

Situating Latin American Critical Epidemiology in the Anthropocene

The Case of COVID-19 Vaccines and Indigenous Collectives in Brazil and Mexico

Laura Montesi, Maria Paula Prates, Sahra Gibbon, and Lina R. Berrio

Received: 1 March 2022; Accepted: 15 December 2022; Published: 30 June 2023

Abstract

Diverse histories and traditions of critical epidemiology in Latin America provide an important, although underutilised, alternative framework for engaging with the embodied health inequalities of the Anthropocene. Taking COVID-19 as ‘a paradigmatic example of an Anthropocene disease’ (O’Callaghan-Gordo and Antó 2020) and drawing on ethnographic research in Brazil and Mexico on vaccination campaigns among Indigenous Peoples, we review and analyse the scope and limits of Latin American critical epidemiology in addressing Anthropocene health. While there are intersecting and parallel dynamics between diverse national and regional histories of epidemiology, we argue that the relatively differential focus on political economy, political ecology, and colonialism/coloniality in Latin American critical epidemiology, alongside the attention to non-western disease experiences and understandings, constitute a counterpoint to biomedical and specific ‘Euro-American’ epidemiological approaches. At the same time, Indigenous understandings of health/disease processes are intimately connected with territory protection, diplomacy with non-human entities, and embodied memories of violence. We examine how this presents new and challenging questions for critical epidemiology, particularly in how the ‘social’ is defined and how to address both social justice and social difference whilst also navigating the biopolitical challenges of state intervention in the era of Anthropocene health.

Keywords

Anthropocene health, Critical epidemiology, COVID-19, Indigenous health, Latin America.

‘Coming back to Nhanderu and Nhandesy world’
(Xadalu Tupã Jekup, Porto Alegre, Brazil, May 2021).

Introduction

I always wonder: why are we a priority in the vaccination campaign and not in our right to the territory? Why am I going to get a vaccine if I don't know what my future will be like tomorrow? (Mbo'y, Kaiowá leader, Central Brazil, June 2021).

In January 2021, the first vaccines against COVID-19 were made available in Brazil. Among the groups considered a priority were the more than 300 Indigenous Peoples. There was significant adherence to the vaccination programme among Brazilians, despite campaigns orchestrated by vaccine denialists coupled with the daily output of fake news on social media at the time. Such misinformation was also publicly disseminated in official broadcasts by the then president Bolsonaro. Nearly a year later, in December 2021, about 80% of the national population, though varying greatly from region to region and by age group, had been vaccinated with two doses¹. Among Indigenous collectives, there was also adherence to vaccination programmes. According to the *Secretaria Especial de Saúde Indígena* (Special Secretariat for Indigenous Health, SESAI) attached to the Ministry of Health, 87% of Indigenous people had been vaccinated with both doses by September 2022. However, the vaccination campaigns were not devoid of obstacles. The Kaiowá people had the lowest vaccination rate (44% had received two doses by April 2022) among Indigenous peoples and suffered one of the highest numbers of deaths caused by COVID-19, according to official data². What lies behind Kaiowá leader Mbo'y and other Kaiowá people's concerns? What reasons and sentiments drive vaccine hesitancy, beyond a simplistic pro-vaccine and anti-vaccinationist rhetoric? And how has the COVID-19 pandemic been experienced and reflected upon by Indigenous Peoples in different Latin American contexts?

In this Research Article, based on ethnographic research carried out in Brazil and Mexico, we explore COVID-19 as ‘a paradigmatic example of an Anthropocene disease’ (O’Callaghan-Gordo and Antó 2020) that reveals much about the embodied inequalities of health and the colonial legacies within the practices of biomedicine. Mounting evidence suggests that COVID-19 and other zoonoses³ are

1 See: <https://www.gov.br/saude/pt-br/vacinacao/>.

2 In September 2022, the *Secretaria Especial de Saúde Indígena* (SESAI) launched a report indicating that 87% of the Kaiowá Peoples had been vaccinated with one dose and 46% with two doses. Most of the Kaiowá people receive health assistance from the Distrito Sanitário Mato Grosso do Sul (DSEI), a regional division of the SESAI. Initially, the Government data was contested by the *Articulação dos Povos Indígenas do Brasil* (Indigenous Peoples' Articulation of Brazil—APIB) due to the fact that the Brazilian Government, led by Bolsonaro, had aimed their vaccination campaign at Indigenous Peoples living in recognised state territories only.

3 An infectious disease transmitted from animals to humans.

caused by environmental degradation driven by large companies such as global agribusiness (Segata 2021). It can be argued that while the powerful corporations that feed capitalist markets bear an overwhelming responsibility for such transmissible diseases, it is those populations which have historically experienced discrimination that have to bear the brunt of them. At the same time, governments' responses have mainly focused on epidemiological control through behavioral approaches rather than on more structural, long-term interventions, as documented by Bodini and Quaranta (2021) in Italy, for example. Thus, by addressing Indigenous understandings of COVID-19, and more broadly their understandings of health and disease processes, this analysis seeks to comprehend the contrasting biopolitics of state and Indigenous collectives. The biopolitics of the state, we argue, is premised on the protection of biological (primarily human) life; whilst the Indigenous approach is oriented towards fostering an active relation between humans and non-humans, based on an understanding that all things classified by the western⁴ taxonomy as plants, animals, mountains, among others, are beings with their own vitalities and souls (Viveiros de Castro 1996).

To help shed light on what we call 'Anthropocene health', we engage with Latin American critical epidemiology approaches. These provide a vital, yet somewhat neglected framework, in which Indigenous claims of wellbeing interweave with claims of social justice, and against reductionist views of health and illness. While acknowledging the growing body of work in medical anthropology that is exploring the health effects of climate change and loss of biodiversity (e.g., Zywert and Quilley 2019), the notion of 'Anthropocene health' (rather than health in the Anthropocene) suggests a different orientation. On the one hand, it points to a dense entanglement between human and non-human health, and how anthropogenic changes to the environment are mutually imbricated, rather than one being an outcome of the other. On the other hand, it also requires us to 'stay with the trouble' (Haraway 2016); that is, to consider, rethink and reimagine what health is as a form of living with the Anthropocene.

Without wanting to diminish the importance and key role of COVID-19 vaccination campaigns, which helped to save millions of lives, it is worth asking, as Jaime Breilh puts it, whether vaccination indeed was, 'the only route to salvation' (2021) or whether a focus on alternatives could have been considered. The critical reflections on health-disease processes in Latin America have cultivated diverse intellectual and disciplinary formations, exemplified by critical epidemiology. As

4 While recognising that this terminology is problematic, we nonetheless use 'western' and 'Euro-American' to refer to concepts that are embedded in and developed from structures of knowledge and power that are geopolitically and historically located.

Laurell (1982) notes, at the end of the 1970s, the social, economic, and political crises in several Latin American countries and a new wave of social struggle stimulated an intense debate on how to best approach health-disease processes in light of the perceived inadequacy of clinical medicine and institutional epidemiology to fully explain patterns of morbi-mortality. Critical epidemiology in Latin America has taken up the challenge to analyse health and disease as historically situated biosocial processes.

Critical epidemiology has emphasised relations of production and social class as key drivers of health-disease processes. It views health through the lens of political economy, with important influences from Marxist political theory. In Laurell's words:

In very general terms, the health-disease process is determined by the way in which men (*sic*) appropriate nature at a given moment; appropriation that happens through the labour process based on a determined development of productive forces and social relations of production. In our view, the social categories that enable us to develop this general proposition and deepen and enrich an understanding of the health-disease process and its determination are social class, as proposed by Breilh, and the labour process (Laurell 1982, 10; our translation).

Since its emergence, critical epidemiology has not only paid attention to the social and political-economic aspects of health and disease, but also to its cultural dimensions, primarily influenced by the reading of Antonio Gramsci's theory. Thus, in addition to questions of labour relations and social class, there have been calls to include aspects such as gender, race/ethnicity, and phenomena such as racism into such research. Addressed within this framework, the disquieting questions raised by Mbo'y and other Indigenous Peoples take on a new meaning. This approach recognises that the question of 'Why am I going to get a vaccine if I don't know what my future will be like tomorrow?' cannot simply be put down to cultural beliefs that should be changed in order to reach vaccine compliance. Instead, it identifies such questions as evidence of the presence of deeper and more profound troubles.

The complexity of the above scenarios demands a different kind of praxis, which poses new challenges for critical epidemiology (both focussed in and beyond Latin America). These include the question of how to align the unique context of Anthropocene health with state-led public health interventions. In an epoch characterised by increasing and unforeseen biosocial health concerns, this has acquired new relevance and urgency.

With COVID-19, the 'epistemic authority' of epidemiology as a discipline has emerged as central in public discussions and political agendas (cf. Lavazza and

Farina 2020), and will likely continue to influence decisions on many aspects of individual and collective life beyond the pandemic. At the same time, while social inequalities have been widely recognised as both influencing the pandemic, and being deepened by it, the social sciences have largely been sidelined as a source of expertise and insight (Bodini and Quaranta 2021, 449).

