RESEARCH ARTICLE

‘Because people here are ignorant’: The failure of a community intervention to prevent mycetoma in Sudan

 Mohamed Nasr Elsheikh, Caroline Ackley, Victoria Hall, Shahaduz Zaman

Global Health and Infection, Brighton and Sussex Medical School, Brighton, BN1 9PX, UK

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Abstract

Background: This study is based on fieldwork conducted amongst a community in Sudan where the neglected tropical disease (NTD), mycetoma, is endemic. In 2018 government officials attempted an unsuccessful intervention and we examine what caused this to fail. This intervention was a collaborative project building animal enclosures, designed specifically to counteract some principal causes of mycetoma, i.e., scratches and cuts common in disease transmission. It was a carefully researched, privately funded, and government-endorsed project, which was almost unequivocally rejected by the community.

Methods: Data collection took place in July 2018. Eight interviews and two focus group discussions (FGDs) were conducted with village residents. One FGD was conducted with government officials in charge of the implementation and enforcement of the project; three key-informant interviews with officials from the State Ministry of Health and three interviews with community leaders in the village were conducted, including those responsible for allocation of the new enclosures. The data was analysed using framework analysis.

Results: The village residents explained that they didn't use the enclosures for three reasons: (1) it interferes with the relationship they have with their livestock, (2) the function and design are not practical, and (3) they continually feel let down by government officials. The government officials and representatives from the State Ministry of Health identified two reasons the project failed: (1) ignorance of the people in the village, and (2) poor enforcement.

Conclusions: This study shows that government enforcement isn't a viable intervention to reduce disease burden without considering community ways of life, values, and priorities. We revealed that government officials and villagers have contrasting views on the failure and original necessity of the project. Future behaviour-change interventions need to show respect for different ways of life and the values, beginning with the open facilitation of communication.
between divergent perspectives.

Keywords
mycetoma, Sudan, qualitative study, behaviour change intervention

Corresponding author: Caroline Ackley (c.ackley@bsms.ac.uk)

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Plain English summary
This study is based on research conducted amongst a community in Sudan where the neglected tropical disease (NTD), mycetoma, is widespread. In 2018, government officials attempted to carry out an unsuccessful intervention and we examine what can cause such interventions to fail. This intervention was a joint project that built steel animal cages for the community and that was designed to prevent scratches and cuts from the thorny bushes and trees that can play a part in getting mycetoma. It was a researched, privately funded, and government-permitted project, which was rejected by the local community. Eight interviews and two group discussions (FGDs) were conducted with village residents. One FGD was conducted with government officials in charge of overseeing the implementation and enforcement of the steel animal enclosures; three interviews were conducted with officials from the State Ministry of Health, alongside three interviews with community leaders who reside in the village, including those responsible for allocation of the new enclosures. This study shows that government enforcement of steel animal enclosures is not a practical intervention to reduce cases of mycetoma without considering community ways of life, values, and priorities. Future behaviour-change interventions need to demonstrate respect for different ways of life and the values that these life choices are founded upon.

Introduction
This study is based on research conducted amongst a community in Sudan where the neglected tropical disease (NTD), mycetoma, is widespread. In 2018, government officials attempted to carry out an unsuccessful intervention and we examine what can cause such interventions to fail. The name of the village that this paper describes has been anonymized to protect the people who have informed this research, as well as to protect in-country researchers and health care providers. The failure of this intervention is a point of tension with funders, the government, and researchers in their efforts to prevent, treat, and eradicate mycetoma. The authors wish to respect relevant stakeholders by anonymizing the location in this paper.

Walking down the dusty streets on a hot and dry day in April 2018, you can see contemporary cinderblock houses that populate the village. Somewhat distant and sitting separately is a group of houses made from mud, each with an animal enclosure made of thorns with cows and goats inside. Beyond this, about a mile away, are a group of steel fences that are also meant to be animal enclosures sitting empty and abandoned. In this paper we try to understand why the people in this village abandoned and even tore down the steel animal enclosures that were built by a nationally based corporate firm in an effort to prevent the neglected tropical disease (NTD) mycetoma.

