or eating infected animals
- The Mpox virus is likely to spread faster within healthcare settings than during household contact because of its transmission dynamics.
- Mpox virus clade 1B is more severe among young children and immunocompromised individuals.
- Several preventive and treatment measures are available:
  - At least two doses of vaccines, especially when administered early and in high-risk groups.
  - Brincidofovir, an antiviral agent, could be considered during the pre-exposure period.
  - Other antiviral agents, such as tecovirimat and cidofovir, are effective against the Mpox virus.

Where did this Rapid Response come from?

This document was created in response to a specific question from a policymaker in Uganda.

It was prepared by the Center for Rapid Evidence Synthesis (ACRES)

✚ Included:

- **Key findings** from research
- **Considerations about the relevance** of this research for policy decisions in Uganda

✕ Not included:

- Recommendations
- Detailed descriptions

ACRES THE CENTER FOR RAPID EVIDENCE SYNTHESIS

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Short Summary

Background

The Mpox virus has caused two major outbreaks in the last three years. The first Mpox outbreak was in 2022, and it spread mainly in Europe and the Americas. The second and current outbreak of Mpox, attributed to Clade 1B, was declared a public health emergency of international concern in August 2024 and has spread to more than 120 countries globally.

Rapid Response Question: What is the current epidemiological profile of the Clade 1b Mpox variant?

Updates:

- ⊕ As of September, the cases had risen to 2,500 daily recorded.
- ⊕ Mpox has caused 581 deaths out of over 12,500 cases in DRC since February 2023.
- ⊕ Uganda has reported cases in at least ten districts, including Kampala

Findings:

The observation period of potential cases is from:

- ⊕ Estimates of the incubation period, between infection and symptom onset, of the Mpox virus ranges from 5 to 21 days.
- ⊕ Estimates of the invasion period, between exposure and infection, of the Mpox virus range from 0 to 5 days.

- ❖ The Mpox virus often spreads through contact among household contacts. However, the virus could spread faster in health facilities with a basic reproduction number of 1.3 compared to 1.2 among household contacts.
- ❖ Confirmatory diagnosis is done using a PCR with specimens from skin lesions. However, swabs from the mouth, nose, anus and rectum are possible.
- ❖ Common risk factors for the Clade IB Mpox virus include Children <= 15 years (odds ratio 1), People living with HIV and AIDS (odds ratio 4), and household contacts (odds ratio of 2.5). However, a history of immunization against smallpox is likely to protect an individual from infection.
- ❖ Common measures to interrupt transmission include quarantine/ isolation, hand hygiene practices, and use of personal protective equipment. However, there is no adequate information on how these strategies work during an Mpox outbreak.
- ❖ Vaccines are available and effective when administered in two doses.
- ❖ Brincidofovir, an antiviral agent, is a promising pre-exposure prophylaxis treatment. When taken before

exposure, individuals given the drug had better survival rates (they were not infected).

- Antiviral agents, such as tecovirimat and cidofovir, are effective for treating infected individuals.
- It is important to align Mpox interventions within the One Health Approach to ultimately achieve minimal viral transmission.

Conclusion:

The Mpox pandemic has currently spread to at least 120 countries. While few deaths linked to this outbreak have occurred, the Mpox virus could spread more in hospital outbreaks than household outbreaks, underscoring the need to enhance infection prevention and control measures in healthcare settings. Children under 15 and individuals living with HIV are particularly susceptible to severe Mpox infection due to their compromised immune systems. As such, preventative and control interventions should target these groups due to their high transmission potential. Vaccines such as MVA-BN1 are effective when administered in two doses, and antiviral agents are effective in managing symptoms and reducing hospital stays. Brincidofovir shows potential as a pre-exposure prophylactic. Furthermore, raising awareness of One Health and integrating it into Mpox intervention strategies could further reduce the risk of viral transmission across humans and animals.

