Outlining a 'Semantic Anthropology of Data Science'

The Humanitarian Response to the Cholera Epidemic of Doctors with Africa CUAMM in Mozambique

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Abstract: This work intends to describe the humanitarian response to the cholera epidemic carried out by the international health non-governmental organisation Doctors with Africa CUAMM in the provinces of Zambezia, Sofala and Tete in Mozambique. The knowledge and practices of applied medical anthropology have proved to be fundamental in the management of prevention and monitoring activities in homes where cases of cholera have been identified and confirmed. The collection and management of data relating to the epidemiological curve has represented a challenge in the field and pose considerable theoretical problems with respect to the representation, public discourse and policies of local government and large international donors in response to health emergencies caused by the ecological crisis- climate, especially in Africa and Mozambique.

Keywords: data interpretation, epidemic, humanitarian response, medical anthropology, Mozambique

Mozambique is suffering from the deadliest cholera outbreak in 25 years. The outbreak started in September 2022. Based on updated data from Ministry of Health, which redrew a new epidemiological landscape, from October 1, 2023 until December 11, 2023, the country recorded a total of 6,091 cases of cholera, 12 deaths, which corresponds to a fatality rate of 0.2%. Currently, the locations with an active outbreak are: Nampula province, (districts of Erati, Malema, Mecuburi and City of Nampula), Cabo Delgado (districts of Montepuez, Chiure and Balama), Tete (districts of Angónia, Mágoe, Zumbo, Marávia, City of Tete, Tsangano, Marara, Changara and Moatize) and Zambézia (districts of Gurué, Alto Molocue, Mocuba and Gilé), Sofala (Cáia, Maríngue and Buzi) and Niassa (districts of Lichinga, Majune and Chimbonila). Of the 6,091 cumulative cases reported, 2,160 (35.5%) were reported from Nampula province, 1,433 (23.5%) from Tete province, 1,211 (19.9%) from Zambézia province, 801 (13.1%) in the province of Cabo Delgado, 406 (6.7%) in the province of Sofala and 80 (1.3%) cases in the province of Niassa. While cholera is endemic in Mozambique, the current outbreak is larger than the usual and, with the upcoming rainy season, the situation can rapidly escalate to a potentially uncontrolled situation spreading illness and death. A combination of factors contributes to the spread of cholera in the country: low levels of access to safe drinking water, sanitation, and hygiene facilities; compounded by a weak health system, weak surveillance and late and/or underreporting; lack of essential cholera commodities, including the oral cholera vaccine (OCV); an overstretched health workforce responding to multiple emergencies including polio); and high cross-border movements with countries also experiencing cholera outbreaks. There is also a significant amount of misinformation about cholera that has led to people's continued use of untreated water even when they have access to potable sources. Mistrust towards government inter-

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ventions has caused incidence of aggression against health workers and local leaders viewed as supporting cholera interventions.

Notably, neighbouring Malawi is facing the deadliest cholera outbreak in its history. Considering the frequency of cross-border movement and the history of cross-border spread of cholera during this outbreak, WHO considers the risk of further disease spread as very high at the national and regional levels. The first case of cholera in the current outbreak was reported to the Ministry of Health and WHO from Lago district in Niassa province on 14 September 2022.

In the central region of the country, nine districts (Beira, Buzi, Caia, Cheringoma, Chibabava, Gorongoza, Maringue, Marromeu, Muanza) of Sofala province reported on the 17th of May a total of 5,985 admitted cases for treatment and 30 deaths (CFR 0.5 percent). The cholera vaccination campaign was implemented by health authorities from the 28th of March to the 3rd of April, seeing 649,033 people vaccinated, being 99.90 percent in the exposed districts of Beira city, Caia and Marromeu.

Twelve districts from Tete province, reported at 2,941 cases with 16 deaths (CFR 0.9 percent) since December 2022 with the most affected being Tete City with 652 cases, Chifunde, Angonia, Mutarara, Doa, Tsangano. On the 21st of May, Zambezia province had a total of 12,643 confirmed cases with 35 deaths (0.3), with most affected districts as Quelimane city (hardly hit by Cyclone Freddy the 11th of March) with a total of 12,191 cases followed by Nicoadala with 185, Inhassunge with 185 and Maganja da Costa with 62.

