

KEY CONSIDERATIONS: Behavioural, Social and Community Dynamics related to Plague Outbreaks in Madagascar

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This brief explores behavioural and community dynamics related to plague outbreaks in Madagascar. The aim is to support actors involved in plague response to acquire a deeper understanding of behavioural and cultural practices and structural inequities that may exacerbate plague transmission. It also provides suggestions on how to improve communications and community engagement as part of a context-adapted plague response.

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KEY FINDINGS AND CONSIDERATIONS

- Plague in Madagascar is primarily a problem of structural inequality, poverty, and social neglect. An effective response requires addressing problems related to public health reach and basic healthcare access as well as housing and infrastructure. This may include efforts to improve living conditions and support for improved sanitation at the household and community level. Strategies to minimise contact between humans and rodents should also be tailored to poorer households and those settling in previously uninhabited areas, enabling them to store food safely and to house livestock outside of living spaces.
- Burial traditions have an essential role in Malagasy culture. These rituals have been associated with the spread of plague; however, currently available data has not established this. Additional research is needed to establish the possible role of burial in plague transmission. Protocols developed to reduce the risk of burial-related transmission have not been well-accepted by the communities, resulting in efforts to evade safe burial processes.
- A large segment of Madagascar's population has no functional access to primary healthcare, and mistrust in formal medical authorities is common. Traditional healers are more widely trusted and are often approached first. As is the case throughout the African region, many Malagasy will use the combined services of traditional and biomedical healers, and collaboration between these groups has been effective in improving outcomes of plague patients. The response coordination should establish mechanisms to promote cooperation between biomedical practitioners and *ombiasy* for all phases of plague prevention, diagnosis, and treatment.
- Affordability and proximity of services, severity of symptoms and trust all influence treatment-seeking behaviour. People tend to self-medicate at first, to consult private health care providers when they worsen, and to seek treatment at formal health facilities only when their symptoms become severe. However, early recognition of symptoms and treatment for plague, especially pneumonic, is essential for survival and reduction of transmission.
- Most Malagasy are receptive to preventive and curative antibiotic treatment, though this has been affected by reports of corruption in local plague response.¹ Antimicrobial resistance must be considered, working with both drug sellers and plague response actors to track resistances and identify appropriate treatment.
- People in Madagascar generally have a clear understanding of what plague is, though they may not fully understand its causes and transmission patterns or the difference between bubonic and pneumonic plague. Their response to plague may be influenced by the high burdens of other

infectious diseases and competing priorities in their communities. There is a need to reinforce knowledge to encourage early treatment seeking.

- Adoption of plague prevention and containment measures may be affected by information gaps and by mis- and dis-information. Lack of community engagement and of accurate, timely and reliable information can erode public trust in the government and health authorities. Both historical experience and rumours can contribute to mistrust of authorities. Response actors should provide up-to-date, complete and accurate information in language that communities can easily understand.
- A plague diagnosis can be stigmatising, especially in urban areas. Stigma may be exacerbated by response teams whose actions announce to the community that they are attending a suspected plague case. This may make people less likely to seek diagnosis or treatment and less likely to report contacts. Public health teams should be discreet when arriving at a home, and public health campaigns should destigmatise plague and take care not to speak in a manner that associates plague with poverty or lack of hygiene.
- Communication approaches should use carefully considered language and avoid framing the situation in pejorative terms, which can increase stigma. Top-down communication approaches can be counterproductive; two-way communication with active listening and dialogue is preferred by the community and thus is more effective.
- While recognising existing accepted practices in communities, such as self-medication and the use of private health care providers, public health communication should promote early referral and formal treatment seeking. Local level communication channels, such as the *cellule informationelle* and the green line, should be used when possible.
- Because mistrust of government and international response actors is widespread in Madagascar, it is essential that trusted community actors be involved in all aspects of the response. *Chefs fokontany* (local authorities) and other trusted actors, such as elders, religious leaders and *ombiasy* (traditional healers) can be important liaisons with the community.
- Community cultural and religious practices must be incorporated into any approach to addressing plague. Malagasy burial rituals and *famadihana* (turning of the bones) are vitally important to many communities, and public health measures that do not fully accommodate those rituals are unlikely to be followed. Community participation in development of safe and dignified burial protocols is essential. When formulating these protocols, elders, *ombiasy*, community health workers and other trusted leaders, including religious leaders, should be engaged to shape practices at the local level.
- Additional integrated research efforts should be considered on a variety of issues related to plague in Madagascar. Additional KAP surveys can lead to a better understanding of care-seeking behaviour. Epidemiological research can shed light on any association between plague transmission and aspects of burial/*famadihana* rituals. Qualitative research can enable better understanding of barriers to implementation of existing safe and dignified burial guidelines and how best to adapt them in a way that is acceptable to individual communities. It can also illuminate local level community dynamics, including relationships between the community and responders.

