

**Thresholds of empire: Women, biosecurity, and the Zika chemical vector program in
Puerto Rico**

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Abstract: The recent emergence of a new form of the Zika virus raised the stakes of human vulnerability to nature with its capacity to damage the brains of growing fetuses. With microcephaly as its public image, Zika ignited fears about the plasticity of the human form in the face of infectious disease, the permeability of nation-state borders to infectious disease, and the lifetime healthcare costs of infectious disease. In the United States, these fears were mapped onto the “unincorporated territory” of Puerto Rico, where one-fourth of the population was predicted to contract the virus. This article examines U.S. government chemical intervention as a Zika public health technique in Puerto Rico. I argue that chemical vector control was underpinned by a contradictory mapping of the island as inside the United States in terms of risk, and outside the United States in terms of rights. Women were spatialized as the threshold between the dangers of the virus and the future of the U.S. population, and when they were perceived to fail to manage their bodies and homes, aerial chemical intervention was threatened in an aggressive display of sovereign power. This article offers careful and critical geographic analysis of how imperial state power is extended in the name of health and how women in different places are made into biosecurity objects. It also notes a broader destructive logic that positions the reproductive capacities of poor racialized women outside of Northern states as the pivot between an increasingly unruly nonhuman world and the future. *Biosecurity, Chemical geographies, Empire (Puerto Rico), Gender, Zika*

Public health emergency of international concern

The recent emergence of a new form of the Zika virus raised the stakes of human vulnerability to nature with its capacity to shape the human in utero. Zika existed before, but this strand was the first that could be transmitted by both mosquitoes and sex, leading the World Health Organization to predict in excess of 4 million cases and name it a Public Health Emergency of International Concern. It was only the fourth such declaration in the organization's history (Worland 2016).

The public image of Zika is microcephaly. Diagnosed postnatally or in the womb, the term denotes a smaller-than-normal head size for age and problems in brain development (Oster et al. 2016; Rasmussen et al., 2016). Zika ignited anxiety about the permeability of nation-state borders (Ingram 2005) and the plasticity of human musculoskeletal and neurological systems in the face of infectious disease (Ahuja 2016). It also folded into “widespread panic about the overtaxed U.S. health care system” (Ehlers and Krupar 2017, 39), embodied in Center for Disease Control and Prevention (CDC) director Tom Frieden's “pricing” of a single case of microcephaly at USD \$10 million or more across a lifetime (Center for Disease Control and Prevention 2016a). This is a striking example of the reduction of the unborn or not-yet-born to

speculative economic futures that Michelle Murphy (2017a) has called the “economization of life.” These fears—corporeal, financial, national—converge in microcephaly.

In the United States, such fears were mapped onto Puerto Rico. This is because of Puerto Rico’s geography as *at once* a Caribbean island with *Aedes aegypti* mosquitoes *and* an “unincorporated territory” of the United States. The former meant that one-fourth of the population in Puerto Rico was predicted to contract Zika by the end of 2016 (McNeil Jr. 2016a); the latter meant abundant circulations of bodies between island and mainland, unfettered by a border.

Chemical regulation of Zika’s mosquito carriers was the U.S. government’s dominant response to active Zika transmission in Puerto Rico. It spanned the intimate and the atmospheric, from pressing schoolgirls to coat their skin in DEET, to fumigating homes, to proposing the island be sprayed from planes overhead. The CDC and other federal agencies rationalized these injunctions and interventions as life-saving, but many Puerto Ricans saw them as potentially life-destroying. Which was it?

In what follows I will argue that these readings are not mutually exclusive. Chemical intervention was premised on shielding the United States from the biophysical effects of the virus in the short term and lifespan healthcare costs in the future. As a promise, chemical intervention would save abstract future children from the terrors of a new and wily virus. In practice, however, it was coercive and exposed some Puerto Ricans to chance of chemical harm.

Explaining this biopolitics requires delving into how the chemical program of Zika management actually worked. It also requires placing chemical intervention in the historical and geographical context of U.S. sovereignty in Puerto Rico. I do so by examining insect repellent

guidelines, the chemical fumigation of houses, and a proposed plan to fumigate Puerto Rico from the air as part of the Zika public health program. I analyze chemical intervention plans, studies, and educational material, as well as public discourse on Zika in the United States and Puerto Rico. I also draw on observations from a four-month period of research in San Juan, in which I went to public health information sessions, participated in webinars for Puerto Rican doctors, attended a chemical fumigation work fair, and immersed myself in Puerto Rican media and social media.

A range of Puerto Rican government agencies were enlisted in Zika management broadly and chemical vector control specifically, while ordinary people across the island removed debris in their own communities to obliterate sites of mosquito reproduction. My focus in this essay, however, is on chemical vector control that was organized and orchestrated by two U.S. government bodies that are premised on fostering human health: the CDC, which is the national public health agency, and Women, Infants, and Children (WIC), a federal nutrition assistance program for low-income women and children. The point is not to suggest that these institutions are unilaterally harmful, nor that they are monolithic arms of U.S. empire. Both are peopled with Puerto Rican scientists and other officials, after all, and linked with island health, environmental, and housing departments in complex ways, rendering any clean binary between imperial and island governance impossible. Nor is it to suggest that the CDC and WIC were the only bodies involved in chemical vector control in Puerto Rico. Rather, the point is to understand how U.S. government chemical intervention was licensed, to explore how it worked, and to consider its possible effects on the ordinary Puerto Rican people—women especially—whose bodies were its object. In this sense I approach the analysis with Puerto Rican sociologist Ramón Grosfoguel's (2003, 35-36) discussion of “speaking from,” as opposed to “speaking for,” in mind: this essay

centers “the structural location of, and knowledge produced by” Puerto Ricans in scrutinizing chemical intervention.

