



Introducing improvised pragmatism of care: animal health, epistemic frictions, and veterinary governance

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ABSTRACT

This article introduces the concept of *improvised pragmatism of care* to analyze how Indigenous communities, living in and around protected areas navigate animal health amidst ecological disruption and limited institutional capacities. Drawing on focus group discussions conducted in 2024 in seven communities of the Great Limpopo Transfrontier Conservation Area in Mozambique, we show how livestock care emerges not as static tradition nor simple adoption of biomedical protocols, but as dynamic practices that combine embodied diagnosis, herbal repertoires, and selective engagement with veterinary interventions. These plural strategies constitute resilient responses to epistemic injustice and ontological displacement in a conservation landscape. Improvised pragmatism of care captures this mode of governance from below: an active reconstitution of knowledge and practice under conditions of uncertainty. Our analysis cautions against treating animal health as an abstract, detachable component independent of human–animal relations or as separable from historical trajectories and contemporary territorial and environmental management policies. By foregrounding community improvisation as both epistemic and political practice, this study contributes to veterinary anthropology and health social sciences, highlighting how Indigenous actors can sustain multispecies health in contested landscapes marked by displacement and inequality.

1. Introduction

Animal health in Indigenous communities is deeply embedded in multispecies ontologies that link human–animal–environmental well-being (Brown & Nading, 2019; Lynteris & Keck, 2018; Nading, 2013). Medical geography, medical anthropology, and ethnoveterinary studies have documented plural, adaptive animal health care practices and their articulation within conventional veterinary systems (Kearns & Moon, 2002; Kleinman, 1980; McCorkle & Mathias-Mundy, 1992). Veterinary anthropology has shown that animal health interventions are never purely technical but rather are negotiated within governance,

biosecurity, and historical inequalities (Broz et al., 2023; Gardiner, 2016). Yet, we know little about how Indigenous communities (re) combine knowledge to navigate and remake veterinary governance for animal health in conservation landscapes characterized by institutional fragmentation and reconfigured human–animal–environmental relationships. This article helps address this knowledge gap with an empirically grounded and conceptually driven account of veterinary governance in a conservation landscape in southern Mozambique.

Veterinary anthropology positions the entanglements of animal health, governance, and power; in our case study described below, these entanglements cannot be divorced from conservation. On the African

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continent, conservation landscapes have been widely analyzed as post-colonial modalities of territorial governance: ways of regulating land use that reorder access, authority, and obligations in places inhabited by Indigenous communities (Adams & Hutton, 2007; Brockington et al., 2008; Silva & Strong, 2025a, 2025b). National parks, as one form of conservation, can not only serve as a veterinary terrain but also as conservation practice shaped by forced human-animal-environment relocations, tightly regulated or even criminalized subsistence practices, and shifting human-wildlife interfaces (Givá & Raitio, 2017; Milgroom & Spierenburg, 2008). Prior research has documented how these conservation landscapes can produce forms of marginalization, from the displacement of communities (Ferreira, 2012; Ramutsindela et al., 2022; Otsuki, 2022) to the criminalization of local practices (Green, 2025; Hübschle, 2017, 2025; Hübschle & Shearing, 2018). This hysteresis is central for understanding why communities in and around national parks can be both simultaneously reliant on and alienated from veterinary infrastructures. It is against this backdrop of conservation-induced rupture and institutional fragility—and of the continuities and creative recompositions through which communities sustain multispecies life—that we develop the concept of *improvised pragmatism of care*.

We introduce *improvised pragmatism of care* as an analytical lens to examine how Indigenous communities living within the Great Limpopo Transfrontier Conservation Area (GLTFCA)—and particularly those situated in and around Limpopo National Park (LNP) in Mozambique—manage animal health under conditions of ecological uncertainty, institutional fragility, and epistemic marginalization. Our research aims to advance understanding about how veterinary authority can be contested and reconstituted in contexts where formal veterinary systems are weak or intermittent; particularly in communities maintaining diverse animal health practices that challenge dominant biomedical rationalities. Our conceptual approach is grounded in the lived realities of Indigenous communities located both inside LNP and in adjacent areas of the GLTFCA. These communities have historically maintained strong relationships with their livestock and wildlife not only as sources of subsistence, but also as central actors in social, traditional, and territorial life (Beinart & Brown, 2013; Direito, 2024; Ekblom et al., 2013). Since the park's creation in 2001, a series of overlapping disruptions (e.g., settlement relocations, conservation-driven land restrictions) have profoundly altered human-animal-environment relations (Ferreira, 2012; Givá & Raitio, 2017; Milgroom & Spierenburg, 2008; Silva et al., 2018). We make two contributions: conceptually, we theorize community improvisation as pragmatist care and locally rooted governance; empirically, we document how community-driven manifestations of animal health governance emerge through focus group discussions across seven communities located within LNP and in its broader GLTFCA surroundings.

Amidst overlapping disruptions, new vulnerabilities have emerged with implications for animal health and human well-being. The combination of living conditions (e.g., inadequate sewage and waste management, shared living spaces with livestock) and livestock's limited access to water resources, grazing areas, and intensified proximity to wildlife has increased exposure to zoonotic diseases (Jori et al., 2016; Tanner et al., 2015; Zaffarano et al., 2023). While the public health significance of these zoonotic risks is well recognized, veterinary infrastructure operates with limited diagnostic capacity and irregular outreach in remote areas (Bocchino et al., 2013). These challenges are further shaped by broader systemic constraints in Mozambique's health sector, including budgetary limitations, uneven territorial coverage, shortages of trained professionals, and the continued reliance on traditional healing practices where biomedical services remain scarce (Mpofu et al., 2011; Nebane, 2023; WHO, 2021). The practical response of many Indigenous people to these conditions has been to mobilize hybrid repertoires of care, blending experiential knowledge and informal veterinary strategies, as practical and epistemic tools to manage health and sustain life (Strong, 2019).

We develop the concept of improvised pragmatism of care below (Fig. 1) and show how it structures our analysis into three interlinked themes: (1) situated knowledges and plural practices of animal health; (2) transformed human-animal relations; and (3) governance arrangements and epistemic frictions. Beyond disciplinary contributions to veterinary anthropology and health social sciences (Whittaker et al., 2021), this article intervenes in critical debates on global health governance, particularly One Health (OH). Recent critiques call for ontological reflexivity, warning that without it OH risks reproducing epistemic violence by marginalizing non-biomedical ways of knowing and by narrowing interspecies health to biosecurity logics of zoonotic containment and surveillance (Hinchliffe, 2015; Kaiser-Grolimund et al., 2025; Keck, 2020; Steffens & Finnis, 2022). Echoing Redvers et al.'s (2026) insistence that OH engagement must begin from local ontologies, responsibilities to land, and Indigenous knowledge systems, we show how such grounded understandings shape the improvised pragmatisms through which communities navigate multispecies health. Against this backdrop, we provide grounded evidence of how health governance unfolds amid colonial legacies, infrastructural fragility, and multispecies entanglements.

1.1. Conceptual framework: improvised pragmatism of care

In dialogue with veterinary anthropology that foregrounds the negotiation of authority, biosecurity assemblages, and historical inequalities—and treats animal health interventions as situated and contested practices (Broz et al., 2021; Broz et al., 2023; Gardiner, 2016)—we introduce improvised pragmatism of care to help conceptualize how communities compose animal health, and in doing so, govern from below amid ecological uncertainty, institutional unevenness, and epistemic marginalization. The concept does not describe a

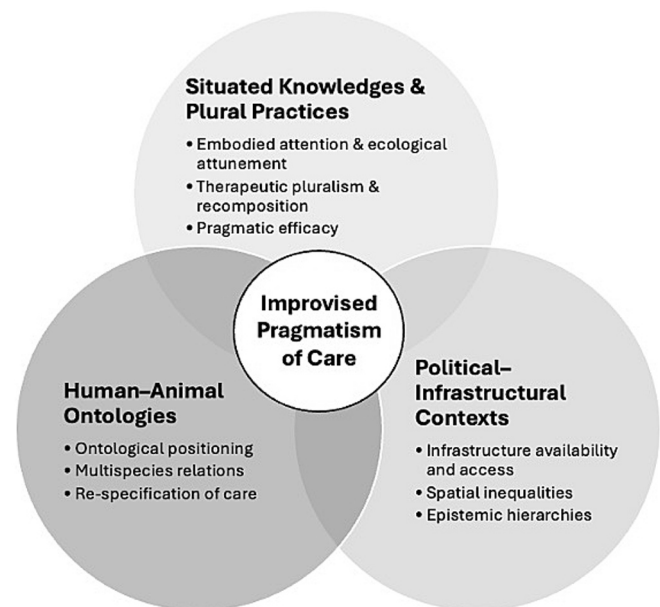


Fig. 1. Conceptual framework: Improved pragmatism of care. The diagram situates improvised pragmatism of care at the intersection of three interlocking domains: (i) Situated Knowledges & Plural Practices (embodied attention & ecological attunement; therapeutic pluralism & recombination; pragmatic efficacy), (ii) Human-Animal Ontologies (ontological positioning; multispecies relations; re-specification of care), and (iii) Political-Infrastructural Contexts (infrastructure availability and access; spatial inequalities; epistemic hierarchies). Overlaps signal that these domains function as mutually conditioning fields rather than discrete spheres; their articulation both enables and is reshaped by governance-from-below grounded in pragmatist reasoning, tinkering, and enskilled improvisation.