FEATURES OF PLAGUE OUTBREAKS IN MADAGASCAR

The epidemiology of plague

Plague is an infection caused by the *Yersinia pestis* (*Y. pestis*) bacteria. It has three forms: bubonic, pneumonic and septicaemic. Bubonic plague is the most common; it infects and results in swelling of the lymph nodes ("buboes"). It is transmitted from rodents to humans via fleas. Human-to-human transmission of bubonic plague is rare, but can occur through flea bites.¹ It is more likely to be found

in children, adolescents and women, particularly in agricultural settings, likely linked to sleeping on the floor or on simple mats, which increases their exposure. Typically, pneumonic plague is caused by spread to the lungs from an untreated bubonic plague.² Primary pneumonic plague also occurs through person-to-person contact, transmitted through infected aerosol droplets. It is found more frequently in adults aged over 30. Pneumonic plague often develops due to late treatment and greater exposure to crowded spaces and when caring for the sick.³ Septicaemic plague occurs when the bacteria enter the bloodstream. It is more frequently fatal but also more uncommon.

Box 1. The three types of plague

Bubonic plague: an infection of the lymph nodes
Pneumonic plague: an infection of the lungs
Septicaemic plague: an infection of the blood

Plague outbreaks in Madagascar have increased in frequency in recent years, due to climatic variations, deforestation, population movement and resistance: rodent resistance to *Y. pestis*, flea resistance to insecticides, and *Y. pestis* resistance to antibiotic treatment.⁴

Plague is endemic and seasonal in rural areas of the central highlands of Madagascar. Cases typically occur between October and April. In the period 2000-2015 over 75% of notifications were bubonic cases from rural areas.⁵ Outbreaks of plague are seen only occasionally in urban areas and are more frequently pneumonic cases.⁶ In 2014, 13 cases were detected in the capital Antananarivo, out of 263 cases. In 2017 there were 2,417 confirmed cases of plague (77% pneumonic) in Antananarivo and Toamasina, and 209 people died.⁷

The most recent plague outbreak was detected in August 2021 and was relatively smaller. At the time of writing, it was contained to endemic areas, mainly in the municipality of Miandrandra, district of Arivonimamo (Middle West of central highlands). By 21 September 2021, 20 suspected and 22 confirmed cases of plague had been reported (19 pneumonic and 3 bubonic). The median age of cases was 36 years (range 3 to 74 years) and approximately half were males and half females. Six pneumonic plague and 2 bubonic plague deaths were reported, for a case fatality ratio of 37%.⁸

Vectors, reservoirs and pest control

A vector is the agent that carries and transmits a disease; a reservoir is the habitat in which the virus or parasite normally lives. In the case of plague, fleas are the main vector and rats the main reservoir. The main breeds of rats found in Madagascar are *Rattus norvegicus* (Norway rats, also called sewer rats) and *Rattus rattus* (black rats), the dominant host for *Y. pestis*. Sewer rats are found mainly in big cities and seaports. Black rats can be found everywhere, from sea level to highlands, in urban areas as well as fields and forests. Although black rats live mainly in trees and are commonly found in rural areas, they are often found in deprived neighbourhoods in urban settings.⁹ In urban areas, the expansion of sewage networks and improved housing quality with concrete roofs have reduced the possibility of contact between rats and humans.

Agricultural activities, deforestation and bushfires can contribute to the multiplication and spread of rodents. The cultivation of cleared land provides abundant food resources for rodents, and the frequent contact between humans and rodents can increase transmission risks. This can particularly affect migrants living in poor conditions as they cultivate new farmlands.⁹

Socioeconomic factors have a great impact on an individual's risk of exposure to plague. In Madagascar, poorer and marginalised population groups continue to be more exposed to rats and fleas and are disproportionately affected by the disease. In urban areas, poorer population groups living in overcrowded dwellings and poor sanitation conditions in the lowlands face increased infection risks, particularly when flooding occurs. In rural settings, plague is increasingly reported among people living in poor shelters at the outskirts of a village, where food crops are stored within houses to prevent robbery, attracting rats and their fleas.⁶ Historical social-economic divisions may have a continuing impact: for example, people of *andevo* (slave) descent are more likely than those of *andriana* (noble) or *hova* (free) descent to have reduced upward mobility and live in poorer housing, where they may be more vulnerable to infection.¹⁰ They also have less access to

healthcare.¹¹ New migrants to Madagascar often reside around villages or hamlets, close to fields,¹² increasing the risk of contact with rodents.

