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Crisis futurities in pathogen-responder relations in Kenya: A genealogical approach

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Constructing a genealogy of pathogen-responder relations, I reveal how pathogens register in complex ecosystems of human intervention. I illustrate how a grouping of pathogens orients the sensibilities of scientists toward calamity and dystopia through what I conceptualize as 'crisis futurities'—doing so in ways that drive biopolitical impulses toward protecting life, mitigating human suffering, and experimentality. Crisis futurities spring from anticipatory temporalities scientists assign to pathogens: incubation and latency periods; speed and modality of spread; and causal risk factors. Intervention from this perspective is driven by an ethics of precision; a calculus of planning; and an experimental wrestling with 'the hypothetical' that anticipates the potential devastation and political consequences of pathogens.

Introduction

A diverse panel of Canadian scientists—which included microbiologists, epidemiologists, and infectious disease clinical scientists—once asked for my perspective on 'pressing global health problems facing our times.' As a social scientist of HIV, my mind flew to scholarship that outlined how International Monetary Fund and World Bank programs produced barriers to HIV prevention and treatment services, especially in African contexts. Internally I reasoned that my answer needed to be straightforward enough to engage the scientists while also enabling me to explain the various HIV vulnerabilities endured by members of African queer and sex worker communities. Aloud, I summarized how structural adjustment programs decimated public health care and social welfare systems across various African nations. My explanation was met with the furrowed brow of the Department Chair of Medical Microbiology, who adamantly declared: 'Well, that all sounds too abstract to me. *You have to get in, find the pathogen, kill the pathogen, and get out again*!'

At first, I felt dismay by what I thought to be a crudely simplistic statement, one that clashed with my sensibility as a medical anthropologist. Privileging an ethics of immediate action (Carr 2019), her statement left little room for critical rumination. However, over the coming years, as I came to work closely alongside many of these disease responders and their Kenyan colleagues and learn about their rich history of scientific discovery, epidemic mitigation, and treatment attempts, I gained a new perspective on the nuances behind the chair's provocative statement. For indeed, the work of identifying pathogens,

attempting to eliminate them, and finding a way to exit a 'completed' infectious disease control project is no straightforward matter.

In my ensuant study of infectious disease interventions, I soon realized that I needed to grapple with pathogens as vibrant things that get made in their interactions with scientists and other responders planning public health programs. Taking pathogens seriously, I ask what role, over time, do they play in generating forms of socio-political change, as humans attempt to apprehend and respond to them? I place analytic attention on a constellation of pathogens—particularly Haemophilus ducreyi (HD), Human Immunodeficiency Virus (HIV), and Human Papillomavirus (HPV)—that came into existence within complex ecosystems of human intervention. By constructing a genealogy of three pathogen-responder relations, I reveal important biopolitical transformations as arriving through a series of encounters, relationalities, and embroilments between different pathogens and scientists, clinicians, and activists. In this view, pathogens are critical resources and mediators that enable human intervention to project itself into the future, so that intervention continues almost ceaselessly, while furthering the existence of pathogens in the world. A greater attunement to pathogens as complex actants that stir up human responses, I argue, offers fresh ways of understanding mutations in power that govern public health interventions.

My approach to understanding intervention by including nonhuman actors follows on the new materialist turn in social theory, which disrupts anthropocentric narratives of world making, a paradigm shift that has especially gained traction in social studies of science and technology. I take much inspiration from Hannah Landecker's (2016) 'biology of history,' which examines the co-evolution of human history and microbiological life courses. However, instead of emphasizing 'the physical registration of human history' (Landecker 2016, p. 19) in the life of pathogens, I emphasize the ontological aspects of pathogens that emerge as they play into distinctive technical arrangements, producing 'more-than-human' entanglements, reverberations, effects, affects, and temporalities that generate a distinctive field of intervention.

Building on Foucault's genealogical method that disrupts unified, linear, developmentalist portrayals of human progress (Foucault 1977), my conceptual framework unearths the irregular, historically contingent conditions and practices that produce authoritative knowledge. To borrow the words of feminist philosopher Maria Tamboukou (1999, p. 202) 'genealogy is concerned with the processes, procedures and apparatuses by which truth and knowledge are produced, in what Foucault calls the discursive regime of the modern era.' History here serves as a tool to understand this 'now' we inhabit. My genealogical approach, although rehashing 'the past,' renders a *history of futurity* that draws out the prospective dimensions of disease-responder relations in contemporary health interventions. Pathogens not only leave a material legacy as significant disruptors of health development, but they historically are cast as vital harbingers of disaster yet to arrive. My portrayal of pathogen-responder relations points to the way these undesirable futures create possibilities and limits for responders to act at different moments. As a grouping of pathogens register in and become intertwined with the anticipations at play in human health interventions (see Adams et al. 2009), they facilitate configurations of response in Kenya to emerge and persist, reshuffling and recombining their constitutive elements (i.e., risk groups, disease categories, scientific facts, activist formations, state priorities) over time into new modalities.