The current outbreak of cholera in Mozambique covers a wider geographic area and has a higher CFR compared with the previous outbreak. Moreover, most of the affected districts, especially in Niassa province, had not reported cholera cases for more than five years and many of the health professionals do not have experience in responding to a cholera outbreak. Weak surveillance with late reporting, inadequate WASH conditions (lack of access to safe drinking water, poor sanitation and hygiene practices), a weak health system and exhausted workforce responding to multiple emergencies pose a threat to continued disease progression, as do the ongoing heavy rains of the season. A request for approximately seven hundred thousand doses of the oral cholera vaccine was approved by the International Coordinating Group on Vaccine Provision and a vaccination campaign in affected districts in Gaza, Niassa, Sofala and Zambezia provinces was implemented from 27 February to 3rd March 2023.

The epidemiological bulletin for Cabo Delgado Province reports zero new cases on the 19th of May, but at the end of April reported a total of 633 confirmed cases since 13th of March, with a total of three deaths. Giving this recurrent situation and having CUAMM already cholera prevention community based programmes, the programme is willing to strengthen the actual surveillance ongoing programme and to enable province and district authorities to respond adequately in case of further outbreak to raise. The intervention strategy is defined on the basis of the epidemiological situation and in accordance with the coordination of the response of the partners managed by the provincial and district health authorities DPS and SPS.

At the level of follow-up of confirmed cases, the CATI—CORT approaches can be implemented, with the provision of dedicated teams) or the positioning of community activists at the outpatient clinics of the health centres concerned, in order to provide rehydration support services and follow-up in the communities where suspected cases have been reported for kit distribution activities and information sessions. Doctors with Africa CUAMM is an Italian international non-governmental organisation founded in 1955 and currently operating in eight African countries (Sierra Leone, Central African Republic, Uganda, South Sudan, Tanzania, Angola, Ethiopia and Mozambique).

The main areas of intervention are maternal and child health, infectious diseases, nutrition, response to humanitarian emergencies and others, focusing on strengthening the health systems of host countries, always with a view to tackling the fundamental pillars to improve access, equity and quality of basic health services for the population, from a Continuum of Care perspective. We have been present in Mozambique since 1978, the year of independence and we currently work in six provinces where we operate with a strategy of constant and widespread presence among the population. In this context, Community Health programmes represent a privileged vision that sees us among the first partners in the response to the humanitarian crisis that began in 2019 in the province of Cabo Delgado in the north of the country, due to attacks by non-state armed groups. The current crisis has so far led to around five thousand confirmed victims and more than a million internally displaced people.

We have also been protagonists in supporting the Ministry of Health in dealing with the Covid-19 pandemic, through prevention interventions, support to health units and in the definition of policies

and social communication at the technical tables of the Ministry of Health. Therefore, when the umpteenth cholera outbreak broke out in March 2023 in the provinces of Tete, Sofala and Quelimane, we intervened in collaboration with UNICEF in the home response to the cases of cholera identified at the CTC (Treatment and Care Centres) supervisors.

Methods

The CAT-CORT strategy provides that a duly trained team, made up of health technicians and community health workers, goes to the home of the identified case to carry out a standardised series of interventions aimed at reducing the risk factors in the family of the case and, through the 'ring approach' in the homes of nearby houses, in order to create a sanitary cordon aimed at isolating the spread of the epidemic. At the coordination mechanism level, it is managed by a 'Cholera Emergency Cluster' managed by the local provincial health institutions and by the implementation partners present on the ground. The protocols for intervention, identification and management of confirmed cholera cases are extensively structured and the procedures have been applied with confidence under the operational guidance of the WHO World Health Organization.

The data collection and management algorithm has represented a practical and theoretical challenge for the humanitarian machine and poses numerous problems of an anthropological nature, heralding the development and germination of interpretative perspectives useful for studying the phenomenon of entanglement between quantitative and computational disciplines. data analysis and anthropological interpretation of the outbreak as a complex public health problem.

The standard data collection system includes registers located at the treatment and care centre (CTC) level where healthcare personnel receive cases with full-blown symptoms whose samples are examined in the laboratory to confirm that it is Vibrio Choli and therefore the case can be ascribed and treated accordingly.