Background

In August 2024, the Africa Centers for Disease Control (Africa CDC) and the World Health Organization (WHO) declared a Public Health Emergency of International Concern (PHEIC) in response to the Mpox virus (MPVX) outbreak[1,2]. Monkeypox/ Mpox virus (MPVX) was first identified in Central Africa during the 1970s, particularly in the tropical rainforests of West and Central Africa[3]. The virus exists in distinct strains: Clade 1 and Clade II. Over the last three years, the virus has caused two major outbreaks, with the first outbreak starting in 2022 being attributed to Clade II (b), while the ongoing outbreak is linked to Clade 1 (b)[4].

As of September 13, 2024, more than 26,544 cases and 724 deaths linked to the illness were reported across 15 African Union member states, with over 1,644 cases in Eastern Africa[5]. The Democratic Republic of Congo (DRC) remains the most affected African nation, currently accounting for 96.3% of all Mpox cases and 97% of the related deaths[6]. Symptoms such as a vesicular-papular skin rash, fever, fatigue, headaches, low energy, and swollen glands [7,8] are common among Clade 1 patients. However, patients with Clade 1b have been reported to experience additional symptoms such as neurological and renal complications[9].

How this Rapid Response was prepared

After clarifying the question, we searched for global and local evidence relevant to the policy question.

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The virus predominantly spreads through direct physical contact with infected individuals, contaminated surfaces, or through respiratory droplets, and bodily fluids [10,11]. Mpox transmission in the DRC has surged by at least 160% in recent weeks[12], with each infected individual contributing to a 20-30% increase in new infections, raising concerns about sustained viral transmission. Additionally, the potential for further spread is shown by estimated reproduction numbers of 1.22 for household outbreaks and 1.33 for hospital settings. However, the exact transmission routes and intensity remain unclear, especially with the emergence of new virus strains[13].

Clade 1 consists of subclades 1a and 1b. Whereas Clade 1a primarily affected men who have sex with men and spread mainly in the Americas and Europe, Clade 1b is more prevalent in Africa and severe among young children and immunocompromised individuals [13-15]. The WHO and Africa CDC recommend preventive measures to curb the spread of the Mpox virus as efforts to develop an effective vaccine continue. However, significant inequities in vaccine access persist despite global efforts to mobilize resources for vaccination.

Rapid Response question: What is the current epidemiologic profile of the Clade 1b Mpox variant?

Update on the Mpox Pandemic in Africa

In the last three years, there have been two major outbreaks of Mpox, one in 2022 and another in 2024. While global cases spiked in September 2022 to over 5000 cases a day, Africa's surge in cases is more recent, mostly affecting DRC and Burundi [13]. As of September 2024, the Mpox suspected and confirmed cases in Africa have peaked at almost 2,500 daily, with cases increasingly emerging in non-endemic countries. Furthermore, 581 deaths have been reported out of over 12,500 suspected cases in DRC since February 2023 [16] [17]. By October 2024, 25 deaths linked to the illness were reported only in the DRC.