My genealogy of pathogen-responder relations illustrates how a group of especially troublesome pathogens orients the sensibilities of scientists and other responders toward calamity and dystopia through what I refer to as 'crisis futurities'—doing so in ways that drive biopolitical impulses toward protecting life, mitigating human suffering, and experimentality. Importantly, 'crisis futurities' within pathogen-responder relations parallel but also contrast with the social life of 'crisis' in present-ist declarations of conditions warranting immediate humanitarian action. For instance, speaking to the announcements of an 'opioid crisis,' linguistic anthropologist E. Summerson Carr (2019) discusses the work that crisis does in favoring the immediacy of action over thought. 'Though totally disorienting, as if it comes out of nowhere, crisis nevertheless demands: do now, think later. […] In this sense, crisis

guards against experiment' (Carr 2019, p.162). Medical anthropologist Peter Redfield (2010) similarly depicts the role of crisis in relation to Médecins Sans Frontières (MSF): 'In an urgent situation, the imperative mode of engagement becomes action, rather than reflection' (p.187). MSF's re-deployments of 'crisis' justify 'rapid medical missions' coloured by a persistent sense of urgency that 'foreshortens the temporal horizon surrounding the moment, subordinating past and future within it' (Redfield 2010, p. 187).

Crisis futurities similarly compel scientific responders to act with urgency. However, they spring from the anticipatory temporalities that scientists assign to emergent pathogens: incubation and latency periods; speed and modality of spread; and 'causal risk factors.' Intervention from this perspective, then, is driven by an ethics of precision; a calculus of planning; and an experimental wrestling with 'the hypothetical' that anticipates the potential devastation and political consequences of pathogens. Rather than being swept away by the urgency to act, crisis futurities pivot on the exigency to find soberness in thought and measuredness in technique to avert calamitous possibilities. As I will demonstrate, scientists' assignment of temporalities in their identification of pathogens opens and enlivens (rather than forecloses) possibilities for thinking, multiplying in knowledge quests to perfect intervention. In this view, pathogens appear as more than microscopically scaled actors. According to the different properties and meanings that responders assign to them and the observable changes pathogens produce in physical bodies, their material-semiotic presence make up the desires and doings of responders.

Pathogen-Ethnographer Relations

My genealogical account draws upon more than 15 years of participatory ethnographic study conducted in close collaboration with male and female sex workers, bio-scientists, clinicians, and health officials in Kenya. During this period, I became struck by how an array of pathogens featured in the biosocialities that centred around disease research programs and interventions. Pathogens registered not simply as 'matter *itself* all by itself, but rather [as] matter *in context* […] engaged in many relations' (Abrahamsson et al. 2015, p. 5; original emphasis)

A scientific collaboration between the University of Nairobi and the University of Manitoba—which began in the early 1980s when scientists were just beginning to identify and apprehend HIV and its linkage to AIDS (Booth 2004)—formed my initial entry point in 2009. Over time, I became increasingly immersed in the world of responding to infectious diseases, and soon my ethnographic objects and practices altered. Working on team-based studies alongside researchers with very different epistemological leanings, I began noticing complex, inextricable intertwinings between the technical aspects of doing natural and data science and the 'social dimensions' I was expected to highlight in my role as a medical anthropologist working closely with community-based responders. For instance, in May 2024 two microbiologists and an epidemiologist from Canada met with a group of male sex worker activists in Nairobi to introduce a new Mpox study designed to engage their community. The scientists provided a lay (yet still highly technical) scientific summary of Mpox. I watched as the community activists responded to the uncertainties surrounding this 'new' pathogen. Almost immediately they began reframing the scientific information being delivered to them with advocacy-related questions on public access to vaccines and talk of care-related strategies for potential sufferers in their community. All the while, their reactions cultivated affective dispositions of anxiety and hope toward the clinical, epidemiological, and microbiological characteristics of Mpox introduced to them. The scientists too began reacting to and reframing Mpox, as they built rapport with the community during their scientific knowledge exchange. Hearing sex workers' account of a recent and outbreak of lesions, sores, and anogenital masses, new questions sprang to life around the possible relationship of Mpox to pre-existing pathogens such as HPV, bacterial STIs, and HIV. My point here is that in the process of observing these biosocial bondings over the years, my own thinking of 'the social' as an object of analysis transformed. I could no longer regard 'the social' as any kind of analytically distinctive 'aspect,' 'dimension,' 'domain,'

or 'set of forces' that could be abstracted from the technical happenings (and mishaps) of the scientists alongside whom I came to work.