The discipline of epidemiology appears at the crossroads of manifold conceptual and applied healthcare issues. It has secured its position, on the one hand, due to its reputation of being the sole trustworthy guide for public life in times of emergency. On the other hand, it has received criticism for being an imprecise discipline with limited capacity to predict health outcomes. It is also recognised that its disciplinary approach to population health can be utilised as a powerful political tool. Due to its influence and diversity, critical appraisals of this approach from the perspective of Latin American scholars are of vital importance. Epistemological and methodological discussions stemming from this perspective have been focused on identifications of cause-effect relationships in, for example, disease propagation (Álvarez-Hernández 2008). In fact, one of this discipline's concerns is to be able to control 'factors' (e.g., biological, behavioural, environmental) so as to distinguish causal relationships from other types of associations which may not be aetiological in nature (Boem 2021). Yet, establishing and manipulating factors constitute practices that in themselves can be considered a 'construction' and therefore subject to debate. Epidemiologists work with scientific models that are, after all, idealised representations of a phenomenon (Boem 2021, 60). However, understanding the logics behind the collection of epidemiological data and the construction of epidemiological models is not only a *disciplinary* matter but also a *sociocultural* one, rooted in regional histories and politics of public health that have shaped genealogies of the biosocial within different fields of epidemiology.

Breilh's (2021) critical analysis of dominant Euro-American traditions of epidemiology has highlighted a number of key characteristics; its prevalent focus on the individual as a unit of analysis, based on the assumption that diseases develop as bounded entities; the tendency to treat social and environmental influences as 'risk factors' and in extrinsic relationships to individuals and groups; its emphasis on proximate rather than ultimate causes; its orientation towards simple chains of causality instead of multi-level, complex relationships, and its often ahistorical approach. Equally, the unfinished and partial conceptualisation of the 'biological' and the 'social' in these traditions of epidemiology can limit the understanding of complex and multidimensional phenomena such as epidemics, making epidemiological modelling particularly difficult.

In this article, we contribute to these debates by exploring Indigenous desired futures vis-à-vis planetary crises as well as conceptualisations of health and

disease premised on radically different views of socialities. We engage with the opportunities that a dialogue between Indigenous and Euro-American approaches to life enables; a dialogue that the field of Latin American critical epidemiology has been advocating for decades.

While we are aware of the risk of generalising about 50 million or more people self-identifying as Indigenous in Latin America, we do recognise some common cultural and historical traits. These include a worldview in which a radical separation between humans and non-humans is absent, a lived experience of European colonisation as well as the ongoing sequelae of coloniality. We argue that diverse histories and traditions of Latin American critical epidemiology provide an important alternative framework and resource for understanding and managing population health in the time of COVID-19 and amidst the emerging contexts of the Anthropocene. The focus on political economy, political ecology, and colonialism/coloniality in these approaches alongside the attention to Indigenous disease conceptions and practices, can contribute to an epistemological and praxiological aim. We contend that this approach helps to frame health issues as biosocial phenomena within larger political-ecological dimensions and contributes to the arts of ‘living (well) on a damaged planet’ (Tsing et al. 2017). Some of the current criticisms and dissatisfactions with dominant epidemiological approaches to COVID-19—which are seen to overly focus on biology, to rely on imprecise data collected in fragile health systems, and as detached from socio-political configurations—have already been anticipated and addressed by a number of scholars of Latin America (see Gamlin et al. 2020).

In what follows, we interweave ethnographic evidence with theoretical analysis. The ethnographic data presented here on Brazil draws from Prates’s engagement as co-investigator in the research project ‘Indigenous Peoples Responding to Covid-19 in Brazil: Social Arrangements in a Global Health Emergency’ (PARI-c), carried out in 2021. The narrative extracts in this article are derived from two case studies: ‘Social Distance’, coordinated by Valéria Macedo and Maria Paula Prates (2021), and ‘Vaccination’, coordinated by Maria Paula Prates and Adriana Athila (2021). The Mexican data draws from Berrio’s involvement as co-coordinator with Paola Sesia in the research project ‘Current State of Indigenous Midwifery in Mexico’, with fieldwork undertaken in Chiapas, Guerrero, and Oaxaca, during the pandemic (Sesia and Berrio 2021), as well as from Montesi’s participation in the research project ‘Biogovernance of COVID-19 among Indigenous Communities’ (CONACyT-CIESAS PS 2021) with fieldwork in Oaxaca. Stimulated by Mbo’s question at the start, this article unpacks the reasons that fuel some of the Indigenous understandings of state-led public health actions, in particular, in regard to COVID-19 vaccination campaigns. These actions have been viewed as being contradictory, nonsensical, and/or harmful. We show how the reasons for

disquiet among these Peoples stem from differing engagements with the concept of the 'social' in Indigenous and western health and disease models. We also identify these populations as emerging from the persistent legacies of coloniality which inform states' political actions towards Indigenous Peoples.

Trust, land and the coloniality of COVID-19 vaccination in Brazil and Mexico

Throughout Latin America, critical approaches to health and illness have positively influenced institutional public health in different moments (see Waitzkin et al. 2001), particularly during periods of emerging left-wing political regimes, and especially in Brazil towards the end of the military dictatorship. At the same time, the general neoliberal restructuring of the global order from the 1980s onwards has made it increasingly difficult for governments to implement progressive health policies and reforms. Until very recently, and most importantly during the period of the COVID-19 pandemic, Brazil and Mexico appeared on opposite sides of the political spectrum. The former was led by president Bolsonaro⁵, a conservative and far-right politician, and the latter is run by president López Obrador, a politician with many decades of service, who self-ascribes to the left and leads national politics based on the motto 'For the sake of all, the poor first'. Although both countries implemented non-stringent surveillance measures during the pandemic (Esteves 2020) and both presidents have been accused by segments of the public and the media of downplaying or even denying the gravity of COVID-19, their personal attitudes and their respective government's responses have shown significant differences. This includes the way that epidemiological communication was managed. For months, the Mexican government dedicated daily evening conferences to providing epidemiological bulletins and to explaining biological and social aspects of the pandemic. In contrast, the Brazilian government continuously omitted or deleted data in its public communications (Phillips 2020). The opacity in the management and communication of official data has led to the creation of many independent and voluntary data collection initiatives, such as those instigated by the Indigenous Peoples' Articulation in Brazil [Articulação dos Povos Indígenas no Brasil, APIB], resulting in numerous publications.

Despite these differences in pandemic management by the respective governments, two approaches appear to have been shared by both Brazil and Mexico: firstly, the priority given to Indigenous Peoples in the vaccination campaigns vis-à-vis otherwise deficient medical care provision to these populations, and secondly, the unstoppable advancement of large-scale infrastructural projects on Indigenous lands despite (or perhaps especially during)

5 Jair Bolsonaro was defeated by Luiz Inacio Lula da Silva in the last election of October 2022.

the pandemic. Moreover, in both countries the state-led management of the pandemic was perceived ambivalently by the general population. In the first months of the pandemic, there were public expressions of discontent with health personnel in Mexico, including some acts of aggression. In Brazil, protests were held against the delay in vaccination, which was seen to especially impact disenfranchised population groups, who have historically suffered from a lack of access to health rights.

Throughout the pandemic, COVID-19 fatality rates among Indigenous Peoples in Mexico remained higher than in the general population, an embodied outcome of entrenched inequalities. By the end of May 2021, case-fatality rate in the population that self-identifies as Indigenous had reached 15 deaths to every 100 cases (DGE 2021, 10), higher than the national case-fatality rate, which was established to be around 9% (Sánchez-Talanquer et al. 2021, 19). Muñoz-Martínez (2020) suggests that Indigenous Peoples in Mexico were situated by state health actors as a population group with little exposure to the SARS-CoV-2 virus due to racialised representations of alterity (i.e., they live in isolated areas, are rural, and are younger than the general population). He proposed the notion of 'ethnic immunity' to interpret this representation, which is 'nourished by the racist matrix originating from Spanish colonisation, co-produced by various social sectors such as, among others, the official epidemiology' (Muñoz-Martínez 2020, 325).

The under-reporting of COVID-19 data in Mexico has become a highly contentious issue, which has been fiercely debated and manipulated by opposing political parties for their own ends. Certainly, the lack of medical infrastructure in several regions of the country and the low use of health and social services by (but not exclusively) Indigenous Peoples, even when faced with serious COVID-19 complications, suggests that under-reporting is high in Mexico and also likely in other Latin American countries.

