

**The Highly Pathogenic Avian Influenza A(H5N1) Virus:
a twenty-year journey of narratives and (in)secure landscapes**

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ABSTRACT

This dissertation is comprised of two manuscripts that explore various contestations and representations of knowledge about the highly pathogenic avian influenza H5N1 virus. In the first manuscript, I explore three narratives that have been produced to describe the 20-year journey of the virus. The journey begins in 1996 when the virus was a singular localized animal virus but then over the next 20 years multiplied its ontological status through a (de)stabilized global network of science and politics that promoted both fears of contagion and politics of otherness. Written by and for powerful actors and institutions in the global North, the narratives focused on technical solutions and outbreak fears. In doing so, the narratives produced policies and practices of biopower that obscured alternative considerations for equity, social justice, and wellbeing for the marginalized groups most directly affected by the H5N1 virus. The second manuscript explores a unique aspect of the H5N1 virus's journey as an emerging infectious disease – its representation as a potential weapon for bioterrorists. The US government's recent attempt to secure what constitutes H5N1 knowledge produced a global debate between scientists and policy makers over how to balance the nation-state's desire for security with the life science's tradition of openly shared research. Known as the dual-use dilemma, this debate set up binaries of impossible reconciliation between the two groups. This dissertation argues that the dual-use dilemma obscures larger questions of justice. I propose a new concept of justice, *knowledge justice*, as an alternate more globally inclusive framework for exploring ways out of the dilemma. The concept is premised on the assertion that if knowledge is framed to obscure justice issues, then the justice questions of owning that knowledge can be used as a way out of the dual-use dilemma. Thus, knowledge becomes a question of justice that should be as important to policy makers as more traditional justice considerations of inequities in distribution, recognition, representation, and fairness.

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“This excess of biopower appears when it becomes technologically and politically possible for man not only to manage life but to make it proliferate, to create living matter, to build the monster, and ultimately, to build viruses that cannot be controlled and that are universally destructive. This formidable extension of biopower...will put it beyond all human sovereignty.”
(Foucault 2003, 254)

INTRODUCTION

In the first two weeks of 2016, three disconnected events occurred that illustrate the arguments of this dissertation. On January 7 and 8, I attended the National Science Advisory Board for Biosecurity (NSABB) meetings to hear presentations and discussions on the board’s preliminary risk and benefit assessments for “gain-of-function studies of concern” – or research with the potential to generate pathogens with enhanced pathogenicity, transmissibility, and ability to evade public health control measures.¹ The meeting was part of a deliberative policy making process set in motion in late 2014 when the US government took the unprecedented step of pausing all gain-of-function (GOF) funding research on influenza (the Highly Pathogenic Avian Influenza A virus, subtypes H5N1 and H7N9), Middle East Respiratory Syndrome (MERS), and Severe Acute Respiratory Syndrome (SARS) viruses until a new government policy could be developed.² While the meeting minimized the potential bioterrorist fears that dominated the 2011/2012 NSABB meetings and emphasized the global nature of GOF research, the new risk benefit assessments generally relied on earlier materials-based, technological deterministic models. In fact, the weakness in these models was admitted in the NSABB’s

¹ See the NSABB’s meeting website for the agenda and links to the meeting’s presentations and working papers. Accessed 10 January 2016. <http://osp.od.nih.gov/office-biotechnology-activities/event/2016-01-07-130000-2016-01-08-220000/national-science-advisory-board-biosecurity-nsabb-meeting>.

² Gain-of-function research in the life sciences generally refers to laboratory research that increases the pathogenicity or transmissibility of an infectious virus.

working paper, “estimating [biosecurity] risk by understanding consequences without their likelihood is challenging” (NSABB 2015, 15).

On January 13, the National Academy of Medicine (NAM) released a major policy report addressing the global infectious disease crises (GHRF 2016). In a departure from previous reports by international and national public health organizations, the NAM report detailed the deficiencies in the way new threats from infectious diseases – Ebola, SARS, hantavirus, Human Immunodeficiency Virus (HIV), and novel strains of H5N1 influenza – are “framed.” Previous reports by the most powerful actors in the infectious disease story, including various US agencies, the World Health Organization (WHO), and the rest of the United Nations system have focused on one of three predominant framings: public health, human security, and economic growth and stability. As the report points out, these framings have produced underinvestments in the global South’s public health infrastructure and capabilities at the expense of overinvestments in militarized national security resources and “non-scientific-based actions” that exacerbate health crises from infectious diseases.

On January 15, the US Department of Agriculture (USDA) activated its new emergency response plan when a new strain of avian influenza that was confirmed on an Indiana turkey farm. The plan was only recently drafted in September 2015 in response to the worst outbreak of avian influenza in US history that resulted in the culling of 7.5 million turkeys and 42.1 million chickens (USDA 2015a). A critical component of the plan is to cull all poultry within a 10-km radius, within 24 hours of diagnosis, and either quarantine or severely limit movement of humans and vehicles within the 10-km radius. This means that USDA and state officials immediately culled over 400,000 chicken and turkeys and enforced cordoned off areas around the farms (Poultry Site News 2016). Significantly, the plan is the first government document to put greater

weight on controlling the known human factors associated with the spread of avian influenza viruses than on previous practices that focused on unspecified culling practices. Previous plans were based on practices that blamed the spread of viruses primarily on wild birds and backyard flocks. But this paradigm was upended in 2015 when less than 10% of the backyard poultry flocks were infected at the same time almost 100% of the commercial farms were infected in Iowa, the state hardest hit by the 2015 avian influenza epidemic (USDA 2015b). This redirection of US policy away from wild birds towards humans is significant to controlling the spread of H5N1 in poultry worldwide because frequently both the Food and Agriculture Organization (FAO) and the World Organization for Animal Health (OIE) use USDA's policies as models and guidance for agriculture policies in the global South.

I begin this dissertation with these three current events because they highlight recurring themes and their associated questions that I explore in this dissertation. The H5N1 virus was first discovered in China in 1996 and has since spread to 73 countries. Unlike its contemporary zoonotic infectious diseases, SARS and MERS, which initially spread quickly and efficiently via the highly interconnected global transportation network, H5N1 has spread relatively slowly through a combination of bird migrations, massive investments in centralized poultry production in the global South, and a failure to recognize the importance of human farming practices that vary from country to country and within countries. And unlike SARS and MERS, H5N1 has both an animal and a parallel public health dimension as well as a security dimension.

As an animal disease, the H5N1 virus has wrecked economic and social havoc in the global South's poorest countries and on the poorest most marginalized people within these countries due to policies imposed on them from international global animal and public health organizations. These policies were lacking in social justice considerations and heavily focused

on considerations of containment and security. As a public health concern, H5N1 ranks at the top of the WHO's list of global pandemic concerns with projected economic and human mortality consequences greater than the 1918 Spanish Flu. While the scientific evidence over the H5N1 virus's actual pandemic potential is highly contentious, the pandemic concern still drives policies in the global North. These broad meta trends have played out against a crosscutting security trend that has caught the H5N1 virus in fears of bioterrorism and a resultant associated desire for greater national security. Securitization of H5N1 has produced attempts to close down knowledge about the virus or restrict that knowledge to the most privileged countries and dominant actors, created policies of otherness that seek to stop the virus at nation-state borders, and stoked fears of contagion in the popular media and politicians.

These three current events also highlight another dimension of the H5N1 journey that I explore in this dissertation. For all their well-intentioned purposeful statements and actions, these events remain a product of dominant actors in the global North – untouched by the H5N1 virus's dire animal or public health consequences – which are empowered to advise on and direct policies for countries in the global South. For example, the NSABB remains paralyzed by the dual-use dilemma in its attempts to reconcile security concerns with the need for more research on H5N1, while failing to account for ongoing GOF research programs being conducted in European countries, China, and Vietnam. Even though it acknowledged for the first time in its January 2016 meeting that there is an unaddressed ethics concern in developing regulations that seek to contain knowledge about emerging infectious disease within the US borders, it has not found a way to accommodate that concern with its competing and more vocal speculative securitization concerns. As Melinda Cooper (2006) noted, when biology comes to be known in

terms of “emergence” the future can only be “speculative” and political calculation must become “future-invocative” to produce a desired future.

Secondly, the NAM report is useful by lending a critical voice of authority to highlight the failures of previous framings and their associated failed policies and actions. However, NAM’s proposed solution is based on wealthy countries in the global North funding more research for vaccines and diagnostics tools – “science is our most powerful weapon in combating infectious diseases” (GHRF 2016, iv). Rather than advocating for policies and funding to promote indigenous scientific research capacities, such as Vietnam’s small but promising avian influenza research programs, NAM’s “new” framework for countering infectious disease crises is based on flowing more research funding through the already wealthy global North’s government and pharmaceutical labs that will ultimately benefit the world’s poorest populations. The affordability crises created by a similar trickle-down approach to the AIDS pandemic 15 years ago was succinctly summed up by bioethicist David Resnick, “the problem of access to medications goes far beyond the HIV/AIDS pandemic: people in developing nations cannot afford medications used to treat or prevent malaria, tuberculosis, cholera, dysentery, meningitis, and typhoid fever. The affordability problem also extends beyond a lack of access to new drugs designed to treat devastating infectious diseases: 50% of people in developing nations do not have access to even basic medications, such as antibiotics, analgesics, broncho-dilators, decongestants, anti-inflammatory agents, anti-coagulants, or diuretics” (Resnick 2001, 12).