Pathogen-Responder Relations

HD

I begin my genealogy with what seems, at first, to be a rather obscure and unremarkable pathogen, HD, which causes the genital ulcerative disease known as chancroid. One might consider it as better relegated to a marginal footnote in the history of human responses to infectious diseases in Kenya. For, relatively soon after its appearance, it was brought under control and essentially eliminated, as the linear temporal scientific narrative tells us (Steen 2001). However, as an antagonist in the world of intervention, it has proven highly generative in unfurling scientific knowledge quests while setting the stage for decades of intervention to come. Creating a joint focal point of scientific interest and public health concern, HD brought a diversity of people (i.e., international scientists, Kenyan clinicians, and sex workers) into an unusual cohabitation—cultivating biosocial intimacies that would enable particular configurations of intervention to endure long after chancroid's liveliness subsided in Kenya.

Initially elusive for scientists to identify, HD became instrumental in igniting a transnational research program—one that blended possibilities for scientific discovery with the humanitarian potential to ameliorate the suffering of stigmatized people. In sum, HD turned Kenyan and Canadian microbiologists into public health responders, bringing them out of the lab and into the clinic. This new proximity also placed the scientists into intimate and regular contact with the daily lives of sex workers, from whom they began regularly collecting biological samples. In HD's encounters with humans, we see the microbiologists respond to the troublesome pathogen by selectively forming 'female sex workers' into an aggregate—a convenient, standardized experimental unit capable of producing 'self-validating evidence' (Nguyen 2009, p. 213) that confirms effectiveness, thereby justifying the need for further intervention. Indeed, HD's legacy in grouping people into a collective unit for intervention analysis is a leitmotif that simultaneously opens and circumscribes the experimental futures of those who would eventually come to be called key populations (cf. Biruk 2022).

HD's Identity Crisis

From its first attempted description by microbiologist Léon Bassereau in 1852 and its preliminary identification by Augusto Ducrey in 1889, HD, or 'chancroid' in its active human disease form, had an identity crisis. It was hard to distinguish, via microscopy, from the polymicrobial flora it often clusters with, making it difficult to isolate from other bacteria. HD was also difficult to culture independently of human bodies, as it rapidly died outside human hosts. These troublesome features thus posed a challenge for the development of a precise therapeutic response: How can HD be targeted for treatment if it can't be differentiated from other closely related bacteria? Debates circled around whether chancroid's distinctive characteristic soft chancres were, in fact, caused by singular or multiple microorganisms. And although scientist Augusto Ducrey was able to isolate the bacterium, HD refused to grow in artificial cultures and would only make its appearance in the human body through 'auto-inoculation' (Hammond 1996, p. 93). HD also refused gram staining (i.e., a test performed by scientist to reveal bacteria at the site of infection) and would not elicit lesions in guinea pigs or rabbits when 'injected subcutaneously with material taken from the […] ulcers' (Hammond 1996, p. 93). With a lack of a defined culture medium for more than a century, HD resisted scientists' attempt to cultivate therapeutic interventions. HD's difficult nature coupled with 'a lingering uncertainty regarding the etiologic role of H. ducreyi as a causative agent of chancroid' (Hammond 1996, pp. 93-94).

Scientists' attempts to isolate and artificially culture HD between 1889 and 1974 receded as chancroid became less common because of 'improved hygiene and antibiotics' (Hammond 1996, p. 94). This waning scientific interest continued until HD made a dramatic appearance in the mid 1970s as a major outbreak in Winnipeg, Manitoba, among unhoused people living in a low-income neighborhood. At this time, HD continued its long history of defying scientists' attempts to isolate it, as the Manitoban clinical microbiologist Gregory Hammond (1996) notes:

> We faced a number of issues that had caused confusion in the laboratory diagnosis of chancroid. The situation was confounded by report of multiple clinical variants of chancroid, up to seven in number. Some of these clinical variants likely may have been other sexually transmitted diseases or superinfections. […] We sought to obtain reference strains from the American Type Culture Collection and the Institute Pasteur, but these strains generally grew poorly and in our later studies were nonpathogenic in rabbits. (Hammond 1996, p. 94)

HD also proved to be 'relatively resistant to vancomycin and to polymyxin [broad spectrum antibiotics]' (Hammond 1996, p. 95), making it recalcitrant to treatment. However, HDs appearance in 137 suspected Winnipeg cases between 1975 and 1977 provided the ideal human host conditions for scientists to study the live bacteria and to develop and test new isolation techniques to apprehend the elusive pathogen. These 'wild-type isolates' (Hammond 1996, p. 95) from Winnipeg proved to be highly generative in the unfolding of a scientific program. Because these heartier strains maintained their virulence in rabbit models (unlike referent strains from the United States and France), they enabled scientists to successfully grow and sustain HD bacteria, thereby accomplishing to date what other scientists could not. The existence of these robust strains of HD created the conditions of possibility for a team of Winnipeg-based microbiologists to develop an effective therapeutic course that would earn them the international reputation of having locally eradicated the bacterium.