Despite the repurposing of general hospitals exclusively for COVID-19 care and the optimisation of healthcare facilities, centuries of structural violence have materialised in insufficient and inadequate healthcare service provision for Indigenous collectives. This has resulted in understaffed, under-resourced, and ill-prepared hospitals, making healthcare inaccessible, and obliging the individual and family to rely on their own resourcefulness in seeking healthcare. The harsh experiences of those who have fallen seriously ill or died from COVID-19 adds to the history of protracted and multilayered experiences of abandonment or mistreatment of Indigenous Peoples; an embodied memory of suffering with the potential to be transmitted intergenerationally along biosocial paths (cf. Argenti and Schramm 2012). This history has had tangible effects on how Indigenous Peoples

have come to perceive the risk of falling ill with COVID-19. It impacts upon the prevention, protection or caring practices they decide to implement (or not) for themselves or others, as well as affecting their responses to public health initiatives such as vaccination.

There has been deep mistrust evident in the Tzeltal and Tzotzil communities in Chiapas, in the region of Los Altos, for instance, as well as among other Peoples of the Mexico-Guatemala Border and the Soconusco (Sesia and Berrio 2021). Some Indigenous people interpreted measures introduced to combat the pandemic, such as sanitary fumigations or vaccinations, as mechanisms intended to introduce the virus into Indigenous people's bodies or territories. In the Los Altos region, there was resistance to such intervention, which reactivated collective memories of what the communities had previously considered to be deceptions on the part of the government, as these interview excerpts illustrate:

When the drone was roaming around San Cristóbal [performing fumigation work], people from surrounding communities ward it off because they said 'this one is carrying the virus, they are going to leave it here'. Many comments such as this! (Traditional Tzotzil midwife, Chiapas, Mexico, October 2021).

Nearly all Indigenous communities don't want to be vaccinated. My parents, for example, didn't want to get the vaccine because of the bad information they received. It is said that [through the inoculation] they put a chip into people, or that in a year-time those who are vaccinated would die, or that the old people will disappear because the government doesn't want to give them their 'Opportunities' [governmental social programme] anymore, that the government itself sent this virus (Young traditional Tzotzil midwife, Chiapas, Mexico, October 2021).

Concerns were especially focused on the elders, conceived as a vulnerable population group that could easily die when inoculated with the vaccine. At the same time, elders themselves, who had experienced longer life spans and who were considered wise repositories of memories, also responded cautiously to vaccination, as Prates et al.'s (2021) research in Brazil illustrates:

The elders were very afraid because here in this region, in the past, the Juruá [whites] infected food, clothes, etcetera; to kill the Guarani families who lived here, to finish off the Indigenous people to take their land, because of all this (Woman from the Avá collective, Central Brazil, June 2021).

There is a complexity of elements at work that can help explain the hesitancy among some Indigenous people to be vaccinated. For instance, among the Kaiowá, people were afraid that the vaccine would weaken them and cause them

to fall ill and die, so that they could no longer fight for land rights. In a context where distrust of governmental actions prevails and where violence against Indigenous Peoples—with houses of prayer being burned down, leaders being killed, and territorial rights denied—is a day-to-day reality and not a risk calculation, the possibility of conducting an effective vaccination campaign is unlikely.

Historically, Brazilian governments and public health institutions have strongly prioritised vaccination campaigns for Indigenous Peoples. This approach is emblematic of what has been referred to as *Saúde Indígena* (Indigenous health), since at least the early 2000s. Vaccination has provided, both materially and symbolically, a form of reparation for the consequences of territorial invasion, exacerbated during the period of the civil-military dictatorship, between 1964 and 1985 (Valente 2017). In those years, the development of urban centres brought about the destruction of large territories, the introduction of transmissible and non-transmissible diseases to uncontacted Indigenous Peoples, and, concomitantly, vaccination campaigns. The Trans-Amazonian and Transpantanal highways are examples of initiatives that, on the one hand, extended across and destroyed Indigenous territories, whilst on the other, became literally the paths by which specific initiatives to ‘protect’ Indigenous Peoples were facilitated, including vaccination campaigns (Ibid). Such histories show the complex ways that care and harm can become entangled at the level of state intervention in Indigenous health. ‘White diseases’, Indigenous sociocosmologies, and vaccination campaigns have been intersecting for decades.

Anthropological studies have demonstrated that the emic category ‘White disease’, guides many of the Indigenous understandings about what comes ‘from the outside’ or ‘what is caused by the Whites’ behaviour’ (e.g., Gallois 1991). For some Indigenous collectives, both the disease and the vaccine are part of the same pathogenic cause, since they are external alterities to the Indigenous world. Similar understandings of the idea of ‘external’ as a source of impurity and contamination (Douglas [1966] 2003) have been documented in Afro-Mexican communities of the Costa Chica in Oaxaca. Research on Indigenous midwifery (Sesia and Berrio 2021) conducted in three states of southeastern Mexico (Guerrero, Oaxaca, and Chiapas) documented multiple testimonies of mistrust regarding the existence of the virus and prevention measures undertaken by the Mexican government.

In Prates and colleagues’ remote ethnographic work with Indigenous Peoples in Brazil on COVID-19 and vaccination campaigns (see also Prates et al. 2021), Mbo’y, a Kaiowá leader, questioned why Indigenous Peoples were given priority for vaccination. For her, this was suspicious: How could she and her people trust that the Brazilian state wanted the best for them? How was it possible to reconcile priority in vaccination with a systemic denial of territorial rights? The same

questions were raised by the Guarani Mbya collectives in the Rio Grande do Sul region:

The priority of vaccines for Indigenous Peoples is important, but why is the demarcation of our territories never a priority? Here in the Rio Grande do Sul there are less than 10 villages that are homologated [i.e., officially recognised by the Brazilian state]. There are many who are living on the roadside, that are camping in black tarpaulin. And will the state arrive there with the vaccine and say that they have priority? They are living in misery, living in tents. And to say that the state cares about the health of these people is a joke! The vaccine is not synonymous with health, demarcated territory is synonymous with health! Why is the demarcation and homologation of indigenous lands never a priority, and the vaccine is a priority? Just to tell people abroad that the Brazilian State is concerned about the health of Indigenous Peoples? (Young male leader from the Guarani-Mbyá collective, Southern Brazil, June 2021).

Although the Brazilian state has a legal duty to grant both land and health rights to Indigenous Peoples, the separation of governmental executive functions into ministries and federal agencies, together with either a total absence or marked slowness in complying with legal territorial determinations, serve to stifle expectations of effective land demarcation resolutions among important sectors of the civil society. On the one hand, under the jurisdiction of the Ministry of Justice, the role of the National Indian Foundation (FUNAI) is to identify, recognise, and homologate territories. On the other hand, the Ministry of Health, through the Special Secretariat for Indigenous Health (SESAI), is responsible for providing healthcare to the Indigenous Peoples, including the administration of vaccinations. For the Brazilian state, then, territory and health are disassociated. By contrast, for Indigenous collectives, territory *is* health or, more broadly, wellbeing. Despite structural distrust against the state, ultimately most Guarani Mbya people were vaccinated against COVID-19, thanks to the work of Guarani health professionals working within SESAI, who built trust in the vaccine by drawing on their sociocosmological parameters.

Similarly in Mexico, public health officials prioritised vaccination in rural areas over urban centres, pointing out that remote 'rural areas, have been historically isolated and discriminated against and have less probability of finding specialist healthcare services than those of us who live in urban areas' (Cortés Alcalá, General Director of Health Promotion, 2021). Although not all rural populations are Indigenous and not all Indigenous people live in rural areas, half of the Indigenous population live in rural settings (Coneval 2019). However, the striking contrast between the state's benevolence towards Indigenous, rural, or economically disadvantaged people in the vaccination campaigns, and the continuous advance of infrastructural projects

on their lands despite nonconformity towards these projects, poses complex questions regarding the viability of intercultural relationships between state-led public health initiatives and Indigenous health knowledge practices. The adherence of Indigenous Peoples to vaccination in Mexico is fairly high (perhaps with the exception of the state of Chiapas), due to the fact that Indigenous groups frequently integrate biomedicine into their everyday healthcare practices. Nevertheless, activist Indigenous groups have denounced the lack of health service provision as well as the unstoppable implementation of industrial, commercial, and energy projects on their lands, especially in southern Mexico where the largest Indigenous collectives live. From the perspective of these activists, the government has, in fact, taken advantage of the COVID-19 pandemic (Hofmann 2020, 49) to accelerate these interventions on Indigenous lands. In November 2021, the Mexican government issued a presidential decree (still under debate at the time of writing) that instructs federal agencies to consider infrastructural governmental projects as matters of public interest and national security that can be implemented without the usual procedures (such as environmental impact studies or prior informed consent) that slow down their implementation (Alvarado and Castellanos 2021)⁶. The violation of territorial rights to promote large-scale infrastructural projects to achieve ‘development’ is therefore a constant threat. This became evident during the COVID-19 pandemic in Latin America.