The analysis responds to a gap in the emerging field of chemical geographies by considering the use of chemicals in imperial distributions of health, and builds on theorizations of reproductive women in contemporary biosecurity imaginaries. Just as crucially, it interjects in the silence on Puerto Rico in critical geography (for important exceptions, see Blaut 1974; 1975; 1983; Berman Santana, 1996; 2005; Davis, Hayes-Conroy, and Jones 2007). This is important not only with respect to the politics of the Zika public health emergency, but also to Hurricane Maria, which replaced Zika in mainland news whilst also likely rendering mosquito control more daunting. Yarimar Bonilla (2017) argues that Maria laid bare a state of colonial neglect, and when President Trump then blamed the lack of federal emergency response on Puerto Rico being “an island surrounded by water. Big water, ocean water” (quoted in Holpuch 2017), he built on the U.S. political tradition of utilizing topographical features as a proxy for race in the face of nature’s wrath (Braun and McCarthy 2005). CDC and WIC responses to Zika in Puerto Rico foreshadow the cruelty of U.S. government *abandonment* of the island after Maria, while also pointing to the coercive ways Puerto Rican women’s bodies are forcibly *incorporated* into the United States, as objects to be administered.

I argue that much like U.S. government mappings of Guántanamo Bay (Gregory 2006), public health expertise produced Puerto Rico as *inside* the United States in terms of disease risk, and *outside* the United States in terms of political rights. The former geography was underpinned by fears over whether and how the virus could affect the mainland; the latter enabled chemical intervention on the island to be realized without consent. To be more precise, Puerto Rican women and girls were spatialized as the bodily “threshold” (see Mansfield 2012) between the

Zika virus and the future of the U.S. population. When they were perceived to fall short in properly managing their bodies and homes in relation to mosquitoes, the CDC threatened aerial chemical intervention in an aggressive display of sovereign power.

I build this argument across four parts. The first situates the Zika public health emergency within broader historical questions on global health, biosecurity, and synthetic chemicals, while the second approaches the virus through the lens of the “protracted liminality” of Puerto Rico (Goldstein 2016). The third part examines how women and girls were called upon as subjects of chemical vector control to manage their bodies and homes in relation to mosquitoes and shows how they were disciplined as objects of chemical vector control in response to a broad perception of failure. It also analyzes the spatial logics of the CDC’s plan to aerially fumigate the island with the organophosphate Naled without the consent of the Puerto Rican government. The fourth part connects the gendered biopolitics of chemical vector control with its imperial geopolitics.

In building this argument, I theorize the framing of women as what Jade Sasser (2014, 3) calls “intervenable subjects” in contemporary biosecurity knowledge. I adapt her phrasing to “intervenable objects” to indicate a tighter linkage with the top-down power of U.S. statecraft, and insist that this positioning, and the long-term human and extra-human health consequences it poses for those who occupy it, are intensely, irrevocably geographical. One crucial thing I track in this paper is an emergent logic that positions the reproductive capacities of poor, often racialized women outside of powerful Northern states as the fleshy pivot between an increasingly unruly nonhuman world and the future, a destructive logic that is much broader than Zika. However, I want to make clear that my central objective in the article is political: to write against

the reduction of Puerto Rican women to intervenable objects and the extension of U.S. sovereign power over Puerto Rico.

Public feelings of risk

When active Zika transmission was reported in Florida in 2016, microcephaly was plotted as a possible reproductive outcome for privileged people for the first time, and like H1N1 in 2009, it was viewed as “a disease that threatened to cross borders between poor and rich” (Sparke and Anguelov 2012, 727). “When I saw the first picture of a baby with microcephaly, I burst into tears. It seemed so far away in the jungle, and then it was in my backyard,” one woman stated (Harris 2016). Infectious disease is raised as specter, and public health programs raised as antidote, when the well-being of the privileged is felt to be under threat by something “the rest” cannot contain.

“Felt” is the key word here; we are talking about the “public feelings of risk circulat[ing] between experts and broader publics” (Ahuja 2016, 5), and the sensationalist storying of diseases bursting beyond their place has a long history. Paul Jackson’s (2013) historical geography of cholera demonstrates how fear over the arrival of the disease in Toronto (not *whether* it would arrive, but *when*) shaped the nation, neighborhoods, and psyches, while Nancy Stepan (2007) argues that the extent to which a disease can take hold of the public imagination is more potent in assembling public health infrastructures than the actual health toll it may take. Key here is the racialization of disease narratives. Priscilla Wald (2008) has identified the use of literary techniques—character development, motive, plot—in accounts of contagion: In these “powerful stories of ecological danger and epidemiological belonging,” (2008, 33), disease outbreaks are

framed as “‘foreign’ or ‘alien’ agents that posed a national threat” (27). Indeed, across the history of the U.S. nation-state, germs, disease, and infection have been assumed to have come from elsewhere, rationalizing restrictive immigration policies (Markel and Stern 2002, 775), and as Neel Ahuja (2016, 5) argues, public fears of the capacity of diseases to shape the human figure were inextricably bound to the imperial state’s constitution of colonized bodies and spaces as “lively domains of warfare.”

Public feelings of risk and the technocratic solutions they sanction have both changed shape and intensified in the twenty-first century, amidst what Alan Ingram (2005, 532) calls the “radical dissolution of epidemiological space”: increasing circulations of bodies and commodities call sovereignty into question, meaning states can “no longer rely on the defenses of distance to protect them.” This and 9/11 are the background against which a range of initiatives for trying to control biological futures for the nation through interventions realized outside the nation-state emerged, such as the multibillion-dollar programs BioSense, BioShield, and BioWatch (Cooper 2006; Fearnley 2008; Ahuja 2016). Biosecurity trades in the language of military operations: of “terrible organisms,” Tom Friedan stated, “Like terrorism, you can’t fight it just within our borders. You’ve got to fight epidemic diseases where they emerge” (Sun 2018).

While biosecurity’s *raison d’être* can be “crudely defined as making life safe” (Bingham, Endicott, and Hinchcliffe 2008, 1528), there are of course crucial questions to be asked. Who or what may be deemed biological threat, and on whose behalf can biosecurity measures be carried out? Perhaps unsurprisingly, research on contemporary disease control reveals an uneven global geography of interventions which, like their twentieth-century predecessors, have been mobilized on behalf of the privileged. Derek Gregory (2014), for instance, contends that international responses to Ebola functioned as “tactical vectors” for Northern militaries and paramilitaries,

while Sarah Davies (2008) suggests that the World Health Organization (WHO) organizes disease intervention around the sheltering of states in the Global North from contagion.