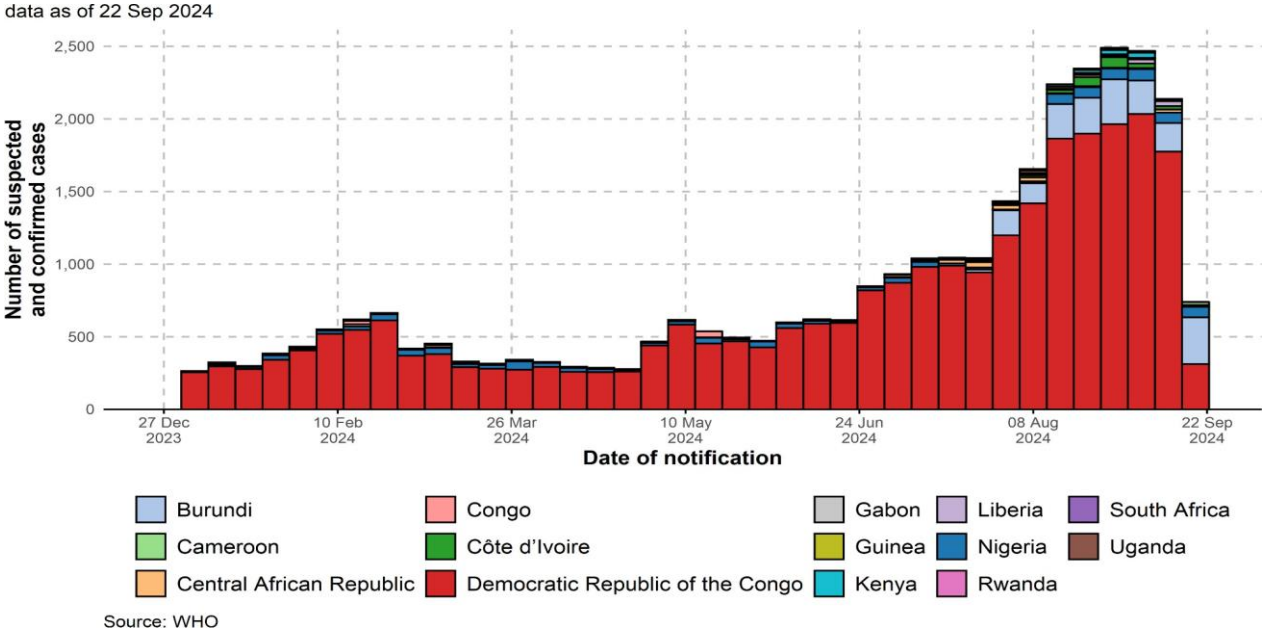

Figure 1: Daily confirmed Mpox cases in Africa from January 2024 to September 2024 [13,18,19]

Affected countries

Other than DRC, Burundi has registered the highest number of cases (696), followed by Uganda (25), Kenya (9), and Rwanda (8) [13]. Uganda's cases are distributed across the nine districts of Kampala (6), Wakiso (6), Kasese (4), Mayuge (3), Amuru (1), Nakaseke (1), Nakasongola (1), Kagadi (1), Adjumani (1) and Mukono (1)[19,20]. However, no cases of death have been reported in these countries so far. As such, the progression of outbreaks in neighbouring countries is being closely monitored to evaluate the risk of regional transmission and to adapt response strategies as needed[21].

Summary of findings

Cases and transmission

Individuals suspected of having Mpox commonly present with a characteristic skin rash, fever, headaches, and muscle aches (see figure 3 below). While Clade 1 patients present with rash and fever, patients infected with subclade 1b have been reported to also experience neurological and renal complications[9].

Although the skin rash could be a key indicator of Mpox, false positives could arise due to other common conditions such as chickenpox, measles, bacterial skin infections, scabies, herpes, syphilis, and drug-related allergic reactions[18]. The Mpox skin rash is common around the anogenital areas[22].