The ‘competing rationales of state-based and Indigenous territorial control’ that emerged during the pandemic as outlined by Watson and Davidsen (2021, 2) in Peru were also reflected in actions undertaken by Indigenous communities in Mexico. During the first year of the pandemic, these communities prohibited access to outsiders, installed sanitary filters, and developed their own ‘epidemiological’ registers, leading to the collection of data that contradicted official records (CONACyT-CIESAS PS 2021). However, the prohibition of mass gatherings also affected Indigenous political action, where decisions are discussed in large community assemblies and ideally are reached unanimously. The restrictions on collective and direct sociopolitical participation brought about by the pandemic, were met with anxiety, particularly among the Indigenous communities most affected by infrastructural and industrial megaprojects (Montesi and Soto 2021). A Zoque medical practitioner interviewed in October 2020 (as part of Montesi and colleagues’ research project) stated that the pressure to reauthorize social gatherings came from the need for political action:

In the first assembly we had, we proposed to inform the village that social gatherings were forbidden and it worked out. People accepted it quite well, no

6 The presidential decree aims to establish a fast-track authorisation to be issued in five days and whose validity lasts one year (once this period ends the project would need a standard authorisation).

birthday celebrations, no assemblies. But now people are starting to demand we go back to do assemblies and meetings. Why? Well, the entire village *está de cabeza* [is upside down] right now. We haven't met as a village and the most serious issue is the mining threat, nobody knows anything [about the mining project], the [local] authorities haven't been informed (Zoque physician, Oaxaca, Mexico, October 2020).

This medical practitioner belongs to an Indigenous community that is situated in Isthmus of Tehuantepec, in the Oaxaca region, and is a key area for the government's 'development' plans. The Mexican government is, in fact, intent on fulfilling the centuries-old colonial dream of connecting the Atlantic and Pacific coasts through a railway line that would constitute a global industrial and commercial corridor across the country. As many other studies have shown, development and infection have historically been mutually facilitated (cf. Farmer 2004). During the hardest months of the pandemic, in June 2020, municipal authorities of five Isthmian communities gathered in an assembly to demand a halt to the railway works. They denounced the infraction onto their lands by persons suspected to be employees working on the megaproject. Furthermore they raised concerns that these workers could also spread the virus into a region that was already short of medical services (EDUCA 2020).

The embodied memories of Indigenous people of past and present epidemics (e.g., measles, smallpox, flu) also reconfigure and subvert dominant narratives about the COVID-19 pandemic, reframing the notion of 'crisis' in the context of different biosocial phenomena. Indigenous conceptualisations of epidemics and crises as something already experienced, as rooted in history and myth, and crossing different temporalities and life cycles, offer necessary points of reflection on COVID-19 and wider contemporary concerns such as climate and ecological breakdown. As Bold (2019, 4) argues, consulting Amerindian communities 'on whether the world is ending, whether and why it has ended before, and how we can change contemporary practice to make it sustainable' brings about a much needed alternative to established insights on the Anthropocene. As Bold states, Indigenous Peoples similarly frame the current moment as one of crisis, '[p]ast crises are connected to current conditions' (2019, 13). Since colonialism, extractivism, health and climate breakdown have become interlinked from the perspective of Indigenous Peoples: 'Worlds end [...] when people stop engaging in these healthy net-works of reciprocity, with both visible and invisible co-habitants, or when relationships are strained beyond their limits' (Bold 2019, 5). The need to recognise the shifting and nonlinear temporalities and parameters of past and current crises are a key articulation of Anthropocene health that we seek to foreground, where non-dormant sedimented histories of exploitation and

suffering are actively and simultaneously interacting with both contemporary pandemic and environmental crises.

As Fassin, analysing HIV/AIDS in South Africa (2007), has shown, there are multilayered, recursive, and always reconstituting dynamics of embodied temporalities of suffering. The embodiment of memory, for Fassin (2007, 28), has two dimensions: 'One corresponds to the way in which past facts are inscribed in objective realities of the present; [...] The other consists in the way past facts are inscribed in the subjective experience of the present; [...] Through this twofold inscribing, memory becomes actualized'. These dimensions, we argue, also feed the desired futures that collectives express. The desired future that Mbo'y alludes to is one in which she is able to live as a Kaiowá, in her territory, among her relatives. Vaccination campaigns are about securing life physically, yet say little about ensuring life as a people, as a Kaiowá collective. For Mbo'y, the greatest threat to the Kaiowá way of life is the lack of rights allowing them to live in ancestral territories. Instead, they are compelled to live quite literally on the roadside and are in constant danger from being targeted by gunmen hired by the landowners and ranchers. 'What's the point of being vaccinated if tomorrow I or a relative of mine can die from a gunshot?' added Mbo'y. The relation between body and territory and the preservation of good diplomatic relations between humans and other beings in order to grant Indigenous desired futures is further explored in later sections of this article.

Latin American critical epidemiology and biosocial ecologies

In Latin America, an important discussion in epidemiological theory has centred on how to conceive the imbrication of the 'social' into health/disease processes, namely how biology and society interact and shape each other. Jaime Breilh is a prominent theoretician in Latin American critical epidemiology. He is well known for having developed the concept of 'subsumption' to describe the dynamic process of mutual transformation between society, the environment, and health. For Breilh, the term 'subsumption' can be used to think about how different spheres of biology and society might encompass one another and be constituted by their mutual multi-directional shaping in specific socio-historical contexts. In his own words: 'the external and internal unity between "the biological" and "the social" does not allow the connection to be reduced to external links alone –the unity of the spheres is granted by the dialectical movement of subsumption' (Breilh 2010, 101).

Many of those active in the field of critical epidemiology have mobilised Breilh's conception to critique the social determinants of health approach, mainly

developed in English-speaking contexts, considering it somewhat static, overly focused on single social factors, and failing 'to capture that individual biology is subsumed in the social order' (e.g., Abadía-Barrero and Martínez-Parra 2017, 1231; cf. Fonseca 2020).

Also discussions in other epidemiological traditions outside Latin America have illustrated the importance of these encompassing dynamics, such as American epidemiologist Nancy Krieger's framing of embodiment in the context of an 'eco-social framework' (2021). These discussions have gained further relevance in the wake of emerging terrains of biosocial science that are directly concerned with how a range of social environments shape health, biologies, and bodies (cf. Lappé and Landecker 2019, Gibbon and Lamoreaux 2022). At the same time, it is important to note how Breilh and other Latin American theorists' discussion of subsumption emerged from particular histories in the development of Latin American critical epidemiology. This includes concerns with political ecology, environmental pollution, and toxicity within the context of colonialism that have been central to this critical field of public health since its founding and also its evolution in dialogue and tension with Indigenous perspectives and intercultural approaches. This attention towards the political dimension of health, in part, explains why some scholars in Latin America have judged the social determinants of health model as firstly, one that is excessively rooted in a positivist paradigm, manifest in the influence of causalism and risk theory in its epidemiological foundations, and secondly, one that reflects a 'liberal' notion of justice that can be at odds with Latin American popular framings of justice (Morales-Borrero et al. 2013).

By contrast, epidemiologists working in/focused on Latin America have proposed the 'social determination of health' model as an alternative framework that, according to them, rejects causal reductionism, i.e., the view of 'society' as the sum of individuals and of the 'social' as an additional, extrinsic factor impinging on biological processes. In this vein, the social determination of health framework rejects the individual/society dichotomy and puts forward the notion of *modo de vida* (way of life, which differs from the western idea of 'lifestyle') that captures 'all the processes of production, reproduction, deterioration, exhaustion which are embodied in health/disease across the singular, particular and general levels of life' (Morales-Borrero et al. 2013, 800). Social determination theorists criticise the concepts of 'risk' and 'exposure', on the grounds that individuals are not exposed to an external environment with risks factors but are continually subsumed in life conditions imposed by a social totality (Ibid). In reviewing critical epidemiology and social determination of health literature, capitalism seems to surface as the largest (but not the only) 'social totality' operating on the planet. It does so through mechanisms of exploitation based on the intersectional triad of gender/class/ethnicity inequalities (Breilh 2003, 218–24). Other alternative *modos*

de vida, the Indigenous ones for example, follow other organisational logics, with their own embodied effects on health and illness.

The centrality of the idea of *modos de vida* in the social determination of health framework seeks to avoid static visions of health/disease processes and, instead, points to the ‘dialectic movement of reality’ (Breilh 2003, 83). This sees the biological and the social interacting as a unity, and where genotypes and phenotypes, everyday lifestyles, and social histories shape specific vulnerabilities and protective factors (Ibid, 82). This viewpoint resonates with the concept of ‘local biology’⁷, or the ‘biological difference that results from bodily responses to differing environments over time and across space’ (Lock 2017, 5).