Shifting the scene to Kenya, HD made a startling appearance, between 1976 and 1979, among 20,000 patients with genital ulcers—18,245 of which were diagnosed with chancroid (Nsanze 1981) by Kenyan clinicians working in the Nairobi-based STI treatment facility known as the Special Treatment Clinic. However, lacking the required equipment to perform laboratory investigations, chancroid was diagnosed solely from visual clinical inspection. Without the required laboratory technology, HD's identity could not be confirmed as the actual cause of the raised soft sores. Furthermore, because the Kenyan HD strains resisted an array of treatments, there was hope that the treatment course developed by the University of Manitoba team would prove effective.

Although HD strains in Winnipeg differed from those in Nairobi, the common identity that scientists ascribed to these pathogens enabled a bridging between distant geographies. In the early 1980s, the University of Nairobi Departmental Chair of Medical-Microbiology, Herbert Nsanze, approached the Winnipeg scientists at an international conference to forge a collaboration, enticing the University of Manitoba team with the opportunity to further study cases of the HD in a large outbreak in Nairobi that occurred among mostly men (Booth 2004). Studying HD within the context of a large outbreak ignited a particular crisis futurity—bringing together the urgency of humanitarian action in mitigating human suffering and protecting life with the prospect of scientific discovery.

HD registered in the interventional pursuits of the scientists and clinicians in a gendered way. The first treatment study led by Nsanze and Manitoban medical-microbiologist Alan Ronald focused almost entirely on men.

> A total of 97 patients was entered into the study and all but two were male. Their average age was 25-6 years. Forty-four of the men were married, but only eight lived with their wives in Nairobi. Many of the men had migrated to Nairobi and were physically separated from their wives in the villages for long periods of time. The source of infection was usually reported to be prostitutes and only two men had had sexual contact with their wives (Nsanze et al. 1981, p. 379).

Although the HD outbreak first appeared among men, the pattern of reporting female sex workers as having infected them soon gave rise to the labelling of these women as 'the source' of HD infection, as an early epidemiological study demonstrates:

> A woman was considered a source contact if her ulcer symptoms preceded those in the male partner […] or if she was a prostitute. […] Prostitutes were named source contact of 57% of the 300 consecutive men with H Ducreyi culture positive chancroid. (Plummer et al. 1983, p. 1293).

Following a circular logic, 'prostitutes' become identified as *source* contacts, when named as sexual partners, because they were already defined as source contacts. Logical fallacy or not, HD investigations provide the foundation for constructing women selling sex as a favored experimental unit—chosen instead of the large group of mostly migrant men initially found to be infected.

HD's troublesome nature yielded rich experimental possibilities. The plentiful cases of humans infected with drug resistant strains in Kenya opened a territory on which scientists could chart a future program of research and international collaboration. In other words, there was sizeable room to launch a transnational microbial expedition to explore this relatively rare STI. As the program gravitated toward a primary focus on women, and to get closer to the places where HD was perceived to spread, the scientists began to conduct their investigations in the informal settlement where the women accessed health services at the Special Treatment Clinic (Bandewar et al. 2010). In this impoverished location, despite HD's startling appearance, no crisis alarm was sounded. Because the pathogen was found to have a very short life outside human bodies and was only infectious through intimate sexual behaviors, it appeared relatively containable and less of an immediate threat to public safety. Given the relatively early scientific declarations of 'control,' 'elimination,' and 'cure,' this intervention occupied little public controversy or news media attention, thereby maintaining its isolation from politics in its protective enclave of experimentality and urban marginality.

HIV

Had it not been for HIV's unruliness—its slow disease progression, its recalcitrance to treatment and cure, and its early status as a terminal illness (once referred to in Kenya as a 'killer disease')—the story of Kenyan-Canadian research program likely would have soon come to an end. HIV's incurability, evasive tendency toward mutation, widespread transmission throughout sub-Saharan Africa, and global political volatility animated a crisis futurity that gave birth to a open-ended trajectory of intervention. Interestingly, there are some similar qualities that scientists assigned to HIV as compared to HD (even though the former is a virus and the latter a bacterium). Like HD—and unlike other pathogens such as COVID-19, Ebola, or TB—HIV is neither spread through 'casual' contact nor transmitted through air-borne droplets or aerosols. HIV finds its vitality within the physical envelope of the body proper. Found within select infectious bodily fluids (especially in blood, vaginal fluid, semen, and breastmilk), HIV remains relatively contained inside human physical bodies, losing its virulence soon after it encounters the air. As such, HIV's infectivity is not recognized as taking place in open public spaces under the clear(er) jurisdiction of public health governance. At the same time, although confined to the body, HIV's crisis character comes through its transmission via the penetration of bodies, whether by sex, by injection, or by breastfeeding. In a political sense, its virulence is recognized in the more intimate bodily spheres that stir up juridical questions of individual consent, bodily integrity, and human culpability which: 'allows HIV to continue to be figured as exceptional in legal terms, whereby knowingly exposing sexual partners to a potentially deadly virus can be construed as attempted murder' (Moyer & Hardon 2014, p. 266).