What is so important about this body of work is that it flies in the face of hopeful narratives of health. Such hopefulness is best captured by the influential work of Nikolas Rose (2007), which notes an historical shift from the state management of health risk at the level of the population to what he terms “ethopolitics,” the personal management of health risks specific to one’s genetic code. Rose’s argument begins with the suggestion that molecular biology and genetics have brought into being a public orientation to the molecular scale. That is, twenty-first century people think about what they cannot see: their unique genetic inheritance, for example, or the unique genetic inheritances that could arise from human reproduction. These scientific advances have made a prominent mark on high-end reproductive health care: women can choose to terminate a pregnancy based on the diagnosis of genetic conditions of the embryo or fetus. Implicit to this molecular orientation to health is an orientation to pregnancy as a time-space for “ethopolitics” to be realized.

But as critical work on biosecurity has shown, there are other ways people think (and feel) at the molecular scale. Bruce Braun (2007) has argued that the molecular age is not solely defined by the genetic risks associated with one’s own body: it is equally defined by the risks people in privileged social locations feel in connection to a global field of biological chaos. “For every story in the U.S. media that speaks breathlessly of advances in stem cell research and gene therapy, or that worries over the ‘post-human’ futures these might usher into being,” he writes, “we find two or three other stories that speak ominously of migrating birds and backyard chickens, and that mix together Vietnamese peasants, influenza viruses and homeland security” (Braun 2007, 14). Similar dystopic imaginations are evident in U.S. media reporting of Zika, in

which *Aedes aegypti* mosquitoes, the winds and rains of tropical climates, the *favelas* of Brazil, the sexual practices of people in Honduras, and the precarious procreative futures of North American honeymooners are churned up with reports of the imperceptibility of the virus, for Zika is asymptomatic in most adults. And in this mix, one image reigns: the underdeveloped craniums of children born with congenital Zika syndrome.

Braun's thesis is that self-management of health in some places depends on the deployment of sovereign power to try to manage biological chaos elsewhere. He posits, in other words, a relationship between the "ethopolitical" and empire. But how does this relationship work? Where? And whose bodies, specifically, does it concern? Braun's thesis is compelling but must be tested, especially because imaginaries of roiling posthuman futures have only thickened since the avian flu emergency.

One thing glossed over in work on biosecurity is women's bodies, which in the Zika public health emergency are produced as the locus of danger and intervention. The exception to this general silence on women and biosecurity is Becky Mansfield's (2012) work on seafood guidelines for pregnant women in the United States; it sets the scene for Zika management in two key ways. First, Mansfield argues that environmental contaminants "mark a new arena of biopolitical concern about how the contaminated environment is changing the nature of humans" (2012, 2). Environmental health emerges as a biosecurity concern through its capacity to mark the growing human fetus. Second, she shows the centrality of reproductive women to this biosecurity regime. Spatialized as "threshold," the corporeal gateway between a wider contaminated environment and the future, women are called upon to protect the population from environmental pollutants through responsible consumption choices.

This exegesis is in keeping with recent work in feminist theory, which has shown that women are seen to enfold a range of possible lives, and that that enfoldment is linked to a range of possible forms of population decline for which they can be “responsibilized.” Feminist philosopher Penelope Deutscher (2017) has argued that the image of “women as life” is tied to “the attribution to women of the counterpotential for maternal harm, negative impact over life, negative population or collective impact” (2017, 5). Women are produced as subjects with “the capacity to propagate death (to futures, races, peoples and nations) through reproductive transmission” (2017, 65) at every turn. This is a much-needed feminist take on Foucault’s points on “responsibilization” in *The History of Sexuality Vol 1*, and it flows directly into the politics of Zika. Women in areas of active Zika transmission are called upon to behave responsibly, both in term of sexual relations with men and in inter-species relations with mosquitoes. They are interpellated like this to protect the population from microcephaly—or at least, that is how the story goes.

But which population? And which women, where? Zika is an emphatically global problem, enfolded in and constitutive of a wider geopolitical order. As in most recent disease outbreaks, it has involved states, pharmaceutical firms, NGOs, and doctors from the Global North, while the sexual transmission mechanism of the virus renders it capable of spreading in the absence of tropical and subtropical mosquitoes. In the biosecurity regime I analyze, Puerto Rican women were not only urged to behave “responsibly” vis-à-vis mosquitoes, they were also chemically disciplined when perceived to behave “irresponsibly,” demonstrating that women are exposed to greater chance of bodily harm in line with “the perception of their biopolitically promising or harmful impact” (Deutscher 2017, 116). And this discipline, I will show, was conditioned by U.S. sovereignty. U.S. government efforts to impede human connections with

mosquitoes were enmeshed with various forms of political inclusion in and exclusion from the United States. Disentangling chemical Zika intervention in Puerto Rico requires connecting women's roles in biosecurity with critical work on global health and local histories of empire.

One final point: the political inclusion and exclusion I am about to analyze were neither immaterial nor disembodied. However small their granules, the synthetic chemicals dispersed onto the skin or from the sky can reach deep into sea, soil, and cell. Against the image of microcephaly, chemical vector control could reshape worlds.

I am not the first to note this capacity. The premise of research on chemical geography is that industrial chemicals – of which over 85,000 have been created (Galt 2017) —have transformed landscapes and bodies across the globe. In fact, new biomonitoring tools have produced evidence of a universal condition of contemporary life: xenobiotic chemicals with known negative health effects are present in *all* human bodies (Murphy 2017b). Yet while synthetic chemicals are omnipresent, their concentration is highly uneven. This story builds on work on environmental racism (Pulido and Peña 1998; Galt 2009) and how chemical regulation has “biopolitically sorted” people (Guthman and Brown 2016). Missing from these bodies of research, however, is attention to the inclusions and exclusions of imperial state forms (though see Murphy 2017b), which is what I address here.