Thirdly, the new USDA policies for controlling avian influenza in the poultry industry are also on their surface a much-needed step in the right direction. With an emphasis on establishing rapid militarized command and control structures to limit the movement of people and immediately eradicate all possible sources of the virus before it has a chance to spread, the

USDA has finally taken a page from Hong Kong's successful approach to stopping the spread of H5N1. In 1997, Hong Kong officials essentially locked down the city and mobilized their military and police forces to kill over a million and a half birds during a five-day stretch effectively stopping the global spread of the virus for six years (Sims and Brown 2009). The difficulty here is that as I noted above, the dominant international organizations working in this area, such as the WHO, FAO, OIE, and other UN-related bodies, tend to base their policies on US policies. But in the United States there is an extensive network of insurance and government compensation schemes that shield the large corporate farmers from little more than a temporary inconvenience or drop in their stock price when the H5N1 virus invades their factories. This economic security network does not exist in the countries of the global South, or only exists for the benefit of the indigenous corporate farmers, and so massive military style culling schemes also produce massive economic and social catastrophe in populations already economically marginalized. As I show in this dissertation, Hong Kong's experience was only successful because it was coupled with a US style compensation scheme for small scale and backyard poultry producers. No other country where the H5N1 virus is endemic has been willing or had the resources to adopt the second part of this eradication equation.

As these three examples show, the H5N1 virus presents scientists, public and animal health professionals, and policy makers with a paradoxical set of intertwined epidemiological, ecological, social, political, and technological challenges. That is to say the science, policies, and technologies designed to secure the borders of the global North's nation-states and their population's wellbeing from the threat of the H5N1 virus have generally served to weaken the security of the global South's nation-states and their population's well being. Thus, the story of the H5N1 virus is also a challenge of justice for marginalized populations of poverty as well as a

question of knowledge production. And while there is a large body of literature that eloquently describes the strong associations between disease, poverty and social inequalities, I argue in this dissertation that it is important to move beyond the easy linear and deterministic arguments to a deeper understanding of how such inequalities become structurally embodied in societies. As Nguyen and Peschard remind us, “in modern society, inequality becomes embodied biologically, as those lower on the ladder suffer higher morbidity and mortality rates” (2003, 447).

As the first example of recent NSABB deliberations shows, complicating the already difficult discussions on H5N1 and poverty is that the virus has also become the subject of intense debates in the life sciences and security communities as a potential bioterrorist weapon. At the heart of these debates is a relatively simple story promoted by US policy makers. That is to say, since the WHO, CDC, and other international health organizations predicted the H5N1 virus could have apocalyptic pandemic potential should it ever mutate to become readily transmissible between humans, it would naturally be of interest to malevolent actors who would seek to create such a pandemic for malintent. Continuing the linear deterministic logic of this argument, therefore, given the advances in life science technologies which allow anyone to quickly modify life at the molecular level, certain types of knowledge about the virus should either be classified, i.e., only available to the US government, or simply not produced at all. While loud protests over the United States’ attempted assertion of its moral authority to control the production of H5N1 knowledge have been widespread, the debates continue five years later. As a Science and Technology Studies (STS) scholar it is easy to dismiss the underlying flawed technological determinism and duality inherent in this story, but the fact remains that the story has powerful political resonance especially when combined with continuously promoted fears of contagion in the popular media. Therefore, charting a possible pathway away from these binaries of good and

evil about the H5N1 virus requires a deeper understanding of how perceptions of risk and their associated political and social consequences become embodied in a society.

This dissertation seeks to contribute to that need for a deeper understanding by tracing the 20-year journey of the H5N1 virus while examining three important overarching questions that have not been asked in an interdisciplinary and integrative way: What is H5N1 knowledge? How is it acquired, transferred, secured, and given authority? What facilitates or impedes its development? Exploring these questions demonstrate how nonlinear issues of global public health, human rights, and social justice can quickly become entangled with extreme inequalities when confronted by asymmetric formations of power and knowledge. Exploring these questions also show how difficult it can be to unravel contestations of security and knowledge production, especially when those most affected by the contestations are not party to the discourse.

Following Virginia Tech's guidance for a dissertation prepared in manuscript format,³ this dissertation is composed of two publishable manuscripts that examine the H5N1 virus's 20-year journey through multiple lenses. The first manuscript, "Narratives of Disease: following the H5N1 virus from birds to (de)stabilized networks," explores the three predominant H5N1 narratives (as a bird flu virus, a public health concern, and a source of outbreak fears) using a Foucaultian framework to examine how these narratives can be seen as constructions of biopower by the global North. This manuscript also addresses the gap in Foucault's concepts of security and power created by his human-centric formulations by looking at the exercise of power at the intersection of human and nonhuman agency. Supporting the latter extension of Foucault and extending Latour's actor semiotics, this manuscript introduces a new term, (trans)gressive agent, *transagent*, to describe an actor that crosses the species boundary and

³ See www.edt.vt.edu/guidelines.

thereby multiplies its ontological status functioning as both a nonhuman and within a human assemblage simultaneously. Viewing questions of H5N1 knowledge through the lens of Foucault and seeing the virus as a transagent expose a “counter-narrative” (Nye 2003) that charts the ways inequities, social justice, and poverty associated with the virus have become embodied in the global South.

In the bird flu narrative, I show how dominant actors, both at the global and state levels, sought to prevent the spread of the H5N1 virus in poultry through political policies and veterinary practices that ignored their associated social and economic costs to the marginalized actors most directly affected by their actions. In the public health narrative, I show how another set of actor-networks formed when the H5N1 virus jumped the species barrier, moving from infecting birds to infecting humans, and became a global public health crisis. Lastly, I explore how the outbreak narrative laden with its fears of contagion has come to overlay the first two narratives in the global North to promote policies of security and “otherness” that ensure the H5N1 virus remains a part of the global South, and does not invade its Northern borders. Crosscutting these narratives are ways in which security and power has been linked to the control of H5N1 knowledge. I conclude this manuscript with the idea that there is also hope in these narratives because each has an associated counter-narrative that when recognized can help produce more socially just policies.

The second manuscript, “Application of Knowledge Justice to the Life Sciences: an alternative approach to resolving the H5N1 dual-use dilemma,” explores the three intersecting dimensions of security, ethics, and justice that are found in the current H5N1 GOF research debates. These debates center on the question of how to articulate meaningfully and universally agreed upon principles of regulating dual-use research in the life sciences. The debates expose

the difficult problem faced by policy makers of how to balance the desire for open publication of scientific research with the nation's security. This conundrum is known as the dual-use dilemma.

Using two highly publicized H5N1 GOF virus research studies as a touchstone for their larger unaddressed and invisible social justice questions, this manuscript develops the concept of *knowledge justice* to describe the social justice issues created when knowledge is framed in a way to obscure justice issues. This manuscript examines how STS scholarship, especially the role of tacit knowledge in research, can be applied to counter arguments that frame the H5N1 debates in the mantle of security. It also examines why the discourse of bioethics has been lacking in its ability to ask questions on the rightful ownership of knowledge when confronted with unchallenged presumptions of security. Both examinations are useful in avoiding the technical and political framings that reduce debates on research to simplistic arguments of securitized binaries while allowing for a more globally inclusive discussion of justice.

In the first section of the second manuscript, H5N1 Debates and Myth of Easy Replication, I explore how the policy makers and technical experts have framed the H5N1 from the very beginning to produce the current environment in the related science and security policies. I briefly trace the avian virus's journey from its first appearance in 1996 in China to its position as a global pandemic threat, and then on to its status as an object of research in the laboratories of the world's two leading virologists, Drs. Fouchier and Kawaoka. Along the way, the virus was simultaneously the subject of potential bioterrorism in the United States and the subject of intense public health interest in countries like Vietnam that continues to suffer tremendous economic and social losses from the virus.

In the next section, Bioethics of Silence, I explore the relationship of these framings to a

lack of serious ethical reflection on the subject of H5N1 and the dual-use debate. As bioethicist Michael Selgelid has pointed out, “it is noteworthy that most of the debates about the dual-use dilemma have primarily involved science and security experts rather than ethicists...bioethicists have had relatively little to say about security in general, or the dual-use dilemma in particular” (2009, 722). I point to two considerations when examining the bioethics community’s general silence on the subject of dual-use in the life sciences – the actions of a “risk society” (Beck 1999) and the coincident growth of corporate university structures combined with the slowly emergent transition of the bioethics field away from its historical technology-centric orientation.

Lastly, the bioethics discussion provides a segue to this manuscript’s final section, Thorny Problems of Justice and Securitized Knowledge, in which I develop the concept of knowledge justice to extend existing justice theory as an alternative approach away from the current dual-use dilemma’s technical and political framings. I argue that a concept of knowledge justice can be a useful way out of the US government’s current paralysis while offering a consideration of justice to those most in need of the H5N1 knowledge.