residual set of beliefs; it names a practical reasoning assembled in place and time under shifting constraints and opportunities. While conservation-induced rupture and intermittent infrastructures sharpen these constraints, the improvisational orientation we describe also draws on longer-standing, intergenerational repertoires of multispecies care in which diagnosis and treatment are continuously recomposed with animals, plants, landscapes, and partial institutions (Catley et al., 2012; Lainé & Morand, 2020; Lainé & Payyappallimana, 2025; Wolf, 2015). In this sense, improvisation is not only reactive—a response to fragility—but also generative; it is a routine way of inhabiting ecological uncertainty and sustaining multispecies livelihoods over time. Such continuities reflect what Ruwet et al. (2025) describe as the deep, context-specific Indigenous and local knowledge through which communities have long sustained the health of humans, animals, and landscapes.

Improvised pragmatism of care draws on a pragmatist lineage that understands knowledge by its consequences—experimentation, adjustment, and the search for “what works” in practice (Dewey, 1927; James, 1907). It aligns with practice-based accounts of care as tinkering—ordinary testing, modifying, and calibrating relations, tools, and bodies (Mol, 2008; Mol et al., 2010)—and with anthropological approaches to enskilled improvisation, where situated attention and embodied skill guide action under uncertainty (Ingold, 2002, 2018). It also resonates with more-than-human ethics of care, where animal health is understood through relational and multispecies obligations rather than through exclusively biomedical or human-centered frameworks (Hinchliffe, 2015; Puig de la Bellacasa, 2017). Building on multispecies OH scholarship, we treat animals not only as targets of intervention or objects of risk, but as participants in the production of diagnostic knowledge, insofar as their habits, signals, and responses co-shape what counts as illness, efficacy, and recovery (Kaiser-Grolimund et al., 2025; Lainé & Morand, 2020; Lainé & Payyappallimana, 2025). From this vantage, Indigenous knowledge is validated not by prior doctrinal authority but by its effects on animal, human, and ecological well-being.

Three key implications orient the framework. First, improvised pragmatism of care approaches local diagnostic and care practices as strategic, responsive adaptations rather than passive tradition. Knowledge is situated: it emerges from close, embodied attention to animals, ecological attunement, and the navigation of changing frictions and affordances—availability and cost of pharmaceuticals, timing and reach of campaigns, advice from veterinary actors, and the circulation of herbal repertoires. The emphasis falls on recomposition across heterogeneous tools and explanations, with criteria of efficacy refined through everyday observation and collective memory (Ingold, 2018; Mol, 2008). This draws on ethnoveterinary work documenting rich repertoires and their articulation with conventional systems (Barbosa et al., 2023; Barbosa et al., 2020; Dzoyet et al., 2020; McCorkle & Mathias-Mundy, 1992; Mengistu et al., 2017), and on medical anthropology accounts of therapeutic pluralism and the situated production of care (Kleinman, 1980; Langwick, 2018; Olsen & Sargent, 2017). Second, this pragmatism recognizes animals’ ontological positioning as kin, co-workers, property, pests, charismatic assets, or disease risks conditions what forms of care are appropriate or legitimate. For instance, restrictions on hunting can reframe wildlife from co-inhabitants to protected risk-bearing entities, transforming how health and harm are diagnosed, prevented, or repaired (Strong & Silva, 2020). Such shifts exemplify ontological displacement in which multispecies relations are recast and the moral ecology of care is reorganized (Blaser & de la Cadena, 2018; Escobar, 2017; Nading, 2013). The framework helps track such reconfigurations without assuming a linear transition from “tradition” to “biomedicine.” Attending to these positionings also entails recognizing animals as co-participants in health governance, moving beyond risk-only, human-centered representations toward relational accounts of care that are central to decolonizing OH (Redvers et al., 2026). Third, care is embedded within political–infrastructural arrangements, including

governance and epistemic hierarchies that shape what practices are feasible, when and how, and by whom. As Redvers et al. (2025) emphasize, these governance and epistemic hierarchies are inseparable from colonial legacies that continue to constrain Indigenous self-determination, land rights, and the ability to exercise relational, land-based knowledge systems in health practice. Roads, cold chains, pharmacies, extension agents, and communication channels; the intermittence or density of state presence; and the recognition (or dismissal) of experiential expertise collectively structure the feasibility of care. Drawing on medical/health geography, we understand disease and care as mediated by place and shaped by spatial inequalities in access and responsiveness (Kearns & Moon, 2002). Where procedures circulate as surveillance rather than collaboration, epistemic injustice may arise (Fricker, 2007) prompting communities to reassemble care—coordinating information, triaging urgencies, purchasing or withholding drugs, and selectively adopting or suspending formal protocols. These are not merely coping tactics; they comprise a pragmatic mode of governance from below that holds multispecies livelihoods together amid partial infrastructures (Brown & Nading, 2019; Broz et al., 2023).

As elaborated above, improvised pragmatic care offers a lens for analyzing plural practices, shifting ontologies, and infrastructural constraints as interlocking conditions. The framework organizes the analysis that follows by tracing how repertoires are assembled and judged in everyday practice; how ontological positions of animals reconfigure moral and epidemiological horizons; and how governance devices and epistemic hierarchies are negotiated, resisted, or reworked in place.

2. Methods

2.1. Study area

The GLTFCA, covering approximately 95,000 km² across Mozambique, South Africa, and Zimbabwe (Fig. 2), is one of the largest transboundary conservation initiatives in southern Africa. It integrates several transfrontier conservation areas and core national parks and reserves—Kruger, Gonarezhou, Banhine, Zinave, and Limpopo—together with surrounding buffer zones, and communal lands, with the aim of promoting ecological connectivity, coordinated wildlife management, and regional cooperation. Within this landscape, the LNP in Gaza Province, Mozambique, spans 10,980 km² and constitutes a critical Mozambican anchor of the GLTFCA. The park protects endangered ecosystems and facilitates species dispersal and transboundary genetic exchange, with elephants, buffalo, lions, and other large mammals recolonizing from South Africa’s Kruger National Park (ANAC, 2022; Roque et al., 2022).

Indigenous communities residing within the GLTFCA, and particularly in and around the LNP, have weathered successive disruptions such as hunting restrictions, displacement, and ongoing exclusion under conservation policies (Ferreira, 2012; Hübschle, 2017; Massé, 2016; Otsuki, 2022; Strong & Silva, 2020). We use Indigenous (capitalized) to recognize historically rooted communities with distinctive livelihoods and vulnerabilities, following rights-based usage in Africa (ACHPR, 2005) and scholarship that treats naming and capitalization as political recognition rather than mere description (UN, 2007). These communities’ experiences are embedded in persistent spatial inequalities and uneven state presence (Silva, 2020). Over the past five decades, these disruptions have unfolded in two major phases of territorial transformation, each reshaping multispecies relations through political conflict, environmental disruption, and conservation policy.