The diffusion of Zika in Puerto Rico bridges infectious disease control through biosecurity, reproductive health, and chemical geographies, the politics of which are often held apart. Examining their convergence offers new insights on the way some women in some places are turned into intervenable objects in contemporary biosecurity knowledge; it also allows for richer theorization of the long-term health consequences of biosecurity practice.

“Officially Spreading on American Soil”: Mapping Zika risk in Puerto Rico

When *New York Times* global health reporter Donald McNeil Jr. (2016a) heard of the first case of Zika in Puerto Rico, he ominously penned, “So now the disease was officially spreading on American soil.” Later, Puerto Rico would report “the first microcephaly case acquired on U.S. soil” (Coto 2016b). The repeated invocation of soil captures the island’s unique position in the geography of the virus: not merely “America’s backyard,” as Latin America is so often deemed in U.S. political discourse (Livingstone 2009), it was *inside* the United States. The projected spread of Zika to one-fourth of the population brought the island to the forefront of U.S. politics.

Alongside the pricing of a “Zika baby” at \$10 million across a lifetime, reports of Puerto Rico’s position on the “front lines of the battle” (Sun 2016b) proliferated. These reports highlighted tropical climate, unruly cohabitations with mosquitoes, and a general culture of carelessness. For instance, in a plea to Congress for funding for Zika intervention, Vann Newkirk II (2016) wrote in the *Atlantic* of heat and rain, “a unique tropical climate that is an outlier compared with that of much of the continental United States” (Newkirk 2016), while Bert Putterman of chemical pesticide corporation Rentokil spoke of a “laissez faire attitude among the [Puerto Rican] public” (Gooch 2017). In the *Washington Post*, Health writer Lena Sun (2016a) described the arrival of the virus in terms as ominous as those of McNeil—“Zika has landed forcefully in America, in one of its poorest and most vulnerable corners, a debt-ridden territory lacking a functioning health-care system, window screens and even a spray that works against mosquitoes spreading the virus in homes, workplaces, schools, and parks.” The idea was that Puerto Rico foreshadowed what could befall the United States, temporally positioning the island

as ahead of the mainland in the development of immunity and behind the mainland in terms of healthcare infrastructure, attitudes about commingling with mosquitoes, and general public health expertise.

We can also observe reports on circulation of people *between* island and mainland as constitutive of Zika risk. The *Washington Post* piece was accompanied by photo album titled “Puerto Rico becoming a breeding ground for the Zika virus in U.S.” The first photo displays a brown-skinned woman walking next to a canal, which the viewer will soon learn is an ideal site for mosquito reproduction. Cast around one of her shoulders is a fabric baby wrap; in it, she’s carrying not a baby, but a dog, drawing connections between the “Zika baby” and the nonhuman animal. The photo is subtitled with two concise sentences: “Cases of Zika are expected to rise in Puerto Rico in the coming months. And that raises the likelihood of transfer to the mainland.” Similarly, a study of the virus by a health consulting firm pointed to “inadequate attention to Zika risks arising from predictable family travel between the mainland United States and its territories” (Gruendel, Gann, and Reynolds 2016, 6). It carried on:

The CDC continues to issue stern travel warnings and information about Zika is more widely available at ports of departure (including airports), however, it is likely that families will continue traveling to visit their families in U.S. territories. Given the dramatic increase in reported Zika cases in the U.S. territories, including Puerto Rico, the number of individuals returning to mainland U.S. as carriers of the Zika virus may be much higher than we are now predicting.

In the geographical imagination of Zika, therefore, diasporic circulation constituted biosecurity risk to the United States.

As reports on the risk the island posed the mainland proliferated, so too did examinations of the sexed living-being of Puerto Rican women and girls. Because Zika's threat of disability was located in the timespace of pregnancy, the body that could become pregnant was a central site of public health investigation. Surveys of the island from years past took on new meaning, and new surveying mechanisms bloomed; bodies and behaviors were tabulated and aggregate risks assessed. Tepper et al (2016), for example, counted 138,000 women "of reproductive age (15-44 years)" that did not desire pregnancy but who were not practicing effective contraception. They also reinterpreted a 2013 survey of risk behavior to argue that 50-percent of teenage girls (15-19 years) were "sexually experienced," with a birth rate almost double that of the United States overall. Of Puerto Rican high school girls, Leefelt (2016) declared, "Preventing pregnancy in this group could prove harder than stopping Zika" (Leefelt 2016). As Adriana Garriga-López (2016) has noted, public health expertise sexualized teenage girls, stigmatized teenage pregnancies, and produced the teenage girl body as the "focal point of control" (my translation). CDC research also centered the insecticide resistance of mosquitoes on different regions of the island (Center for Disease Control and Prevention 2017) and the insect repellent practices of women who had recently given birth (D'Angelo 2017). The latter study operated as a crucial behavioral link between research on sexed bodies and research on mosquitoes. As a suite, the CDC studies framed Puerto Rican women and girls as the hinge between *Aedes aegypti* and the "Zika babies" that were projected to cost millions of dollars.

In sum, mainland public health imaginations took Puerto Rican climate, habits, and bodies as raising the vulnerability of the United States to a Zika epidemic, a vulnerability that was at once corporeal and financial, and CDC expertise constituted Puerto Rican women as the central site of contemplation and intervention.

The political geography of Puerto Rico explains, at least in part, these mappings of Zika risk. Following the Spanish-American War, Puerto Rico became part of the United States, and since 1917 Puerto Ricans have been U.S. citizens. Puerto Rico's status as "foreign in a domestic sense" to the United States, as ruled by the Supreme Court in *Downes v. Bidwell* in 1901, and as a "free associated state," as later deemed by U.S. Congress in 1952, mean that the island is inside U.S. borders and that Puerto Ricans may move between island and mainland without restriction. Indeed, there is a long history of migration to and from the mainland, as well as abundant flights between San Juan and mainland cities (Grosfoguel 2003, 58). But they are mappings of Zika and island territoriality from an emphatically mainland perspective, reduced to the biological and financial risks Puerto Ricans might pose the U.S. government. When in Puerto Rico, I was struck by the extent to which people questioned whether the Zika virus was even real, let alone a legitimate reason for U.S. government intervention. There were whispers of U.S. government experimentation and a more general culture of skepticism, which has been noted by Puerto Rican doctors (Rodriguez-Díaz et al. 2017).