Unlike HD, HIV in Kenya refused to be confined to discrete, marginalized groupings of people. Globally, epidemiologists would soon construct adult Africans as an entire risk group, conjuring imaginaries of a general population, a nation, and an entire region under threat (Patton 1998). Nevertheless, the Kenyan-Canadian team's early attempt to become better acquainted with HIV under

the banner of an observational cohort study of female sex workers, which operated in the quieter shadows of marginality, enabled them to pursue an experimental-interventional course that would persist for decades, while navigating a thorny field of politics that would eventually unfurl.

The Cohort Study as Experimental Futurity

The Kenyan-Canadian team did not initially expect their cohort study to stretch into the horizon for decades (Bandewar et al. 2010). However, HIV's unruly nature had other plans for them. Its lengthy latency and comparatively small window of incubation and infectivity, and its stubborn resistance to human attempts to develop effective vaccines, demanded an experimental trajectory that would eventually make it one of the world's longest-standing clinical cohort studies (Bandewar et al. 2010), called the Majengo Observational Cohort (which still operates in Kenya today). Unlike cross-sectional studies—which are designed for scientists to draw statistical inferences related to HIV infection risk factors—longitudinal cohort studies offer scientists the possibility of uncovering 'causal risk factors,' which are considered to provide greater statistical certainty (Mann 2012, p.45) and, therefore, greater scientific satiation. However, because of the qualities that scientists assigned to HIV, any legitimate attempt to identify causal factors of transmission or to understand disease progression through a cohort study design would require extended periods of time to generate statistically persuasive findings. In this way, HIV's lengthy latency afforded a temporality for the Kenyan and Canadian scientists to anticipate and plan longer-term research collaborations with their local clinical partners. As an integral part of an experimental system, the challenging and uncertain nature of HIV, although somewhat constrained by the standardized protocol of the COHORT study design, kept experimentality 'open to the future,' allowing scientists 'to make sense of the moments of emergence in experimental practice' (Davies 2011, p. 436) for years to come.

Given HIV's troublesome qualities—its temporality, and the human complexities of its sexual transmission—a cohort study would require a reliable and large participant pool to yield statistically confident results. Fortunately for the Kenyan-Canadian team, there was already a sizeable, steady stream of sex workers regularly receiving treatment for STIs in the Special Treatment Clinic (Booth 2004). Female sex workers were aware that sexually transmitted pathogens posed an occupational hazard, requiring ongoing follow-up and clinical management. Men infected with STIs tended to be part of migrant labour systems and, with their transient residences, posed a logistical challenge to tracking these pathogens. By contrast, female sex workers were regarded as a more convenient host to locate and study STIs, being highly visible in Nairobi's entertainment industry. They worked on the streets near well-known commercial establishments, and also regularly sold sex inside an array of public venues, including restaurants, hotels, and nightclubs. Thus, their more stable residence and visibility in Nairobi made them the more convenient experimental group to set up a cohort to effectively study HIV.

HIV also afforded the ethical conditions required to uncover 'causal risk factors' in the Majengo cohort study. Its sexual transmission was subject to the nuances of human erotic desires and intimacies, something that is generally placed outside the control of liberal governance in democratic nation states (as long as individual consent is not violated). Coupled with a lack of effective treatment until the mid-1990s and the availability of only behavioural prophylaxis (condoms) in the early years, HIV's sexual transmission between people could not be directly intervened upon by the scientists. From a research bioethical perspective, people could only be educated on the risks of unprotected sex, and, otherwise, would need to be left to their own judgment. At the same time, testing for the causal factors of HIV sexual transmission in a longitudinal cohort was only possible because of overriding structural factors that inhibited condom use among these women who were assumed to be multiply exposed to HIV in their workplaces. Put another way, the ethical clearance of the cohort study relied on its own isolation from and lack of intervention into the structural factors that reinforced patterns of condomless sex.

By 1985, the international team enrolled more than a thousand female sex workers into an 'open cohort' in Nairobi and administered surveys every six months along with providing physical exams,

STI/HIV diagnostics and treatment, and blood drawl for HIV serological study. The cohort study set the stage for HIV to make its dramatic debut in Kenya, which showed a tremendously high HIV prevalence of >80%. This prevalence elicited an adverse reaction from the Kenyan State, which asserted that any public announcement of health crisis would destabilize Kenya's economy. After all, sex work was a conspicuous feature of Nairobi's vibrant nightlife (Spronk 2009), which generates considerable revenue for the tourism industry—Kenya's leading source of GDP. In an interview with Canadian journalist Stephanie Nolen (2007), the late Kenyan public health scientist, Dr. Elizabeth Ngugi, who worked closely with Nsanze and Ronald's team, recollects the state's feedback:

> [O]ne of the earliest recorded signs of the African [HIV] epidemic did not go down well. The Government of Kenya threatened to deport the foreign researchers and shut the whole project down. 'The government said, "It's not true what you are saying! You're going to drive the tourists out of Kenya!"' recalled a rueful Elizabeth Ngugi. (Nolen 2007)

The government's reaction to HIV as a looming crisis in Kenya triggered responsibilizing interventions targeting female sex workers. Ngugi—cherished by sex workers for her unstinting efforts at sympathizing with their circumstances—established networks of support groups with hundreds of these women. Employing the Kenyan political participation practice known as a *baraza* to educate about HIV transmission and prevention (Ngugi et al. 1996), she provided health promotion sessions to these women to help them understand how HIV was spreading in their community and how to prevent its infection. Within these baraza-style support groups, HIV produced a double-edged futurity that stressed sex workers' leading role in creating a public health destiny of either security or ruin. HIV, in its existential threat to Kenya, further morally bound the women's participation to the cohort study.