I conclude this dissertation with a very brief discussion of the current Zika virus crisis and its parallels with the H5N1 journey. While most of the deterministic predictions discussed in this dissertation about the H5N1 virus were never realized, it doesn’t mean that there aren’t valuable insights to be gleaned from the virus’s journey that can be useful in the future STS scholarship. The Conclusion points to some of those insights, and offers hope that we aren’t doomed to a future of repeated social construction failures in the face of each new infectious disease crisis.

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Narratives of Disease: following the H5N1 virus from birds to (de)stabilized networks

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Keywords: H5N1, HPAI, highly pathogenic avian influenza, outbreak narrative, transagent, biopower, pandemic, emerging infectious disease

Acronyms and Abbreviations

AAAS	American Association for the Advancement of Science
AIDS	Acquired Immunodeficiency Syndrome
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
BSE	Bovine Spongiform Encephalopathy (Mad Cow Disease)
CDC	Centers for Disease Control and Prevention
CIDRAP	Center for Infectious Disease Research and Policy (University of Minnesota)
DG SANTE	European Commission Directorate-General for Health and Food Protection
ECTAD	FAO Emergency Centre for Transboundary Animal Diseases
EID	Emerging Infectious Disease
FAO	Food and Agriculture Organization of the United Nations
FDA	United States Food and Drug Administration
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
GISN	Global Influenza Surveillance Network
H5N1	Shorthand reference to Highly Pathogenic Avian Influenza (HPAI) A virus, subtype H5N1, or HPAI A(H5N1); where the A stands for the genus of influenza, H5 stands for the fifth of 16 known types of the hemagglutinin glycoprotein, and the N1 stands for the first of 9 known types of the neuraminidase glycoprotein.
HA	Hemagglutinin
HEW	Department of Health, Education, and Welfare
HHS	Department of Health and Human Services
HIV	Human Immunodeficiency Virus
HPAI	Highly Pathogenic Avian Influenza
AIV	Avian Influenza Virus
IFAD	International Fund for Agriculture Development
IHR	International Health Regulation (World Health Organization)
LPAI	Low Pathogenic Avian Influenza
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MERS	Middle East Respiratory Syndrome

NA	Neuraminidase
NAM	Non-Aligned Movement
NAMRU	Naval Medical Research Unit (United States)
NGO	Non-governmental Organization
NIAID	National Institute of Allergy and Infectious Diseases
NIH	National Institutes of Health
NSABB	National Science Advisory Board for Biosecurity
NSCAI	National Steering Committee on Avian and Human Influenza (Vietnam)
OIE	World Organization for Animal Health
PAHPA	Pandemics and All Hazards Preparedness Act, Public Law 109-417
SARS	Severe Acute Respiratory Syndrome
STS	Science and Technology Studies
TAD	Transboundary Animal Disease
UK	United Kingdom
UNICEF	United Nations Children's Fund
UNSIC	United Nations System Influenza Coordinator
US	United States
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
UN	United Nations
VCP	Vietnamese Communist Party
WHO	World Health Organization

Abstract

In 1996, the highly pathogenic avian influenza H5N1 virus appeared in Southern China. Originally characterized by the international public health and veterinarian communities as a problem endemic to the global South due to prevailing “backyard farming” and cultured poultry practices, H5N1 has since spread to 73 countries. As this paper shows, the global response strategy, designed by and for countries in the global North and dominated by powerful actors and institutions, focused on outbreak events, containment, and eradication that obscured alternative considerations for equity, social justice, and the wellbeing of poor and marginalized groups. This paper uses Foucault’s conceptualizations of power and biopower to show how dominant science and political actors have sought to frame the three major H5N1 narratives to emphasize technical, political, and economic stability and security. It also extends Foucault’s human-centric thoughts to show ways that power is also exercised at the interface of human and nonhuman actors with the introduction of a new semiotic, (trans)gressive agent, *transagent*, to describe an actor that crosses the species boundary thereby multiplying its ontological status. This paper explores the H5N1 virus’s journey in an integrative way across three previously siloed narratives: from its nonhuman bird flu form, to its public health human assemblage in crisis, and finally to the crisis-induced outbreak fear of the “other.” It concludes with some thoughts on a counter-narrative that balances technical and expert knowledge with considerations of less dominant forms of knowledge.

“What seems to us more important, more painful, and more unendurable is not really what is more important, more painful, and more unendurable but merely that which is closer to home. Everything distant which for all its important moans and muffled cries, its ruined lives and millions of victims, that does not threaten to come rolling up to our threshold today we consider endurable and of tolerable dimensions” (Solzhenitsyn, 1970 Nobel Lecture).

Introduction

In February 1976, two soldiers at Fort Dix, New Jersey came down sick with flu like symptoms. Subsequently, over 200 other soldiers also became sick. The Center for Disease Control (CDC) identified the flu as being H1N1, similar to the flu virus that caused the 1918 Spanish flu pandemic, and better known as “swine flu.” In an attempt to avert a potential pandemic the Ford Administration and Congress rushed through legislation creating a National Influenza Immunization Program to vaccinate “every man, woman, and child.” The program began on October 1 and was suspended on December 16 after reports of at least 54 cases of Guillain-Barre syndrome resulting from the vaccine and no evidence of a flu pandemic.¹

In 1978, Secretary of Health, Education, and Welfare (HEW), Joseph A. Califano, commissioned a study in an attempt to develop lessons learned following the much criticized attempt by the Ford Administration to vaccinate the entire US population against a projected epidemic of swine flu that never materialized. In setting up the study, Secretary Califano asked the authors two remarkably reflexive sets of questions that echo loudly to this day:

First, how shall top lay officials, who are not themselves expert, deal with fundamental policy questions that are based, in part, on highly technical and complex expert knowledge—especially when that knowledge is speculative, or hotly debated, or when “the facts” are so uncertain? When such questions arise, with how much deference and how much skepticism should those whose business is doing things and making policy

¹ See Sencer and Millar (2006), the program’s two principle architects, for a reflexive firsthand account of why the vaccination program failed.

view those whose business is knowing things—the scientists and the experts?

Second, how should policymakers—and their expert advisers—seek to involve and to educate the public and relevant parties on such complicated and technical issues? To what extent can there be informed and robust public debate before the decision is reached? (Neustadt and Fineberg 1978, 3).

Almost 35 years later, national policy makers were still wrestling with influenza-related questions, but this time their focus had shifted from public health to public security with an even more threatening influenza virus. In March 2012, Paul Keim, Chairman of the National Science Advisory Board for Biosecurity (NSABB) announced his decision to recommend full publication of two highly controversial articles on the H5N1² virus. (See **Figure 1-1.**) The controversy sharply divided the life sciences world between experts and policymakers concerned about bioterrorists potentially replicating research for malevolent reasons and experts and policymakers advocating for the sanctity of openly published scientific research. In his announcement that reversed his earlier unprecedented decision to censor the papers, he said, “Why should the NSABB be telling the world what to do? Why has not the world already had these discussions and debates?” (Keim 2012, 2).³ The intervening 35 years between the H1N1 pandemic scare and

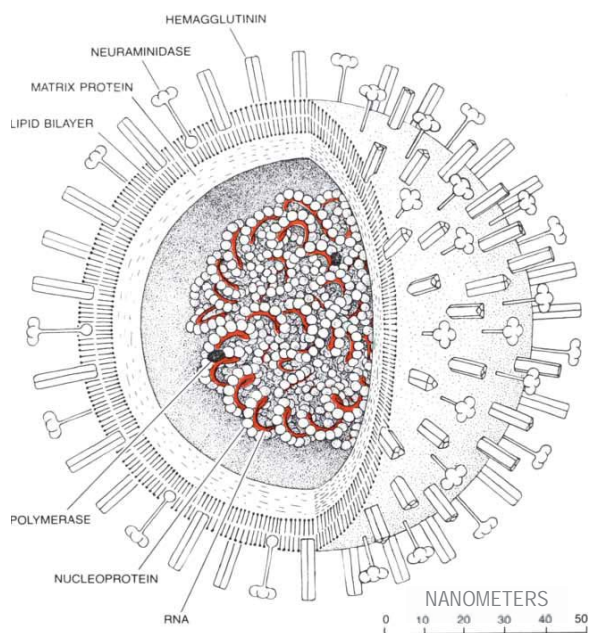
² Throughout this paper, I use “H5N1” as shorthand for its scientifically correct reference: Highly Pathogenic Avian Influenza (HPAI) A virus, subtype H5N1, or HPAI A(H5N1); where the A stands for the genus of influenza, H5 stands for the fifth of 16 known types of the hemagglutinin glycoprotein, and the N1 stands for the first of 9 known types of the neuraminidase glycoprotein (see footnote 4).

³ In November 2011, the NSABB took the unprecedented action of recommending that two publically funded scientific research papers should be censored. Two teams of scientists conducted the research: Ron Fouchier of Erasmus Medical Center in Rotterdam and Yoshihiro Kawaoka of the University of Wisconsin-Madison. Both teams independently developed mutant strains of the H5N1 virus that could be aerosolized and passed between mammals – something previously considered impossible to create in the laboratory.