The first transformative phase began with the creation of the Coutada 16 hunting reserve in 1969 under Portuguese colonial rule, which restricted Indigenous land use and hunting. Subsequent natural disasters, including the 1972 flood and 1985 drought, triggered displacement and temporary migration. The Mozambican civil war (1977–1992) intensified these pressures, causing widespread mortality,

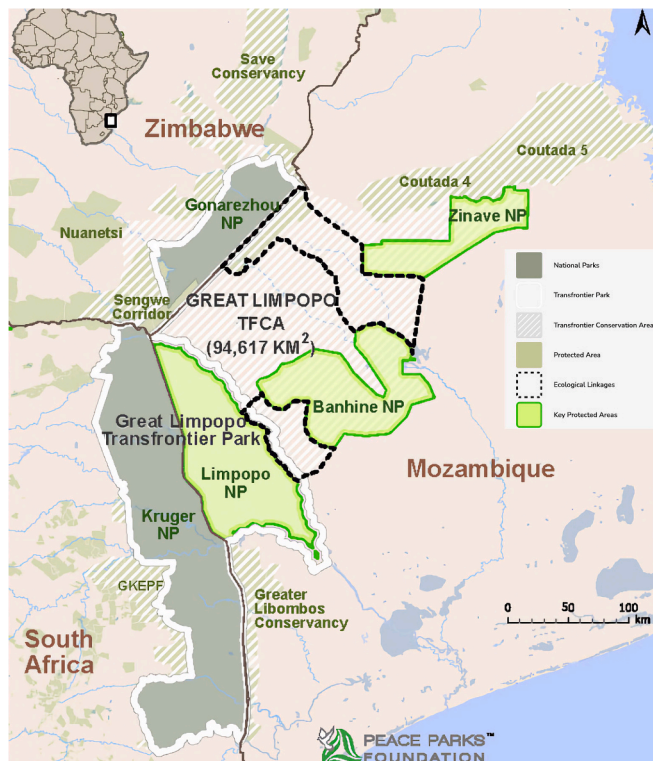


Fig. 2. Map of the Great Limpopo Transfrontier Conservation Area (GLTFCA), spanning Mozambique, South Africa, and Zimbabwe. The map highlights the five core national parks (Kruger, Gonarezhou, Limpopo, Banhine, and Zinave), ecological linkages, and surrounding protected areas that together form the transboundary conservation landscape (~95,000 km²). .
Source: Peace Parks Foundation

displacement, and household fragmentation (Malate et al., 2025). Armed groups exploited wildlife for subsistence and trade, leading to ecological collapse and severing long-standing human–animal relations (Ferreira, 2012). Conflict-related violence and insecurity pushed residents off their land, disrupting subsistence practices and weakening intergenerational ecological knowledge (Givá and Sriskandarajah, 2012; Givá and Sriskandarajah, 2014). Resettlement policies—initiated during late colonial rule and expanded during the war and post-war reconstruction—reconfigured settlement patterns and contributed to the erosion of cultural and territorial continuity (Massé, 2016; Milgroom & Spierenburg, 2008). Thousands fled to South Africa, and although some returned, the region's socio-ecological fabric was profoundly altered.

The second phase of territorial disruption began with the establishment of LNP in 2001. The park, modeled on South Africa's Kruger National Park and guided by fortress conservation principles, aimed at tourism and ecological connectivity (Massé & Lunstrum, 2016; Notelid & Ekblom, 2021). At its inception, LNP encompassed roughly 27,000 residents, including 7,000 across eight communities in the Shingwedzi River valley (Wamir et al., 2017). Today, the park maintains formal relations with around 60 Indigenous-origin communities (ANAC, 2022). Conservation policies have introduced major regulatory changes, including Law 16/2014 and Decree 89/2017, which institutionalized a licensing system for subsistence hunting, perceived by residents as effectively prohibitive due to bureaucratic hurdles, enforcement patterns, and uncertainty over permissible zones—disrupting long-standing environmental management and ecological knowledge transmission (Givá & Raitio, 2017). Wildlife restocking and the removal of barriers with Kruger National Park facilitated the movement of over 5,000 animals, including more than 1,000 elephants into previously cultivated and inhabited areas, intensifying human–wildlife conflict (Givá and

Sriskandarajah, 2012; Otsuki, 2022). Crop destruction, loss of food reserves, and property damage led some residents to view wildlife as threats or state property, signaling a symbolic rupture in multispecies coexistence (Strong, 2019; Strong & Silva, 2020). Human relocation during LNP's gazettement further compounded these tensions, disrupting social networks and increasing reliance on external support—while many promised improvements in infrastructure and livelihoods failed to materialize—(Hübschle, 2017; Massé, 2016; Milgroom & Spierenburg, 2008).

Health systems within and around LNP reflect a broader pattern of infrastructural neglect affecting both humans and animals. Medical services are scarce, particularly in remote interior areas where poor roads and limited staffing make access difficult (WHO, 2021). In response, communities rely heavily on traditional medicine—herbal remedies, spiritual practices, and local healers—which, despite its cultural legitimacy, remains marginalized in national health planning and often dismissed as superstition (Bandeira et al., 2001; Mpofu et al., 2011; Nebane, 2023; Nicosia et al., 2022).

Animal health systems reflect the same structural neglect that characterizes human health systems. Livestock is central to subsistence, cultural identity, and economic resilience (Beinart & Brown, 2013; Direito, 2024), yet veterinary services are limited to sporadic vaccination campaigns with little ongoing support (Bocchino et al., 2013). This institutional absence is especially concerning given the ecological proximity between wildlife, livestock, and humans, which heightens the risk of zoonotic disease transmission. Studies have documented high prevalence rates of cystic echinococcosis (Zaffarano et al., 2023), bovine tuberculosis, brucellosis (Tanner et al., 2015), and foot-and-mouth disease (Jori et al., 2016) among park fauna, underscoring the fragility of current surveillance systems. One rationale for the creation of the GLTFCA was precisely to address these risks and promote not only ecological connectivity and tourism, but also regional coordination on transboundary animal disease control (Geoghegan, 2009; Mavhunga & Spierenburg, 2009). Yet, in practice, both human and animal health systems remain under-resourced, fragmented, and poorly integrated into broader conservation and development agendas.

2.2. Data collection

This study draws on 12 focus group discussions (FGDs) conducted between June and July 2024 in seven Indigenous communities, five located in the LNP (Chicumba, Cunzi, Machaule, Mbuza, and Muguambane), and two in the southern part of the GLTFCA (Baptine and Mucacasa) (Fig. 3). The seven communities were selected not only because of their long-standing ecopolitical and historical entanglements with the environment, livestock, and wildlife, but also to capture spatial diversity. Their inclusion further reflected the guidance of park officers regarding the practical conditions of access and safety shaped by the degree of conflict, ongoing negotiations over resettlement, and research fatigue (Casal-Ribeiro et al., 2024) resulting from repeated research demands on these communities.

Two distinct scripts were used to guide the conversations (Suppl Mat): FGD-A, which explored the intersections of conservation, health, and intercommunity relations and FGD-B, which focused primarily on the tensions between conservation policies and animal health. Prior to data collection, consent was obtained from local leaders in all participating communities, ensuring culturally appropriate engagement and collaborative participation throughout the research process (Baule, 2024; Gore et al., 2025).

All FGDs were conducted in Changana. Each group consisted of approximately 12 participants, with careful attention paid to gender balance and age diversity (Table 1). Participants sat in a circle, and each session was recorded. Sessions (~90 minutes) began with a welcome message and verbal informed consent, during which the goals of the research were explained. In some cases, community members led an opening prayer. The discussions concluded with a summary, collective