In collaboration with the State Ministry of Health and an independent research unit that specialises in NTD work, this corporate firm built steel animal enclosures as a replacement for the thorn enclosures that had been – and frequently still are – used by regional livestock herders, often for generations. Thorn enclosures can cause routine scrapes and cuts, which might appear harmless initially, but are thought to be conduits for aerobic actinomycetic bacteria and certain fungal species (organisms responsible for mycetoma) to enter the body (CDC). However, this highly expensive interventional facility was ultimately futile, as hardly any of the villagers used it. This rapid anthropological study was conducted to understand why these artificial animal enclosures were not used, from the perspectives of both the local community members and government officials.

In what follows, we briefly describe mycetoma, including its suspected modes of transmission, treatment, and disease presentation. Next, we situate the newly erected steel animal enclosures and locate them in the study site. We expand on the viewpoints of the government officials who established these animal enclosures, and the community who were at one point forced to use them. Finally, we provide recommendations for future interventions.

Mycetoma: transmission, treatment, and disease presentation
Mycetoma is an NTD that thrives in “tropical and subtropical environments characterized by short rainy seasons and prolonged dry seasons that favour the growth of thorny bushes”\(^6^\). The global burden of mycetoma is not currently known\(^7\). However, in many African countries epidemiological mapping is currently underway\(^8\). There are indications that mycetoma is endemic in multiple African countries\(^9\).

Mycetoma is a “chronic, progressively destructive infectious disease of the subcutaneous tissues, affecting skin, muscle, and bone”\(^1\). The organisms responsible for the disease are thought to originate in soil or animal dung, with both bacterial and fungal causative agents identified in soil samples\(^6\), and fungal agents identified in dung\(^7\). Both causative agents are introduced into subcutaneous human tissue through open wounds\(^3,8\). Although uncertainties remain as to modes of transmission, research has identified thorn pieces at the site of mycetoma infection\(^6,9\). The thorny tree branches used for both domestic fencing and for the removal of guinea worm are possible culprits for infection. Additionally, minor injuries that cause a break in the skin, such as insect/snake bites, are also believed to contribute to transmission\(^10\).

The most vulnerable populations are low-status socio-economic groups, with little to no health education about mycetoma, modes of transmission, or treatments\(^6\). People who walk and/or work barefoot are particularly affected\(^1\). Wearing open-toed sandals or walking barefoot while attending to livestock is common in the region of Sudan where this research was conducted, and can result in frequent thorn pricks/cuts, subsequently leading to high rates of mycetoma. Indeed, initial research suggests a link between higher rates of mycetoma infection and regional areas where livestock are the primary source of livelihood\(^7\). Men have higher rates of mycetoma infection generally, as they tend to such livestock more often than women\(^7\). Living close to livestock increases vulnerability to infection, and an earlier study conducted by the Mycetoma Research Centre found that housing with mud walls and floors allows bacteria and fungi to flourish, as well as facilitating constant exposure to animal dung\(^7\).
Successful treatment choices depend on the correct diagnosis of the causative organism and disease progression\textsuperscript{11,12}. Bacterial infections can be treated with long-term antimicrobial combination therapy\textsuperscript{11,12}, while fungal infections require surgical removal or reduction of the lesion, alongside long-term use of anti-fungal medications\textsuperscript{6}. Surgery often results in amputations and permanent disability, and treatment for fungal infections is “highly unsatisfactory and expensive”\textsuperscript{9}. However, current treatments for mycetoma are generally considered inadequate given high rates of recurrence, and the tendency for infections to be chronic.

Steel animal enclosures
In the study village, branches from thorny trees are used as the primary material to build fences around people’s homes (Figure 1). These thorny fences do not only delineate private property, but also serve as animal enclosures for household livestock. They provide a sense of security that animals will not escape during the night, and also that this will protect the householders from predators. Fences made of thorns are also erected around trees to prevent animals from eating the leaves. To prevent mycetoma, a previously integrated patient management model, structured at village-level, was successfully launched between 2010–2013 in Sudan\textsuperscript{7}. However, the behaviour change intervention outlined here was launched more recently, taking place in 2018, and in collaboration with a State Ministry of Health, a non-governmental NTD research and development organisation, and financed by a private company. The company provided materials for the alternative fencing structures, overseeing the construction of 72 steel animal enclosures (Figure 2). This intervention was designed to help prevent scratches from thorn animal enclosures by using what might be considered a safer material. These enclosures did not surround family compounds, and instead were located about a mile away from the cluster of village housing. Enclosures were communal, so that each neighbour’s livestock lived in adjoining squares of equal size, with one side of each shared. Enclosures consisted of three steel bars, each set at ankle/shin height, thigh/waist height, and chest height; to prevent livestock from escaping (Figure 2). All enclosures were built and offered free of charge to the villagers\textsuperscript{8}.