In 2011, the H5N1 virus was thought to have about a 60% mortality rate based on the few reported cases of animal-human transmission (compared to the 1918 Spanish flu pandemic mortality rate of ~5%). The H5N1 virus is the World Health Organization’s (WHO) singular most important pandemic concern (WHO 2005) due to the fact that the human population lacks any protective immunity against the H5 and N1 proteins. However, there is no evidence of naturally occurring mutations that allow for animal-human or human-human aerosolized H5N1 transmission.

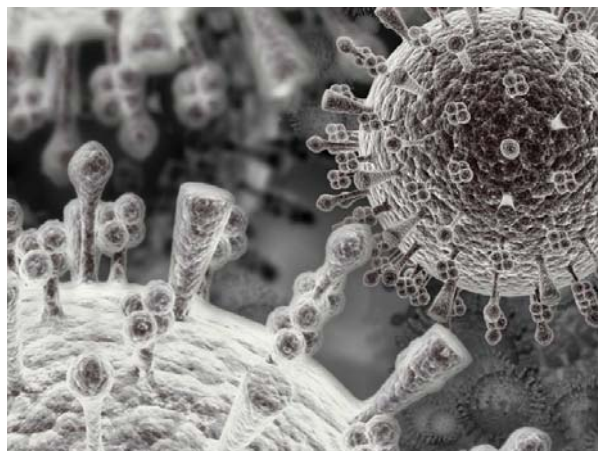
News of the research sparked an intense debate about whether the two teams’ work should be published in full to aid global pandemic preparedness or censored to prevent misuse by potential bioterrorists. In February 2012, the

the H5N1 publishing controversy reflect an evolution in US policymaking that on one hand acknowledges the global nature of animal-human transmissible H5N1 virus but on the other hand also reflects the difficulty of identifying appropriate forums, participants, and agendas when confronted with competing claims of expert knowledge and representation.



Cutaway Diagram of HPAI H5N1 virus (Kaplan and Webster 1977).*

*One nanometer (nm) is a billionth of a meter. The typical HPAI virus is round shaped, approximately 100nm in diameter. By comparison, the Ebola virus is worm shaped, approximately 970nm long and 80nm in diameter. And, a human hair is almost a 1,000 times wider in diameter at 75,000nm.



Electronic microscope view of HPAI H5N1 virus enlarged approximately 20,000 times (Greenfieldboyce 2012).

Figure 1-1. Diagrammatic and Electronic Views of the HPAI H5N1 Virus.

WHO concluded the scientific value of the papers outweighed any security concerns and they should be published in full. In March 2012, the NSABB reversed its previous recommendation and the two papers were published in the journals, *Nature* and *Science*. Both journals have devoted extensive coverage to this ongoing controversy. Excellent comprehensive timelines and links to hundreds of related articles can be accessed at: <http://www.nature.com/news/specials/mutantflu/index.html> (*Nature*); and, <http://www.sciencemag.org/site/feature/data/hottopics/biosecurity/index.xhtml> (*Science*).

This paper examines the global journey of the H5N1 virus focusing on the evolving political economies of knowledge (Harding 1993a; Weiler 2009; May and Perry 2011). The journey begins with the H5N1 virus in its localized natural state as a nonhuman actor, confined to its avian hosts,⁴ and moves to its current representation as a human assemblage actor in a (de)stabilized actor-network of global science and politics that promote fears of contagion and politics of otherness. The H5N1 journey illustrates the complex and confusing trade-offs involved in formulating and implementing governance policies for a globally heterogeneous group of actors with competing political, economic, and scientific interests. The journey also illustrates how little power and knowledge the largest group of actors in the network—the silent, “implicated actors” (Clarke 1998) who make up the majority of the populations in the global South—have over matters fundamental to their health and safety.

⁴ The earliest and most widely quoted date for the beginning of the recorded history of avian influenza is from an 1878 paper by Perroncito in which he described a disease with high mortality rates in chickens and other poultry in Italy. Initially, the disease was referred to as “fowl plague,” but in 1981 this was changed to “highly pathogenic avian influenza.” See Alexander and Brown (2009) for a history of highly pathogenic avian influenza.

There are three genera of influenza viruses: A, B and C. Only influenza viruses of genus A are naturally found in birds. Genus A influenza viruses are further divided into subtypes based on the antigenic relationships in the surface glycoproteins hemagglutinin (HA) and neuraminidase (NA). There are currently 16 HA subtypes (H1-H16) and nine NA subtypes (N1-N9). Each virus has one HA and one NA antigen, in any combination. (Recently, Tong et al. [2012] isolated an avian influenza virus (IAV) from little yellow-shouldered bats in Guatemala and based on a large divergence with all of the other known HAs and NAs, the HA of the bat virus was designated as H17 and the NA as N10. But the resultant new numbering schemes are not in the general literature yet.)

To date, only the H5 and H7 subtype viruses have been shown to develop into highly pathogenic avian influenza, but not all H5 and H7 viruses are highly pathogenic. Low pathogenic avian influenza viruses are very common in birds, especially waterfowl, and are generally benign rarely resulting in symptoms. But low pathogenic avian influenza viruses tend to rapidly mutate to highly pathogenic avian influenza forms of H5 and H7 when acquired by poultry resulting in 90-100% mortality rates in the poultry within 48 hours. Additionally, only highly pathogenic avian influenza forms of H5 and H7 have been able to cross the species boundary into mammals, including humans (DG SANTE 2000; Webster et al. 2007). It is important to note however, that not all highly pathogenic avian influenza H5 viruses are harmful to humans. For example, the 2015 outbreaks of highly pathogenic avian influenza H5N2 and H5N8 viruses in the United States that resulted in the deaths of more than 48 million chickens and turkeys are not considered threatening to humans.

This latter group of implicated actors are primarily impoverished “backyard poultry”⁵ farmers who have been largely excluded from the H5N1 discourse given the three predominant narratives that define the problem of containing or eradicating H5N1 and its associated suggested solutions. By examining these normally disassociated narratives, it is possible to see how they have been strengthened by a close association between the mass media and science and policy makers since the H5N1 virus first crossed the species barrier in 1997 infecting 18 people with 6 resultant deaths (Claas et al. 1998; Subbarao et al. 1998). The narratives exist in parallel, shaping the actions of different sets of heterogeneous actors, some of which continuously move between the narratives forming new networks.

Prior to 1997, there was no such set of narratives and outbreaks of highly pathogenic avian influenza diseases in poultry were relatively rare and treated as a standard veterinary procedure without international-scale political, economic, or social linkages.⁶ But for reasons that I explore in this paper, narratives subsequently became a useful tool for political and

⁵ “Backyard” is not a universally used term and tends to be used most frequently used in the United States. It corresponds to the Food and Agriculture Organization of the United Nation’s (FAO) Sector 4 classification of poultry production systems (FAO 2004). More commonly used terms worldwide are “scavenging poultry” or “village poultry” (Conan et al. 2012; FAO 2008a) to refer to free grazing flocks of chickens or ducks, comprised of unselected breeds of various ages and species, and in flocks of 100 animals or less that are raised by a family, household, or village in rural or peri-urban areas. Approximately 70-80% of all poultry in the global South is raised in these types of flocks (Branckaert et al. 2000; Sonaiya 2008; Pym et al. 2006).

Similarly, “poultry” is also not a universally used term and can denote many different types of birds. In the United States, the term is commonly used to refer to homogenous flocks of chickens or turkeys. But elsewhere in the world, and particularly in the global South “backyard poultry” may consist of mixed flocks with any combination of mixed breeds of chickens, turkeys, ducks, geese, quail, pigeons, pheasants, ostriches, guineafowl, partridges, and even rabbits (FAO 2007). For the purposes of this paper though, I am using “poultry” as shorthand for any type of bird flock raised in a noncommercial environment by rural or peri-urban farmers.

⁶ Between 1959, when the first reported highly pathogenic avian influenza outbreak caused by a virus of the H5 subtype was diagnosed, and 1996, there were 25 reported outbreaks of the H5 subtype virus (Alexander and Capua 2008). These outbreaks were very isolated, created minimal financial or other impacts, and were eradicated in a very short time. However, since 1996 when the H5N1 virus was first discovered in farmed geese in Guandong Province, China, there have been thousands of outbreaks in 73 countries. Unlike earlier forms of the H5 subtype virus outbreaks, the post-1996 form has not been successfully eradicated in any country it has appeared (see the OIE web portal at: [http://www.oie.int/animal-health-in-the-world/web-portal-on-avian-influenza/.](http://www.oie.int/animal-health-in-the-world/web-portal-on-avian-influenza/))

scientific experts to assert their agendas in the face of conflicting scientific evidence surrounding the H5N1 virus. As Wald notes, “They [narratives] influence how both scientists and the lay public understand the nature and consequences of infection, how they imagine the threat, and why they react so fearfully to some disease outbreaks and not others at least as dangerous and pressing” (Wald 2008, 8).⁷ As such, narratives become a necessary shaping element of H5N1’s socially constructed knowledge. Understanding the role of narrative in constructing knowledge exposes counter-narratives that can lead to a more effective, just, and compassionate response than those currently available to addressing the problems posed by the H5N1 virus on the segment of the world’s population least empowered to address those problems.