Effective plague control strategies must therefore address structural barriers linked to poverty. This may include efforts to improve housing and living conditions as well as support for improved sanitation at the household and community level. Strategies to store food safely and to house livestock outside of living spaces should also be developed to minimise contact between humans and rodents.

RODENT AND VECTOR CONTROL AND SURVEILLANCE

Current rodent and flea control strategies include the use of traps, indoor raticide and insecticide sprays. Currently, the focus is on flea vector control (rather than rat reservoir control). However, the widespread use of insecticides has negative environmental impacts and if misused can be counterproductive: recent evidence has shown increased flea resistance to insecticides.⁴ Rat control is primarily done during the plague endemic season as part of surveillance programmes. Public health advice also includes improving sanitation, proofing granaries, using bioactive plants that are effective against fleas, keeping domestic cats, etc. Many of these activities require significant investments of labour and time, and if uncoordinated at community level might have little impact on the effective control of rodents – resulting in limited population level uptake.¹³

Plague surveillance of rodent, flea and human populations is crucial in early warning of the disease. These were particularly useful in detecting outbreaks beginning in the 1990s, but they were discontinued in 2006.⁴ Community surveillance can play a role in early detection, provided that disease surveillance is working effectively and communities are integrated into these mechanisms to identify and report unexpected deaths of rodents.

Burial practices and plague transmission

Burial rituals have been widely associated with the spread of plague in Madagascar. As a result, public health guidelines have placed significant restrictions on burial practices. However, at this point there is still insufficient evidence globally on the infectiousness of *Y. pestis* in body fluids and on the time-length of survival of the bacteria in soil or family tombs.^{14,15} There is also incomplete epidemiological evidence of the role of burials in transmission of plague, compared to other means of exposure to infected fleas or people.¹⁶ Despite this uncertainty, guidelines have emerged to curtail traditional burials.

In Madagascar, particularly in the Central Highlands, death is only one step towards the coveted state of being an ancestor. A loved one can become an ancestor only if specific funeral rituals are followed. These include a 'first burial' upon death, normally in an individual grave, and the subsequent transfer of the body to the family vault. This transfer coincides with the *famadihana* (turning of the bones) ritual,¹⁷ which occurs every five to seven years and is central to Malagasy rituals of respect for deceased ancestors. The ancestors' remains are removed from the family tomb and their silk burial shrouds are replaced. Family members speak to and dance with the ancestors before returning them to the tomb.

If these practices are not honoured, loved ones are unable to join the ancestors. It is believed the ancestors in turn feel neglected and may seek vengeance on the living, at both an individual and a community level. It is further believed that they will generate illness and misfortune, even if the reasons for not following the rituals are benevolent, for example, preventing the plague.¹⁸

Following the 2017 plague outbreak, the Malagasy government, in collaboration with WHO, UNICEF and community stakeholders, developed a safe and dignified burial (SDB) protocol. The protocol allowed plague victims to be transported to their hometowns for initial burial in an individual grave. Families would be permitted to move them to the family tomb only after 7 years had passed – though there was no epidemiological basis for this specific waiting period. The protocol also required washing and disinfection of plague victims by specialised burial teams, incineration of their clothes, and the use of a body bag.

In initial pre-tests of the protocol, 90% of participants were in favour of the proposed SDB measures.¹⁹ However, modified burials have not been accepted in practice, during either the 2017-18 epidemic or the 2021 epidemic. The guidelines do not accommodate Malagasy beliefs in the importance of family involvement in preparing and shrouding the loved ones' bodies, and the use of body bags interferes with the natural return of the body to the earth. In many cases, enforcement of the guidelines has been coercive rather than enabling. In Antananarivo, for example, clashes occurred in October 2017 between relatives of victims and officers from the Municipal Office of Hygiene (BMH), the institution in charge of burial teams, when the teams were taking away the bodies - often accompanied by law enforcement officials. In Toamasina, bodies were buried in mass graves; they were later dug up and taken by family members.²⁰ There have been similar reports of secret burials during the 2021 outbreak.