There were public meetings in the village, during which the implementing officials presented their plans to erect these metal enclosures to the villagers and explained the benefits of using them. However, most community members resisted moving their livestock from their home compounds to the distant steel enclosures; instead, they preferred the thorn-materials and living side-by-side with their animals. The government issued directives, and the police issued warnings for people to comply with the movement of their livestock to the ‘better’, safer option of the steel structures. Despite this pressure from the government and the police, during our visit in 2018 only three of the 72 enclosures were being used. The three that were actively being used for village livestock had additional thorn fencing inside (Figure 1; Figure 3). When we asked a national government official why the steel enclosures were not being used, and why the few enclosures that were in use had thorn modifications, he responded that it was “because people here are ignorant”\textsuperscript{10}.

Figure 1. Branches from thorny trees used as the primary material to build fences around people’s homes and as additional thorn fencing inside the steel structures.

Figure 2. Steel animal enclosures.

Figure 3. Secondary thorn enclosures inside the steel enclosure, resulting in a hybrid structure.
In this analysis, we attempt to better understand the perspectives and the experiences of the community and government officials who were a part of this intervention. We also consider the demands and pragmatic issues of such a ‘resolution’ and its subsequent local rejection.

Research setting
Research was conducted in a Sudanese village, with high local and national rates of mycetoma infection. The name of the village that this paper describes has been anonymized to protect the people who informed this research as well as to protect in-country researchers and health care providers. The environment and way of life contribute to these high rates of infection. For example, the village is in an area prone to annual flooding, increasing susceptibility to infection and making it difficult for people to maintain good hygiene and sanitation. The way of life in this region is primarily based around one’s land and animals. The primary source of livelihood for people locally is agriculture, with animal herding also a common income-generating activity. Animals constitute a significant source of income and indicate one’s status in the village (socio-economic status, and also subsequent personal/familial power). The most common types of animals for herding are cows, goats, and sheep. Cows were the preferred animal to herd but are now considered expensive to graze. Consequently, goats are now preferred due to their lower overhead costs and high financial returns. Livestock are considered essential for their meat and milk and can easily be converted to cash when people are in need. It is common to feed visitors, and serving one’s livestock to guests fulfills specific social commitments that are placed in high regard in the village. This emphasis on livestock highlights the need for animal enclosures that are close to the home and can hold many animals at a time.

Methods
Ethical statement
Ethical approvals were obtained from the Brighton and Sussex Medical School, reference no. ER/BSMS9DHJ/9 and the Soba Center for Research and Audit, Soba Teaching hospital, University of Khartoum IRB No. 27122018. Oral consent was obtained from the appropriate governmental and non-governmental bureaucratic figures, including the State Ministry of Health, prior to data collection. Participants were given the choice of written or oral consent, and they all chose oral consent. We followed local IRB protocol and informed the Research Governance and Ethics Committee at BSMS accordingly. Oral consent was documented on audio recordings and subsequently in written transcripts. Participants gave informed consent before taking part. The name of the village that this paper describes has been anonymized to protect the people who informed this research as well as to protect in-country researchers and health care providers. Anonymisation was not required for ethical approval.

Study setting
This was a rapid qualitative study, carried out from the 1st to the 30th of July 2018 in a Sudanese village with high local and national rates of mycetoma infection. The lead author (ME) gained an entrance to the village through a ‘gatekeeper’ at a local research institution who introduced him to one key government official. Following that introduction, ME was introduced to other government officials and villagers residing in the community. ME is a Sudanese medical doctor who has treated mycetoma patients in Khartoum, as well as a medical anthropologist.