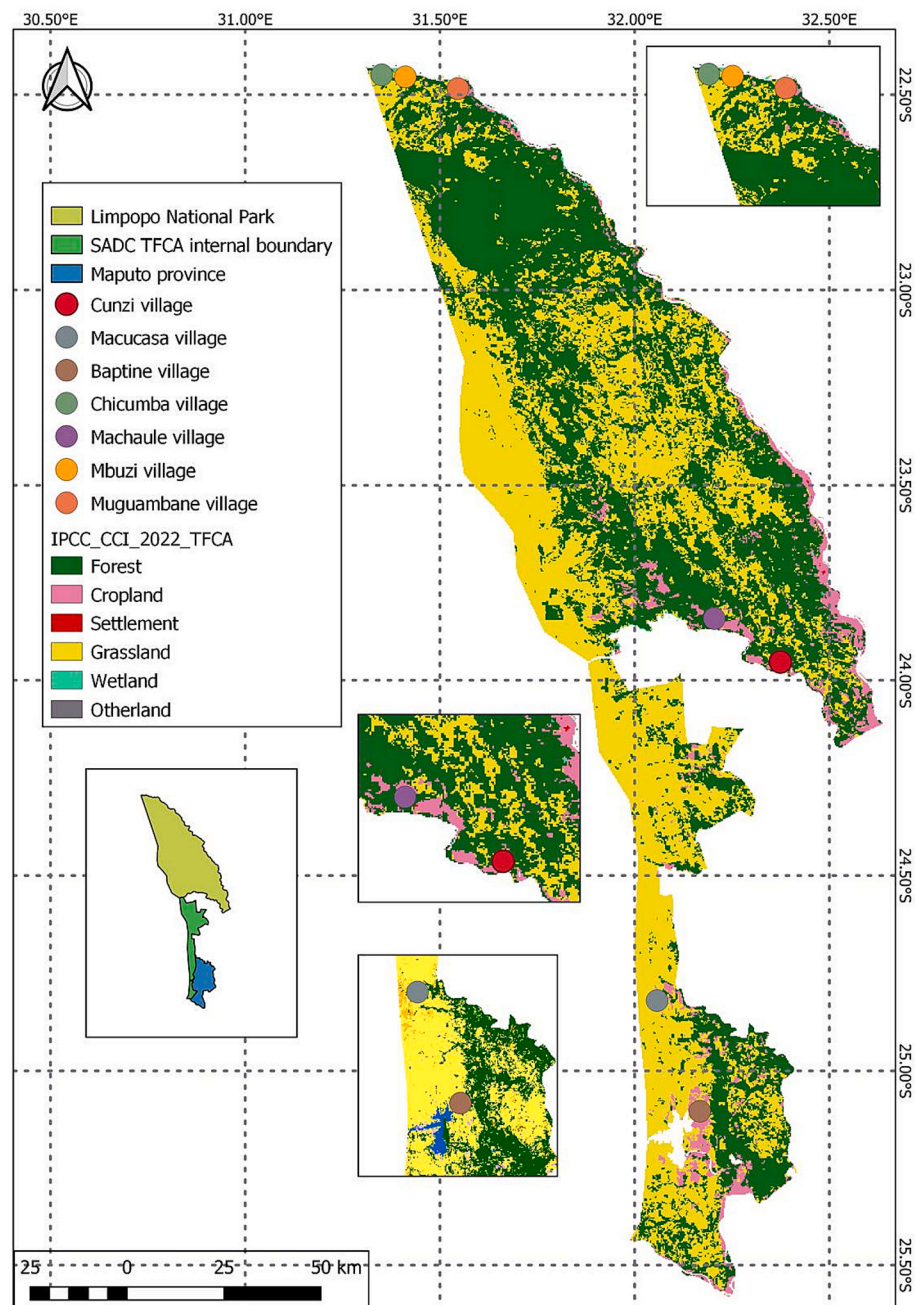


Fig. 3. Location of the seven study communities in relation to the Limpopo National Park (LNP) and the Great Limpopo Transfrontier Conservation Area (GLTFCA), Mozambique. Five communities (Chicumba, Cunzi, Machaule, Mbuzi, and Muguambane) are located inside the LNP, while two (Baptine and Mucacasa) lie outside the park boundaries but within the broader GLTFCA. Land cover is shown according to IPCC CCI 2022 categories (forest, cropland, settlement, grassland, wetland, other land).

reflection, and final expressions of gratitude. Participation was entirely voluntary, without monetary compensation, and participants were free to join, leave, or withdraw from the activity at any point, without any consequence.

The general structure of the FGDs followed a participatory, multi-lingual format designed to broaden inclusion and reduce language-related power asymmetries (Kitzinger, 2008). The lead researcher posed questions in Portuguese, a trained enumerator interpreted into Changana and facilitated turn-taking, and a second enumerator provided the researcher with real-time whispered back-translation of responses into Portuguese. Such paired interpreting in cross-language qualitative research helps preserve interactional flow, supports probing without halting discussion, and mitigates misinterpretation (Esposito,

2001; Squires, 2009; Temple & Young, 2004).

Two data enumerators were selected per community, all of whom were local residents. Recruiting facilitators from within the village helped build trust, ensured cultural and linguistic competence, and supported more accurate interpretation, especially in participatory, cross-language research (Chilisa, 2012). Selection took place during a prior visit in May 2024 by a Mozambican team member, in coordination with LNP staff and community leaders. Criteria included literacy, fluency in Portuguese and Changana, prior experience in research or community work, and a reputation of trustworthiness (Baule, 2024). Enumerators received targeted training in a two-person interpreting model: one moderated and translated questions, while the other provided real-time back-translation and assisted with note-taking—an

Table 1

Summary of communities and Focus Group Discussion (FGD) participation during fieldwork (June–July 2024). The table presents the location, estimated population, type of focus groups conducted, and gender composition of participants. FGD-A explored the intersections of conservation, health, and inter-community relations, while FGD-B focused on tensions between conservation policies and animal health.

Community Name	Location	Estimated Population	Focus Groups Conducted	Gender Distribution by FGD
Baptine	Maputo Province, Mozambique	714	FGD-A	FGD-A: 4 women, 5 men
Chicumba	Pafuri, Gaza Province, Mozambique	250	FGD-A and FGD-B	FGD-A: 6 women, 5 men FGD-B: 5 women, 5 men
Cunzi	Massingir, Gaza Province, Mozambique	960	FGD-A and FGD-B	FGD-A: 6 women, 3 men FGD-B: 6 women, 4 men
Machaule	Massingir, Gaza Province, Mozambique	500	FGD-A and FGD-B	FGD-A: 4 women, 6 men FGD-B: 9 women, 8 men
Muguambane	Pafuri, Gaza Province, Mozambique	725	FGD-A and FGD-B	FGD-A: 5 women, 5 men FGD-B: 5 women, 4 men
Mbuzi	Pafuri, Gaza Province, Mozambique	450	FGD-A and FGD-B	FGD-A: 4 women, 4 men FGD-B: 3 women, 6 men
Mucacasa	Maputo Province, Mozambique	340	FGD-A	FGD-A: 5 women, 5 men

approach shown to maintain conversational flow and reduce misinterpretation in multilingual focus groups (Temple & Young, 2004). Training also emphasized neutrality, respectful facilitation, and cultural sensitivity.

This research was approved by the University of Maryland, College Park Institutional Review Board as Exempt (2068333-1), permitted by the Mozambican Administracao Nacional das Areas de Conservacao (ANAC), and authorized by traditional authorities.

2.3. Data analysis

All audio recordings were translated and transcribed by a native Changana speaker and underwent two rounds of review to ensure accuracy and consistency, a process recommended to minimize errors and strengthen reliability in translated qualitative data. Prior to analysis, transcripts were de-identified: personal names and specific identifiers were removed; quotations are referenced by community and FGD labels only. Audio files and consent materials were held separately from the de-identified corpus, and access to the analytic dataset was restricted to the research team.

Transcripts were imported into NVivo 12 for qualitative data management and coding (Q.S.R.NVivo, 2018). The first analytic cycle applied structural coding aligned with the FGD scripts to enable cross-group comparison (Saldaña, 2016). In the subsequent phase, analysis proceeded iteratively between data and concepts. The deductive strand was explicitly structured by the article's analytical framework, using its three sensitizing domains as top-level code families for cross-case queries: (1) situated knowledges and plural practices of animal health; (2) ontological positioning of animals and implications for care; and (3) governance arrangements and epistemic frictions. In parallel, inductive open coding generated emic categories that were constantly compared against and used to refine the framework (Charmaz, 2006). In practice, this meant moving back and forth between fragments and emerging

arguments rather than following a strictly linear coding sequence. This iterative and interpretive strategy, characteristic of anthropological inquiry, rests less on replicability or scalability than on the weaving together of qualitative data and theoretical concepts into a coherent analytical narrative (Hammersley & Atkinson, 2001).

This study faced several limitations. Variation in the number of FGDs per community (Table 1) reflected logistical constraints rather than substantive design flaws. The presence of park liaison officers, common in protected areas research for permitting and safety, may have shaped responses through social desirability or reduced critical discussion (Bernard, 2011). Moreover, the team's composition, primarily non-Mozambican and white, introduced linguistic and cultural asymmetries that raised issues of positionality and privilege. Although mitigated through the recruitment of local enumerators and repeated visits over two years, such dynamics inevitably influenced interactions and interpretations, as is typical in cross-cultural research shaped by historical inequalities (Holmes & Marcus, 2008).

3. Results & discussion

Drawing on our analysis of focus group data, we present a combined analysis of results and discussion to explore how Indigenous communities in and around LNP navigate multispecies health and governance amid ecological uncertainty and institutional fragmentation. While we document rupture, marginalization, and infrastructural absence as key features of the conservation landscape, we also attend to continuities and creative recompositions through which people inhabit ecological uncertainty and maintain multispecies livelihoods. Rather than treating these practices primarily as responses to zoonotic threat, we read them as multispecies health-making. This shift foregrounds animals as active participants in relational practices whose behaviors and movements co-produce diagnostic insight and shape the rhythms of care.