Zika skepticism speaks to the lived conditions of U.S. colonialism in Puerto Rico, in which two recent abuses loom large. First, in the mid-twentieth century, racist "culture of poverty" discourses held that large families were the cause of poverty in Puerto Rico and positioned women's bodies as targets of U.S. government intervention. In the 1970s and 1980s, up to one-third of women of childbearing age were sterilized. Although Laura Briggs (2002) has shown this to have been much more complex than a coordinated genocidal scheme, many sterilizations were coerced. U.S. government anxiety about—and abuse of—Puerto Rican women predates and informs Zika. Second, between 1983 and 1998, the U.S. Navy dropped over 17,000 tons of bombs on the island-municipality of Vieques, as well as testing Agent Orange,

Napalm, and depleted uranium (Davis, Hayes-Conroy, and Jones 2007, 168). The spatialization of the island as a U.S. military laboratory lingers on in toxins sedimented in land and fatty tissues of humans and nonhuman animals (Berman-Santana 2002, 41-42). There is a historical precedent for the mapping of Puerto Rico as *outside* the United States in an ethical sense, in which the rights of Puerto Ricans as U.S. citizens may be selectively suspended.

Furthermore, chemical vector control was carried out amidst the thickening of ambiguity over sovereignty on the island, for alongside Zika, another storm was brewing, one which resulted in the shuttering of scores of hospitals and the out-migration of more than one physician per day (Ora Bannan 2015). That storm was a \$72 billion public debt, over which U.S. Congress instantiated a financial control board that would have *total authority* over public spending on the island. Coupled with the June 2016 Supreme Court ruling in *Puerto Rico v. Sanchez Valle* that an individual cannot be tried twice for the same criminal offense under the same sovereignty, the “already limited sovereignty seemingly granted by the island’s free-associated status” (Goldstein 2016, 2) was dramatically reduced as the Zika virus was constituted as an American problem.

It is easy to see why Puerto Rican historians Ayala and Bernabe (2006, 335) designate the island a “possession of but not part of the United States.” The density of U.S. government interventions into the island as place, increasing territorial ambiguity of the island as space, and the persistent racialization of its people (Rodríguez-Silva 2012) recall Stoler’s (2006, 128) description of the “imperial formation,” in which “technologies of rule thrive on the production of exceptions and their uneven and changing proliferation.” She continues:

Critical features of imperial formations include harboring and building on territorial ambiguity, redefining legal categories of belonging and quasi-

membership, and shifting the geographic and demographic zones of *partially* suspended rights.

As I will now show, the Zika chemical vector program engaged territorial ambiguity and quasi-membership. Puerto Rican women were included in the United States as subjects and objects of vector control but excluded from ethical consideration through the selective stripping of corporeal autonomy and limited island sovereignty (Sundberg 2015). Zika made biological the problems of territorial ambiguity, figuring Puerto Rican women as a biosecurity risk and reducing them to intervenable objects—and the island, as we shall soon see, was made intervenable as well.

Chemical intervention: women’s bodies, domestic space, island

The Zika public health campaign in Puerto Rico was structured around three imperatives. The first was to provide access to contraceptives. The second was to “protect the pregnant woman” through the distribution of Zika kits in clinics, linking women to proper care services throughout pregnancy, and disseminating public health messages through television and radio (Martínez 2016). And finally, there was mosquito control, “a major area of attention for preventing Zika virus infectious in Puerto Rico, as in most places affected by the epidemic” (Rodríguez-Díaz et al. 2017, 144). Much of the focus on vector control stemmed from the fact that mosquito bites are the most common form of Zika transmission (Center for Disease Control and Prevention 2018), but vector control also promised to address the first two imperatives: it was carried out under the banner of protecting women and children, and, if effective, could

eliminate the need to prevent pregnancies. The latter promise was important, given the Archbishop of San Juan denunciation of the CDC's call for condom use (Agencia EFE 2016).

At the scale of the body, we can first observe the recurrent call for people to apply a coat of DEET-based insect repellent in the morning and throughout the day, which focused especially on women and girls. During my research, doctors, public health officials, and public health educational material implored Puerto Ricans to “wear DEET like perfume,” an exhortation bound up in perceptions of female beauty rituals. And crucially, public school teachers were explicitly instructed to distribute repellents to *girl* students (McNeil Jr. 2016a). U.S. government agencies also targeted Puerto Rican women through government food assistance. This targeting was principally realized through WIC, a program that serves over 90 percent of pregnant women in Puerto Rico in the form of nutritional and childcare counseling and food vouchers (Adams et al. 2016). The role of WIC in chemical vector control exemplifies the deep presence of the U.S. state in everyday life in for most women in Puerto Rico, at once providing a monthly lifeline for women and their families in the context of island food insecurity (LeBrón 2016) and instructing women on the chemical mitigation of mosquito bites. Through WIC over 21,000 pregnant women were instructed on how to prevent Zika and given insect repellent, and according to the CDC, WIC was utilized as an institution for Zika management in order to access as many women as possible (ibid; see also Gooch 2017). Puerto Rican women and girls were therefore in the first instance made into *subjects* of chemical vector control: through their chemical self-regulation, the U.S. population could be secured against Zika's biological and financial threats.

It is crucial to note that the CDC's instructions for women in Puerto Rico to maintain a DEET skin barrier did not differ from instructions for women on the mainland: women in areas of active Zika transmission on the mainland were urged to do exactly the same (Begnaud 2016).