Participants were included in the study according to role (government official, villager) and use of steel animal enclosures (those who refused and those who utilized them). Data was collected using in-depth interviews, focus group discussions (FGDs), and participant observations. Data was collected within the village of study at participant’s homes and in private locations that allowed for confidentiality. Interview audio recordings of interviews and FGDs, as well as field notes were gathered over the course of data collection. Field notes were written while conducting interviews and FGDs as well as while making observations in the study site. Data was collated first by transcribing and translating audio recordings. Then data was uploaded into NVivo and coded in manually in NVivo. Field notes were collated manually and integrated into analysis.

On 20th July 2018 one two-hour FGD was conducted, with four government officials in charge of overseeing the implementation and enforcement of the steel animal enclosures. All the government officials were affiliated to the State Federal Ministry of Health. They oversaw the implementation and enforcement of the steel animal enclosures. The State Minister of Health was first introduced to the lead researcher, ME, through the Mycetoma Research Centre. The Minister then introduced ME to other officials that supervised and oversaw the project in Sinnar State. In addition, interviews were conducted with three officials from the State Federal Ministry of Health, and one interview was conducted with the lead coordinator for the project. Finally, three interviews were conducted with community leaders who reside in the village, including those responsible for allocation of the new enclosures.

Additionally, eight in-depth interviews and two FGDs were conducted with village residents. The FGDs took place on 22nd July 2018 and included villagers who used the artificial animal enclosures. The FGDs were two-hours each with four participants in each. Participants were identified and recruited by the lead researcher, ME, during his participant observation at the steel animal enclosures. The in-depth interviews were conducted for better understanding of the context and the reasons for using/not using the animal enclosure.

Interview and FGD question guides were developed with open ended questions by ME, CA, and SZ. During the FGDs ME was facilitator and note taker. A research assistant organised the logistics and prepared refreshments for participants but did not sit in on the FGDs.

Participant observation was conducted to learn about people’s interactions with livestock and the use of the thorn and steel animal enclosures. It was carried out amongst host
families and friends made over the course of the research, their neighbours and relatives, as well as amongst visiting families of mycetoma patients. Multiple visits were made to the steel animal enclosures and to the traditional enclosures throughout the village. ME was able to visit villagers while they were resting at night near the steel animal enclosures, so as to better understand the perspectives of those who agreed to use the new animal enclosures. Participant observation was documented using an open-ended field notebook.

The units of study for the article were the participants themselves, the villagers, and the government officials. Photographs of the animal enclosures were taken during the study in July 2018 by the lead author (ME).

The data was processed through a field notebook, transcription and translation, and by inputting this into both NVivo Version 12 and the framework matrix. All interviews were audio recorded and accompanied by fieldnotes. All observations included detailed field notes. We used framework analysis because it is a systematic and flexible approach to analysing qualitative data in multi-disciplinary health research9. First, audio recordings and fieldnotes from observations were transcribed and translated from Arabic into English by the lead author (ME). This process also facilitated familiarisation with the data through multiple readings of the interviews, FGDs, and fieldnotes. Next, we (ME, CA, VH, SZ) coded the transcripts in NVivo Version 12 according to patterns in themes that emerged from the data. We developed a code tree that formed the basis of our analytical framework and that was applied across all the data. Data was then charted into a framework matrix and, finally, the data was interpreted to understand the broader meaning and implications of the study, as well as by identifying the inter-relationality between themes.

The authors reduced bias through triangulation of methods (interviews, FGDs, and participant observation) and by all authors conducting data analysis. There were no conflicts of interest that influenced the study or its conclusions. Additionally, the funder had no influence on data collection, interpretation, and reporting.

Patient and public involvement
Patients and/or the public were not involved in the design, conduct or reporting of, or the dissemination plans for, our research.

Results
Perspectives of government officials
Government officials from the State Ministry of Health identified two main reasons for the ultimate failure of the steel animal enclosures, namely ignorance of the people in the village and poor enforcement.