PLAGUE AND HEALTH CARE IN MADAGASCAR

Health Service in Madagascar

Madagascar has a pluralistic health system consisting of biomedical state-provided and private clinics, traditional healers and herbalists, pharmacists and other vendors of drugs and herbs.

BIOMEDICAL PROVIDERS

About 60%–70% of Madagascar's inhabitants have access to any form of primary healthcare, and it is common to have to travel distances of more than 10 km to the nearest health facility.²¹ Lack of physical access is exacerbated in rainy season in remote rural areas, where approximately half of facilities are accessible year round. Lack of physical access and low levels of service provision, added to the unaffordability of costs of transport and treatment, mean that some 60% of those reporting an illness do not visit a health centre.²² Health provision is biased towards urban areas, which have a diversity of doctors and other health workers and, with them, private clinics, public hospitals, and pharmacies. However, these are unequally distributed, and people in deprived neighbourhoods have less access to services and are less able to afford them.²³

Mistrust in medical authorities is common.^{24,25} According to the Wellcome Global Monitor survey, 25% of respondents in Madagascar reported not trusting health clinics and hospitals.²⁶ Private clinics (*docteurs libres*) are more likely to be trusted than State provided healthcare, as they have more flexibility in opening times, in payment arrangements and loans, etc.²³ There is a lack of adequately trained health personnel and equipment,²⁷ with 'systemic inaccurate diagnoses and poor treatment outcomes' and 'lack of medicines at healthcare centres' which 'frequently results in patients not seeking healthcare services and relying on self-treatment'.²¹ Mistrust is particularly prevalent in rural areas, where people often perceive hospitals as places where people go to get sick rather than to be cured.²¹ People believe the patient is at risk of infection and see treatment outside hospital as less risky.²⁸ Hospital treatment is viewed as an expensive last resort, with families paying for treatment, accommodation and food. Historical experiences of colonial health interventions may engender fear and non-compliance in the postcolonial period. Fear of injections, for example, may arise from the belief that hospital staff are infecting people with diseases such as plague, rather than treating them.²⁵

TRADITIONAL AND ALTERNATIVE MEDICINE AND ALTERNATIVE THEORIES OF CAUSATION

Traditional healers, *ombiasy*, are well respected by Malagasy people, except by some protestant churches.²⁹ *Ombiasy* provide care not only at a therapeutic level, but also at a sacred and socio-cultural level, allowing for holistic care.³⁰ There are different sorts of traditional healers, including herbalists, masseurs, traditional midwives, diviners, astrologists, and so on.³⁰

Malagasy people may understand illness as having an immediate natural cause, but when misfortune happens to individuals or a community, as in the case of plague, they will seek ultimate causes as well, generally from *ombiasy*. In rural areas in particular, people are wary of the biomedical profession and may have less belief in the germ theory of disease, including plague. They tend to

believe in personalistic explanations of causation, in which misfortune can arise due to an attack by an angered ancestor or due to a curse by a person using a wizard or sorcerer. Some communities in the current plague outbreak have attributed plague to witchcraft.

COMBINED APPROACHES TO HEALTH CARE

Explanations and treatments for disease may combine biomedical and traditional approaches. Malagasy simultaneously use biomedical health clinics, traditional healers and self-care and medication depending on finances, physical availability and how their health status evolves.²⁷ In people's eyes, a clinical case becomes an emergency (grave) when initial treatment does not work and symptoms persist or increase (e.g. fever after the use of antipyretics) or atypical symptoms emerge, pushing people to the biomedical provider, albeit with some delay.²³ Finances play an important role, with urban people delaying their attendance to clinics due to having to seek an affordable provider.

In the case of plague, biomedical explanations can co-exist simultaneously with other transcendental explanations and treatment. Disease can be understood to be spread by rats and fleas, and treatment sought that includes antibiotics and hospitalisation, but individuals will also consult with a diviner providing tinctures of medicinal plants.¹⁸ *Ombiasy* will cure the biological disorder (using herbal treatment, for example, and on occasion getting inspiration from conventional medicine and using allopathic drugs³¹). But they will also address supernatural causes, such as contravention of taboos, a wizard attack, possession by *vazimba* (original inhabitants of the island), etc. The role of the *ombiasy* is to heal the person, but also to repair social rifts and restore the natural order.³⁰