The CATI Team made up of personnel with district health training and community health workers collects the data and goes to the home of the confirmed case to carry out the standard sanitisation activities of the home and nearby environments, of the water sources, of the latrine, the distribution of the basic kit for the family (consisting of bottles of chlorine for the purification of drinking water and sources, soap, bucket with tap, information material), as well as, through the 'ring approach' methodology, provide the same package of activities in all homes around the identified house in order to create a sanitation cordon and limit risk factors and diffusion of the virus. The quantity and complexity of the quantitative and qualitative data collected is exemplified by the data sheets reproduced here.

MENCIONAR A CADA FAMÍLIA QUE AJUDA HUMANITÁRIA É GRATUITA. NINGUEM PODE PEDIR NADA EM TROCA: PARA REPORTAR CASOS DE ABUSOS NA AJUDA HUMANAITÁRIA, LIGAR PARA 1458 (GRATUITO)

Data	Posto Administrativo	Localidade	Comunidade/ Bairro	Nome do Chefe da família	N. de pessoas no agregado familiar	Caso Suspeito		Qual é a principal fonte de água para beber e preparar a comida						Como e que a família trata a agua que bebe?							Tem sistema de lavagem das mãos?		Como lavam as maos		Tem latrina? (verificar)			Se não, onde faz as necessidades?		A família come alimentos preparados fora da casa		Qual o mercado principal onde se procura alimentos	Como a água é armazenada (pedir para ver abaixo)	Se teve um evento particular. funeral, evento colectivo particular, comida em comum, avaria de um sistema de agua, viagem				Sabe como reduzir o risco de morte por cólera? (devem responder à reidratação imediata com solução de reidratação oral (produto comercial ou de fabrico caseiro). Em alternativa, outras bebidas (sumo, água de arroz, ..)
						Sim	Não	Agua canalizada	Bomba Manual	Poço	rio	outro		Nao trata	Cartaza	Cloro	Ferve	Outro			Sim	Nao	Agua	Agua e sabao ou cinza (pedir para verificar)	SIM com tampa	SIM sem tampa	Não	Latrinas comunitarias/ Palhotas	Defeca ao ar livre	Sim	Não			Funeral	Evento colectivo	avaria de sistema de água	Viagem	

Table 1: Cholera confirmed case monitoring sheet

Identificação da equipa Nome do Supervisor: CTC de referência:					Nr. telefone:																					
Data	No.	Posto Administrtaivo	Localidade	Comunidade /Bairro	Número de casas visitadas no cinturão	Número de pessoas na casa do paciente	Idade do paciente	Sexo do Paciente	Promoção de higene na casa do caso			Tratamento de água a nível doméstico (na casa do caso)				Desinfecção de latrinas e casas de banho		Tratamento de água na comunidade		Promoção de higiene para a comunidade				Principal tópico/tema discutido	Observações (Algum tipo de rumor e/ou feedback)
									Materiais IEC distribuidos	Número de membros da casa engajados em diálogo de higiene	Número de barras de sabão distribuidas	Número de frascos de cloro distribuidos	Número de frascos de certeza distribuidos	Número de baldes distribuidos	Número de de poços privados clorinados	Número de detergentes distribuidos (garrafa)	Latrina e casa de banho desinfectadas	poço partilhado	Poço individual	Número de pessoas alcançadas pelas actividades de promoção de higiene					
																				Mulheres	Homens	Raparigas	Rapazes		
	1																								
	2																								
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	6																								
	7																								
	8																								

Table 2: Quick Household Survey "Ring approach" model

For the purposes of our argument, it is important to underline how the role and perception of the village leaders acting as sentinels for epidemiological surveillance play an active function and contribute to the dissemination of information and to the definition of the community's perspective in terms of the seriousness and danger of the epidemic.

Proactively organizing the populations in mobilisation and prevention activities requires a careful reading of the image and the anthropological meaning of what statistical processing and the numerous correlations and variables provide.

Attributing Values to Behavioural Variables During a Cholera Epidemic

The families in the neighbourhood of the 'confirmed' house receive an assessment by the outreach team, an assessment aimed at evaluating not only the presence of people with serious symptoms who may need to be referred to the health units, but also aimed at measuring the adoption and fulfilment of a basket of preventive behaviours defined by the Ministry of Health, through a programme called 'Familia Modelo' that CUAMM is implementing both in emergency contexts such as the province of Cabo Delgado and in 'development'.