Ignorance. Government officials expressed general frustration about the fact that community members did not use the steel enclosures. They suggested that the reason the enclosures were not used was due to the ignorance of people in regard to what was ‘best for them’ and their health, rather than their specific viewpoints or as acts of resistance:

“Government official 1: It is just ignorance, as I already told you: they are ignorant, and this is their character…”

Researcher: …how can we solve this issue [not using the new enclosures]?

Government official 1: This is how they are, we need to be patient….

Government official 2: But I don’t think this can be solved. I swear they will never change; I know them very well.”10.

The government officials thought that this ignorance was due to illiteracy and that this made people in the village unable to appreciate the value of the steel enclosures. Many government officials used derogatory names for community members, calling them ‘thieves’, and accused them of stealing the steel. They expressed opinions that the people of this village are, historically, migrants from distant lands, and that they have criminal records and are known thieves:

“Government Official 1: They are migrants and are very greedy. They will always ask for more without helping themselves … We live with them for a long period of time. We know their behaviour, everyone in [this] village wants one enclosure for himself – they want everything to be ready for them... bed, electricity, and a tank with water supply.”

The villagers were perceived to have multiple negative characteristics, such as greed, ignorance, and laziness. Although one government official acknowledged that many community members may have felt anxious moving their livestock from their home compounds to distant enclosures, other officials disagreed with him:

“Government Official 1: As I understand from them [community members], they don’t want to put their animals inside the artificial animal enclosure because they fear, they want to protect their animals.

Researcher: Protect from what?

Government Official 1: From being stolen.”

All participants of the group then started to speak together:

“Government Official 2 (joined by others): ... but they themselves are thieves. They don’t want to leave their animals outside, it’s their nature, they grew up like this.”

Poor enforcement. The other reason the steel animal enclosures failed, according to all of the government officials, is because state authorities could not properly enforce the use of the enclosures. The inability to enforce their use perhaps comes down to differential power between state and federal
governments, and specifically to the issue that such state-level governments do not always have the legislative power to enforce a federal government directive. This was felt to be the case regarding the steel animal enclosures, with the representative government officials perceiving state authority as ineffective, "I think the executive power in the state was weak, they were indolent.”

The community were given notice by the federal government to evacuate the thorn animal enclosures, but most people did not do this. State government officials said that, even though villagers did not follow national governmental directives, they could not do anything about it as the forms of executive power necessary for such action can only be afforded directly by the federal government to local or state governments. Some villagers did not respond to the directives; state-level officials could not do anything in response, subsequently expressing considerable dismay and frustration with both the federal government and community members. Their frustration was often positioned as being a practical issue, indicating a need for more efficient state-level resources. As one government official stated “…more police surveillance was needed to make the people use the enclosures.”

Indeed, this was identified as being a matter of hierarchy, authority, and ability (or lack of ability) to take ‘official’ action to back up legislative decisions. Some officials also thought that there was a lack of proper follow-up for the intervention from state administration, which also resulted in the perceived failure of the project. An inability to communicate across different levels of social and political authority was frequently returned to as a fundamental element of the failure of this (and potentially other) intervention(s).

Perspectives of community members

The perspectives of the community members proved to be very different to those of the government officials. The community provided numerous reasons as to why they did not use the new enclosures, including an emphasis on the relationships that they have with their livestock, practicalities like function and design, and the continued feeling of being let down by officials.

The human-animal relationship. The relationships that people have with their livestock are paramount to their way of life and well-being. These relationships are predicated on a sense of personal ownership of the animals. This personal ownership is seen as being directly threatened by the steel enclosures. For example, thorn enclosures tend to denote a sense of personal possession and individual rights through ownership as they are more private and located close to the home. Yet the new enclosures seem to create a space of ‘community ownership’, or even competition, as everyone counts and identifies the numbers and kinds of livestock their neighbour has. The perception of animals becoming ‘community’ property through the practical use of the new structures also caused a level of confusion, which was interpreted as inhibiting the proper care of livestock, as one villager said “When I put the cows into my own cage, I can observe them carefully, but when I put them in their [the government] one, I get confused…”

Interaction with one’s animals is an integral part of everyday life. Community members described a strong need to keep their animals as close as possible so that they can see, hear, and regularly interact with them. As was explicitly stated by a villager, "I feel content when I hear the noise of the animals beside my house, I even can hear them when I am asleep…”

It was interesting to note that the two villagers who used the new enclosures were nervous to leave the animals alone at night. They built a tent near the steel enclosures, sleeping there instead of at home.