Yet importantly, situating health inequalities as a result of hierarchies established mainly by the capitalist political-economic system has led social determination of health scholars to approach health processes from the analytical lens of ‘dialectics’ and to politicise health. From this standpoint, sustaining and accompanying popular movements on several fronts (land defence, gender justice, etc.) are key to achieving collective health. The defence of land and territory, in this sense, is not a parallel political agenda but integral to health goals. The Latin American feminist notion of *cuerpo-territorio* (body-territory) describes how bodies do not live in a territory: bodies *are* the territory (Marchese 2019), as the Mbyá testimonies also illustrate. What we argue is that Latin American critical epidemiology approaches to health/disease processes are well-suited to make sense of Mbo’y’s and other Indigenous people’s concerns over COVID-19 and public health interventions. Therefore, it is crucial to reflect on how academic concepts such as ‘subsumption’ and *modos de vida* speak to Indigenous experiences of health/disease processes, particularly Anthropocene health. While critical epidemiology has focused extensively on the social causation of health disparities, on its processual nature, and on the unity of biology and the social, it has perhaps reflected less on what constitutes the social. Grasping Indigenous views of life requires a profound and radical reconceptualisation of the social and of the place of humanity on earth, as the following section suggests.

Embodying land, health, and socialities

Disease comes from the wind, but trees protect us, or disease passes over the forest and does not reach human beings. Now there is no more forest and the disease spreads very fast. Because of the ‘whites’, now diseases spread very quickly because ‘whites’ don’t have trees in their city anymore (Shaman from the Avá collective, Southern Brazil, July 2021).

7 For a critical appraisal of the concept of ‘local biology’, see Menéndez (2008, 21–2), where he spells out and warns about its theoretical antecedents. See also Meloni (2016).

Many kinds of diseases come through the air, and the earth sucks the bad things. That's why we say that in the city it is more dangerous than in the village, because in the city there is no more land, the cement and the buildings do not let the air out. And all these bad things, the diseases, stay there more and more and can't get out anymore, because there's nowhere else to go, that's why we say that the land protects us. And we have to take care of the earth because it takes care of us (Young male leader from the Guarani-Mbyá collective, Southern Brazil, June 2021).

In many Indigenous cosmologies body and territory are one, and the loss and deterioration of land equate to increasing threats to humans. The COVID-19 pandemic has been framed in this light by several Indigenous collectives, as the evidence collected by Prates and colleagues shows.

Amongst Indigenous Peoples of lowland South America, the rise of the new coronavirus has been directly linked with how non-Indigenous people relate to other beings who are not human (Prates et al. 2021). To them, this world is filled with human and non-human beings, and health comprises the practice of sustaining good diplomatic relations with such others. In their eyes, the absence of a negotiated relation between non-Indigenous people and these others is the main reason behind recent misfortunes, including COVID-19.

Among the Guarani-Mbyá, the *ja* (owner-master) are spiritual entities that are connected to each animal, plant or outcrop collective, and have the role of protection, as keepers of each non-human collective. For example, there are the *xivija*, owner-spirit of the jaguars, the *yvyraja*, owner-spirit of the trees, the *itaja*, owner-spirit of the stones. Besides, there are also the owners of human feelings such as laziness, the *ateyja*, or of jealousy, the *takateyja*, and so on. The role of the *ja* is to mediate relations between non-human collectives and humans. This mediation is premised on an unstable relationship that requires effort to strengthen bonds between people-bodies and deities-people through chants and dances, for example. Even though the *ja* are invisible to the human eye, they form real crowds throughout the planet, to the extent that a simple fishing expedition to a nearby river must be negotiated to prevent human bodies from becoming sick due to adverse interactions with *ja* entities. For example, one of the most common attacks from the *itaja* is to throw tiny invisible stones which are then lodged into the body of the victim, and which can cause rheumatic problems, leading potentially to death. In this ontology, the relationship between humans and non-humans is horizontal; here, the world is endowed with an immanent character, according to which everyone is interconnected, so that speaking of 'nature' or 'environment' as something external, different, or around us makes little sense. This has important implications for rethinking nature/society (Descola 2005) in western medical and

epidemiological models that somehow rest on anthropocentric relations and conceptualisations of health.

When the first scientific speculations on the appearance of the new coronavirus began to arise early on in 2020, linking it to wild meat consumption in markets throughout Wuhan, China, the Mbyá found these explanations reasonable, although from a different standpoint: consuming meat without paying respect to each animal's *ja* is considered dangerous:

For the whites there is no owner-spirit [*ja*], it's just a body that you can kill, create, eat anything whenever you want, they don't know what's behind things [...] When they raise pigs, or cattle, it's in huge numbers. For us, each food has its ritual, even in the first fruits we put smoke so that it does not harm us. But the Jurua ['whites'] don't have that respect, and obviously that's going to have a consequence (Shaman from the Guarani-Mbyá collective, Southern Brazil, February 2021).

The Mbyá's underlying assumption is that the *ja*, bothered by the disrespectful human-animal relationships triggered by non-Indigenous people, created coronavirus as a response to the harm inflicted by the *Jurua* (White people). Therefore, vulnerability, in principle a basic human condition at *teko axy* (this earthly level where everything perishes) is aggravated by an active variable—the destructive action against animals and plants undertaken by non-Indigenous people (Prates et al. 2021).

Rather than focusing on the characteristics of the virus only, the Guarani-Mbyá have reflected upon strained human-animal relationships and plant degradation. As the interview excerpts that introduce this section illustrate, the absence of trees in urban (and increasingly in rural) settings may also favour the spread of diseases among humans, as trees act as a protective skin, a larger body-territory. Such understandings of COVID-19 and health/disease processes have profound implications for current debates within sociomedical disciplines grappling with the increasing biosocial challenges of Anthropocene health. In the cosmologies of Indigenous Peoples from lowland South America, humanity is a *condition*, not an essence determined biologically. Viveiros de Castro (1996) proposed Amerindian perspectivism as a theory to think about the way Indigenous Peoples in lowland South America generate difference and alterity; if humanity is a condition and materialises through specific types of relations, some animals and plants or even mountains can hold that condition too. Likewise, reflecting on the Indigenous Ikoots' *modo de vida* in Mexico, Cuturi (2020, 252–66) has highlighted the continuity of humans and plants, proposing that the Ikoots' cognitive and motor skills appear to be similar to those of plants because their capabilities are not centralised in the brain or a specific organ but diffused across the body. The fact

that each body part holds some form of intelligent agency, as it happens in plants, contrasts with Cartesian body/mind epistemologies prevalent in western ontologies. Moreover, body concepts are not exclusive to humans but shared with non-human and more-than-human entities. For instance, the term *ombas* signifies the body but also an alter-ego, a wild animal or atmospheric agent to which each person is associated from birth and whose destinies are entangled (Cuturi 2020, 267). In other words, Ikoots are born, live, socialise, and represent themselves as interspecies beings. Overall, what we have described about Mbya and Ikoots' views of human-nature relationships evidences that what 'social' means in Euro-American terms does not necessarily always converge with Indigenous Peoples' understandings of this term.

The conceptualisation of humanity separate from nature is the result of a western historical process. The adjective 'social' derives from the Latin *socius*, or companion. It presumably draws on the Indo-European root *sak-*, 'to follow'. By extension, this signifies the one who follows others, or the one who accompanies and is implicated in a common action. Through the Enlightenment and the gradual consolidation of capitalism after the 16th century, western thought leaned towards separating humanity from nature, thereby applying the 'social' to understandings of human organisation only. Latour (1991) drew attention to this when revisiting the work of Émile Durkheim and Gabriel Tarde, arguing that by the beginning of the 20th century the social sciences had been defined by Durkheim's theoretical approach rather than Tarde's. This meant excluding objects, plants, animals, and other entities as part of the social realm or, in other words, establishing society as a category definition. The assumption that sociality refers only to 'human' relations in Euro-American ontologies continues to have contemporary reverberations.

This conception is dominant in Euro-American epidemiology and, we argue, also in traditions of critical epidemiology within Latin America. The models of the social determinants of health and the social determination of health have mainly focused on producing explanations of the effects of human-made socialities on human health and biology. That is, they both consider the impact of the activities of social actors' (e.g., corporations, government agencies), environmental factors (e.g., housing, proximity to food markets), and individual behaviours (e.g., smoking, diet). In these models, such effects on human health are also mediated by larger, structural social forces such as gender, class, race/ethnicity inequalities. Under this assumption, non-human entities enter the picture in these models' explanation of health/disease processes only as infectious agents, vectors or toxigenic substances that 'trespass' thresholds and affect humans, with the capacity to cause human illness.

If we were to shift viewpoint and adopt an Indigenous perspective, then some of those non-human entities considered intrusive could be conceived of as companions (Haraway 2016; Tsing 2015). Following such an angle, even an undesired virus such as SARS-CoV-2 may be considered a companion. Adopting this perspective demands a more radical approach towards health/disease processes, also when conducting research through a critical epidemiology lens.