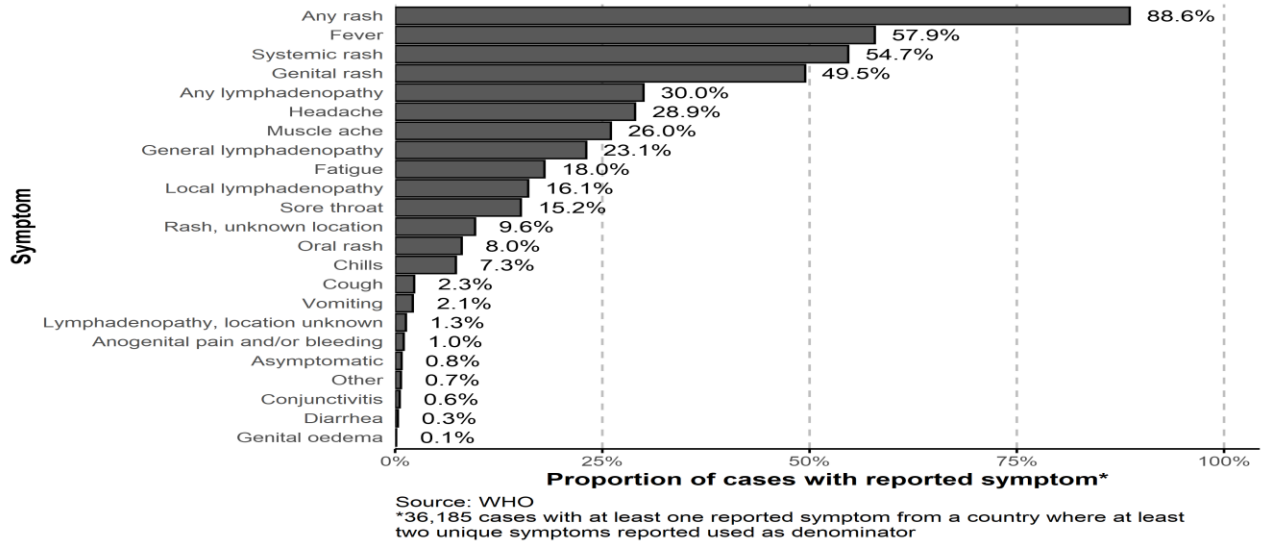

Figure 3: Proportion of cases with reported symptoms [13]

Disease progression

Mpox disease progresses through 2 stages (see figure 4 below):

I. The invasion period. This is the period between exposure to the virus and infection and usually ranges from 0 to 5 days for Mpox cases[10]. Patients often experience fever, headache, swollen lymph nodes, back pain, muscle aches, and fatigue during this period.

II. The incubation period is estimated to range from 5 to 21 days. This period between infection and the onset of clinical symptoms provides an opportunity for monitoring symptoms among identified contacts. A mean incubation period of 9.1 (95% CI: 6.5 – 10.9) days is estimated for Mpox cases [23,24]. However, recent reviews suggest that the average incubation period for Clade 1 is longer than that of Clade 11 [23 13].

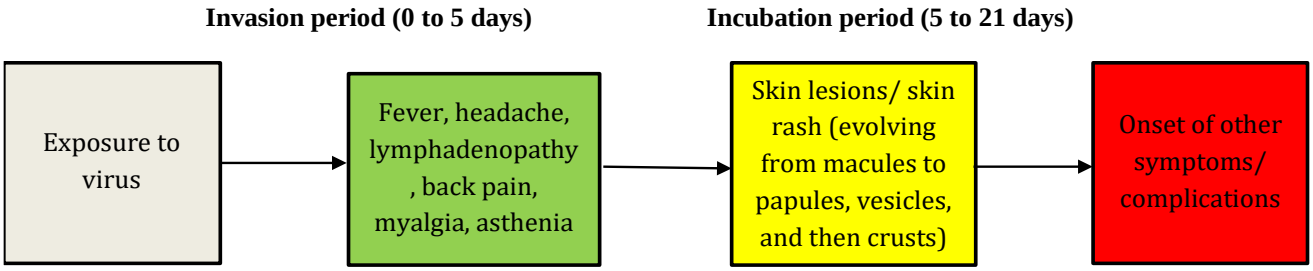

Figure 4: Clinical presentation of the disease over time

Laboratory diagnosis

Polymerase chain reaction (PCR) of specimens from skin, fluid, or crusts, collected via vigorous swabbing is the preferred method for detecting the Mpox virus[12]. In the absence of skin lesions, swabs can be harvested from the oropharyngeal, nasopharyngeal, anal, or rectal mucosa[25].

When using lesion material, clinical sensitivity and specificity of 97% and 99%, respectively, are preferred. However, for clinical diagnosis, a minimal clinical sensitivity of 95% and specificity of 97% should be achieved[25]. Diagnostic accuracy of PCR tests could be affected by cases with mild symptoms or asymptomatic cases[26]. Delays in diagnosis of Mpox could last 7 (IQR: 4 to 10) days[13], providing opportunities for the spread of the infection in communities[27].