Practical limitations. Many practical issues were raised by community members as being principal reasons for their non-use of the steel enclosures. The animal enclosures were too distant from their houses, and it took such a long time to reach the new enclosures that it was then too much trouble to access them, and not possible as an everyday activity. Almost all community members that were interviewed explained that they prefer to keep their cows close to them during their morning routine; including cleaning their cows each day before walking to their farms, which tend to be far away from the village. In the evening, after returning from their daily agricultural work, people then milk their cows for their dinner preparations. If the cows are kept far from their homes, people are unable to adequately care for their cows, and they become unable to consume the cow’s milk after a laborious day of work. Simply put, the new enclosures are too far from people’s day-to-day activities, and the new location is inconvenient.

Limited functionality of the enclosures. Unlike the new steel animal enclosures, thorn enclosures serve multiple functions. Cows are required to have regularly prepared feeding throughout the year, except during the early rainy seasons (June–August) when they can graze outside in the fields. Hence, the thorn animal enclosures can serve as effective locations for the storage of this food. In this context, the thorns that are used around the enclosure have a reverse function – to prevent animals from reaching the food, rather than protecting the animals as food. Given this common usage, in many cases the thorn enclosures are utilised for the storage of dry human foods (such as grains and seeds), as well as for any foods that need exposure to the sun for an extended period of time (e.g., onions).

Design issues with the steel enclosures. Design issues were equally practical and aesthetic. All community respondents stated that they think there are significant problems in the design of the new animal enclosures, and that these enclosures are technically inefficient. The new animal enclosures were built from a relatively weak steel that cannot resist the power of the bigger cows. Doors are areas of structural vulnerability; considered as the weakest points in the enclosures by village members: “Some cows actually hit and managed to break the enclosure…”
Furthermore, because of relatively wide distances between steel bars, the new animal enclosures cannot house goats and young cows. This is difficult, as some villagers only have goats: “How can I keep my goats in such a cage where it can easily escape…?”10.

Additionally, young cows sometimes need to be isolated from their mothers to facilitate milk production. The new enclosures cannot serve this function due to their structural design. Also, people often prefer to walk between enclosures to reach a specific space, which the current design does not allow.

To overcome these perceived practical and structural faults, some villagers made secondary thorn enclosures inside the steel enclosure, resulting in a hybrid structure (Figure 3); thereby undermining the intervention project’s objectives.

In terms of aesthetics, the thorn enclosures are circular in shape and therefore very unlike the steel enclosures which are designed and built in squares. This geometric shape is unfamiliar, resulting in enclosures unlike those that community members have been accustomed to for generations. These discrepancies further increase the reluctance for usage.

**Being ‘let down’ with false promises.** The villagers claimed that when government officials introduced the idea of steel enclosures, they were told that there would be small rooms inside the enclosures for calves and their food. They were also told that there would be water tanks around the enclosures, and trees planted inside the enclosures. However, none of these promises materialised, with a far more ‘basic’ steel structure produced. This generated a sense of mistrust amongst villagers regarding the joint government and private business project: “Where are those tanks? The trees that the government officials promised? They must have stolen the money from the budget allocated to the project…”10.

Some villagers also complained about the allocation of enclosures, which they thought had been both unequal and unfair, thus demonstrating an ethical issue with the implementation of the project. Some villagers who have animals did not get enclosures, whereas others were given an enclosure without having animals: “They give to those who they already want to give to, and they ban those who they already want to ban.”10.

**Discussion**

Our study explored the roles of divergent perceptions amongst both the government officials and the villagers on the enactment of the animal enclosure intervention. We revealed that government officials and villagers have completely contrasting views on both the failure and original necessity of the project. While government officials think that the ignorance of the villagers, and the lack of official enforcement to then induce complicity with the government directives to use the steel enclosures, are the main reasons for the failure of the project, the villagers identified several other structural, social, and cultural barriers. This was partly a matter of conflicting value systems, as well as divergent interpretive and explanatory forms. The government officials framed the problem structurally as a governmental and legislative issue, also referencing the historical and personal ‘inferiority’ of the villagers, whereas the villagers framed it as an issue of fundamental incompatibility with their ways of life.