Three interrelated themes structure the analysis. First, communities rely on diagnosis through close observation and relational attunement, adjusting care through iterative, experience-based reasoning—a mode we describe as *improvised pragmatism of care*. Second, conservation regimes have reconfigured human–animal relations through ontological displacement, fracturing integrated cosmologies and recasting wildlife as external and threatening. Third, epistemic frictions emerge as local knowledge is routinely dismissed or excluded from decision-making, prompting demands for recognition, accountability, and more dialogical forms of governance. The sections that follow examine these themes in depth, tracing how they unfold across diagnostic practices, ecological relations, and governance encounters.

3.1. Situated knowledges and plural practices of animal health

While biomedicine often assumes a standardized system of care, participating communities described a flexible, pragmatic approach that draws on everyday observation and the shifting availability of both state and non-state interventions. This pluralism is not a vestige of tradition but a dynamic response to changing ecological and institutional conditions. The following sections examine: (1) how diagnoses emerge through embodied observation; (2) how therapeutic repertoires adapt to new disease dynamics; and (3) how care is mobilized amid infrastructural gaps and evolving perceptions of efficacy.

3.2. Embodied diagnoses and the everyday practice of animal care

Across the LNP, illness in livestock is typically identified through physical signals from individual animals—limping, hair loss, lack of appetite, mouth foam, or bleeding—and addressed first through domestic treatments. In Machaule, one man explained: “*When the cattle are limping, we take the plant, chop it up or burn it and put it in the cattle’s food and the cattle get well*” (Machaule, FGD-A). This approach was echoed in multiple villages, where participants described a range of herbal

preparations administered via ingestion, topical application, or infusion in drinking water. Such practices resonate with ethnoveterinary studies across Africa, where livestock illness is commonly recognized through embodied observation and treated with locally available plant remedies before formal veterinary care is sought (Dharani, 2015; Eiki et al., 2021; Mathias, 2004; Tabuti et al., 2003). In Mucacasa, a woman recalled: “We don’t call healers when cattle are sick. We grew up seeing our parents go to the bush, get the right plant, soak it, boil it or feed it to the animals. This is the medicine we use. We cure our cattle ourselves” (Mucacasa, FGD-A).

This knowledge is not fixed but remains sensitive to changes in animal behavior, disease patterns, and environmental cues, such as recent buffalo incursions, signs of wildlife presence at shared water points, or the sight of carcasses near grazing areas reported by participants. People routinely observe their livestock to interpret signs of illness. As noted in Chicumba: “The main disease that plagues the cattle is bile disease. If they’re not treated quickly, they die. Chickens get swollen eyes and goats get dizzy” (Chicumba, FGD-A). Diagnostic practice, in this sense, is embodied and relational. It emerges from continuous proximity to animals and an intimate attentiveness to the rhythms of their well-being, what Ingold (2002, 2011, 2018) might describe as knowing-from-within, rather than through detached expertise. At the same time, participants’ accounts point to intergenerational continuity in these practices of attentiveness and therapeutic recomposition, as people describe having learned plant-based treatments and everyday diagnostic skills by “growing up” alongside livestock and observing how others cared for animals over time. This continuity matters for how we theorize improvisation: what we call improvised pragmatism of care is not only triggered by institutional absence, but also sustained as an enskilled way of living with variable disease ecologies, where practical knowledge is refined through long-term familiarity, collective memory, and animals’ responses (Lainé & Morand, 2020; Wolf, 2015).

These accounts also allow us to treat animals more explicitly as participants in diagnostic worlds. Caregivers do not simply “read” symptoms on animal bodies; they learn to differentiate what counts as abnormal against each animal’s ordinary dispositions, rhythms, and routines, and they recalibrate treatments through the animals’ own responses over time. In this sense, diagnosis is co-produced across bodies and environments through interspecies attentiveness, rather than being a purely human-centered act applied to animals as objects. This is consistent with multispecies scholarship that emphasizes care as an apprenticeship in responsiveness, where animals’ capacities to signal, resist, and recover are part of how practical knowledge is learned and evaluated (Ingold, 2018). It also resonates with more-than-human OH arguments that call for taking animal knowledges and interspecies co-diagnosis seriously, rather than reducing animals to vectors or protected assets (Kaiser-Grolimund et al., 2025; Lainé & Payyappallimana, 2025).

However, as “new diseases” emerged —“new” for community members meaning unfamiliar symptom clusters, illnesses perceived to originate from wildlife contact, or conditions that did not respond to customary herbal remedies— participants confronted the limits of their therapeutic repertoire. In Chicumba, they described sudden deaths in cattle after grazing on grass believed to be contaminated by pathogens from wild animals (especially buffalo), wounds that fail to heal, and skin diseases attributed to buffalo: “With that disease, once they eat the grass, they die immediately,” explained one participant, while another added: “There’s another type of disease from the buffaloes which affects the cows’ skin, causing them a skin sickness. It makes their skin look whiten” (Chicumba, FGD-B).

Participant experiences reflect a diagnostic process grounded in observation and empirical reasoning: “You can see that it is sick and it trembles... it has a biliary disease and when it is bitten it stays with a wound that doesn’t heal” (Chicumba, FGD-B). At the same time, they underscore the affective and epistemic stress of facing unfamiliar pathogens. As one respondent concluded: “We don’t know where it is from, but once they eat that grass which is infected, they die” (Chicumba, FGD-B). These

challenges do not negate Indigenous knowledge but expose the need for improvisation under conditions of ecological and institutional uncertainty. Rather than fixed protocols, care practices are improvisational, responsive, and grounded in continuous relational attunement to animal well-being.

3.3. Limits of tradition and the expanding role of veterinary interventions

Herbal remedies for animals are not invoked uncritically. In some areas, their perceived efficacy has declined. In Cunzi (FGD-A), participants stated plainly: “The herbs don’t work anymore”. A similar concern was raised in Mbuzi (FGD-B), where one man linked treatment failure to new disease ecologies: “The problem is that our animals now have diseases from the buffaloes. That’s why traditional medicine doesn’t work anymore, because the sickness is from the buffaloes”. These remarks do not reject local knowledge but underscore its perceived limits when confronted with emerging health challenges and changing disease ecologies. Rather than dismissing traditional practices, residents point to the need for complementary strategies, especially when the source of illness is perceived to lie beyond the known and familiar.

This dynamic opens the space for veterinary interventions. In Muguambane (FGD-A), some participants described how extension workers are called upon during outbreaks: “We call in extension workers to help,” explained one respondent, “because that’s their job.” Yet, another added: “Here the cattle get sick and even die waiting for help to arrive. So as an alternative we go to the healers”. This tension between state veterinary support and local resourcefulness highlights the uneven geography of care. While some participants reported proactive strategies like individual vaccination (“I vaccinate, personally,” said one woman in the same FGD), others voiced frustration over delays and inaccessibility.

Participating communities also displayed situated ecological knowledge about disease transmission, particularly at the intersection of domestic and wild animal spaces. In Muguambane (FGD-B), participants recounted how sick livestock had grazed where carcasses of dead wild animals were previously seen. “We can observe that domestic animals are not growing up well and they have some skin problems, and the wild animals also share the same place where they drink water with our domestic animals”. Such observations—rooted in everyday interactions with landscape and animals—demonstrate a form of empirical reasoning that informs health decisions, even in the absence of formal veterinary explanations.

In this fragmented landscape, veterinary interventions appear less as solutions than as intermittent moments of institutional presence (welcomed when functional, circumvented when absent). This uneven geography of care demonstrates the pragmatic pluralism with which communities navigate animal health: integrating herbal repertoires, embodied diagnosis, and sporadic veterinary services into a flexible assemblage. Improvised pragmatism here becomes a form of governance from below, sustaining livestock and livelihoods in the face of ecological uncertainty and institutional fragility (Mol et al., 2010; Puig de la Bel-lacasa, 2017).

3.4. Improvised pragmatism in a fragmented health landscape

Although herbal remedies continue to play a prominent role in animal care, biomedical treatments are increasingly present (albeit inconsistently). In Chicumba (FGD-A), older participants recalled that “before the veterinary brigades, we used plants [...] now, to keep the cattle going until the brigades arrive, we buy [a veterinary supplement] and give them a little to drink”. Others add salt to the water as a supplementary measure. These practices reflect not a wholesale adoption of one system over another, but a layering of techniques guided by necessity, availability, and pragmatism.

Pragmatism was also shaped by the economic and logistical constraints that determine what forms of care are viable in practice. While some respondents described seeking assistance from trained veterinary agents, others emphasized the prohibitive cost of conventional

treatments. In Mucacasa (FGD-A), a participant noted: “*We use conventional medicine now, but they’re very expensive and we can’t all afford them*”. Even when biomedical options are perceived as more effective or symbolically powerful, their use remains contingent on affordability and availability. In this context, traditional remedies are not abandoned, but persist as the most accessible and contextually adapted tools for care.