Transmission

The average duration between successive Mpox cases within a transmission chain is 5.6 (95% CI: 1.7-10.4) days, which is essential for contact tracing within communities[13,28]. It was observed between August 2023 and March 2024, that an infected person will cause about 20% to 30% additional cases, raising concerns about sustained transmission [23]. This net production estimate increased in South Kivu to range between 40% and 60%.

As the virus continues to spread, affected populations keep shifting, with the virus potentially spreading within households and other settings[21]. For purposes of infection control, it is important to note that the rate of Mpox transmission is possibly higher in hospitals compared to households, with an estimated reproduction number of 1.33 and 1.22, respectively[24]. This is further seen in shorter intervals between Clade 1 infection and symptom onset of 11.3 (95% CI: 9.5-13.6) days, compared to 17.2 (95% CI: 14.2-20.8) days in household outbreaks[23].

Routes of transmission

MPVX is spread through direct sexual or non-sexual physical contact with skin lesions, body fluids, respiratory droplets, and contaminated materials [7]. With Clade 1b, the most common transmission routes remain sexual and close contact human-human transmission[10,29]. There is uncertainty concerning the potential for asymptomatic transmission of Mpox[10]. Nevertheless, such transmission may occur through small mammals and rodents[30].

Table 1: Infection rates of Mpox by routes of transmission [10]

Route	Cases	Descriptions
Direct physical contact (sexual)	54.9%	In situations where a single route of human-to-human transmission was identified
Direct physical contact (non-sexual)	0.1%	
Percutaneous injury with a contaminated object	0.1%	
Multiple routes	23.2%	This includes inhalation of respiratory droplets, as reviewers reported no cases where it was reasonably a single transmission route.

Factors associated with increased risk of Mpox infection

Factors associated with increased risk of Mpox infection include direct physical contact with an infected person, interaction with infected animals, being unvaccinated against Mpox, being HIV positive, men having sex with men, being under 15 years of age, and being a healthcare worker (See table 2). HIV infection particularly causes immunosuppression, which hinders the body's ability to generate a strong immune response to the disease hence a greater likelihood of illness severity [31]. Additionally, being a self-limiting disease, healthcare workers who have been exposed to Mpox-infected patients stand at a high risk of Mpox infection[32] [33].

Table 2: Factors associated with increased risk of transmission [34]

Factor	Risk of transmission [OR (95% CI)	Context
Children <= 15 years	2.0 (1.4 – 2.9)	In children, interferon responses toward the Mpox virus tend to be weaker, making them highly susceptible to infection [35]
Men who have sex with men	2.2 (1.9 – 2.5)	Increased sexual contact increases the invasion reproduction number, resulting in more infections per Mpox-infected person at the onset of an outbreak[36].
Healthcare workers	Data on the risk of transmission is not available	In healthcare settings, healthcare workers may contract Mpox through unprotected direct contact with infected patients or by inhaling contaminated aerosols [32].
HIV-infected persons	4.1 (2.0 – 8.1)	In an HIV-endemic population, particularly among individuals with low CD4 counts or those who are not virally suppressed, the invasion reproduction number increases,

		resulting in more secondary infections at the onset of an outbreak [36].
Previous vaccination for smallpox	0.2 (0.1 – 0.6)	Residual immunity from past vaccination lowers the occurrence and severity of Mpox symptoms [37]. Additionally, secondary attack rate estimates indicate that 0-11% of unvaccinated contacts of primary cases may develop clinical symptoms during an Mpox outbreak.
Contact with an infected person	2.05 (1.10 – 3.79)	Transmission occurs through sexual contact or contact with bodily fluids and infectious lesions, especially among household members and healthcare workers.
Interaction with animals	5.61 (2.83 – 11.13)	This occurs via direct contact with or exposure to infected animals' bodily fluids and excretions, especially with frequent, daily contact/ exposure.