The list of observable behaviours—and therefore the operator's action becomes decisive and objectifying—includes indicators such as the following:

- presence in the housing unit of a closed latrine with washable floor
- presence of hand washing tools
- presence of support so as not to place crockery and utensils on the floor
- presence of a system for storing water for domestic use
- presence of waste pit

In an intervention framework for response to a cholera epidemic, the foregoing information is fully appropriate to collect in order to compose a socio-health behavioural profile of potentially affected families and to analyse the presence of risk factors.

On the other hand, it is theoretically and anthropologically remarkable—also opening up perspectives for reading the epistemology of the anthropology of humanitarian interventions—that the assessment tool also reports indicators of access and fulfilment of some basic services in terms of maternal and child health and education, with the aim of bringing out any correlations and/or causality between the two dimensions investigated. The indicators structured in this way are collected by the project operators through paper files, verified by local supervisors and subsequently entered in an Excel database

Figure 1: Data collection at re-hydration point, Mozambique 2023, Photo by author

managed by the area supervisors at the district level and channelled to the provincial managers who, after further filtering and aggregation work, share with project managers at national level.

CUAMM in partnership with UNICEF are currently evaluating the feasibility of establishing a coordinated cholera-response database among all partners involved in order to improve effectiveness on the field and better informing the Ministry of Health analysis through standardized pool of indicators.In this order of magnitude we are in the context of a database made up of a few tens of thousands of families, which multiplied by about the 12 associated variables allow us to address the complexity of what arises with the ambition that the perspectives offered will be able to inform a broader discussion regarding the interaction of the anthropology contribution with the formulation of algorithms and the collaboration with data scientists, therefore shaping the collaboration and entanglement between contiguous disciplines that seem to need mutual support to determine their ontological status.

The information produced by our work in the field is already being processed with international institutes for the study of infectious diseases to establish mid and long term projections of epidemic trends, geographical spatialisation for the identification of 'hotspots' throughout the territory but identified and disaggregated at neighbourhood and macro-analysis level to favour preparedness cost plans that will presumably be adopted by the local government through the national cholera elimination plan that the Ministry of Mozambique is preparing to detail and distribute as an internal guideline and for international donors. The range of problems that opens up in front of this perspective simultaneously displays multiple research directions, towards which these first hints can serve as an introduction. The applied and medical anthropology that we practice in our interventions can be defined as a discipline that develops together with people and is contaminated by them, or the need to generate answers inhibits the potential of anthropology, perhaps making it an unwitting handmaid and instrument of crystallised knowledge of the communities and people who compose them.

In six districts out of three provinces affected by the cholera epidemic, we carried out focus group discussions with 'target groups' identified on the basis of analytical trends produced on previous epidemics in different countries, including countries outside of Africa. The focus groups were conducted with 'key informants' at the community level, both with individuals identified and spontaneously invited to participate, such as mothers of children under five, adult men, young men due to high proximity to the infection, the elderly, and also formal and informal institutional leaders—basic health committees, religious leaders, healers enrolled in the AMETRAMO association (Association of Traditional Doctors of Mozambique) recognised by the Ministry of Health, responsible for the management of district WASH services.

Figure 2: Data collection at community level, Mozambique 2023, Photo by author

Although the material collected is currently being processed, listening to the testimonies reveals a significant discrepancy between the widespread knowledge relating to the determinants of the disease and the adoption of preventive behaviours together with the poor quality of service management. The aim is to investigate recurrences and perceptions of cultural and structural determinants at a social level and of service effectiveness and quality. The qualitative

information, analysed through interpretative grids and coding analysis, allows standardisation and equivalence with similar contexts where the methodology has previously been applied in order to hypothesise variables and constants on behaviour and cultural adaptation related to epidemiological trends. The dialectic between qualitative and quantitative evidence allows a cross-checking of data and information aimed at defining renewed intervention models based on experience and validation of practices for a desired revision of the guidelines for preparedness and rapid response to cholera epidemics.