Collaboration between biomedical and traditional healers has successfully taken place in the response to plague and indeed was important in containing the 2010 plague outbreak in the area. Over 20% of cases were identified by traditional healers, who encouraged early presentation at health clinics; as a result there were no deaths for three years.³² Since 2005, there has been an effort to integrate traditional healers into plague efforts. Health authorities have come to understand them as "antennae" for local implementation, similar to Community Health Workers, due to their proximity to the social and village environment, their status of respect and trust, and their capacity to raise awareness in their communities.³² A pilot programme in d'Ankadikely Ifafy, a commune in the Central Highlands, promoted dialogue between public health authorities and traditional healers; healers were trained to recognise the symptoms of the plague and refer them to the Centres Sanitaires de Base (the community level state health clinic). In turn, healers shared some treatments, including the use of clay to delay multiplication. In this programme, healers, together with religious authorities and *chefs fokontany*, were involved in rat monitoring and control, and in the plague response in general.

HEALTH-SEEKING PATHWAYS AND BEHAVIOR

Distrust in the public health system can become an important barrier to formal and timely healthcare seeking. People are likely to seek care initially with non-biomedical providers such as *ombiasy* and other traditional healers, or to self-medicate using home remedies or remedies obtained through local drug sellers. Épiceries (grocery stores) sell drugs as well as other products and are very popular and trusted.²⁷

With respect to plague specifically, Malagasy people appear to have a high awareness of plague risks and relatively high health-seeking intention. According to a KAP study into outbreaks between 2006 and 2015, 96% understood plague to be fatal. When asked whether they would visit a biomedical doctor in case of the development of symptoms compatible with plague (fever, buboes), 67% said they would visit a doctor, 5% said they wouldn't and 28% were uncertain.¹⁰

Evidence shows that affordability, proximity, severity of symptoms and trust influence people's treatment-seeking behaviour for plague and may affect rates of self-medication. As noted above, cost and distance are material impediments to healthcare generally, and this affects care-seeking for plague as well. People tend to self-medicate when symptoms first appear; the use of traditional practitioners seems less common, though data is scarce. People in rural areas tend to visit Community Health Workers.¹⁶ If symptoms continue to worsen, private healthcare providers may be

consulted, to avoid going to public health centres and being labelled as 'plague-affected'. Treatment is often sought at the formal health facility level only when symptoms become more severe (e.g. blood-streaked spit) and is preferred at community-based health care centres and public hospitals as they provide free care.³³

Public distrust of healthcare providers is influenced by the perceived lack of transparency and efficient management of the disease as well as prior experience. During the plague outbreak in 2017, high levels of self-medication led to the drastic step of hospitalising all confirmed or suspected plague patients. This has had a profound negative impact on people's trust in formal treatment and care.^{34,35} Limited testing and treatment capacities in that outbreak reinforced public concern that diagnoses might be incorrect. The public also feared an increased transmission risk at the health facility level (due to the large number of patients and limited IPC measures), leading to further avoidance of formal care.

Surveillance and treatment of plague

REPORTING AND SURVEILLANCE

Surveillance is conducted by the Ministry of Health (MoH) through local healthcare facilities. Active surveillance is also used to detect emerging cases during outbreaks. Since 2017, community health workers have been mobilised and rapid response teams have been deployed to support epidemiological case-finding and investigation, as a result of the collaboration among Institut Pasteur, WHO and the MoH.³⁶

Rapid testing technologies and point-of-care laboratory capacity have played a crucial role in surveillance. Even remote clinics have access to rapid testing kits.^{16,37} A definitive plague diagnosis makes people more likely to accept related health and prevention measures, though acceptance is counterbalanced by the stigma related to plague diagnosis,³⁶ as discussed below.

CASE MANAGEMENT AND TREATMENT MEASURES

Early recognition of symptoms and initiation of antibiotic treatment is critical for preventing progression to severe disease and death, particularly for pneumonic plague. Early treatment in combination with active case finding, early testing and community engagement is effective; for example, only 25% of confirmed cases died in the 2017 epidemic, a largely urban outbreak in which normal plague response resources were overstretched.⁵ High case fatality rates, particularly for pneumonic plague, are expected with delayed treatment. Delay in presentation can be attributed to the non-specific nature of pneumonic plague symptoms (high fever, weakness, headaches), as well as lack of knowledge of the disease, self-medication and care-seeking from non-biomedical providers.³ The referral of a patient suffering from signs and symptoms of plague might take from one to three weeks.³³ A decision to immediately refer to formal treatment is generally taken when the patient knows that he or she has been in contact with a positive plague patient.³³