While HIV's peculiarities as a pathogen further fanned the experimental futurities of the scientists, and eventually showered them with research funds, accolades, and professional advancements, HIV figured quite differently in the lived realities of sex workers, increasingly edging them toward activism. In the 2006 *Globe & Mail* article 'Sex slaves for science,' Nolen (2006) underscores the dire economic circumstance of the longtime cohort participants. As one participant states, 'I feel they take advantage of me, because I've made such a big name all over the world [for the project] but I'm still in this [sex work] business. I need something to lift me out of Majengo.' My ethnographic work in Kenyan began during these moments of emergent critical awareness, where sex workers began to recognize how their vulnerability to HIV fed a flourishing scientific industry (Česnulytė 2017). As an elusive pathogen that evaded scientific and clinical apprehension, HIV's initial uncertainties and crisis character created fertile ground on which a global form of activism could be realized. First launched in 1992 as part of the International AIDS conference, the global Network of Sex Work Projects formalized its membership in 2007, while also inspiring the mobilization of the multi-country African Sex Workers Alliance, and the Kenyan Sex Workers' Alliance, in 2009 and 2010, respectively.

HPV

In contrast to HIV's unruliness, the natural sciences characterize the human papilloma virus (HPV) as almost docile and submissive. Despite the discovery of numerous genotypes, most HPV variants are easily quelled by a healthy human immune system. In many ways HPV, unlike HIV, is relatively innocuous and seems to stay in its microbiological place. Classified as the most common sexually transmitted disease, scientists estimate that as many as 80 % of sexually active people will have, at some point in their lives, a form of HPV infection that the body often clears on its own, sometimes unbeknownst to the human host. Having less of a propensity for mutation than HIV, HPV has been relatively amenable to effective vaccination development.

However, in recent years, this relatively nonthreatening microbe has provoked enormous scientific interest and public health distress because of its emergence in Africa in the form of a high disease burden

of cervical cancer. This dramatic appearance of HPV in East Africa has prompted scientists to label the region as the 'epicentre of cervical cancer.' To understand HPV's geographically concentrated presence in this active disease form, we must attend to the relational qualities that scientists assign to the virus, especially in its proximity to HIV. Indeed, HPV-associated cancers flourish in places where immuno-compromisation exists—a narrative employed by infectious disease scientists to explain the high prevalence of cervical cancer in sub-Saharan Africa. Although HIV disease progression in human hosts has been significantly slowed by universal access to life saving antiretroviral medications, the extension of life for people living with HIV has spelled a marked increase in cancers, prompting epidemiologists to announce cancer as 'The Second Wave of AIDS' in Africa (Livingston 2012). Prevalent HPV-related cervical cancers accentuate this announcement of crisis, sending reverberations that strike at the heart of biopolitical pre-occupations with human reproduction, population health, and the fate of the nation. For this reason, the government of Kenya has placed HPV at the centre of their national cancer screening programs, rolling out free HPV vaccinations for adolescent girls and young women.

HPV has also made a dramatic appearance among female sex workers in Kenya, which has compelled the Kenyan-Canadian team to integrate cervical cancer screening into the Majengo HIV cohort intervention-research program. This team, furthermore, has capitalized on the crisis futurity of HPV by proposing and receiving a large multi million-dollar BMGF grant to explore HPV's effects on human immunity and its interrelation with other STIs like chlamydia and gonorrhea—with the goal of 'novel vaccine development' and the hope of a more desirable future of cervical-cancer-free bodies.

At the same time, however, HPV's less acknowledged role in producing cancers in African men—especially among men who have sex with other men (MSM)—exposes an area of latency in human response. This gendered elision continues the longer global history of HPV's feminization (Daley et al. 2016), a history currently embodied in Kenya's national HPV immunization policy that emphasizes the vulnerability of adolescent girls and young women to the relative exclusion of boys and men, and the complete omission of MSM. This omission is striking in the face of statistical associations that tie HPV to anal cancer in MSM, with those living with HIV showing the highest anal cancer rates of any group (Schim van der Loeff et al. 2014). In Kenya, HIV prominently exists among MSM (McKinnon et al. 2014), a reality which is setting the stage for future anal cancer outbreaks in this group. Rising rates of anogenital cancers in MSM throughout Africa (see Müller et al. 2016) creates another crisis futurity, further intensified by HPV's entwinement with political homophobia that denounces homosexuality as 'un-African' and neocolonial. In other words, HPV is sharply refusing to be confined to its microbiological and clinical scalings in interventions targeting Kenyan MSM, instead entangling with wider dystopic postcolonial anxieties of re-colonization.