The pluralism observed here was not just a catalog of options but reflects a flexible epistemic orientation. Participants indicated that they did not adhere rigidly to inherited knowledge, nor did they uncritically adopt new forms of treatment; they move between epistemologies depending on what works, for whom, and under which conditions. This movement, as noted by Olsen and Sargent (2017), is not confusion but a way of navigating a fragmented therapeutic landscape shaped by economic constraints, institutional absences, and shifting ecological pressures. We extend this insight by framing such pluralism as an improvised pragmatism of care: a mode of reasoning where knowledge is judged by consequences (Dewey, 1927; James, 1907), adjusted through tinkering (Mol, 2008), and co-constituted across animals, plants, drugs, and infrastructures (Puig de la Bellacasa, 2017).

The growing presence of state-led interventions—vaccination campaigns, livestock movement restrictions, and animal registration—has valorized formal veterinary practices. In Cunzi (FGD-A), one respondent remarked: “*There is a vaccination programme. And it helps a lot!*”. Yet even when these services are appreciated, their availability remains uneven. Where they succeed, they are valued not just for their curative power but for their pedagogical influence: they shape expectations, normalize certain logics of care, and condition perceptions of legitimacy. When institutions falter, such as when the vaccine is late or when the extension worker is absent, communities return to herbal remedies, not out of nostalgia, but because they remain the most accessible and context-relevant tools.

Rather than treating local knowledge as an epistemic residue or resistance (Dabiez, 2021), it must be seen as a dynamic and legitimate response to the ontological uncertainties of a conservation landscape marked by wildlife mobility, shifting disease ecologies, and partial state presence. What emerges, then, is not a linear transition from tradition to modernity but an improvised pragmatism of care: a flexible, relational mode of reasoning that draws on heterogeneous repertoires in response to ecological, economic, and institutional contingencies. Knowledge is deployed as needed, negotiated in real time with animals, landscapes, and infrastructures. In a fragmented health ecology, this flexibility becomes a mode of survival.

Within this contradictory landscape, improvised pragmatism of care appears as an active epistemic reconstruction in landscapes of uncertainty. Communities develop situated responses that move between fragmented local knowledge and limited biomedical infrastructure through enskilled improvisation (Dabiez & Taks, 2021; Ingold, 2002)—testing plant combinations, adapting biomedical protocols, and turning to informal promoters when brigades fail to arrive or when diseases linked to buffalo contact challenge known remedies. In line with Ingold, these practices also resonate with Lévi-Strauss’s (1966) bricoleur, whose creativity lies in recomposing heterogeneous elements at hand.

4. 2-Human–animal relationships and their transformations

The establishment of the LNP precipitated a fundamental transformation in human–animal relations extending beyond restricted access to resources. This section examines how conservation regimes have generated a process of ontological displacement (Blaser & de la Cadena, 2018), one that redefines how wild animals are perceived, experienced, and related within the social world of local communities. To examine these dynamics, the section is divided into three parts: (1) the ontological rupture between domestic and wild animals, focusing on how conservation regimes have redefined wildlife as external and threatening; (2) the emergence of new patterns of disease transmission and

vulnerability as spatial boundaries blur and health risks intensify; and (3) the legal and moral asymmetries produced by this reordering, where calls for fencing reflect not only demands for protection but also claims to epistemic and ontological justice.

4.1. From coexistence to ontological rupture

Ontological displacement becomes most evident in the categorical redefinition of wildlife. Where relations of interdependence and mutual knowledge once prevailed, there now emerges a radical separation between “our animals” (e.g., livestock, poultry, goats) and “park animals” (e.g., elephants, buffaloes, lions). This distinction is not merely descriptive but ontologically constitutive: it marks the boundary between beings embedded in the community’s moral world and entities appropriated by external bureaucratic regimes.

The hunting restrictions stand as a catalytic moment in this transformation. As a participant from Machaule (FGD-B) explained: “*Hunting [for subsistence] in the past was not illegal... But now wild animals have owners. That’s why people are afraid of hunting*”. This statement illustrates how wildlife has been repositioned, from relational resources to untouchable property. The shift not only criminalizes subsistence hunting practices in the absence of licenses but alters the very ontological status of animals: they move from being relational resources to administrative property, untouchable and external to the community’s moral world.

This transformation can manifest in daily conflict. Participants consistently described how wild animals have lost their fear of humans precisely because they are no longer hunted: “*Animals in the past were afraid of people because they knew that they were prey. But animals now are like us people. They are not killed; they are taken care of. That’s why they’re so close to people because they know they’re not going to be killed.*” (Machaule, FGD-B). The ontological externalization of wildlife generates new forms of conflict that make coexistence increasingly untenable under current conservation frameworks. Participants identify different kinds of tensions such as competition for water, crop destruction, attacks on cattle and humans, and the transmission of disease. In Mbuzi, one woman explained: “*These animals are giving us a hard time because we share the same space with them and we drink the same water with them and we cannot do the farming because they destroy everything.*” As Redvers et al. (2026) emphasize, these encounters illustrate how Indigenous communities perceive humans, animals, and environments as interconnected within shared but contested spaces. Direct physical violence emerges as a critical dimension of this transformation. Participants report fatal attacks on humans with alarming frequency: “*Only this year about 5 to 7 people have died*” (Cunzi, FGD-B), while others described permanent injuries such as the case of “*a child who has lost her arm due to a crocodile attack*” (Mbuzi, FGD-B).

The presence of predators—“*we have problems with lions, hyenas and other animals in the park*” (Mbuzi, FGD-A)—transforms everyday activities like farming and herding into high-risk practices, illustrating how the differential protection of wildlife systematically exposes communities to structural forms of violence. These conflicts, grounded in spatial disruption and normative shifts, lay the groundwork for further ruptures in health ecologies and moral logics of care (Griffin et al., 2019). When elephants, buffalo, and predators cross into community land and water points, they not only destroy crops or attack livestock but also alter the epidemiological landscape, creating new circuits of contagion that link wildlife, livestock, and humans. The redefinition of wild animals as untouchable “park property” intensifies this problem, since communities are simultaneously prohibited from managing wildlife and left vulnerable to its effects. The result is a widening fracture in moral ecologies: while livestock remain embedded in care practices, wildlife is externalized as a source of risk, unaccountable to community forms of responsibility and reciprocity.

Within the LNP, conservation has contributed to the reconfiguration of human–animal relations through what Blaser and de la Cadena (2018) term ontological displacement. Integrated cosmologies linking wildlife,

livestock, and humans (IPBES, 2022; Tosam, 2021) have been fractured, recasting wildlife as state property and disease vector rather than as beings within reciprocal care. This mirrors Escobar's (2017) tension between relational pluriverses and conservation logics and produces what de la Cadena (2015) calls partially connected ontologies in conflict. Comparative work across southern Africa documents similar reconfigurations tying conservation to struggles over land, property, disease, and justice where fences, hunting limits, and bureaucratic protections fragment ecosystems, harden racialized inequalities, and heighten rural risk (Büscher & Thakholi, 2024; Ferguson & Hanks, 2010; Sinthumule, 2017).

4.2. Vulnerable ecologies and circuits of contagion

Disease transmission involving wildlife has become a central axis of concern, revealing how ontological displacement reconfigures not only spatial relations but also local understandings of health and risk. Across all focus groups, participants described a profound shift in disease ecologies attributed to the increased and unregulated proximity between wildlife, livestock, and humans. As one man explained: *"The cattle get sick, and we don't realize where the disease comes from, as they share the same source as the elephants and buffaloes"* (Machaule, FGD-A). In Mbuzi (FGD-B), another added: *"We can see that these diseases are from wild animals that come and live in the same place with us and then transmit that to our cattle. Sometimes we see diseases of the skin that we don't know, but we are sure they come from the wild animals"*. These accounts do more than identify wildlife as a source of infection; they situate illness in a shared ecology that composes an everyday topology of interspecies exposure through which vulnerability is experienced and reasoned as relational rather than as an external threat to be fully contained. In this register, "zoonosis," "contagion," and "vulnerability" can be read less as stable technical categories and more as locally inflected ways of naming shared exposure, proximity, and responsibility in a transformed multispecies landscape (Brown & Nading, 2019; MacGregor & Waldman, 2017).