In the first section of this paper, I briefly discuss my theoretical framing of these narratives that extends Foucault’s concepts of power to address its application to nonhumans and several Latourian theoretical elements that are also useful in this framing. Since its introduction in *The History of Sexuality* (Foucault 1978), “biopower”⁸ has permeated research in the social sciences, including STS, and particularly in the ways scholars think about the knowledge

⁷ Emery Roe (1991) was one of the first critics of the global North’s health and rural development policies. He used narratives to frame the negative consequences of the North’s dominant actors in the global South. For Roe, narratives are simple stories with beginnings that define the problem, middles that elaborate its consequences, and endings that celebrate solutions. Narratives are created and promoted by particular actors, networks, and institutions. Narratives therefore, suggest and justify particular kinds of actions, strategies, and interventions by dominant actors. These narratives, in turn, come to be supported by institutional and political translations in the actor-network that define and shape particular directions in which interacting social, technological, and environmental networks co-evolve. Following Roe, my intent in examining these narratives is not to overthrow them, but to examine ways in which they may be improved or superseded.

⁸ Bruce Braun (2007, 8) described Foucault’s use of the general term “biopower” as a way to designate new forms of power that took the capacities of bodies and conduct of individuals as their concern. But Foucault (1978) also distinguished between two more specific forms of biopower. He used the term “anatomo-politics” for those disciplinary techniques that sought to maximize the body’s forces and integrate it into efficient systems, such as through proper training, or through rationally organizing workplaces, armies and domestic economies. Foucault (2003) also used the term “biopolitics” to designate those political technologies that took the biological existence of the nation as their object, understood as a population imbued with mechanisms of life (birth, morbidity, mortality, longevity, vitality) and knowable in terms of statistical norms. In doing so, he defined biopolitics by contrasting it with the juridico-legal power of classical sovereignty. In this paper, I use “biopower” as a shorthand way of describing both forms of biopower: disciplinary techniques and political technologies.

production of disease. Foucault's (2003) later development of biopower and his sense of security itself is also useful because biopower includes not just the exercise of power by nation-states and their militaries, but also by populations and their associated political, technological, and social networks. For Foucault, biopower represents a crucial shift in the politics of power in the modern era; individuals and populations can now be seen as assemblages of natural processes that can be defined and controlled. Foucault also understood power as a cluster of relations as well as a wide range of instruments, techniques, and procedures (Foucault 1995, 215). In this paper I use three Foucaultian concepts, which he repeatedly returned to in his discussions of both biopower and power, to frame the ways power has been produced and maintained across the three H5N1-related narratives discussed in this paper: discourse, knowledge production, and technologies. Cutting across all three narratives are Foucault's (1973; 1995) conceptualizations of security at both the nation-state and population levels as well as Collier and Lakoff's (2015) conceptualizations of vital systems security. Additionally, I extend Foucault's human centric conceptions of biopower to include its application to nonhuman actors to address the ways power is performed at the intersection of human and nonhuman agency.

To support the latter extension of more traditional conceptualizations of biopower, this paper extends Latour's semiotics with the addition of a new term (trans)gressive agent, or *transagent*, to describe an actor that crosses the species boundary while residing on both sides of the human and nonhuman boundary simultaneously. In doing so, it exercises a unique form of biopower. Thinking about a nonhuman agent as having agency allows us to avoid black boxing the H5N1 virus and render visible its species boundary transgressions and human associations. This paper also adopts an actor-network sensibility to follow the chains of these heterogeneous actors and their associations. I adopt the term "sensibility" from Law and Singleton, rather than

the more frequently used terms and analytical approaches, such as theory, methodology, or framework, who describe the process of investigating actor-networks as “best understood as a sensibility, a set of empirical interferences in the world...that cherishes the slow process of knowing rather than immediately seeking results or closure” (2013, 485). Adopting an actor-network sensibility within a Foucaultian framework also allows us to broaden the lens, away from a strictly flat ontology to see the network’s environments that include both the winners and losers. Or, as Scott Frickel observed in his actor-network analysis of nuclear submarine development, a sociological explanation of heterogeneous networks requires a consideration of the “social contexts in which actor networks are embedded” (1996, 48). Viewing the H5N1 virus through the lens of Foucault and seeing the virus as a transagent exposes a “counter-narrative” (Nye 2003)⁹ that charts the pathways of inequities, social justice, and poverty in the global South—excluded in the following three predominant narratives.

The first narrative is one that links veterinary concerns with agriculture and livelihood issues. I refer to this narrative as the bird flu narrative (virus to disease). This narrative is centered on either draconian culling practices (with its implied ethical judgments about the value of human and nonhuman life: it is assumed that animals can be killed on a massive scale to avert a possible human disease even if the risk to humans is unknown) or costly veterinarian control measures, primarily animal vaccines, to control epizootic outbreaks of the virus before they become panzootic. The narrative features an actor-network based on policies that promote

⁹ I am following David Nye’s use of this term that he coined in his book, *America as Second Creation: Technology and Narratives of New Beginnings*. He uses the term to describe the narratives of marginalized peoples, such as the impoverished, unpowered, and/or native peoples, who are generally unacknowledged or whose positions are not considered important enough to figure into the narratives told by dominant white male empowered actors. Nye shows how these dominant actors use narratives of technology and security to explain and justify their actions and how the resulting events come to be as they are. In contrast, “counter-narratives resist or reimagine technological change and seek to ground identity not in machines but in other cultural artifacts or values” (2003, 14).

restructuring the global poultry industry in favor of large-scale international corporate poultry producers. This is a human actor dominated network, but I refer to it as the bird flu narrative to highlight the most important actors missing in the narrative: the predominant nonhuman actors, the H5N1 virus and its avian host. They exist only as black boxes – subjects of eradication. The World Organization for Animal Health (OIE) (OIE 2004; 2010; OIE/FAO 2007) and the FAO (2008b; 2013) have been the two primary proponents of this narrative with not unsurprising support from large national and international poultry corporations. Initially, the WHO also engaged with this narrative through its promotion of economically devastating mass culling practices to prevent the spread of H5N1 to humans (WHO 2004; 2005). More recently, confronted with the mounting ethical and economic failures of this promotion, WHO adopted the “One Health” agenda (Zinsstag et al. 2011; Vandersmissen and Welburn 2014) while continuing to pursue a different pathway with the next narrative.¹⁰

The second narrative focuses on the human public health pandemic preparedness aspect of H5N1. It is the prevailing narrative adopted by the public health experts to assert their own agendas and influence the actions of policymakers. I refer to this narrative as the public health

¹⁰ The “One World, One Health” or now more simply just, “One Health,” agenda is based on the framework outlined in the FAO et al. (2008) document, *Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal–Human–Ecosystems Interface*. Developed as a holistic response to the global spread of H5N1 and other emerging infectious diseases (EID), the framework “focuses on EID at the animal–human–ecosystems interface, where there is the potential for epidemics and pandemics that could result in wide-ranging impacts at the country, regional and international levels. The objectives and outputs...focus on some of the major drivers for emergence, spread and persistence of EID. The approach...builds on lessons learned from the response to ongoing HPAI H5N1 infections” (2008, 5).

Initially, the idea of holistically addressing zoonotic EIDs was published by the Wildlife Conservation Society in 2004 in what has become known as the Manhattan Principles, but was quickly adopted by the primary global public and animal health organizations resulting in the 2008 strategic framework (Gibbs 2014). Although the “One Health” agenda remains the official joint policy framework for responding to H5N1 and other EIDs by the WHO/FAO/OIE (FAO 2009a), its implementation has been widely regarded as ineffectual and criticized for being a simple repackaging of the top-down, one-size-fits-all previous approaches which previously failed to account for the enabling underlying social and economic conditions of H5N1 and other EIDs (Craddock and Hinchliffe 2014).

narrative (disease to crisis). The actor-network in this narrative features human and nonhuman actors linked by policies to promote a combination of vaccines and behavior changes—again, primarily in the global South—when the H5N1 transgresses the species boundary and ceases to just be a “bird flu” problem for veterinarians. Some have observed the actions of the actors in this narrative have sought to stabilize their networks in such a way as to free those in the global North from any responsibility for the economic exploitation of the global South that actually created the epidemic conditions in the first place (Wald 2008, 269-270). The WHO (2015), the United Nations Children’s Fund (UNICEF) (UNICEF 2008; 2012), most international public health non-governmental organizations (NGO), and the Centers for Disease Control and Prevention (CDC) (CDC 2015a) have been the primary authors of this narrative.

The third narrative is focused on the deterministic inevitability of pandemic outbreaks based on the presumptive inevitability that the H5N1 virus will continue to mutate either in nature or helped along through biosecurity failures and become a source of global pandemic not unlike the 1918 Spanish flu pandemic that killed an estimated 50 to 100 million people (Taubenberger and Morens 2006). I refer to this as the outbreak narrative (crisis to [de]stabilized networks) (Wald, 2008).¹¹ In many ways it can be viewed as an overarching narrative that combines the actor-networks of the first two narratives in a more powerful way since it is amplified and has greater visibility because of mass popular culture. This narrative has been popularized in works such as Richard Preston’s (1994) Ebola-based nonfiction thriller *The Hot Zone* and subsequent movie, *Outbreak*, based on the book, Laurie Garrett’s (1994) *The Coming*

¹¹ Although the term and concept of outbreak narratives are not original with Wald (Altman 1989), in this paper, I am using Wald’s general characterization: “The outbreak narrative – in its scientific, journalistic, and fictional incarnations – follows a formulaic plot that begins with the identification of an emerging infection, includes discussion of the global networks throughout which it travels, and chronicles the epidemiological work that ends its containment” (2008, 2).