The Reactivity of Anal Growths

Recognition of HPV's presence in the bodies of male sex workers began in 2016, shortly after the leaders of the male sex worker organization known as HOYMAS had decided to break away from the Kenyan-Canadian clinical system that focused primarily on female sex workers via the cohort study that I described earlier. Initially, in 2009, the Kenyan-Canadian scientists placed a group of 500 male sex workers into a programmatic cohort modeled on the Majengo study. Much like the Majengo Cohort, HIV among MSM made its presence known with a high baseline prevalence (40%) (McKinnon et al. 2014). However, over time, the members of the male sex worker cohort eventually decided to form their own clinical services based on the distinctive sexual health needs of their community, which differed from female sex workers. This included the need for a dedicated anal health program, given the emergence of HPV-related diseases, the severity of which scientists, clinicians, and policy makers had yet to fully acknowledge.

In the coming years, the growing arrival of late-stage HPV-related growths generated considerable distress among HOYMAS clinicians, activists, and members of the multidisciplinary research team that I was leading. Allied health officials working in the Kenyan ministry of health also expressed their alarm

and concern. The masses were unusually large and plentiful. Between 2016 and 2019, 239 MSM showed up at their community clinic with severe cases of anal warts and suspected cancers requiring surgical intervention, 72 of whom had diseases requiring additional treatment and surgery (Lorway et al. 2022). These anogenital masses were scientifically assumed to be tied to HPV genotypes 6 and 11, which normally appear in much smaller and benign forms.

These severe HPV diseases detected in the HOYMAS clinic mostly appeared among MSM living with HIV (Anyula Gorigo et al. 2024). Many of these men did not know their HIV status, nor were they taking anti-retroviral medications freely provided by the state. For the responders, these factors help to explain why HPV-related diseases were making such dramatic appearances in the bodies of MSM. But the more important part of this story is how HPV's alarming presence began to unveil major inadequacies in interventions targeting MSM in Kenya. Put differently, the materiality of HPV as a multitude of large masses loudly announced the state's deep neglect of the sexual health of MSM. The looming possibility of an HPV crisis among MSM formed in the shadows of HIV's hegemony: the sexual health of these men was narrowly viewed within standardized interventions set out by global policy makers preoccupied with the metrics of 'getting to zero' in terms of new HIV infections. Yet HPV's alarming appearance was exposing the existence of a group of men who were completely disconnected from the sexual health services 'available' to MSM. Thus, HPV's materialization as unexpectedly large growths—which were accompanied by tremendous pain and suffering (see Thomann et al. 2025)—performed an interventionistic role by compelling the previously 'uncounted' (Davis 2020, p. 45), out of desperation, to access HOYMAS's clinical services.

HPV's visibility in the figure of multiple large growths in many ways announces a major failing of the national HIV program, making HPV affectively and political charged. I observed this reactivity while numerous clinical photos of severe growths were circulating between HOYMAS clinicians, activist leaders, and our team. The depictions of unsightly suffering became the focal point of much outrage, dread, anxiety, horror, and a sense of disgust with the state's neglect of the wellbeing of these men: 'This is why we need to have access to the HPV vaccine—*now*! Our members are suffering too much!' declared the HOYMAS's activist-director after viewing some of the photos. The HPV-related masses, in other words, signaled a dystopic future *as if* it were arriving, as though a community of male sex workers were inhabiting an unravelling ruinous crisis.

The crisis futurity generated by the clinical study of and our group's reaction to these anogenital growths on the one hand produces a form of abjection (Kristeva 1982) whereby a group of men being excluded from health services access, suddenly begin to appear in the program, driven by the unbearable pain and suffering of severe HPV disease. The horror of their bodily disfigurements continually haunts the program with repeated reminders of the homophobic postcolonial state. On the other hand, sharing visual depictions of these advanced growths with our team and with allied government health officials during dissemination meetings, elicited reactions that ignited visions of social justice and an outpouring of compassion—pointing a way forward to planning and improving the health protection and care of the community. The growing critical awareness of the state's neglectfulness among clinicians, activists, and scientists alike speaks to the transformative political potentiality of HPV, an ubiquitous, ordinary microbe, when it makes an exceptional appearance in a marginalized group.