Where women's self-regulation on the island differed was its interlinkage with coerced chemical intervention at the scale of the home. In the summer of 2016 physician Wanda Beltrán brought a case to the attention of the Puerto Rican Civil Rights Center, proclaiming that WIC beneficiaries had been coerced into signing a form that allowed government officials to freely enter homes for chemical aspersion (Departamento de Salud 2016). Reports over how many women signed vary; some say over 20,000, some say closer to 10,000. They were not allowed copies for themselves and were told not to discuss the matter with their doctors. WIC sent the registry of signatories to the CDC, which then coordinated the fumigation of over 2,000 homes with the chemical pesticide Deltamethrin. The forms made no mention of what chemical might be sprayed, nor of any associated health risks, and released Puerto Rican and U.S. governments from liability over any health damages related to fumigation (Criollo Oquero 2016; Quintero 2016b; 2016c). Chemical intervention into Puerto Rican domestic space proceeded on the premise that women's self-regulation was insufficient. Homes needed to be chemicalized directly, no matter the ethics of informed consent or the potential health risks of aspersion.

It also appears that U.S. government agencies assumed Puerto Rican women's self-regulation to be insufficient from the beginning. As news of the WIC- and CDC-coordinated domestic fumigations began to circulate, people noted earlier rounds of unauthorized fumigation of 3,000 pregnant women beneficiaries of WIC. Carried out by Oliver Exterminating Corporation, this round of fumigation happened without the mediation of a signed document (Quintero 2016c) and therefore without even the pretense of transparency. Chemical intervention into domestic space thus did not follow the dissemination of instructions for women's self-regulation of body and home as escalating stages in Zika management, but was carried out alongside that dissemination, secretly. If U.S. biosecurity knowledge spatialized Puerto Rican

women's bodies as the site of self-intervention, biosecurity practice dispossessed women of autonomy over domestic space. And because the dispossession of domestic space was enacted through the aspersion of a synthetic chemical that would encounter and pass through the body, this practice also dispossessed women and their families of bodily autonomy. Self-regulating subjects of chemical vector control were therefore also objects of chemical vector control.

The CDC's aerial fumigation plan scaled up the injunction for insect repellent use and the covert fumigations of domestic space. It sought to rapidly reduce *Aedes aegypti* numbers across Puerto Rico through the aspersion of the organophosphate Naled from airplanes. Three logics of chemical vector control at the scale of the island must be highlighted.

First, aerial Naled fumigation was premised on the obliteration of mosquitoes across large areas on the island. As Vanessa Agard-Jones (2014) has noted, spray technologies encompass the enjoinder of liquids and solids in the correct ratios to "bring chemicals to 'life'" and the pressurization of the reconstituted liquid into a mist that may be dispersed. It is the granularity of spray technologies that allow broad coverage, and this was especially true for the "ultra-low volume" Naled spray proposed for Puerto Rico. Developed by U.S. military entomologists in World War II, aerial chemical vector control is "referred to as a space spray since the goal is to drift droplets through a particular space resulting in contact with flying insects" (Breidenbaugh and Haagsma 2008, 55). Aerial "space spray" is celebrated for being able to access areas that may be inaccessible to backpack or truck-mounted spray units—or to kill mosquitoes that would otherwise reach the surface of the skin of people not using repellent. The CDC's plan promised expansive spatial reach over the island.

Second, the Naled plan was pitched as a form of anticipatory environmental governance against an explosion in Zika infection rates amongst Puerto Rican pregnant women generally,

and cases of microcephaly more specifically. “If any part of the continental U.S. had the kind of spread of Zika that Puerto Rico has now, they would have sprayed months ago. This is more a question of neglect than anything else,” stated CDC director Tom Frieden, continuing, “If we wait until children with microcephaly are born, it will be too late” (quoted in Coto 2016b). The CDC invoked an abstract image of future children as “the fantasmatic beneficiary” (Edelman 2004, 3) of aerial fumigation, asserting that Naled was the “island’s best defense” (Coto 2016b). And crucially, this rationale was tied to insect repellent guidelines: WIC Puerto Rico director Dana Miró stated aerial fumigation was necessary because Puerto Ricans were not following CDC guidelines for mitigating against mosquito bites (*Noticel* 2016). The expansive spatial reach of proposed aerial Naled fumigation, therefore, was deemed a corrective measure against Puerto Rican irresponsibility in self-management.

Third, the aerial fumigation plan was proclaimed safe, despite, as Rodriguez-Díaz et al. (2017) have noted, legitimate concerns over the toxicity of Naled for humans and bees having been raised in scientific studies (e.g. Hoang and Rand 2015). CDC documentation cited the chemical’s 1959 approval by the Environmental Protection Agency (EPA) and its half century of use in mosquito control and agriculture on the mainland (Center for Disease Control and Prevention 2016b) as evidence for its safety. It also argued that the small ratio of active Naled to the area of application—less than two tablespoons per acre—was below the ratio that could cause negative health impacts in the area of application. Recourse to a “small enough” ratio and “innocent until proven guilty” logic is consistent with dominant toxicological paradigms, which cast human body and environment as spatially distinct and define an amount below which a known toxin is safe (Nash 2006). The aerial fumigation plan posited microcephaly as the sole intelligible risk to health, proclaimed Naled safe because it had not yet been proven unsafe in the

quantities designated, and externalized the health of individual human bodies to environmental health.

But perhaps the most important aspect of the plan for chemical vector control at the scale of the island was that it was kept secret from the people who would have to live its effects. In July, *Telemundo* reported that the CDC had sent 20,000 pounds of Naled to Puerto Rico without the knowledge of local authorities (Gómez 2016); later it came to light that the CDC planned to fumigate the island “with or without” the consent of the local government (Municipality of San Juan v. the Center for Disease Control and Prevention 2016).