It is important to note that no intervention takes place in a social and political vacuum. This approach worked against local circumstances by ignoring the details of the regional political, historical, and social contexts. In doing so, this intervention also impeded successful communication between different layers of the current social hierarchy, with individuals dismissing others who were identified with ‘lower’ or ‘higher’ social groups or roles. This demonstrates a classic case of a hierarchical approach towards public health interventions, in which “vertical top-down programmes pass information ‘down’ but not ‘up’”18. This also introduced competing values, alongside mutual distrust between the government officials and community members. Unless ensured through enforceable legal measures, the success of such top-down, or vertical, interventions depend on the voluntary cooperation and support of local populations. This study shows that the local voices of the villagers were not listened to, either before, during, or after the establishment of the artificial enclosures; illustrating how such an approach may go dramatically wrong.

This failure of mutual communication had multiple, and often contradictory, effects. To a certain extent, the issue was a matter of representational misunderstanding and of unsuccessful inter-relational interactions. There was an inability to recognise or acknowledge local concerns or anxieties amongst those planning the intervention, just as there was little local-community appreciation for the types of anxieties expressed by government officials. Of particular importance was the lack of trust between different social groups. While government officials made frequent references to “how they [the villagers] are”10, implying an endemic hierarchy based on the ‘natural’ or ‘poor’ character and low individual status of the villagers; villagers, equally, referred to being actively ‘let down’ by the government and by the private company funding and planning the project. As our findings show, much of this miscommunication was introduced through contradictions in perspectival and interpretive positions and experiences. However, this was made additionally complex by the fact that these oppositional perspectives were often expressed in the same language, form, or narrative representation. For example, the government officials openly referred to the village communities as being ‘thieves’; yet the members of the villages also stated that officials must have “stolen the money” (i.e., were themselves ‘thieves’)10, which then resulted in the inadequate final intervention from the perspective of the villagers. Even so, despite their shared language, they regularly misunderstood and misrepresented one another – ‘thieves’ meant something very different for the separate social groups (and also within these groups), and ‘local ethics’ were seen as being distinct from ‘structural ethics’ (i.e., national-level political and legal policy-ethics; and/or socio-cultural ethical systems operative on a country-wide scale)10,19. Ingold refers to such structural ethics as being
‘essentialising’\textsuperscript{26}, and other researchers have analysed how focusing only on structural ethics emphasises “top-down conceptualisations of IK [Indigenous Knowledge]” that “pre-suppose a uniform concept”\textsuperscript{22}. The misrepresentations that are shown as being possible through generalisation and hierarchical, top-down interventional planning by these researchers, were also demonstrated in the observations that were made during our research.

The lack of trust both fostered by and resulting from miscommunication was also largely attributable to an absence of respect between groups. This is clear when considering the primacy of human-animal relations as a source of socio-economic stability, community status, and personal-familial ‘identities’ amongst villagers. However, these same ‘identities’ can be dismissed by government officials as being ‘dirty’, ‘ignorant’, or ‘low’. This results in villagers feeling dismissed at a personal level by government representatives, even while the officials are ostensibly planning interventions to ‘help on the ground’. Officials may be planning help, yet it is perceived by the villagers that such ‘help’ does not accurately recognise their need. Or, at least, not authentically in the terms in which help is understood by the local community themselves. As such, questions regarding intervention must be considered as being both practical and moral i.e., as ontologically resonant on multiple levels.

This is a familiar argument within ongoing health promotion, representations of indigenous knowledge, and other development debates; many of which articulate the differences in providing interventions either ‘with’ or ‘for’ communities as being fundamentally opposite approaches. Over the last three decades, researchers have considered the significance of community perspectives and how these can be engaged, involved, and authentically represented. Too many to list here, these have taken multiple theoretical standpoints ranging from the structural to the phenomenological, and to the exclusively political and economic – amongst many others\textsuperscript{22-26}. These statements are not dissimilar to that articulated in the shared ‘open letter’ presented to the World Health Organisation (WHO) by a large collective of “autochthonous peoples and medical anthropologists” and calling for a “new definition of health” that can recognise multiplicitous perceptions of what “health” may be or include\textsuperscript{26}. This has also been represented as a form of research “praxis”, which “accommodates hybridised approaches and other ways of knowing”; this is necessitated by “plural co-existence”\textsuperscript{22}.