But these concerns are not limited to livestock. Residents frequently traced a continuity between zoonotic and human illness: *"You try to treat the cow, and two or three days later you realize that you are also sick with the very same disease"* (Cunzi, FGD-B). We read this cross-species tracking of symptoms and causality as a form of interspecies co-diagnosis and locally grounded epidemiological reasoning, where health knowledge is produced through proximity, shared environments, and practical comparison across bodies and species. In this view, proximity is both spatial and biological: *"We live with these wild animals around here and we breathe the same air [...] They eat what we eat, touch what we grow, and then we get sick"* (Cunzi, FGD-B). Similarly, a woman in Muguambane (FGD-B) drew a direct link between spatial disruption and bodily suffering: *"We've been observing that wild animals and domestic animals share the same place for eating and drinking, and it's in the same river that humans get the water for drinking"*.

Such testimonies articulate not only empirical reasoning but also a moral critique of a conservation regime that has blurred boundaries without wholly offering the level of protection expected by local people. As one elder summarized: *"These diseases are transmitted from the wild animals to the domestic animals [...] and afterwards animals such as cows are killed and eaten by the humans, and consequently the humans also get sick"* (Machaule, FGD-B). When asked whether these illnesses existed before the park, she answered unequivocally: *"No, we didn't have joints ache before the existence of the park"* (Muguambane, FGD-B). Together, these narratives help map a perceived altered ontological landscape in which wildlife is no longer a cohabitant but a contaminating presence.

4.3. Legal hierarchies, moral asymmetries and the demand for fencing

Ontological displacement also transforms the moral ecology of care. Within traditional frameworks, all living beings—humans, livestock, wildlife—were susceptible to illness, healing, and relational forms of

care. Under current conservation regimes, however, wildlife is categorically excluded from the domain of health. For Indigenous people, "park animals" are not seen as beings that can be sick or healthy; they are not cared for, nor can they be cured. At the same time, communities note the paradox that certain species, especially charismatic wildlife like rhinos, are in fact far better resourced and protected than they are. As participants of one focus group, conducted by Hübschle in an earlier study, observed: *"The rhino has its own doctor, its own policeman, its own helicopter, its own land and there are rangers that protect it. We don't have these things"* (Hübschle & Shearing, 2018, p. 2). This perception—that rhinos are better cared for than people or their livestock—underscores the depth of legal and moral asymmetries in conservation regimes. During several FGDs, when asked whether wild animals could fall ill or be treated, many participants reacted with laughter or visible confusion, as if the question itself was incoherent. Such reactions reveal the depth of the ontological break—wildlife no longer figures within a shared moral or therapeutic horizon, but has been externalized as other-than-careable. They exist as governable, managed, and protected assets of the park, positioned as sources of risk rather than subjects of care.

Transformations in human–animal relationships are further intensified by widespread perceptions of legal asymmetry. Participants consistently described how wildlife enjoys legal protection while they remain legally unprotected in cases of damage or attack. One participant in Chicumba (FGD-B) noted: *"We have to pay when we're caught [hunting], but when the animals attack us, we don't get any compensation."* Another from Cunzi (FGD-A) stated: *"Animals are more important: when they kill humans and we call the authorities, they say there is no compensation for people, but if a person kills an animal, they must pay"*.

These testimonies expose how ontological displacement is perceived by communities to operate through governance practices that assign greater value to wildlife than to human lives. Differential protection is not just a political strategy, it is an ontological declaration about which life forms are worthy of care, and which are not. In this context, the recurrent call for fencing takes on more than practical meaning, it becomes a demand for ontological material separation. *"So the fence would block contact between the people and the wild animals and that would make us as humans not to break the rules,"* explained a participant from Muguambane (FGD-B). Fencing is not merely a barrier; it is a symbolic acknowledgment that traditional forms of multispecies coexistence have been rendered unworkable under the current conservation regime.

These accounts reveal a rupture in the logic of multispecies coexistence. While earlier colonial and postcolonial dynamics had already reshaped relations with wildlife, the establishment of LNP and its associated policies—such as restrictions on subsistence hunting, wildlife restocking, and the removal of fences with Kruger—further contributed to the reclassification of animals that were once embedded in social, ritual, and ecological life—as kin, food, or seasonal indicators—into external entities, untouchable and dangerous. Wildlife becomes legally protected yet ontologically detached, no longer part of a shared world but redefined as state property or threat. In this context, fencing is not merely a practical barrier but, in local testimony, a symbolic acknowledgment that previous forms of multispecies coexistence have been rendered unworkable under the current conservation regime. Similar dynamics have been observed across southern Africa, where fortress conservation and transfrontier parks reshape human–wildlife relations and intensify antagonisms (Büscher & Thakholi, 2024; Massé, 2016; Massé & Lunstrum, 2016). This transformation exemplifies ontological displacement (Blaser & de la Cadena, 2018), whereby not only people but also the categories through which animals are known, valued, and related to are forcibly altered, producing partially connected but conflictive worlds (de la Cadena, 2015; Escobar, 2017).

5. Governance and epistemic frictions

This section examines how governance arrangements in the LNP shape not only the delivery of veterinary care, but also the terms through

which knowledge is recognized, participation is framed, and responsibilities for animal health are distributed. Rather than operating through institutionally reliable infrastructures, participants described governance as irregular and fragmented, producing patterns of delayed response, symbolic presence, and epistemic tension. To unpack these dynamics, the section is divided into three parts: (1) how veterinary interventions are perceived as delayed or unpredictable, revealing gaps between institutional mandates and community needs; (2) how these inconsistencies generate friction between official expertise and local knowledge, prompting improvised and hybrid care strategies; and (3) how exclusion from decision-making undermines trust, with communities calling for more equitable and dialogical governance.

5.1. Delays, absences, and symbolic presence

Across communities, participants described veterinary governance as irregular, distant, and often ineffective. Vaccination campaigns are appreciated in principle—*“There is! And it helps a lot”* (Chicumba, FGD-B)—but criticized in practice for inconsistency: *“They come in January one year, and the next year they don’t return”* (Mbuzi, FGD-B). Others spoke of calling for help only to see it arrive too late: *“They may say they will be here tomorrow, but then take a week. Sometimes they come when the cow is already dead”* (Muguambane, FGD-B). Such unpredictability erodes confidence in the state, as people never know if, when, or how veterinary aid will materialize. At the same time, veterinary presence is often described as largely symbolic, more a demonstration of state reach than consistent support: *“They come, write in the notebook and leave. But the animals are still sick”* (Muguambane FGD-B). Participants referred to this as a form of “symbolic care,” where institutional actors fulfill formal obligations—taking attendance, recording data, wearing uniforms—without engaging substantively with the problem at hand. In this governance landscape, official visibility coexists with practical absence, leaving communities reliant on their own therapeutic capacities.

Patterns of irregular and symbolic care reflect deeper structural dependencies, where veterinary governance functions less as a service and more as a mechanism of control shaped by postcolonial legacies. Veterinary services operate not merely as technical assistance but as governmentality devices, reconfiguring territory–community–state relations via irregular presence, exclusionary participation, and opaque decision-making. Participants expressed frustration not with biomedicine per se but with its implementation—an anti-politics dynamic in which governance creates vulnerabilities that subsequently justify dependency (Ferguson, 1994). This shapes a colonial entrapment (Fonseca, 2019): communities need veterinary support because (post) colonial processes and conservation policies disrupted traditional multispecies care, yet the very services available perpetuate epistemic marginalization (Fricker, 2007) and the erosion of local alternatives, forcing reliance on the institutions implicated in the initial ontological fragmentation.

5.2. Epistemic frictions and improvised care

Participating community members consistently reported that their observations are interpreted by authorities in ways that make them feel dismissed or ignored: *“They vaccinate, but they don’t listen when we say what the animal had before. They say we don’t know”* (Mucacasa, FGD-A). In Machaule (FGD-A), a respondent described how veterinary staff bypass those with direct experience: *“They talk to one person who doesn’t even have animals. That’s why what they write [in those records] is different from what we know”*.

In this context, communities develop improvised care strategies that blend biomedical interventions, herbal remedies, and embodied expertise. *“We call the vet and they come and help,”* explained one participant (Chicumba, FGD-A), but others noted that *“we buy the medicines and vaccines and give them ourselves”* (Baptine, FGD-A), or simply *“we use*

injections” (Muguambane, FGD-A). In Mucacasa (FGD-A), one respondent clarified: *“We try to treat them with natural medicines, but now we’re using conventional medicines too”*. Participants noted that the price of pharmaceuticals and paid assistance often put these options out of reach for many households (Mucacasa, FGD-A; Chicumba, FGD-B).