Preliminary Results

These studies indicated young men (aged between 18–30) as the category most affected by cases of cholera and acute water diarrhoea). We have therefore organised discussion groups conducted with rapid methodologies and minimal traces to understand the existing knowledge not only about what cholera was and the ways of transmission but also about the attitude and the social and gender perception of the disease in order to define and target specific prevention messages, implemented and conducted through radio campaigns, cars with loudspeakers, text messages and social media campaigns in collaboration with the government agency of social communication.

Figure 3: Sanitation at the community level, Mozambique 2023, Photo by author

In what terms do the qualitative surveys conducted give us knowledge and practices that can be translated into effective interventions? In what terms are the self-representations of the interviewees systematically accepted in the research and therefore in the definition of intervention strategies? Can qualitative data analysed with other tools inform and alter the image of a context that emerges from the trends produced by data scientists?

While working in the field and aware that we were not carrying out an ethnography but an intervention of applied anthropology in response to an epidemic, we tried to move dialectically and to establish an inner path that went from broader theoretical considerations to methodological ones.

While working in the field and acknowledging that our focus was on applied anthropology for epidemic intervention rather than ethnography, we aimed to navigate dialectically. Our approach involved transitioning from overarching theoretical considerations to methodological ones. Shared with receptive colleagues, our mantra was, "We are shaping the epidemiological and anthropological landscape of this country for the coming years." Alongside a colleague, I reflected, "This involves drawing from hermeneutical and epistemological insights embedded in our data analysis—a contribution to the evolving synergy between disciplines such as applied and medical anthropology, intertwined with the development of algorithms. It's a critical assimilation, navigating the languages and complexities, embracing a panoptical perspective within the realm of One Health, thereby addressing it as a syndemic.

The conceptual framework of the 'syndemic' phenomenon imposes itself in the reflection of those involved in international public health, planning and anthropology as the prism around and through which the entanglement between data science and anthropology can find a system of signs, even before a complete, common vocabulary is designed. If the computational analysis that is underway on the outcomes of the cholera epidemic in Mozambique (not yet declared finished, at the time of writing there are still outbreaks in various districts of the country) will provide the tools for policy makers to direct future strategic lines funding for public health in sub-Saharan African states and in Mozambique in particular, applied, medical and social anthropology should necessarily call for an interpretation of the phenomenon in terms of interdependence between environmental, social, cultural and economic factors in the context of the Anthropocene and the global ecological crisis.

Figure 4: Focus group discussion with Village Leaders, Mozambique 2023, Photo by author

Conclusions and Strategic Recommendations

Mozambique stands out as a compelling case study, offering a unique perspective on the exploration of these phenomenological complexities. Addressing these intricacies requires a paradigm shift towards recognizing interdependence—not merely envisioning data exchange among experts, but embracing an osmotic flow of knowledge and practices, fostering a renewed epistemology.

Engaging in ethnographic practice and fieldwork involves immersing oneself in the lives of people, navigating the ambiguous and dialectic relationships encountered daily. This demands a nuanced dialogue between the professionalism and humanity of anthropologists and the roles of humanitarian workers and international aid program managers—an intricate interplay of functions, processes, and discursive practices that warrants critical scrutiny.

Shake off the routine in ethnographic practice and the self-doubts that come with it. In this field, it's essential to critically examine, from different angles, the knowledge you create through writing, field notes, and interactions with others. Revisit and reinterpret the information, even those labeled as "informant" or "beneficiary," breaking down the walls and revealing the personal side of applied anthropology. Recognize your responsibility for both qualitative (shaping perceptions) and quantitative data. When data scientists rework this information, it leads to fresh insights and contributes to the decolonization of international cooperation and the humanitarian landscape, challenging language barriers that perpetuate inequality.

The circularity of the mechanism we present here, in a purely embryonic form, leads us to find, in the experience of working in a multidisciplinary team and on multiple levels of responsibility, a further push for in-depth study and detail.