Plague: Newly Emerging Diseases in a World Out of Balance, and Mike Davis's (2005) bestseller *The Monster at Our Door: The Global Threat of Avian Flu*. More importantly, this narrative has been the one most frequently adopted globally by a wide range of political and technical expert actors who focus on civil-contingency, emergency and disaster preparedness, containment or quarantine planning, risk and economic analyses, and biosecurity/bioterrorism. A central unifying feature of the actor-network in this narrative is its high level of militarized style command and control, centralized top-down planning and enforcement strategies (Hinchliffe 2007) that attempt to stabilize the networks in a continuously shifting line of defense that creates the "otherness" of H5N1.

Rather than viewing H5N1 within the context of an unending *fait accompli* struggle between nonhuman viruses and humans, a counter-narrative suggests that potential pandemics are not acts of nature to be eradicated or constrained by technology and politics, but are in fact social constructions (Farmer 1999; Greger 2006). This paper is intended to be a contribution to an examination of the counter-narratives hidden behind these dominant narratives. These social constructions produce the pathways of viral transmission created by the failure to address the social and economic inequalities along the route. But, the counter-narratives also offer hope that those existing constructions can be unconstructed to produce a different result.

Foucault on Power & Latour on Semiotics

Foucault's theories of power have been very influential in the ways STS and other scholars think about the knowledge production of disease (Turner 1997). Foucault understood power as a cluster of relations as well as a wide range of "instruments, techniques, procedures, levels of application, and targets" (Foucault 1995, 215). Following Gislason's (2013) analysis of the knowledge production around the West Nile Virus by the Canadian government, there are three Foucaultian concepts useful to frame the ways power has been produced and maintained across the three H5N1-related narratives discussed in this paper.

The first is discourse and how power operates in the social world through texts and their materialization as "social practices and specific activities that sustain and reproduce discursive formations" (Moss and Dyck 2002, 15). A discourse can reformulate a body of heterogeneous ideas from diverse sources into a single collection of texts but can also embody sets of ideas in "technical processes, in institutions, in patterns for general behavior, in forms for transmission and diffusion, and in pedagogical forms which, at once, impose and maintain them" (Foucault 1973, 200). In the public health narrative discourses were central to the construction of the H5N1 as a public health threat because they were productive, dynamic and catalytic. But they also served other purposes such as masking social inequalities when used to develop official government documents. These discourses ultimately triggered the production of other discourses and new social realities in relation to the perceived dangers of H5N1 that I explore in the outbreak narrative.

The second concept, the exercise of knowledge, highlights the interconnectedness between practices of power and the production of knowledge and how, after becoming intelligible to the social world through the acquisition of form, knowledge assumes authority as a

social entity. Foucault's reflection that the exercise of medical knowledge is by its very nature a political act reflecting the power of the state is germane. He argued that, "the struggle against disease must begin with a war against bad government" (1994, 33) and that "[t]here is, therefore, a spontaneous and deeply rooted convergence between the requirement of political ideology and those of medical technology" (1994, 38). The exercise of knowledge is also useful for thinking about the construction of possible responses by dominant actors in both the bird flu and public health narratives. These responses occurred within the framework of national and international governance structures, within the social, political, and scientific assumption that knowledge produced through scientific positivism is authoritative and not a socially constructed reality (Moses and Knutsen 2012). The idea of a risk culture where notions of fear, threat, and disharmony circulate widely formed the political backdrop for these responses across both narratives. Additionally, as I show in the outbreak narrative, this political backdrop linked fears of pandemic emergence to perceptions of global health insecurity and contagion caused by microbial activity.

Third, Foucault drew a nuanced distinction between technologies and techniques of power that serves as a useful analytical lens to understanding how networks of heterogeneous actors were formed to both construct the H5N1 narratives using technology as well as exercise the dominant positions that accrued from that technology. The exercise of power is a technology that assembles various techniques "into a single machinery" (Foucault 1980, 140). Technologies operate on the scale of corporations, institutions, and governments by combining various elements of social, political, and economic constructed realities, according to specific sets of rules and with the purpose of controlling populations (Ewald 1991, 197). But, techniques of power are subtler, as they are the mechanisms, procedures, and tools that turn discipline into an

act of social cohesion. As I show in all three narratives though there are multiple techniques through which power as a technology is enacted, and while each technique of power functions in a unique way, when they work together these mechanisms form “a closely linked grid of disciplinary coercions whose purpose is in fact to assure the cohesion of the social body” (Foucault 2003, 36). As I show in this paper, one use for these techniques of technology-based power was to craft the bird flu and public health narratives so that they protected governments, corporations, and the US population in the face of H5N1 viral endemic and pandemic threats – but didn’t protect those most physically close to the H5N1 virus itself.

Foucault’s conceptualizations of security (1973; 1995) also provide a crosscutting frame that is useful in exploring these narratives. The idea of a nation-state security involves the will to secure territorial sovereignty. It is premised on a bipolar world of friend and enemy and the militarization of borders for protection from the enemy as a matter of foreign and domestic policy. This conceptualization can be found in both the public health narratives as well as the outbreak narratives as public health and security policies are framed to keep the H5N1 virus from coming across the border. Similarly, his thoughts on population security, with its emphasis on government policies to improve the health and wellbeing of national populations, are useful for all three narratives. Population security justifications can be found in each of the three narratives, but as this paper shows, these populations were invariably defined as meaning those with existent power. Lastly, Collier and Lakoff (2015) extend Foucault’s conceptualizations, with their idea of vital systems security that is also useful. They argue that the modern nation-state has developed systems to respond to extreme incalculable emergencies, such as nuclear attacks, terrorism, pandemic disease, and cyber-war, based on preparedness and emergency planning rather than formal risk assessments. They also argue that in many ways, these new vital

systems of security have supplanted older risk-based population security systems. These vital systems of security are particularly visible in the public health narrative where pandemic preparation plans are based not on formal risk-benefit assessments but on templated plans. These plans are designed to give the illusion of security for those most likely to be touched by an H5N1 virus pandemic, the poor and marginalized populations, but real security for those least likely to be affected, the wealthy and corporate dominant actors.

For all its utility as a frame and analytical lens for exploring contestations of power and its use in the creation and control of knowledge, Foucaultian concepts of security and power, including his formulations of biopower, remain essentially human-centric. As he said, “the set of mechanisms through which the basic biological features of the human species became the object of a political strategy, or a general strategy of power...this is what I have called biopower” (2007, 1). To extend Foucault’s concepts to the issues of nonhumans, there is a growing body of scholarship that uses biopower analysis to consider how humans govern animals, how humans are governed like animals, and how animals are governed in moral terms (Kohn 2007; Pandian 2008; Ahuja 2011). However, this literature still tends to treat humans and animals as distinct actors, if not black boxes. There is very little literature that speaks to the exercise of power at the intersection of human and nonhuman agency (Porter 2013b). This paper addresses this gap through an exploration of the narratives produced by the H5N1 virus, but the gap is applicable to any study that seeks to address the social justice issues associated with zoonoses (infectious diseases caused by microorganisms passing from animals to humans and vice versa) which disproportionately affect the morbidity, mortality, social, political, and economic well being of

world's poorest populations living in the global South (Grace 2014).¹² In this context, zoonoses challenge the centrality of humans in the knowledge production and practices of biopower. As I show in both the bird flu narrative and the public health narrative, H5N1 exposes how animals and humans become dual subjects in technical, political, and securitized regimes that are designed to maintain existing dominant actors' political and economic structures as much, if not more so, as they are at safeguarding public health. To describe a nonhuman agent acting at this interspecies boundary, I draw on the rich semantics of Latour as discussed next.

Foucaultian and Latourian analyses take very different positions on the nature of power in society. For example, Latour declared, “[w]e need to get rid of all categories like those of power, knowledge, profit or capital, because they divide up a cloth that we want seamless in order to study it as we choose” (1987, 223).¹³ For this reason, Latourian analyses are rarely used to explore networks of equity, justice, and poverty due to their inherent flat cartography that eschews such traditional social frames.¹⁴ However, Latour's penchant for developing new semiotics is highly relevant to this paper. Early on, Latour understood that it was “crucial to treat nature and society symmetrically and to suspend our belief in a distinction between natural and social actors” (1988, 260). As such, he found it necessary to devise a new lexicon to describe

¹² This approach aligns with a growing body of research on the importance of animals in the processes of knowledge formation, social organization, surveillance, and regulation. For example, see Franklin 2001, Hinchliffe 2001, Holloway and Morris 2007, Haraway 2007, Donaldson 2008, and Twine 2010.