Preventative and control measures

Timely deployment of both non-pharmaceutical and pharmaceutical interventions is crucial to respond to and contain Mpox effectively[27]. Since close contact with Mpox patients and contact with contaminated surfaces have been identified as common routes of spread of the illness[27], protective measures such as quarantine/ isolation, frequent handwashing, sanitizing, and the use of personal protective equipment are recommended for Mpox prevention[3]. However, models for interventions like isolation may vary depending on local transmission dynamics.

Pharmaceutical measures include smallpox vaccines such as MVA-BN, JYNNEOS, ACAM2000, and LC16m8, which offer cross-protection against Mpox due to their shared antigenetics [38-40]. MVA-BN is highly effective in preventing Mpox, while JYNNEOS, a modified MVA-BN vaccine, is considered safer for reducing the chances of infection [38,41]. ACAM2000, though associated with more side effects, was FDA-approved for Mpox treatment in 2007[42].

It is important to note that the availability and access to these vaccines vary across different geographical regions. As of September 7, 2024, the Africa CDC had delivered over 200,000 doses of the JYNNEOS vaccine to the Democratic Republic of Congo, with the first shipment consisting of 99,100 doses and a second shipment of 100,900 doses (https://africacdc.org/news-item/joint-press-release-the-democratic-republic-of-congo-receives-first-mpox-vaccines/).

Table 1: Effectiveness of key primary Mpox interventions

Vaccines	Outcome	Effect	Side effects	Context

MVA-BN	Prevention of smallpox and Monkeypox	Generates antibody response of six weeks (two weeks after the second dose). Vaccine effectiveness increased from 76.2% (64.1 – 88.3) to 81.9% (71.7 – 92.0) with two doses.	Pain, redness, swelling, itching, headache, fatigue, nausea, chills [39]	It is administered intradermally (ID) and mainly used on Adult Mpox patients (18 years and above)/ people at risk of Mpox.
JYNNEOS	Reduced chances of infection and spread of illness after exposure to the virus	The range of vaccine effectiveness increased from 36%-75% to 66%-89% with two doses [41].	Pain, redness, swelling, itching, headache, fatigue, nausea, chills [39]	It is administered intradermally (ID) or subcutaneously (SC) and is highly recommended for individuals 18 years or older, exposed to the virus [33,43].
ACAM2000	Protection against smallpox	Potential humoral response of 99% accompanied by a 38% incidence of adverse effects [44]	Progressive vaccinia, eczema vaccinatum, myopericarditis, post-vaccine encephalitis, affecting children under 12, individuals using topical steroids, and those with cardiovascular disease, eczema, or other skin conditions.	Evaluated in 86 black-tailed prairie dogs that were live-trapped
LC16m8 Vaccine	LC16m8, an attenuated Lister strain, has a deletion mutation in the B5R viral protein.	The vaccine was both safe and immunogenic in vaccinia-naive and vaccinia-experienced participants [40].	Fever, fatigue, redness, swollen lymph nodes, and itching[39].	It was extensively evaluated in clinical trials in Japan by the Ministry of Health, and used for the vaccination of select personnel in Japanese Self-Defence Forces[40].

Treatment

There are no treatments specifically for mpox[45]. Nonetheless, there are FDA-regulated drugs and biologics that may help. These include; tecovirimat, brincidofovir, and cidofovir. Tecovirimat is typically the first therapeutic to consider if patients with Mpox require more than supportive care. It stands out for its superior therapeutic efficacy and fewer side effects compared to the other options[27]. However, Tecovirimat did not reduce the duration of mpox lesions among children and adults with clade I mpox in DRC[46]. It is important to note that immune responses induced by JYNNEOS or ACAM2000 vaccines are unaffected by concomitant treatment with antiviral agents like tecovirimat.

Cidofovir can effectively inhibit viral replication, alleviate symptoms, and reduce viral load when administered early in the course of infection. Brincidofovir is a prodrug of cidofovir used to treat human smallpox disease in adult and paediatric patients, including neonates. It offers similar benefits with the added advantage of reduced nephrotoxicity[45]. Additionally, it serves as a pre-exposure prophylaxis, increasing the chance of survival by 57% when administered before exposure to the virus [47]. Clinicians can switch patients between IV cidofovir and brincidofovir right away without a drug holiday. However, brincidofovir should not be used simultaneously with cidofovir. Nearly all patients who receive brincidofovir are severely immunocompromised and require brincidofovir in combination with tecovirimat[46].