In general, people in Madagascar are receptive to preventative and curative antibiotic treatment. However, this has been affected by reports of corruption in the local plague response, with inadequate antibiotic doses being provided to patients so that the remainder can be sold for profit. This could have two consequences: the patient's treatment fails due to insufficient medication, and antibiotic resistance is accelerated.³⁸ Note that people in cities are more likely to have better outcomes due to the higher quality and physical availability of health systems, and individuals' relatively higher incomes to afford consultations, as well as more intensive antibiotic use.⁵

RISK COMMUNICATION AND COMMUNITY ENGAGEMENT STRATEGIES

Understanding communities' perception and knowledge of transmission risk factors and their socio-behavioural dynamics is vital to inform operational decision-making.²¹ An in-depth exploration of these issues and how they act as barriers or enablers to plague prevention and containment

measures will facilitate the development of effective risk communication and community engagement strategies.

Community knowledge of plague and understanding of transmission risk factors in Madagascar

Three main factors appear to influence public knowledge of plague: geographical location (urban or rural), the form of plague (bubonic or pneumonic) and previous experience with or exposure to plague.

People in Madagascar have a clear idea of what plague is, particularly in endemic areas. However, many people lack a robust understanding of its causes, its transmission patterns, and the distinction between pneumonic and bubonic plague. For example, while people in remote areas (e.g., Moramanga and Mantasoa) report familiarity with buboes (swollen lymph nodes), they do not necessarily associate them with bubonic plague. It is also important to note that buboes do not always present with bubonic plague. In urban areas, such as Antananarivo, people demonstrate increased theoretical knowledge of plague causes and symptoms, but may not have detailed awareness of transmission risks.³⁹

When confronted by the pneumonic plague epidemic in 2017, people recognised the urgency and importance of treatment,¹⁰ although there may have been some confusion around the channels of transmission. Despite this awareness of the serious nature of plague, it is important to consider the effect of people's experience with other diseases. This is particularly so in rural areas when there are high burdens of other infectious diseases such as malaria, pneumonia, and recently (although perhaps not as high in peoples' priorities), COVID-19.⁴⁰ To enhance trust in the plague response, people will need to see integrated or parallel health interventions addressing these other illnesses.

Barriers to adoption of plague prevention and containment measures

INFORMATION GAPS, CONSPIRACY THEORIES AND MIS- AND DISINFORMATION

Information gaps around disease outbreaks can generate and maintain panic and fear, with the result that it can be more difficult to engage communities to support and adopt public health measures. In 2017, the first case of plague in Madagascar was reported through Facebook, not by public health authorities. This created panic and led people to look for information anywhere they could find it -- contributing increased circulation of mis- and disinformation.³³

Mis- and disinformation can affect public trust in government and health authorities. For example, in 2017, media outlets associated with the governmental opposition parties portrayed public authorities as incompetent, feeding into public perceptions of the response.³⁹ Lack of trustworthy information about the plague can also reinforce misconceptions among the local population regarding public health measures. For example, the delay of Madagascar school opening in 2017, combined with rumours circulating on social media about the states' incompetency to manage the outbreak, negatively influenced the public perception of national response authorities and international responding agencies.⁴¹

Situations of crisis, fear and uncertainty can also lead to the emergence of conspiracy theories, often influenced by the historical past. In Madagascar, the appearance of plague in 1898 was associated with the arrival of foreigners, and the colonial government was blamed for the outbreak. During the 2017 outbreak, many rumours circulated that the plague was being used for political gain - to mobilise international funding for the election or to create social unrest.³⁹ Rumours and conspiracy theories also reflected broader structural issues and public discontent over the economy, such as high levels of corruption and rising prices of commodities.

CULTURALLY-ASSOCIATED STIGMA AND OTHER SOCIOCULTURAL BARRIERS

A diagnosis of plague can be stigmatising, particularly in urban areas. Plague is reportedly associated with dirt and poverty, exacerbating feelings of shame and the stigmatisation of sick people. Stigma may make people less likely to come forward for testing or to accept a positive

diagnosis.³³ This is particularly true of those who consider themselves to be relatively wealthy.²⁵ Plague stigma elicits feelings of shame and can lead to individual or group discrimination by others.