¹³ For the most complete introduction to actor-network theory see Latour (2005), but for the most accessible introduction see his footnoted unpublished work co-authored with Hermant (1998 [2004]). Foundational works include Callon and Latour (1981), Latour (1987; 1988), Callon (1986), and Law (1986). For a collection of materialisms, see Law and Hassard (1999) and Law and Mol (2002). For singular works, see Law (2002) and Mol (2002). John Law maintains an Actor Network Resource portal with an exhaustive pre-2001 bibliography at: <http://www.lancaster.ac.uk/fass/centres/css/ant/antres.htm>.

¹⁴ There are exceptions to this. A few authors have used various actor-network approaches to examine the socially constructed relationships between disease and marginalized groups. See for example: Donaldson et al. (2002) on foot and mouth disease in the UK; French and Mykhalovskiy (2013) on public health intelligence and the detection of potential influenza pandemics; Gislason (2013) on the West Nile virus in Canada; and Jerolmack (2013) on organizational silos and zoonotic disease surveillance.

what would be seen. In spite of being famously accused of “obscurantism” (Bloor 1999, 97) for his semantic efforts in the cause of symmetry, many of Latour’s terms have now become accepted and understood descriptors of actors in actor-network analyses across multiple disciplines. To capture various descriptions of all entities (both human and nonhuman) in a network, Latour introduced terms, such as “actor” (1996c), “actant” (1987), “monad” (1988), and “entelechy” (1988). To capture ways of describing various forms of nonhumans, Latour introduced the “quasi-object” (1996c; drawing heavily on the work of Serres [1987] 2015) to describe an object’s co-productionist capabilities to produce knowledge, society, and experience), “quasi-subjects” (1993) to describe collectives of humans and nonhumans, and the “hybrid” (1993) to describe entities that are both human and nonhuman. Callon (1991, 141-142) famously described a nuclear power station as a monstrous hybrid actor in that it is composed of both human and nonhuman entities as well as being a network in its own right. Lastly, the term nonhuman functions as a broad umbrella term that only specifically excludes humans, entities that are entirely symbolic (Latour 1993), and supernatural entities (Latour 1992).

Missing within the actor-network theory corpus though, is a way of describing an actor that is both human and nonhuman simultaneously, an actor that transgresses its nonhuman animal origin boundaries to become part of a larger human assemblage thereby multiplying its ontological status while at the same time remaining nonhuman elsewhere in other networks. To describe this form of actor, I am introducing a new term in this paper, transagent. In examining the H5N1 virus’s boundary transgression metamorphosis, I am extending the work of Mol who said in reference to the atherosclerosis disease inhabiting the human body, “[t]he *body multiple* [emphasis in original] is not fragmented. Even if it is multiple, it also hangs together” (2002, 55). In this sense, Mol was building on the work of Donna Haraway who has developed a significant

body of work highlighting the many human to nonhuman and nonhuman to human transgressions involved in becoming “us” (Haraway 1985; 1991). Indeed, the H5N1 virus as a transagent is more than “parasitic packets of DNA” (MacPhail 2004, 339); it hovers between life-nonlife, between human-nonhuman (Creager 2001).

As shown in the public health and outbreak narratives, when the H5N1 virus transgresses the species boundary between birds and humans – becoming a transagent – it continues living as a bird flu virus, but it also multiplies its ontological status changing its reality to a human public health pandemic crisis and eventually to a potential weapon for bioterrorists. In its new reality, the virus exerts agency in the same way human actors do in a network by disrupting the linkages between other humans and their social, scientific, political, economic, and medical networks. The latter is an important distinction from thinking of the human body, containing the nonhuman virus, such as Mol’s atherosclerosis disease, being an assemblage of human and nonhuman entities.

Bird Flu Narrative (virus to disease)

In the history of medicine, there is a story about three great periods of transition that inform the way we characterize socially constructed disease narratives. The first began about 10,000 years ago with the acquisition of diseases from domesticated animals, such as tuberculosis, measles, malaria, the common cold, and influenza. The early 19th century Industrial Revolution saw a second wave of different forms of diseases, so called “diseases of civilization” such as heart failure, stroke, diabetes, and cancer. The third transition that most directly informs the bird flu narrative began after World War II but began to accelerate in the 1970s, and continues to this day, with the emergence of new infectious diseases as an inevitable consequence of ecological changes, human demographics and behavior, increases in international travel, more intensive agricultural practices, microbial adaptations and changes, and the general breakdown in public health systems in many parts of the world (McNeill 1976; Greger 2006; Harper and Armelagos 2010). Ironically, with the widespread use of penicillin, development of polio vaccines, and discovery of new drugs for tuberculosis, there was a general belief in the global North medical community during the 1960s and 1970s that infectious diseases had been conquered (Petersdorf 1978; Fauci 2001). In 1963, a prominent British physician boldly declared, “[W]e can look forward with confidence to a considerable degree of freedom from infectious diseases at a time not too far in the future” (Cockburn 1963, 158). This unassailable belief in the powers of modern scientific development was short lived.

Jones et al. (2008) report that between 1940 and 2004, 335 new emerging infectious diseases (EIDs) appeared – over half of these appearing since the 1970s. The majority of these

diseases, 71.8%, originated in wildlife,¹⁵ including, human immunodeficiency virus (HIV), Ebola, severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and bovine spongiform encephalopathy (BSE) more commonly known as “mad cow disease.” The viruses causing these newly emerging infectious diseases are now regularly crossing species boundaries on a global scale between humans, domestic animals, and wildlife. About 15 million people die (roughly 25% of all deaths) worldwide from these infectious diseases (WHO 2008a). The burden of morbidity and mortality associated with infectious diseases falls most heavily on people in the global South, and particularly on infants and children (Guerrant and Blackwood 1999). Moreover, within the countries of the global South, infectious disease mortality rates disproportionately affect indigenous and disadvantaged minorities (Butler et al. 2001).

Within this litany of recent infectious diseases that have emerged from wildlife, H5N1 represents one of the greatest concerns for the veterinarian and public health communities. All three of the major influenza pandemics of the 20th century (1918, 1957, and 1968) originated from avian influenza viruses that mutated to more easily spread among humans (de Jong and Hien 2006; Pappaioanou 2009). The veterinary community has been familiar with highly pathogenic avian influenza disease since the end of the 19th century (see footnote 4), but until recently it was a very rare localized occurrence with limited economic or health significance in poultry. Capua and Alexander (2004) estimate that between 1959 (the first diagnosed outbreak of a H5 subtype [Pereira et al. 1965]) and 1998, the impact on the poultry industry affected 23

¹⁵ The FAO refers to some of these infectious diseases that have a greater impact on animals than humans as “Transboundary Animal Diseases (TAD). TADs are highly contagious epidemic diseases that can spread extremely rapidly, irrespective of national borders. They cause high rates of disease and deaths in animals – and in some cases are transmissible to humans – causing serious socio-economic consequences while constituting a constant threat to farmers (<http://www.fao.org/emergencies/emergency-types/transboundary-animal-diseases/en/>).

million birds.¹⁶ But between 1999 and 2004, over 200 million birds were affected (Alexander 2007). Since 2004 however, the numbers of birds affected now number in the hundreds of millions each year. For example, 48 million poultry and turkeys were affected in the US alone in 2015 representing an economic loss of \$3.3 billion (USDA 2015; Greene 2015). In 2003, when it appeared that the H5N1 virus was becoming epizootic in many countries, OIE began keeping outbreak reports. Since that time highly pathogenic avian influenza, of either the H5 or H7 subtype, has been reported in 73 countries on every continent except the Antarctica (Swayne and Suarez 2000). (See **Figure 1-2.**) Not unsurprisingly the virus is at the top of FAO's and OIE's global animal health agendas.

When using an actor-network sensibility to follow the construction of scientific knowledge, it is important to “re-open” black boxes. While the above statistics are frequently used by global animal health organizations to black box H5N1 in networks of dominant actors and macro- or national-level disease biosecurity schemes, the numbers belie the bird flu narrative represented by the 70-80% (see footnote 5) of backyard farmers in the global South who get put in the same H5N1 black box. The counter-narrative seen by opening this black box shows that marginalized populations, sometimes also referred to as “smallholder” or “family poultry” producers, have personal economic, social, and cultural values directly linked to the livelihood of their poultry that are not existent in this narrative. Thus, policies that only view the H5N1 virus as something to be immediately eradicated, fail to account for the alternate values of those who are rendered invisible by the dominant actors in this narrative (Sonaiya 2007; Kryger et al. 2010).

¹⁶ The veterinarian community uses the term “affected” to describe birds that either died after being infected by H5N1 or were culled to avoid further spread of the disease.