In response, thousands gathered for demonstrations and nighttime discussions in public space. People held up signs that said “Don’t fumigate us” and “I’m not your fuckin’ experiment” (*No soy tu fukin experimento*) and charged the CDC of “environmental terrorism” (Quintero 2016a). Opposition ranged from the demand for information, to assertions of unsound scientific evidence, to accusations of U.S. government experimentation (*El Nuevo Día* 2016). That the use of Naled is illegal in the European Union was a recurring point of reference in articulating its danger,¹ as was its toxicity classification by the EPA as a “category 1” with respect to eye irritation and dermal irritation (Environmental Protection Agency 1995), which means it is capable of seriously injuring workers engaged in its aspersion. As a final point, the Facebook page of Puerto Rican commentator Jay Fonseca, who in part broke the discovery of the Naled

¹ But even this is a tangled web: the anti-Naled movement was quick to point to its “banned” status, but proponents argued it was not actively “banned,” but rather pulled from the registry because its manufacturer had decided potential profits from the European market were not worth the cost of evaluations for EU approval. After the *Miami New Times* wrote that Naled was “banned in the European Union,” the Florida Department of Health recoiled, stating in a FAQ that has since been removed that the substance had not been registered in Europe; “banned” and “not approved for use” were very different. The *Miami New Times* answered by citing a 2012 decision to take Naled off the European market (Iannelli 2016). The substance had indeed been actively removed, despite Florida government claims otherwise, demonstrating how rationales for regulatory mechanisms take on a life of their own in wider epistemological struggles over chemical danger.

shipment in San Juan Harbor, became a forum for people to speculate about whether aerial fumigation with Naled had already been carried out covertly (Fonseca 2016; see also Caro González 2016). Thousands of people wrote of skin rashes, feeling unwell, and breathing problems, and submitted photographs of mass bee deaths.

What united these disparate strands of opposition was concern over the unknown human and environmental health consequences of Naled, the fact that consent of the Puerto Rican authorities had not only not been sought by the CDC, but openly flouted, and the lack of transparency on the geography of planned aspersions. In this way, the Naled plan drew on a long history of public health abuse by the U.S. government and exemplified the position of Puerto Ricans as “outsiders looking in” on U.S. sovereignty (Derby 2008, 294). It also threatened the full, if momentary, stripping of already-compromised Puerto Rican sovereignty over the island as a means of addressing the perceived failure of self-regulation.

Biopolitics, geopolitics, and chemical harm

Because of the dual position as an “unincorporated territory” of the United States and a tropical island with active local Zika transmission, public health knowledge and mainland popular discourse mapped Puerto Rico as both inside and outside the United States. Women and girls on the island were spatialized as the “threshold” between the agency of the Zika virus and its mosquito carriers, on one hand, and the future of the U.S. population on the other. I mean this future in both embodied and disembodied senses: microcephaly exemplified the capacity of extra-human nature to shape and mold the human form and carried with it unknown but inevitable debits to the national economy in cost of care and lost productivity. The present conduct of Puerto Rican women was bound to the financial and biological future of the U.S. nation. The island was thus *incorporated* into the U.S. nation through an imaginary of biological

and national economic risk—despite its status as “unincorporated territory.” At the same time, Puerto Rico was also produced as outside the United States in an ethical sense, in which chemical intervention was planned and, in some cases, realized without the consent of the ordinary people whose bodies were targeted.

This tangled geo-graphing of public health risk blamed the self-regulating Puerto Rican woman for rendering the U.S. population vulnerable to the dangers of the Zika virus. Risk, as Becky Mansfield (2012) argues, is very different from biological uncertainty: it is a mode of managing biological uncertainties on the behalf of specific communities. As such, it is a “biopolitical technology for governing the population in the name of security” (2012, 970) that is often tied to “responsibilization.” In public health knowledge on contaminated seafood, for example, pregnant women are spatialized as the “threshold” between a wider polluted environment and the health of the population and urged to modulate fish consumption to protect the fetus. This biosecurity regime reduces contamination—a problem with surefire connections to industrial practices—to one of individual women’s conduct, yoking the vitality of the population in the future to the present actions of women. Likewise, Zika risk is very different from Zika’s uncertainty. That Zika can be transmitted through a fortuitous mosquito bite, reside in humans without producing symptoms, and harm growing fetuses speaks to the uncertainties of living on a dynamic planet, of the “precarious global interdependency of human, animal, and viral ecologies” (Sparke and Anguelov 2012, 726). By contrast, in the chemical vector program’s framework of risk, the global problem of vulnerability to new infectious disease was reduced to the individual actions of Puerto Rican women and the ripple effects those actions might hold for the U.S. population.

Here it bears repeating that the CDC's biosecurity regime was part and parcel of the U.S.-Puerto Rican imperial formation; this is the context in which insect repellent guidelines were both produced and interpreted. The territorial ambiguity of the island, "quasi-membership" of Puerto Ricans in the U.S. population, and the partial suspension of Puerto Ricans' legal rights adds another dimension to the risk and responsabilization dynamic unpacked by Mansfield, for the scales of chemical intervention—body, home, and island—were connected: covert domestic fumigation and the Naled aerial fumigation plan were deemed necessary because Puerto Rican women had not properly amended their comingling with mosquitoes on the surface of their bodies and in the spaces of their homes. They were interpreted to have flouted insect repellent guidelines, exposing themselves to the bite of *Aedes aegypti* and thereby exposing the U.S. population to chance of microcephaly. Accordingly, U.S. paternalism held, they must be shielded from the mosquito by other means.

The other means was the threat of aspersion of a chemical associated with toxicity concerns from above without the consent of Puerto Rican authorities, a move that can be read—and indeed, was read by many Puerto Ricans—as an aggressive display of U.S. sovereignty. Chemical vector control in Puerto Rico sought to secure the U.S. population with synthetic chemicals, a population in which Puerto Ricans were included as self-regulating subjects and excluded in terms of knowledge of and consent to chemical intervention. The Naled fumigation plan was biopolitical insofar as it would, if realized, expose some Puerto Ricans to chance of long-term chemical harm in order for others in the United States to live more prosperously, given the anticipated public costs of microcephaly. Furthermore, the vertical structure of the aerial fumigation plan was both a callback to more overt expressions of U.S. sovereign power on the island (especially bomb testing) and a reminder of U.S. territorial control over the island.

“Biosecurity wedes biopolitics with geopolitics,” writes Braun (2007, 25): the CDC’s chemical vector program tied the incitement of Puerto Rican women’s self-management to the threat of the deployment of chemicalized sovereign power at the scale of the island.