Negative and at times stigmatising framing of the disease can have undesirable implications for public perception of the disease, related response services and public uptake of public health advice. This may result, for example, in delays in referring plague patients to formal health care structures.³⁵ The use of jargon such as 'contact' or 'suspected plague case' can have a dehumanising effect and create and/or reinforce distrust in the public health response.³⁵ The search of alternative locally-accepted language should be carried out in partnership with communities.⁴²

At the individual level, stigma may lead former patients and their relatives to want to keep diagnoses a secret. However, a lack of discretion shown by the response teams coming to a patient's home can contribute to the stigmatisation and social isolation of the patient and her/his family. Arrival of outsiders in cars and dressed in full PPE can be distressing and discourage people from sharing information about contacts or other relevant epidemiological information. People sometimes avoid public health officials and contact tracers or give incorrect contact details to receive test results.²⁴ Such misreporting is not unique to this context and occurs in other settings and with other diseases, including COVID-19. To avoid response teams, patients might falsify their personal information and out of the fear of stigmatisation, people might also reject diagnosis or avoid hospitals.³³

Malagasy people's need for autonomy may also affect their acceptance of plague prevention measures. For example, faced with unwanted authority, 'a typical Malagasy response will be to agree heartily with whatever demands that person makes, and then, as soon as they are gone, to try to go on living one's life as if the incident had never happened'.⁴³ Imerina people have been described as tending to view legitimate authority as one that works 'negatively', indicating the boundaries of what not to do - but not through accepting direct orders.⁴³

Malagasies' acceptance of prevention and treatment measures may be impeded by limited trust in the central state and the public health system,⁴⁴ as noted above. This is compounded by a history of coercive plague management in colonial and postcolonial times, including interrogations, forced quarantines, plague pits and failed vaccination experiments. These measures were historically met with social protests and unrest in reaction to them.^{18,45,46}

As noted above, burial traditions are central to Malagasy life. If public health measures do not respect and accommodate these practices in an acceptable way, there is likely to be resistance to health authorities. Fear of not being able to be buried in an ancestral tomb may also drive underreporting of plague deaths.

Communication approaches and community engagement

COMMUNICATION APPROACH

Timely communication of accurate and accessible information is vital in the context of disease outbreaks. Use of appropriate language is important in avoiding stigmatisation related to plague. Framing by international humanitarian actors and the media sometimes sensationalise the situation, rather than presenting it as an expected seasonal and endemic disease with several hundred documented cases most years. This sensationalised framing has been criticised for ignoring political ecology drivers of the disease such as, social inequality, ineffective containment strategies, resource constraints, political jockeying, and insecticide resistance in the discourses of plague response.⁴⁷

There is a need to communicate that everyone is vulnerable to plague regardless of class or other distinctions and in turn for diagnosis to be delivered discretely and confidentially with written documents³³ to avoid delays in healthcare seeking. In the 2017 epidemic, stigma and discrimination affected several population groups who were (often wrongly) perceived to be among the carriers of the disease including the most vulnerable and marginalised (poor people, street children).²⁸ Potential plague patients or survivors risk being evicted from their homes and suffering from social isolation following locally imposed quarantines.⁴⁴

Adopting a biomedical and didactic approach can be counterproductive and in the context of plague, communities have criticised the top-down approach neglecting local practices.⁴¹ Two-way communication promoting active listening and dialogue is preferred and more effective. The approach should be informed by different settings (urban, rural, digital connectivity etc.) and could, for example, involve the organisation of health debates to address frequently asked questions, bringing together trusted health experts and communities and broadcasted on local TV and radio shows.³⁵

Most people get their information on plague from radio announcements and word of mouth. Mobile phone technologies (e.g. SMS, social media) have significant potential for use in communication,¹⁶ especially in areas with high mobile coverage and reported digital literacy. Health workers and community health volunteers need to have sufficient knowledge and training about the different forms of plague and the modes of transmission in order to best communicate risk to communities. Information content should be clear and simple to understand, focusing on the identified knowledge gaps and socio-behavioural barriers to the effective prevention and control of plague, this is more important than providing highly detailed information, (for example about the first plague outbreak or travel documentation processes). Public health information should also recognise and build on existing practices such as self-medication and the use of private health care providers.³⁵

During the COVID-19 outbreak, the MoH set up a local level information cell (*cellule de veille informationnelle*) to collect rumours, questions and concerns.⁴⁸ This provided a strong foundation to manage and address information needs emerging in the context of new disease outbreaks, including plague. The Green Line set up during the 2017 plague outbreak also appears to be one of the most adapted and locally accessible communication channels. It provided the opportunity to adopt a human-centred approach, listening and responding to questions and concerns. Investments such as the increase of service operators and the training of hotline staff on communication skills, including empathy, can become critical enablers in promoting trust and adherence to public health measures. To effectively filter incoming information, the use of interactive voice response could be also explored.³⁵