This study faces limitations, namely the short duration of data collection. The study would have benefited from a longer qualitative study to provide further insight into the potential hybrid uses of steel and thorn animal enclosures and into community solutions for reducing the spread of mycetoma while also caring for livestock.

**Conclusion**

These observations led us to consider who or what actually failed. For the villagers, the failure of the intervention could be considered a successful act of resistance. It is not uncommon for people to have resisted NTD interventions, including those instigated regarding mass drug administrations in various African countries\textsuperscript{27}. Some authors have indicated that the refusal of treatment is a form of what Scott\textsuperscript{28} calls “weapons of the weak”. The refusal and rejection of the artificial enclosures, as well as their hybridisation using thorn materials, can also be characterised as ‘weapons of the weak’. That is, as a potential articulation of: personal identity; life choices regarding livestock; historical and community identities; and concepts of selfhood and ethical value.

The previous Director General of the WHO, Margaret Chan, stated that: “These Cinderella diseases (NTDs), long ignored and underappreciated, are a rags-to-riches story”\textsuperscript{22}. This study confirms Chan’s statement and shows that the people who suffer from these diseases continue to be overlooked. It is crucial for any behavioural change intervention to address local concerns and anxieties if “riches” are to be successfully yielded from “rags”\textsuperscript{22}. Insights that are offered from anthropological explorations of this kind can help to improve the likelihood of the successful outcome(s) of an intervention. Specifically, our study has emphasised the importance of inter-relational, mutual communication in facilitating trust and the subsequent success of intervention strategies. At the planning stages, strategies need to incorporate methods for the facilitation of communication. Such communication would benefit from the planning of interventions ‘with’, rather than exclusively ‘for’, targeted communities\textsuperscript{22,25}. This could include an awareness of need for acts of ‘figurative translation’; or, rather, for a clear recognition of diverse meanings and/or values – even within ostensibly ‘shared’ expressive mediums, forms, and languages (e.g., languages could mean: national languages; a ‘global language’, such as English; medical language; regional dialects; and etc.). This could help to facilitate mutual understanding, respect, and recognition, as well as reducing the perceived need for acts of resistance and other “weapons of the weak”\textsuperscript{22}.

What we observed in the study as being needed, but not recognised or given, was a respect for different ways of life and the values that these life choices are founded upon. To be successful, the intervention did not need to transform the perspective of the villagers into the perspective of the government officials, or vice versa. Rather, it needed to begin with the open facilitation of communication between these divergent perspectives.

**Data availability**

**Underlying data**

The transcripts in original Arabic and English are restricted to protect the confidentiality and anonymity of the research participants. This is a highly sensitive study, and participants could be identified if original transcripts and field notes are made publicly available. We have made the quotations used in the paper available in a public repository as they are anonymised to the extent that individuals and the village cannot be
identified. Although the entire data set was anonymised, if a village resident or government official was to read the complete data set, they might be able to identify specific individuals who participated in the study. No intermediary data can be de-identified without compromising anonymity. Additionally, the participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research supporting data is not available. The data that support the findings of this study could be requested by emailing NTD.DataManager@bsms.ac.uk, subject to approval by the study PI.


The project contains the following underlying data:

- The failure of a community intervention to prevent mycetoma in Sudan: Data (Quotations used in the paper that maintain anonymity and confidentiality for the research participants. Although the entire data set was anonymised, if a village resident or government official was to read the complete data set, they might be able to identify specific individuals who participated in the study).

**Extended data**


This project contains the following extended data:

- Figure 1.jpg (Traditional fences.)

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).


This project contains the following extended data:

- Figure 2.jpg (Steel animal enclosures in Sudan).

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).


This project contains the following extended data:

- Interview guide.docx. (Blank copy of interview guide in English).

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

Reporting guidelines


Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

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