Conclusion

What does a genealogy of pathogen-responder relations analytically afford? How does taking pathogens more seriously help us to better understand transformations that occur, over time, in human responses to infectious diseases? In this paper, I have tried to centre the agency of pathogens, treating them as meaningful, 'energetic' forms of matter (Voelkner 2022, p. 2) that readily entangle with (as they come into being through) social and political realities. Accordingly, I demonstrated how pathogens register in an enduring field of human investigation and intervention, becoming entwined with bio-politically-

inflected futurities of health protection. Revealing pathogens' liveliness by treating them more symmetrically in their interactions with responders, I have illustrated how their remaking of interventional worldings complicate the modernist, progressive temporalities of experimental scientific practice: '*You have to get in, find the pathogen, kill the pathogen, and get out again*!' as the chair of Medical Microbiology once declared. How pathogens shape, reinforce, evade, refuse, disrupt, and capitulate to experimentalities brings to light a 'viral temporality that accounts for the multifaceted ways that disease, in its multispecies entanglements, creates different structures of time that are not simply quantifiable, discrete, or striving for linearity' (Clemens & Casey 2022, p. 68). My brief genealogical portrayal underscores the vital role of HD, HIV, and HPV in an unpredictable and irregular accumulation of human logics, affects, knowledges, and techniques—an accumulation that exposes a past brimming with futurities, and a 'thickened present […] filled with traces of different moments and temporalities, weighted with sediments' (Harootunian 2007, p. 476).

Crisis futurities for the scientists, while triggering humanitarian impulses to protect life and ameliorate suffering, are also profoundly animated by the incitement to experiment and 'discover' to ensure intervention continuance and improvement. The ethical affordances of pathogens help secure an abundance of accolades and financial support for scientists; but they also enable the Majengo cohort study to proceed without needing to confront structural conditions underlying the uneven spread of diseases in human populations. Confining a view of pathogens to a microbiological register, scientists ethically justify the continuation of a research program that 'paradoxically embodies and […] benefits from the very inequalities it aspires to redress' (Crane 2013, p. 7).

Importantly, the pathogens I highlight all potentially spread through human sexual practices, which, in part, locates them in the terrain of the 'liberal government of unfreedom' (Hindess 2001, p. 94). The ways that HIV and HPV accent the state's delegitimization of nonprocreative sex (i.e., sex work and sex between men) raises questions around Kenya's postcolonial liberal democratic character and the extent to which dissidence is possible. For female sex worker leaders, crisis futurities—which trace back through a longer layered history that includes chancroid intervention research—build resentments over time that eventually lay bare and trouble scientists' normative interventional trajectory, as the article 'sex slaves for science' illustrates. For male sex worker activists and their allies, HPV, in its dynamic co-appearance with HIV, although undeniably devasting to their community, does, in another sense, provoke these men to re-envision and take steps to realize collective wellbeing by reckoning with the necropolitical tendencies of Kenya's public health system.

Viewed solely within a microbiological scaling, HD, HIV, and HPV appear as 'asexual' and 'gender neutral' entities. Yet in their interrelations with interventional worldings they rear strikingly gendered preoccupations. With respect to chancroid, scientists' efforts to be 'closer' to HD (given the necessity of accessing human hosts to study the pathogen) compelled them to shift their attention from the original group of afflicted men being treated to women selling sex, doing so for the convenience of an experimental design that stretched into the future. HD's resistance to being cultured outside of human bodies in many ways sets the course for a gendered preference to produce ongoing scientific knowledge from African women's bodies. In its assumed inclination towards women, HPV further reinforces the over-representation of women in sexual health interventions in Kenya. HPV's feminization colludes with postcolonial homophobia to mute alarming outbreaks of disease and suffering among MSM in Kenya, thereby reinforcing a gendered inequity in vaccine access and cancer-related health policy.

The curiosities, uncertainties, and crises surrounding these pathogens, along with their various temporal manifestations as diseases, make them affectively charged in their interactions with responders. Their reactivity compels the coming together of a varied cast of interveners, from diverse backgrounds, geographies, and sentimentalities—culminating in vibrant epistemic-communities with flourishing experimental possibilities. Microbiologists, in the early years of the Kenyan-Canadian collaboration devoted considerable energy to apprehending the specific identities of pathogens through isolation techniques. Historically, much of their claims to 'know' and 'discover' pathogens pivoted on their ability to isolate, separately grow, and destroy these entities. Over time, this Kenyan-Canadian team's view of

pathogens eventually evolved to recognize the role played by an interrelated community of pathogens co-existing through human intervention. However, the interventional ecosystems in which pathogens gain their vitality go well beyond microbiological scalings of the human immune system. The dramatic appearance of HPV as a multitude of large masses among mostly HIV positive MSM not enrolled in treatment programs illuminates a highly expansive ecosystem that includes national health policies, postcolonial government rhetoric, and transnational systems of aid. For this reason, responders' containment practices operate beyond laboratory biosafety measures and a concern for pathogenic transmission. They also move to contain the political power of 'crisis' embedded in the temporalities assigned to pathogens, a form of power which holds the potential to disrupt scientific neutrality and ignite interventional fields that mutate the state's authority in the government of populations through biopower.

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Conflicts of interest

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