COMMUNITY ENGAGEMENT

Mis- and disinformation, reported poor management of health supplies distribution, historical experiences and a host of other factors have contributed to varying degrees of mistrust in government and international response actors. Given this, the meaningful involvement of trusted community actors is essential. Community health volunteers, and community figures of authority or *raïamandreny* (elders) should be identified and engaged.⁴⁹ Alliances with local authorities (*maires*, *chefs fokontany*) are crucial for public health control measures. *Chefs fokontany* are the public authority closest to local communities, based on traditional social organisation of community affairs (*fokon'olona*) they are intended to act as intermediaries between the State and local communities, they also oversee development projects and lead local participation.^{50,51} It is important that *chefs fokontany* are adequately paid and well supported by the State in order to fulfil their potential and avoid conflict between them and commune authorities.⁵¹

Involvement of a range of community actors, which can be either formal or informal, can effectively enhance communication efforts and also support community-led outbreak responses. The support of known community health volunteers in the 2017 outbreak and the COVID-19 response has been identified as a critical component of locally-effective mobilisation strategies.⁵² Continuous training and support (including providing means of transportation) are important elements to consider when designing local community engagement strategies.

Rapid ethnographic methods can help to identify trusted community-level actors across different contexts. This can be particularly important in settings where distrust in public authorities has been identified. The deployment of local anthropologists should be prioritised, as they can support the development of trusting relationships between communities and response actors.³³

Community level actions should be based on evidence, drawing on a robust understanding of local practices and realities rather than replicating the same activities throughout different communities (e.g., community-level cleaning campaigns, household sanitation, reporting of rodents etc.). This

could, for example, involve the mapping of local treatment-seeking behaviour and the systematic involvement of private healthcare providers in training, case notification and referral.

Drawing on identified gaps between knowledge and practice, response partners should work in partnership with trusted community actors to promote timely and formal health care seeking.⁴⁸ Meetings between the community and formal health providers could be organised to discuss local healthcare perceptions and practices and gather suggestions on how to improve the current service provision. Feedback should be provided afterwards on how these suggestions have been addressed.

RESPECT FOR IMPORTANT CULTURAL AND RELIGIOUS PRACTICES

When working to co-create approaches to addressing plague, it is essential to understand and incorporate the community's important cultural and religious practices and traditions. In Madagascar, burial rituals are key among these. The incomplete evidence base around plague transmission via funerary practices (preparation of the body, burial, *famadihana*, and re-interment) suggests limitations in the current guidelines and invites their revision. Beyond that, there is a need to negotiate with communities to co-create realistic, culturally acceptable burial protocols based on scientific evidence that enable the journey of plague victims toward the status of ancestors. A national level discussion with relevant stakeholders and diverse community group representatives would be a useful way to initiate future discussions on evidence, the applicability of the guidelines and avenues for adaptation. If burial guidelines are revisited with communities, in-between outbreaks, this can contribute to outbreak preparedness, by discussing body preparation, first burial and *famadihana* practices that are acceptable for the population.

It is also important to ensure that guidelines can be adapted to specific local needs. Any agreement on modified burials should also provide that the body preparation and burial process is led by local communities. Engagement with elders of family groups in each commune and *fokontany*, *ombiasy*, religious leaders, community health workers and other trusted leaders is necessary to shape burial practices at a local level.

RESEARCH GAPS

There are several gaps in the research that should be filled to enable better understanding of important contextual factors and better-targeted approaches to community engagement and communication about plague in Madagascar:

Care-seeking behaviour. To date, KAP research on care-seeking for plague in Madagascar has focused on intentions rather than actual behaviours. Future KAP surveys could record actual health seeking behaviours, including an examination of the important role of *ombiasy* and traditional midwives, to get a more accurate depiction of health seeking practices during a plague outbreak.

Role of funeral and burial rituals in spread of plague. Additional epidemiological investigation is needed to understand whether and how Malagasy burial rituals contribute to the spread of plague. Research questions could include: Does plague spread through close contact with infected individuals who attend the funeral? Is it spread through contact with the body of the deceased or with fleas and rat burrows during inhumation rituals, including preparation of the body and re-entombment after *famidahana*? How long does plague survive in the deceased or in the soil? Measures to contain the spread of plague will need to be tailored differently based on the infection route. It is thus vital to conduct additional research to better understand whether and how plague is spread during these important rituals.

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