Recent scientific research has questioned the human exclusivity of the social. In biology, for example, the concept of 'holobiont' has challenged conceptions of 'individual' and 'community' by revealing interspecies relationships that constitute 'symbiotic complexes'. Developed by biologist Lynn Margulis (1991), the holobiont denotes a living entity made of the association of a host and the many other species (primarily microorganisms) that live in it, and has for some time influenced many areas of biological research. In cognitive studies, the so-called 'mind-gut connection' is being proposed as an example of how cognition functions inside the body, yet beyond the 'skull'. This notion of extended cognition has been called the 'internally extended cognition thesis', and seeks to problematise body boundaries and processes (Boem et al. 2021). In botany, plants are increasingly conceived of as intelligent beings because they have been found to be capable of communication, movement, and problem solving; an epistemological turn which is defying anthropocentrism (Mancuso and Viola 2015). Such emerging understandings of life, sociality, and interconnectedness in diverse fields of biosocial science will undoubtedly need to be incorporated into epidemiological models if we want to address the biosocial challenges of the Anthropocene. Learning from Indigenous socialities offers important practical and conceptual pathways for addressing and engaging with Anthropocene health (see also Gamlin, this issue).

Final remarks

In this article, we have foregrounded the case of the COVID-19 pandemic and, in particular, we have looked at vaccination campaigns aimed at specific Indigenous communities in Brazil and Mexico in order to consider the scope and limits of Latin American critical epidemiology in confronting Anthropocene health. Drawing on ethnographic research with differently situated Indigenous groups and COVID-19 vaccination campaigns, we have shown how perceptions and reactions to the public health response to the 'crisis' of the pandemic is shaped by an experience of 'crisis' that is rooted in the ongoing dynamics and consequences of coloniality. This is apparent in state policy which paradoxically denies Indigenous Peoples rights to land and self-governance whilst also prioritising the same populations for vaccination. At the same time, this contradiction in terms fuels doubt among Indigenous Peoples, leading them to distrust public health campaigns. With its

focus on how the social is subsumed within bodies and its dialectical understanding of the social determination of health, critical epidemiology is an important resource. We argue that it can help examine the Indigenous responses to and perceptions of public health campaigns, particularly in terms of embodied inequalities that have historically been shaped by capitalist and colonial relations of exploitation. Nonetheless, we argue that critical epidemiology as it stands does not sufficiently address as yet the fundamental complexities of Anthropocene health. This is because it is still largely focused on redressing the lack of public-health resources for what are seen as under-served communities, instead of reconfiguring and expanding its view on what is meant by the 'social', how it is reproduced, and what it encompasses.

In this concluding discussion, we reflect further on the limits of Latin American critical epidemiology in confronting the challenges of Anthropocene health, whilst also pointing to the ongoing questions about the role of the state in addressing, intervening, and resolving issues raised by this. Critical epidemiology has advocated for the recognition, respect, and sometimes integration of western and traditional medicine. However, the diversification and inclusion of previously marginalised voices in this field of critical epidemiology has precipitated the need to address more directly the interconnected aspects of human and planetary health. These aspects have come to the fore, more explicitly as awareness of the anthropogenic effects of climate change, pollution, and loss of biodiversity grows.

In this light, the studies that have adopted what is described as an 'intercultural approach' (Campos Navarro, Peña Sánchez, and Paulo Maya 2017; Langdon 2007) have provided not only a post-colonial critique of a western universalising narrative of oppression within Latin American critical epidemiology but also a point of leverage to expand the scope of that critique (Fonseca 2020; Breih 2021). In his exploration of the history and emergence of social medicine, a field with parallels to critical epidemiology, Fonseca (2020) argues that the focus of this discipline on class, labour exploitation, and marginalised oppression situated in the period of early 20th century history has been reframed through the momentum towards interculturality. This worldview situates the past and ongoing violence of European colonialism as central. He refers to a 'holocaust of indigeneity', which is not only evidenced in the mass murder of Indigenous communities but also in the whole-scale destruction of ways of living [*modos de vida*]. Control and possession of land by the state often destroys Indigenous knowledge, livelihoods, and spirituality, which are themselves shaped by the capacity to sustain and protect planetary resources (see also Valencia 2014). For some commentators (cf. Taddei 2020), integrating Indigenous perspectives on how to procure a more balanced relationship between human and non-human forms of life into Anthropocene health is therefore a question of social and political justice as well as an urgent response

to the threat of climate change and loss of biodiversity to the planet; both of which are entangled in the ongoing coloniality of global capitalism. Although perhaps utopian in nature, Breilh (2003, 288–92) calls for interculturality as a ‘dialogical or strategic relationship’ that can help to ensure cultural diversity while building a contra-hegemonic unity for the construction of a new, global, and emancipatory society. This utopian call is crucial in the Anthropocene, but in practice difficult to achieve.

The difficulties in building an intercultural, horizontal, and emancipatory society rest partly in relation to the ambivalent role that public health governance should or should not play in addressing Anthropocene health in modern societies. Latin American critical epidemiologists have questioned the social determinants of health model, arguing that by entrusting public health improvements to the state through the strengthening of public policies (Morales-Borrero et al. 2013, 801), this model reflects a liberal approach that in Latin America can be highly problematic. Historically, liberalism has served to sustain independence movements from colonisers and, simultaneously, has reinforced elites in newly-founded nation states. Most importantly, the liberal doctrine has acted as the ‘ideological expression of the global articulation of markets’ (Galeano [1971] 2008, 246), thus nourishing what Walter Mignolo (2007) has termed ‘coloniality’. However, it is far from clear what other political pathways could be pursued in order to transform power relations within and between countries. For many of the scholars who work with a social determination of health framework, the target of any political action (including health) should aim to combat the capitalist model of accumulation, for example, that which has been imposed on the inhabitants of Abya Yala (the Americas)⁸ since the advent of colonialism. Dialogue and transactions with the state in relation to Indigenous health is, therefore, a contentious proposition for critical epidemiology in Latin America, with positions spanning from complete rejection, strategic dialogue, to advocating transformation from within.

COVID-19 has made the issue of governance and legitimacy even more visible and pressing which, in part, is linked to wider questions in relation to Anthropocene health. These include: whether the state should recover centrality vis-à-vis private, corporate capitalist agents? Whether human communities can think about governance beyond state models given that this is the ultimate expression of western political domination and extractivist modes of living? And also, what types of political governance are communities imagining for/in the Anthropocene? Such questions, while not necessarily entirely new, now resonate more urgently, not only for Indigenous communities but also for Latin American critical epidemiology. We

8 Abya Yala (or ‘land in its full maturity’) is a Cuna term employed to address the continent that was invaded by European colonisers and renamed America (Juncosa 1987). Since then, it is widely used by those who want to disenfranchise themselves from colonialist terminology.

end our article not with definitive answers but with these ongoing and vital questions that we hope will further inform further debate and discussion, as differently situated communities confront and find new ways of living in and with the Anthropocene.

Authorship statement

All authors participated in the writing-up and editing of the article. All participated in theoretical discussions although Montesi, Gibbon and Prates contributed most greatly to their shaping in the article drafts. Ethnographic data was obtained through Prates, Berrio, and Montesi's involvement in research projects about or within the context of the COVID-19 pandemic. Montesi's work in this article contributes to CONACyT project 771 'Salud de los pueblos indígenas en México, 2010-2025' coordinated by Paola Sesia.

Ethics statement

The data by Berrio and Montesi presented here is sourced from the research projects 'Situación actual de la partería indígena en México' and 'Biogobernanzas frente a la pandemia de Covid-19', both approved by the National Council of Science and Technology (CONACyT), Mexico, in 2022 and 2020 respectively. The data gathered by Prates comes from the research project 'Indigenous Peoples responding to COVID-19 in Brazil: social arrangements in a Global Health emergency' (PARI-c). Prates' work was funded by GECO MRC/UKRI and NIHR (UK) and the Rede Covid-19 Humanidades MCTI (Brazil). This study was approved by City University of London's Research Ethics Committee, in the UK, and qualified as a social engagement urgent project. The authors declare there is no conflict of interest in the research conducted.

Acknowledgements

We would like to thank the anonymous reviewers of our article who provided invaluable commentary. We also extend our thanks to the lead editor for this special issue Paola Sesia for her help and guidance and also to the MAT editorial team. We are grateful to all our interlocutors and co-researchers, Indigenous and non-Indigenous in the field in Brazil and Mexico who contributed to our understanding of some aspects of Anthropocene health.

About the authors

Laura Montesi is a CONAHCyT researcher based at the CIESAS (Centre for Research and Higher Studies in Social Anthropology) in Oaxaca, Mexico. She is a medical anthropologist specialised in the study of chronic diseases and

conditions, particularly among Indigenous populations with a focus on health disparities. She is co-editor of the books *Managing Chronicity in Unequal States: Ethnographic Perspectives on Caring* (UCL, 2021) and *Los huaves en el tecnoceno. Disputas por la naturaleza, el cuerpo y la lengua en el México contemporáneo* (INAH-Editpress, 2022).