These care practices are not rooted in rejection, but in adaptability. When institutions fail or delay, communities recalibrate. They draw on kin networks, local promoters, past experience, and trial-and-error to sustain their herds. As noted in Mbuzi: *“Each one does the healing at his own home. It’s general knowledge”* (Mbuzi, FGD-B). Such practices show how Indigenous repertoires are continuously reconfigured in response to uncertainty and institutional absence. This bricolage exemplifies non-random improvisation guided by situated skill, collective memory, and ecological attunement. These are forms of governance under uncertainty rather than knowledge deficits. In Mol’s (2008) terms, this is tinkering—care through adjustment and experiment; in Santos’s (2014) terms, epistemologies of the South that adapt and resist dominant veterinary–conservation paradigms; and, as in Nepalese community forestry (Nightingale, 2005), distributed authority grounded in local ecologies, collective memory, and experiential skill. Our distinctive contribution is to foreground the historical–political conditions under which the bricoleur operates: improvisation unfolds amid marginality in a landscape where human–animal relations have been reconfigured by colonialism, armed conflict, forced displacement, and contemporary conservation policies that unsettle Indigenous ontologies.

5.3. Exclusion, representation, and the terms of participation

Governance frictions extend beyond animal care to broader dynamics of inclusion and exclusion. Participants repeatedly described being left out of decision-making processes: *“They make decisions in offices. We are not called”* (Cunzi, FGD-B). When Indigenous representatives are invited, they are often disconnected from the community or fail to report back: *“He didn’t tell us anything”* (Cunzi, FGD-B). In Mbuzi (FGD-B), another respondent added: *“The park never approached us to speak about their animals. That has never happened”*. As Redvers et al. (2026) observe, such patterns mirror OH governance structures in which Indigenous representatives are formally acknowledged yet substantively excluded from shaping decisions. This dynamic helps foster a sense of procedural marginalization, where consultation is seen as symbolic rather than substantive, a topic described in health participation as tokenistic inclusion (Majid, 2020; wa Thiong’o, 2017; Yamin, 2009). Communities are asked to comply, but not to co-design. As one respondent noted: *“They tell us that even if we find [park animals], we should never eat them. But when they attack us, they don’t say anything”* (Mbuzi, FGD-B).

Still, some participating communities expressed a clear desire for what they perceived as relational governance, not simply more presence. What people said they valued is not the mere execution of technical procedures, but the establishment of meaningful and responsive relationships. In Chicumba (FGD-A), one participant stated: *“We value the vaccination campaign—when they come quickly and explain what they are doing”*. What people value is not the execution of technical procedures alone, but the establishment of meaningful and responsive relationships. What is rejected is not veterinary science itself, but the institutional forms through which it is delivered. This dynamic echoes concerns raised by Ruwet et al. (2025), who warn that treating local expertise as secondary to external technical knowledge erodes community trust and undermines genuinely collaborative health governance.

Beyond procedural deficits, our governance materials illuminate a problem of epistemic justice. Communities report testimonial injustice (credibility deficits assigned to local observers) when experiential diagnoses, etiologies, and risk assessments are discounted by officials (Fricker, 2007). These dynamics help explain why participation is experienced as tokenistic inclusion (Majid, 2020; Yamin, 2009): information flows one way (as surveillance), meetings validate decisions

already made, and record-keeping substitutes for co-diagnosis (Hinchliffe, 2015; Keck, 2020). From an epistemological justice perspective (Santos, 2014), this is not merely a failure of consultation but of recognition: whose knowledge is admissible, at what thresholds of proof, and with what consequences for action.

6. Conclusions

Across conservation landscapes globally, Indigenous animal health practices often emerge within a paradox: conservation regimes simultaneously fracture longstanding multispecies health traditions, even as such practices persist and are recomposed in everyday life, while deepening reliance on uneven and often unreliable state veterinary infrastructures. In this paper, we have conceptualized this navigation as an improvised pragmatism of care—a situated, relational, and historically grounded response to the dual pressures of ontological displacement and infrastructural dependency. This form of care is enacted without stable protocols or continuous institutional support, and instead relies on pragmatist reasoning, improvisation, and embodied knowledge under conditions of uncertainty, scarcity, and fragmented governance.

In the case of LNP, animal health practices must be understood within a broader historical context shaped by colonial and postcolonial transformations, armed conflict, environmental disruption, and cycles of displacement and resettlement. These processes have reconfigured human–animal relations and imposed new regulatory regimes that often marginalize Indigenous knowledge systems while failing to provide consistent institutional support. Within this contradictory landscape, communities engage in enskilled improvisation—testing herbal remedies, adapting biomedical protocols, and drawing on collective memory and ecological attunement. These are not residual traditions but dynamic forms of governance under uncertainty, shaped by necessity and sustained through relational care.

Improvised pragmatism of care, as we have shown, is not merely a coping mechanism but a form of governance-from-below. It reflects how communities reassemble diagnostic authority, redistribute responsibility, and recalibrate legitimacy in the absence of reliable state infrastructure. These practices are not static or nostalgic; they are adaptive, experimental, and deeply situated in local ecologies and social relations. They also reflect a broader epistemic struggle—one in which Indigenous knowledge is often dismissed or devalued, even as it continues to sustain multispecies life in contexts marked by institutional fragility. More broadly, our analysis cautions against treating animal health as an abstract, detachable component independent of human–animal relations or as separable from historical trajectories and contemporary territorial and environmental management policies. Illness, risk, and care are co-produced with land tenure, wildlife governance, labor and mobility, moral economies, and locally specific ontologies in ways that are difficult to disentangle. Studying these dynamics in isolation risks epistemic blind spots and decontextualized interventions. Our findings also align with calls to treat OH not only as a governance model but as a situated, relational practice that is made and negotiated in everyday interspecies life, including through vernacular animal knowledge and care.

Recognizing improvised pragmatism of care as a legitimate mode of health governance demands both conceptual and practical shifts. It calls for new metrics of effectiveness that value relational outcomes alongside biological ones, participatory structures that move beyond tokenism toward transformative engagement, and accountability mechanisms that acknowledge community expertise and support autonomous decision-making. In practical terms, this means strengthening infrastructure such as roads, cold chains, and communication systems; revisiting conservation policies that have fostered ontological displacement; and institutionalizing dialogic knowledge practices, including co-diagnostic workshops, bidirectional reporting systems, and co-designed treatment protocols. As conservation targets like “30 by 30” gain traction, and as OH frameworks expand across Africa, supporting

improvised pragmatism of care becomes not only an academic imperative but a practical necessity for sustainable, multispecies coexistence.

Our contribution is both theoretical and applied. For veterinary anthropology, we extend work on negotiated authority, biosecurity assemblages, and colonial legacies by theorizing governance-from-below as a routine and necessary response to fragmented infrastructures. We recast medical pluralism as pragmatic recomposition rather than mere coexistence, and push ethnoveterinary studies beyond remedy catalogues by embedding practice in shifting ecologies and power/knowledge hierarchies. For health and medical geography, our framework highlights how place—through mobility, land use, and infrastructural unevenness—conditions who can enact care and how. Finally, we contribute to ontological critiques of global health paradigms, advocating for more-than-human approaches that value tinkering, situated expertise, and relational obligations.

These shifts need not be insurmountable. Grounded, incremental measures—such as adapting veterinary schedules to local ecological calendars, training local animal-health promoters in both biomedical and herbal repertoires, and measuring trust and participation alongside livestock outcomes—can begin to realign veterinary governance with the lived realities of Indigenous communities. Such efforts would not only improve animal health outcomes but also restore a sense of epistemic and ontological justice in landscapes where both have long been denied. Improvised pragmatism of care offers a historically attentive, culturally grounded, and relational lens for understanding and improving multispecies health. It cautions against decontextualized interventions and invites a rethinking of care as a co-produced, adaptive, and politically charged practice.

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Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work the authors used ChatGPT in order to translate and improve writing consistency. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

CRediT authorship contribution statement

Juan Martin Dabezies: Writing – review & editing, Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. **Annette Hübschle:** Writing – review & editing, Methodology. **Gianluca Pio Zaffarano:** Writing – review & editing, Formal analysis. **Natalia Munoz Cassolis:** Writing – review & editing, Project administration, Data curation. **Susana H. Baule:** Writing – review & editing, Data curation. **Vivienne Williams:** Writing – review & editing. **Julie A. Silva:** Writing – review & editing. **Meredith L. Gore:** Writing – review & editing, Supervision, Project administration, Data curation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.geoforum.2026.104876>.

Data availability

The data that has been used is confidential.

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