In one of the supported provinces (we will not specifically mention it to avoid triggering the same ambiguous process that we want to outline), discussions often arose between the local authorities and the implementing organisations during the Cholera Response Cluster due to the data reported, divided into standard categories such as confirmed cases, people with severe symptoms with scenarios A, B, C, people who have turned to the 'rehydration points' spread throughout the area in order to receive support of various kinds, and suspected cases reported by community sentinels, inhabitants of various neighbourhoods in the catchment areas of the health facilities supported by the project. The criticism generally concerned the authorities presenting an overall situation that was more serious than that experienced, documented and perceived by the communities and health unit operators, therefore not agreeing not only on the veracity of the data produced but more often and with greater insistence on their quality, defined as the ability of quantitative data to adequately describe the state of the epidemic with the fundamental political and social alarm effect that consequently arises.

Without a doubt, these complaints also carry a political undertone, aiming to safeguard the reputation of administrations at different levels tasked with managing the epidemiological situation. These concerns primarily stem from a self-protective stance, guarding against criticism or actions from central authorities. Examining these grievances becomes a lively exercise in acknowledging and connecting them with the more anthropological aspect. These criticisms arise from a unique perception of the territory and its public health challenges, differing from the statistical representations provided by organizations. These representations are often seen as unquestionable due to their nature as quantitative data verified in the field and established using standardized diagnostic criteria.

The restitution of the overall picture of the epidemiological situation affirmed by humanitarian organisations is contested on the basis of less uncritically definable concepts of well-being of the population and evaluated through parameters of social interactions and impact on economies of scale rather than on the accounting of diarrhoea cases.

In a context such as rural Mozambique, where childhood diarrhoea remains one of the main causes of mortality and where gastrointestinal disorders are

often not treated unless it inhibits the person's ability to perform their daily tasks, where the availability of water drastically varies between dry and rainy seasons, communities appeared astounded when in discussions with leaders, healers and other authorities responsible for the epidemic situation. Discussions with village leaders, who complained of a loss of prestige and authority, focused on the particularly negative, in their opinion, would have emerged from the presentation of the data where numbers were indicated for all the categories of gravity of the phenomenon.

The detailed and methodological criticism of the cooperation intervention and its quantitative representation appeared revealing and anthropologically founded: 'You now describe us as a sick community, bringing shame to the country'. 'Now you send these numbers out to Europe and people who have never heard of—will get the wrong idea about us'. 'Of course we have some serious cases that need to be treated, the whole population has been informed, but it's not very different from the current situation. Why only now have you all come here to deal with it?' 'The serious problem and how you talk about us is all in your numbers, without all these exercises and the cards and numbers perhaps no one, certainly even the central government, would not have noticed the difference compared to the life we lead every day'.

Continuing in our dialectic, in our prismatic reading of the phenomena on different scales of magnitude, this episode appears as paradigmatic of the need for a theoretical interlocution first and methodological only secondarily between anthropologists, humanitarian operators and those who professionally define the theoretical models for the elaboration of macro-scale data.

The unsaid, the bridge necessary is still to be built but requires mutual legitimation and recognition and a willingness to listen between anthropological knowledge—whose main function, in the field of humanitarian interventions and international cooperation is to provide keys to understanding complex social phenomena and to design culturally compatible and more effective interventions, and the need to outline a 'modelling semantics' that broadens their views and perspective

Discussing with colleagues who are in charge of framing the current epidemic within the historical recurrence to define predictive curves and consequently provide long-term planning indications to the governments of individual countries and reasoning at the macro area level that present characteristics similar social and environmental factors (as in our case the countries that make up the Southern African Development Countries community), we note a sensitivity and predisposition towards an anthropological reading of the proposed models (in particular as regards the mechanisms of social reproduction which in turn reproduce and fail to effectively limit the risk factors for now), but it is equally clear that the fragmentation of skills, the mantra of 'cost-effectiveness' in any complex analysis and ultimately epistemological bias still represent difficult obstacles. The experience still in the course of intervention in response to the cholera epidemic that afflicts some provinces of Mozambique contains in a nutshell some elements that we believe can be paradigmatic for placing attention and illuminating the need for a review and study of possible integrations, similarities, contiguity between disciplines that today's and future dynamics present to us as inescapably synergistic and convergent. It is a fragile path lined with possible misunderstandings, it is up to the professionals of all fields of knowledge involved to imagine a bridge over the void, towards renewed research tools and approaches.

To look there, beyond the Gregory Bateson 'angels fear' for a new epistemology of cognitive processes.

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