It is crucial to be clear about what chemicalized sovereign power could entail, if deployed. The “granularity” of chemical spray technologies is bound up with peril as much as with promise, as Agard-Jones (2014) argues, such that the expansive spatial reach of planned aerial Naled fumigation was bound to the expansive reach—in both spatial and temporal senses—of its possible ill health effects. Recent research on synthetic chemical use calls into question the ideas of chemical thresholds and discrete cause and effect around which the Naled plan was rationalized. This research points to “enmeshed land and body” (Murphy 2017: 497) and the unruly activity of synthetic chemicals, suggesting that a chemical like Naled could exceed the space designated for application and move spatially across the Earth on sultry Caribbean winds and rains, or interact with the dangerous chemicals left behind by U.S. military infrastructures (see Guthman and Mansfield 2012). Anti-Naled activists in Puerto Rico knew this, of course: the chemical accretions of U.S. empire brought them to view the CDC’s guarantees of Naled’s safety skeptically and subvert the Zika public health program’s reduction of public and reproductive health to microcephaly. The point is any deployment of chemicalized sovereign power would engage bodies and lands, and it could stretch the partial suspension of Puerto Rican rights during the Zika public health emergency into intergenerational futures.

It is also crucial to be clear about why aerial Naled fumigation was ultimately *not* carried out by the CDC. Conceived in secret and threatened to be realized without consent, the plan was resisted through street activism, dense anti-Naled discourses in Puerto Rican news media, and a citizen-suit filed in Puerto Rico’s United States District Court (*Municipality of San Juan v. the*

Center for Disease Control and Prevention 2016). Pursuant to the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA), the suit demanded a trial by jury for a long list of defendants, including the CDC, the Commonwealth government of Puerto Rico, and three corporations. The objective of the suit was to prevent the CDC from spraying until an environmental impact statement has been provided as required by NEPA, which was designed to involve the public in federal decision making related to environmental health. Juanita Sundberg (2015: 217) asserts that, “Although there are no guarantees, NEPA legitimizes the concerns of citizen-subjects about clean air and water and about culturally significant landscapes indispensable to the fabric and long term wellbeing of multispecies communities.” The plaintiffs asserted the CDC had not assessed possible environmental harm of Naled, arguing that aerial fumigation would “pose a significant risk to the well-being of several species of fish, wildlife and plants” (Municipality of San Juan v. the Center for Disease Control and Prevention 2016). In addition to endangered species, the citizen suit highlighted water systems, noting Naled’s label warning that the chemical not be used in or around bodies of water, and to be mindful of weather conditions that could facilitate the deposition of Naled in bodies of water. “The quality of the multiple waterways and the San Juan estuary systems, as well as the safety of wildlife and fish that inhabit said ecosystems and bodies of water directly affects the health, recreational, aesthetic, commercial, and environmental interests of the MSJ [municipality of San Juan],” the plaintiffs charged. The lawsuit’s appeal to water quality came just weeks after U.S. Geological Survey threatened to stop operating 177 hydrologic stations on the island because of an unpaid debt of \$2 million, thereby shutting down water quality monitoring. In other words, the closing down of the capacity to assess water quality as part of austerity had coincided with the plan to fumigate the island with Naled (Coto 2016a). The suit also centered the chemical’s capacity to

interfere with the health of pregnant women and babies, the figures in the name of whom the Naled program was authored in the first place. They thus highlighted the fact that fear over Zika intervening in human reproduction had bred a chemical management plan that could interfere in human reproduction in similar ways.

On the back of mounting public outrage, the CDC recalled the 25,000 pounds of Naled slated for aerial fumigation. What Derek Gregory (2006) has articulated in his exegesis on Guantánamo Bay in Cuba—that law represents a crucial site of struggle within contradictory legal geographies of empire—proved true in resistance to chemical vector control in Puerto Rico. While the story of chemical Zika intervention surely demonstrates a virulent biopolitical logic that chemically worked on the bodies of Puerto Rican women so that the U.S. population might live better, it also demonstrates that this logic was contested time and again.

Nature, women, sovereignty

With its capacity to shape the human child in utero, the latest mutation of Zika struck at longstanding racialized fears over limited healthcare funds, as well as emergent fears over the future of the human in what is imagined to be an ever-unrulier nonhuman world (Sheldon 2016). Biological uncertainties bloomed at molecular and geopolitical scales, in the womb and across seas, which U.S. government agencies set out to manage on behalf of the national population. There was a paradigm of risk. The assembly of a chemical vector control program was driven by fear over the non-sovereignty of human bodies and the non-sovereignty of the United States, which straddles temperate and tropical climates, and whose overseas territories like Puerto Rico are un/incorporated in consequential ways.

Fear over non-sovereignty was tied to attempts to reinscribe sovereignty through the anticipatory governance of human-mosquito interactions in Puerto Rico, including the threatened deployment of chemicalized sovereign power. In this essay I have shown how the bodies of young Puerto Rican women were framed as the pivot between the dense agency of the Zika virus and the future of the U.S. population, and through that framing their bodily sovereignty was reduced. The story demonstrates that the greater power—positive or negative—that women’s reproductive faculties are assumed to wield biopolitically, the greater their chance of bodily harm.

This story should give cause for wariness about similar spatializations of women and girls as the “threshold” between twenty-first-century ecological uncertainty and the future of the population, within and beyond the Zika international public health emergency. It is tempting to plot the provision of Intrauterine Devices to Puerto Rican women in the name of Zika (e.g. Lathrop et al 2018), or the delivery of a range of forms of birth control to poor women in the Global South in the name of climate change (e.g. Cost 2009) along the glossy narrative of expanded access to contraception, for example, but these programs may very well be linked to reductions in bodily autonomy. Careful and critical analysis is needed to scrutinize how women are made into intervenable objects for the good of the population amidst ecological uncertainty, for there is always a geography to defining object and population.

The biopolitical logic that located Puerto Rican women and girls as the hinge between the Zika virus and the future of the U.S. population was enabled by the contradictory mapping of the island as inside the United States in terms of risk, and outside the United States in terms of rights. And yet, as I have also taken care to show, it was the island’s contradictory geography that was seized on as a site of struggle. Just as there is a geography to the extension of state

power in the name of health, safety, or security, so too is there a geography through which this extension may be contested.

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