Maria Paula Prates is a Research Fellow in Medical Anthropology of the Anthropocene at University College London (UCL) and a Collaborator Professor at the Postgraduate Programme of Social Anthropology of the Federal University of Rio Grande do Sul (PPGAS/UFRGS, Brazil). She has been carrying out ethnographic studies among and with the Guarani-Mbyá, in lowland South America, for the last 20 years. Her current research interest includes birthing, sexual and reproductive health and the embodied inequalities of the Anthropocene, with special attention to Indigenous women. Currently she is the Principal Investigator of two research projects: the first on tuberculosis among the Guarani-Mbyá Indigenous Peoples, funded by UCL Social Sciences Plus, and the second on sexual and reproductive health (from an intergenerational approach) among Indigenous women in Brazil, funded by CHIRAPAQ.

Sahra Gibbon is Professor of Medical Anthropology at University College London (UCL). She has carried out ethnographic research in the UK, Cuba, and Brazil examining issues around health inequalities, biomedicine, and public health. Her current work is focused on further examining and intervening on 'biosocial' research and science in birth cohorts and she is Principal Investigator for the Wellcome Trust project 'The Embodied Inequalities of the Anthropocene. Building capacity in Medical Anthropology 'a collaboration with colleagues in the UK, Mexico, and Brazil.

Lina Rosa Berrio-Palomo is researcher and professor at the Centre for Research and Advanced Studies in Social Anthropology (CIESAS, Pacifico Sur), Oaxaca, Mexico. Her research topics are sexual and reproductive health, Indigenous and afrodescendent people and feminist anthropology. She has coordinated several research projects on maternal health in Indigenous areas and works in collaboration with organisations of Indigenous women and non-governmental organisations. Her current work focuses on Afromexicans' reproductive health and traditional midwifery in Mexico.

References

- Abadía-Barrero, Cesar Ernesto, and Adriana Gisela Martínez-Parra. 2017. 'Care and Consumption: A Latin American Social Medicine's Conceptual Framework to Comprehend Oral Health Inequalities'. *Global Public Health* 12 (10): 1228–41. <https://doi.org/10.1080/17441692.2016.1171377>.

- Alvarado, Luis, and Rafael Castellanos. 2021. '¿Es constitucional el polémico "Acuerdo Presidencial" sobre proyectos y obras de seguridad nacional?' Nexos, November 25, 2021. <https://anticorrupcion.nexos.com.mx/es-constitucional-el-polemico-acuerdo-presidencial-sobre-proyectos-y-obras-de-seguridad-nacional/>.
- Álvarez-Hernández, Gerardo. 2008. 'Limitaciones metodológicas de la epidemiología moderna y una alternativa para superarlas: la epidemiología sociocultural'. *Región y Sociedad* 20 (2): 51–75. <http://www.scielo.org.mx/pdf/regsoc/v20nspe2/v20nspe2a3.pdf>.
- Argenti, Nicolas, and Katharina Schramm. 2012. *Remembering Violence. Anthropological Perspectives on Intergenerational Transmission*. New York, NY: Berghahn.
- Bodini, Chiara, and Ivo Quaranta. 2021. 'COVID-19 in Italy: A New Culture of Healthcare for Future Preparedness'. In *Viral Loads: Anthropologies of Urgency in the Time of COVID-19*, edited by Manderson, Lenore, Nancy J. Burke, and Ayo Wahlberg, 443–55. London: UCL Press.
- Boem, Federico. 2021. 'Modeling Pandemic: Proximate and Ultimate Causes'. *Argumenta* 6 (2): 57–77. <https://doi.org/10.14275/2465-2334/202113.boe>.
- Boem, Federico, Ferretti, Gabriele, and Silvano Zipoli Caiani. 2021. 'Out of Our Skull, In Our Skin: The Microbiota-Gut-Brain Axis and the Extended Cognition Thesis'. *Biology & Philosophy* 36: 14. <https://doi.org/10.1007/s10539-021-09790-6>.
- Bold, Rosalyn. 2019. 'Introduction: Creating a Cosmopolitics of Climate Change'. In *Indigenous Perceptions of the End of the World*, edited by Rosalyn Bold, 1–27. Cham: Palgrave Macmillan.
- Breilh, Jaime. 2003. *Epidemiología Crítica. Ciencia Emancipadora e Interculturalidad*. Buenos Aires: Lugar Editorial.
- Breilh, Jaime. 2010. 'Las tres "S" de la determinación de la vida: 10 tesis hacia una visión crítica de la determinación social de la vida y la salud'. In *Determinação Social da Saúde e Reforma Sanitária*, edited by Roberto Passos, 87–125. Rio de Janeiro: Cebes.
- Breilh, Jaime. 2021. 'En el corazón de la pandemia está el sistema agroalimentario.' *Tierra Viva Agencia de Noticias*, 26 August 2021. <https://agenciatierraviva.com.ar/en-el-corazon-de-la-pandemia-esta-el-sistema-agroalimentario/>.
- Campos Navarro, Roberto, Peña Sánchez, Edith Yesenia, and Alfredo Paulo Maya. 2017. 'Aproximación crítica a las políticas públicas en salud indígena, medicina tradicional e interculturalidad en México (1990–2016)'. *Salud Colectiva* 13 (3): 443–55. <https://doi.org/10.18294/sc.2017.1115>.
- CONACyT-CIESAS Pacífico Sur. 2021. *Biogobernanzas Frente a la Pandemia de Covid-19: Necesidades, Recursos y Estrategias en Comunidades Indígenas del Estado de Oaxaca*. México: Consejo Nacional de Ciencia y Tecnología. <https://pacificosur.ciesas.edu.mx/wp-content/uploads/2021/03/Informe-de-poli%CC%81ticas-gobernanza-covid.pdf>.

- Consejo Nacional de Evaluación de la Política de Desarrollo Social [CONEVAL]. 2019. *La Pobreza en la Población Indígena de México 2008–2018*. https://www.coneval.org.mx/Medicion/MP/Documents/Pobreza_Poblacion_indigena_2008-2018.pdf.
- Cortés Alcalá, Ricardo. 2021. 'Por qué se decidió dar prioridad a zonas rurales en vacunación contra Covid-19?' *Milenio Noticias*, February 14, 2021. https://youtu.be/j_n50nrqJgw.
- Cuturi, Flavia G. 2020. 'Al di là della svolta botanica. Continuità tra pratiche di vita e di pensiero scientifici e nativi'. In *La Natura come Soggetto di Diritti. Prospettive Antropologiche e Giuridiche a Confronto*, edited by Flavia G. Cuturi, 219–86. Florence: Editpress.
- Descola, Philippe. 2005. *Par-delà Nature et Culture*. Paris: Éditions Gallimard.
- Dirección General de Epidemiología [DGE]. 2021. *Décimo Primer Informe Epidemiológico 2021 Covid-19 en la Población que se Reconoce como Indígena*. México: Subsecretaría de Prevención y Promoción de la Salud, Secretaría de Salud. https://www.gob.mx/cms/uploads/attachment/file/644484/COVID-19_poblacion_indigena_2021.05.27.pdf.
- Douglas, Mary. [1966] 2003. *Purity and Danger: An Analysis of Concepts of Pollution and Taboo*. London and New York, NY: Routledge.
- EDUCA. 2020. 'Primero la salud: comunidades del Istmo acuerdan frenar obras del Corredor Transístmico'. June 12, 2020. <https://www.educaoxaca.org/primero-la-salud-comunidades-del-istmo-acuerdan-frenar-obras-del-corredor-transistmico/>.
- Esteves, Paulo. 2020. 'Latin America's Uncoordinated Response in Tackling COVID-19'. *South African Institute of International Affairs*. <https://www.jstor.org/stable/resrep29594>.
- Farmer, Paul. 2004. *Pathologies of Power. Health, Human Rights, and the New War on the Poor*. Berkeley, CA: University of California Press.
- Fassin, Didier. 2007. *When Bodies Remember. Experiences and Politics of AIDS in South Africa*. Berkeley, CA: University of California Press.
- Fonseca, Sebastian. 2020. *Latin American Social Medicine: The Making of a Thought Style*. PhD dissertation. London: Kings College London.
- Galeano, Eduardo. [1971] 2008. *Las Venas Abiertas de América Latina*. México: Siglo XXI Editores.
- Gallois, Dominique. 1991. 'A categoria doença do branco: ruptura ou adaptação de um modelo etiológico indígena?' In *Medicinas Tradicionais e Medicina Ocidental na Amazonia*, edited by Dominique Buchillet, 175–205. Belém: Edições CEJUP, Museu Paraense Emílio Goeldi, CNPq.
- Gamlin, Jennie, Gibbon, Saha, Sesia, Paola, and Lina Berrio (eds.). 2020. *Critical Medical Anthropology: perspectives in/from Latin America*. London: UCL Press.