Mpox virus infections tend to be mild and self-limiting, allowing most patients to recover without medical intervention. However, other supportive measures or symptomatic treatments can be employed to treat specific disease symptoms. These may include proper antibiotics for secondary bacterial infection, intravenous or intraosseous fluid therapy for severe dehydration, antipyretic drugs for fever, and Vitamin A supplements for cases of malnutrition, among others [42].

Table 2: Effectiveness of antivirals for Mpox management [48]

Treatment	Outcome	Effect	Side effects	Context
Tecovirimat [49]	Survival Duration of hospital stay	Hospitalization time was ten days[50] Additionally, illness resolution and symptom improvement occurred approximately one day and four days earlier for patients who received the drug compared to those who didn't[49]	Headache, nausea, abdominal pain, mental fog, dizziness, diarrhoea	Antivirals were administered orally approximately nine days after symptom onset among patients. 14% of the patients received post-exposure MVA vaccination, 14% had <10 cutaneous lesions, and 36% had 10-100 lesions [50].
Cidofovir [51]	Survival	100% complete illness resolution	Kidney toxicity, low neutrophil count	
Brincidofovir [47]	Survival Duration of hospital stay	Survival reduced the longer it took to initiate the drug, i.e., 57%, 43%, and 29%[47] The average hospital time was 29 days[50]	Elevated liver enzymes	

One Health Approach to Mpox Prevention

The One Health Approach recognizes the interdependence of human and animal health, as well as their connection to ecosystems [52]. The approach is grounded in the knowledge and understanding that the general population, healthcare workers, veterinary workers and public health actors have regarding transmission routes of the infection. Mpox being a zoonotic disease, the application of One Health in its prevention and control, right from laboratory testing protocols, is necessary to examine the possibility of human infections being transmitted back to animals, ultimately achieving reduced viral transmission [53,54]. However, awareness of the concept is still low, especially among veterinary workers, impacting the development of integrated strategies to minimize Mpox transmission[55].

Conclusions

The Mpox pandemic has currently spread to at least 120 countries globally. While few deaths linked to this outbreak have occurred, the Mpox virus could spread in hospital outbreaks compared to household outbreaks, underscoring the need to enhance infection prevention and control measures in healthcare settings. Children under 15 and individuals living with HIV are particularly susceptible to severe Mpox infection due to their compromised immune systems. As such, preventative and control interventions should target these groups due to their high transmission potential. Vaccines such as MVA-BN vaccines are effective when administered in two doses, and antiviral agents are effective in managing symptoms and reducing hospital stays. Brincidofovir shows potential as a pre-exposure prophylactic. Furthermore, raising awareness of One Health and integrating it in Mpox intervention strategies could further reduce the risk of viral transmission across humans and animals.

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What is Rapid Response?

Rapid Responses address the needs of policymakers and managers for research evidence that has been appraised and contextualised in a matter of hours or days, if it is going to be of value to them. The Responses address questions about arrangements for organising, financing and governing systems, and strategies for implementing changes.

ACRES – The Center for Rapid Evidence Synthesis (ACRES) is a center of excellence - delivering timely evidence, building capacity and improving the understanding of the effective, efficient and sustainable use of the rapid evidence syntheses for policy making in Africa. ACRES builds on and supports the Evidence-Informed Policy Network **(EVIPNet) in** Africa and the Regional East African Community Health **(REACH)** Policy Initiative. ACRES is funded by the Hewlett and Flora foundation.

ACRES' collaborators:

Regional East African Community Health Policy Initiative

EVIPnet

Glossary

of terms used in this report: 01 sure rapid response guides 2011 11.pdf (cochrane.org)

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Conflicts of interest
None known.

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