- Gibbon, Sahra, and Janelle Lamoreaux. 2022. 'Toward Intergenerational Ethnography: Kinship, Cohorts, and Environments in and Beyond the Biosocial Sciences'. *Medical Anthropology Quarterly* 35 (4): 423–40. <https://doi.org/10.1111/maq.12682>.
- Haraway, Donna. 2016. *Staying With the Trouble (Experimental Futures): Making Kin in the Chthulucene*. Durham, NC: Duke University Press.
- Hofmann, Susanne. 2020. 'Putting Large-Scale Infrastructure Projects First: The COVID-19 Pandemic in Indigenous Mexico'. *Bulletin of Latin American Research* 39 (S1): 47–51. <https://doi.org/10.1111/blar.13182>.
- Juncosa, José F. 1987. 'Abya Yala: una editorial para los indios'. *Chasqui* 23: 39–47. <https://doi.org/10.16921/chasqui.v0i23.3036>.
- Krieger, Nancy. 2021. *Ecosocial Theory, Embodied Truths and the People's Health*. New York, NY: Oxford University Press.
- Langdon, E. Jean Matteson. 2007. 'Participação e autonomia nos espaços interculturais de Saúde Indígena: reflexões a partir do sul do Brasil'. *Revista Saúde e Sociedade* 16 (2): 7–12.
- Lappé, Martine, Robbin Jeffries Hein, and Hannah Landecker. 2019. 'Environmental Politics of Reproduction'. *Annual Review of Anthropology* 48: 133–50. <https://doi.org/10.1146/annurev-anthro-102218-011346>.
- Latour, Bruno. 1991. *Nous N'avons Jamais Été Modernes—Essai d'Anthropologie Symétrique*. Paris: La Découverte.
- Laurell, Asa Cristina. 1982. 'La salud-enfermedad como proceso social'. *Cuadernos Médico-Sociales* 19: 1–11.
- Lavazza, Andrea, and Mirko Farina. 2020. 'The Role of Experts in the Covid-19 Pandemic and the Limit of Their Epistemic Authority in Democracy'. *Frontiers of Public Health* 14 (8): 356. <https://doi.org/10.3389/fpubh.2020.00356>.
- Lock, Margaret. 2017. 'Recovering the Body'. *Annual Review of Anthropology* 46: 1–14. <https://doi.org/10.1146/annurev-anthro-102116-041253>.
- Macedo, Valéria, et al. 2021. 'Estudo de caso distanciamento social'. *Plataforma de Respostas Indígenas à Covid-19 no Brasil*. <http://www.pari-c.org/estudos/>.
- Mancuso, Stefano, and Alessandra Viola. 2015. *Brilliant Green: The Surprising History and Science of Plant Intelligence*. Washington, DC: Island Press.
- Marchese, Giulia. 2019. 'Del cuerpo en el territorio al cuerpo-territorio. Elementos para una genealogía feminista latinoamericana de la crítica a la violencia'. *Entre Diversidades: Revista de Ciencias Sociales y Humanidades* 6 (2): 9–41. <https://doi.org/10.31644/ED.V6.N2.2019.A01>.
- Margulis, Lynn. 1991. 'Symbiogenesis and Symbioticism'. In *Symbiosis as a Source of Evolutionary Innovation: Speciation and Morphogenesis*, edited by Lynn Margulis and René Fester, 1–14. Cambridge, MA: MIT Press.
- Meloni, Maurizio. 2016. *Political Biology: Science and Social Values in Human Heredity from Eugenics to Epigenetics*. London: Palgrave Macmillan.

- Menéndez, Eduardo. 2008. 'Epidemiología sociocultural: propuestas y posibilidades'. *Región y Sociedad* 20 (2): 5–50.
<http://www.scielo.org.mx/pdf/regsoc/v20nspe2/v20nspe2a2.pdf>.
- Mignolo, Walter. 2007. 'Coloniality of Power and De-colonial Thinking'. *Cultural Studies* 21 (2–3): 155–167. <https://doi.org/10.1080/09502380601162498>.
- Montesi, Laura, and Alma Patricia Soto Sánchez. 2021. 'Biogobernanzas indígenas. Alcances y limitantes de las respuestas comunitarias a la pandemia de Covid-19'. Paper at *XLIII Convegno Internazionale di Americanistica*, Perugia, Italy.
- Morales-Borrero, Carolina, Elis Borde, Juan C. Eslava-Castañeda, and Sonia C. Concha-Sánchez. 2013. '¿Determinación social o determinantes sociales? Diferencias conceptuales e implicaciones praxiológicas'. *Revista de Salud Pública* 15 (6): 797–808. <http://www.scielo.org.co/pdf/rsap/v15n6/v15n6a03.pdf>.
- Muñoz Martínez, Rubén. 2020. 'Definitions, Differences and Inequalities in Times of COVID-19: Indigenous Peoples in Mexico'. *Social Anthropology/Anthropologie Sociale* 28 (2): 326–27. <https://doi.org/10.1111/1469-8676.12875>.
- O'Callaghan-Gordo, Cristina, and Josep M. Antó. 2020. 'COVID-19: The Disease of the Anthropocene'. *Environmental Research* 187: 109683.
<https://doi.org/10.1016/j.envres.2020.109683>.
- Phillips, Dom. 2020. 'Brazil stops releasing Covid-19 death toll and wipes data from official site'. *The Guardian*, June 7, 2020.
<https://www.theguardian.com/world/2020/jun/07/brazil-stops-releasing-covid-19-death-toll-and-wipes-data-from-official-site>.
- Prates, Maria Paula, Adriana Athila, Ivana Teixeira, and Anderson Jamar. 2021. 'Estudo de caso vacinação'. *Plataforma de Respostas Indígenas à Covid-19 no Brasil*. <http://www.pari-c.org/estudos/>.
- Prates, Maria Paula, Bruno Huyer, Ariel Ortega, and Christine McCourt. 2021. 'What Kind of World Ends When Covid-19 Reaches the Guarani-Mbyá People? Understandings of Vulnerability and New Beginnings from Southern Brazil and Argentina'. Paper presentation, at *Association of Social Anthropologists of the UK Conference* (online), April 2, 2021.
- Sánchez-Talanquer, Mariano, Eduardo González-Pier, Jaime Sepúlveda, Lucía Abascal-Miguel, Jane Fieldhouse, Carlos del Río, and Sarah Gallalee. 2021. *Mexico's Response to COVID-19: A Case Study*. San Francisco, CA: Institute for Global Health Sciences, University of California, San Francisco.
<https://globalhealthsciences.ucsf.edu/news/mexicos-response-covid-19-case-study>.
- Segata, Jean, Beck, Luiza, and Luísa Muccillo. 2021. 'Beyond Exotic Wet Markets: COVID-19 Ecologies in the Global Meat-Processing Industry in Brazil'. *ETropic: Electronic Journal of Studies in the Tropics* 20 (1): 94–114.

- Sesia, Paola, and Lina Berrio (eds.). 2021. *Situación Actual de la Partería Indígena en México. Informe final. Chiapas, Guerrero, Oaxaca*. Working paper. Oaxaca: CIESAS, Conacyt.
<https://pacificosur.ciesas.edu.mx/wp-content/uploads/2021/12/Ciesas-Situacion-Actual-informe.pdf>.
- Taddei, Renzo. 2020. 'Anthropology and the Pragmatics of Climate Knowledge in Brazil'. *American Anthropologist* 122 (4): 941–60. <https://doi.org/10.1111/aman.13500>.
- Tsing, Anna Lowenhaupt. 2015. *The Mushroom at the End of the World: on the Possibility of Life in Capitalist Ruins*. Princeton, NJ: Princeton University Press.
- Tsing, Anna, Heather Swanson, Elaine Gan, and Nils Bunbandt (eds.). 2017. *The Arts of Living on a Damaged Planet*. Minneapolis, MN: University of Minnesota Press.
- Valencia, Marco. 2014. 'Módulo 6, parte 2: Salud familiar comunitaria intercultural SAFCI'. YouTube video. <https://youtu.be/wXuO2mPf6Po>.
- Valente, Rubens. 2017. *Os Fuzis e as Flechas: A História de Sangue e Resistência Indígenas na Ditadura*. São Paulo: Companhia das Letras.
- Viveiros de Castro, Eduardo. 1996. 'Os pronomes cosmológicos e o perspectivismo ameríndio'. *Revista Mana* 2 (2): 115–44. <https://doi.org/10.1590/S0104-93131996000200005>.
- Waitzkin, Howard, Iriart, Celia, Estrada, Alfredo, and Silvia Lamadrid. 2001. 'Social Medicine Then and Now: Lessons From Latin America'. *American Journal of Public Health* 91: 1592–601. <https://doi.org/10.2105/AJPH.91.10.1592>.
- Watson, Ana, and Conny Davidsen. 2021. 'Pandemic State Failure, Hydrocarbon Control, and Indigenous Territorial Counteraction in the Peruvian Amazon'. *Frontiers in Human Dynamics* 3: 654311.
<https://www.frontiersin.org/articles/10.3389/fhumd.2021.654311>.
- Zywert, Katharine, and Stephen Quilley (eds.). 2019. *Health in the Anthropocene: Living Well on a Finite Planet*. Toronto: University of Toronto Press.