HPAI Outbreak Reports in Animals (Type H5 and H7)* (January 1, 2004 - September 30, 2015)													
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Afghanistan			1	2		1							4
Albania			4										4
Australia									3	6	2		11
Austria			2										2
Azerbaijan			4										4
Bangladesh				5	5	11	5	11	4	3			44
Benin				3	5								8
Bhutan							5		8	3		1	17
Bosnia & Herzegovina			2										2
Bulgaria			1				2						9
Burkina Faso			2										6
Cambodia	4	1	3	1	2	1	3	7	2	7	5		36
Canada				4	1						4	10	19
Cameroon			1										1
China	7	13	14	3	11	5	2	1	23	4	19	80	182
Croatia		4	7										11
Czech Republic			6	7									13
Cote d'Ivoire			3	1								5	9
Denmark			11										11
Djibouti			1	1									2
Egypt			2	1	5								8
France			9	3									12
Georgia			1										1
Germany			9	10	4	2					5	8	38
Ghana				15									24
Greece			6										6
Hong Kong	3	3	2	2	3	2	3	9	20	1		2	50
Hungary			5	3									14
India			4	2	12	10	5	7	14	5	8	8	75
Indonesia	7	6	3					2					18
Iran			2		4			9	3				23
Iraq			2										2
Israel			5		3		4	3	4				27
Italy			4							6	3	1	14
Japan	6			6	5	1	7	19			15	8	67
Jordan			3										3
Kazakhstan		3	2									2	7
Korea, DPKR		1	1							2	2		6
Korea, ROK	4			6	6		2	14			9	4	45
Kuwait				4									4
Laos	1		1	3	6	2	2				2		17
Libya											5	1	6
Malaysia	7	1	4	3									15
Mexico									9	11	1	3	24
Mongolia		3	2			6	2	2					15
Myanmar			4	13	2		5	6				2	32
Nepal						4	5	1	3	11	3		27
Netherlands											4	2	6
Niger			3						8				12
Nigeria			6		3	1						32	42
Pakistan			5	9	7								21
Palestinian Territories			4					3					18
Philippines		3											3
Poland			8	8	2								18
Romania		15	15	2	1		3					2	38
Russia		6	1	7	2	2	4				4	5	31
Saudi Arabia				4	2								6
Serbia & Montenegro			1										1
Slovakia			1										1
Slovenia			4	1									5
South Africa			6					10	4	2			22
Spain			1			2	1						4
Sudan			5	1									6
Sweden			3									1	4
Switzerland			15		1								16
Thailand	44	43	6	19	8	2							122
Togo				3	4	1							8
Turkey		6	17	6	11								51
Ukraine		5	16	1	6								28
United Kingdom			4	30	12								61
United States											4	55	59
Vietnam	12	5	5	13	12	13	9	12	21	2	25	23	152
Zimbabwe			1	1									2
Total:	95	119	260	202	145	66	69	116	126	63	120	331	1712

* Each single report contains information on multiple outbreaks and has update information on previous reports. For example, one single report, US Report #30 (September 9, 2015), lists 241 outbreaks effecting over 65 million birds with over 15 million birds put to death. Due to widely varying surveillance and reporting systems, these outbreak report numbers cannot be used for country-country comparisons, only as rough indicators of magnitude and geographical dispersion of H5N1.

Figure 1-2. HPAI (Type H5 and H7) Outbreak Reports in Animals (2004-2015). (Table compiled by author from raw data available at OIE's HPAI reporting portal, <http://www.oie.int/en/animal-health-in-the-world/update-on-avian-influenza/>.)

Backyard farming provides marginal actors with access to markets that would not otherwise be available to them due to poverty,¹⁷ weaknesses (from diseases like HIV/AIDS), conflicts that create refugees and internally displaced people, and other social and economic disadvantaged actors (such as widows, former child soldiers, and militants). Chickens or other local forms of poultry are usually the first livestock established in refugee camps, in resettlement camps, or after natural disasters (Sonaiya 2008). The fact that women own the largest proportion of backyard poultry flocks in the global South emphasizes its importance as a means of improving their livelihoods (Pym et al. 2006; Alders et al. 2014). And, backyard flocks easily integrate into the main occupation of the rural poor – agriculture – because backyard poultry require little in terms of land area and other production factors (IFAD 2004). For example, two-thirds of rural families in Vietnam and 90% of rural families in Egypt, Cambodia, and Bangladesh keep backyard poultry flocks (FAO 2009a). Additionally, in countries where a large proportion of the rural population is landless, these actors can still keep backyard poultry flocks because the flocks can exist purely by scavenging on communal land.

Thus, we can see the H5N1 disease as a network translation effect, a result of the mobilization of an actor-network that consists of a series of associations between the H5N1 virus, an animal that replicates it (the poultry host), and the host's caretakers (backyard farmers). Adopting an actor-network sensibility opens the opportunity for least-advantaged-actor entry points to the network. Opening the H5N1 black box as our actor-network entry point decenters the network away from privileged powerful existing actor-networks comprised of international

¹⁷ Approximately 95% of backyard poultry farmers (570 million) in the global South live well below the poverty line of \$1 a day (IFAD 2004).

organizations, governments, large agribusinesses, and their supporting experts.¹⁸ This black box entry point to the actor-network is not unlike livelihoods-based social justice frameworks (Sen 1999; Chambers and Conway 1991; Chambers 1993) that decenter their networks away from political and technical organizations to place people – in our case, backyard poultry farmers – at their analytical center to better understand the relationship between poverty and food insecurities.

The current dominant actor-network response to the H5N1 virus as a disease can be traced to the 1997 H5N1 outbreak in Hong Kong. That outbreak was the first recorded instance of the H5N1 virus crossing the species boundary and infecting 18 humans, of which 6 died. In an unprecedented experiment, the Hong Kong Director of Health, Dr. Margaret Chan (who is now the Director-General of the WHO) ordered that all chickens, ducks, geese, pigeons, and quails within Hong Kong be killed immediately to stop the spread of the virus. Over the next five days, more than 1.5 million birds were killed, whether or not they were infected or showed any symptoms of infection, in approximately 1,000 retail markets and 200 poultry farms (Sims and Brown 2009). The process was grotesquely bloody and messy, with hundreds of thousands of birds left in the streets to rot, as adequate disposal facilities for this many birds were unavailable (Sipress 2009).

However, unlike subsequent mass cullings throughout the global South to stop the spread of H5N1, Hong Kong farmers and traders were paid generous compensation and *ex gratia* allowances by a trusted government to completely cover the loss of their birds and businesses, and as a result in many cases they supported and contributed to the cullings. Hong Kong's

¹⁸ See Scoones and Forster (2008a) for an extensive analysis of this dominant actor-network. Their actor-network analysis shows more than 50 major global actors and intermediaries engaged in the H5N1 international poultry disease business.

compensation scheme has been considered by many to be the primary reason for the success of the 1997 culling (Sims and Brown 2009). Dr. Chan's order temporarily stopped the global spread of the virus. It reappeared briefly in Hong Kong in 2001 and 2002. The 2002 outbreaks resulted in the slaughter of 950,000 birds (Sims et al. 2003). But for all practical purposes, the massive Hong Kong culling experiment bought the earth a four-year breather from the spread of the H5N1 virus. It didn't reappear until 2003, but generally went unreported by various countries for various political and economic reasons until 2004. When it did reappear, it did so in six countries simultaneously across Asia (China, Vietnam, Cambodia, Laos, Indonesia, and Malaysia), and has since continued its global spread unabated (Sonnberg et al. 2013). Unfortunately, when H5N1 did reappear, the compensation component of Hong Kong's culling experiment was forgotten, and only the mass killings of birds as quickly as possible, without considerations of the socio-economic impacts on the marginalized backyard poultry farmers, was remembered.

The latter point is critical because unlike Hong Kong, until recently, all subsequent attempts to control the H5N1 virus in the global South have been centrally directed mass culling schemes managed and directed by dominant actors (international organizations, governments, and national military, paramilitary, and local police forces) with little or no compensation for the farmers. By 2007, even the FAO, which was initially the loudest supporter of indiscriminate preemptive mass cullings to control the virus, based on the 1997 Hong Kong experiment, was beginning to admit that culling without adequate compensation was self-defeating with serious socio-economic impacts on the lives of backyard farmers throughout the global South. Going further in an attempt to re-open the same black box it had tried to keep closed, the FAO said, “[t]he gender impacts of this [referring to its recommended policies of preventative mass cullings

without compensation] merit further investigation, since income from smallholder poultry production is under the direct control of women, and income controlled by women in poor households is often used for food and education for children” (FAO 2007, 24). The following discussion of Vietnam’s experience is illustrative of how the dominant actor-networks in this narrative both formed and were disrupted by the marginal actors and the political economies of knowledge surrounding H5N1.

When the H5N1 virus reemerged in September 2003, Vietnam was the first country to report its presence to the OIE (Eagles et al. 2009).¹⁹ By January 2004, the virus was detected in 57 of Vietnam’s 64 provinces. Following Hong Kong’s example, Vietnam initiated a mass preemptive culling scheme that meant killing every poultry bird within 3 kilometers of a bird suspected of being infected with the virus (Vu 2009). As a result, over 44 million poultry birds, or 17% of the nation’s poultry, were culled to prevent further outbreaks within four months. Since poultry is such an important part of the nation’s economy, the country lost about 0.5% of its gross domestic product (GDP), or \$250 million (World Bank 2015) during this period of time. More importantly for the purposes of looking at this narrative from a marginalized actor perspective, the negative impacts of Vietnam’s approach were heavily skewed towards the bottom of the income ladder since income from poultry and eggs is extremely important as both a supplemental and primary source of income among the poorest segments of the population (NSCAI 2006).

In a country where almost 65% of the population lives on less than \$2/day, and two-thirds

¹⁹ The first outbreaks of H5N1 actually took place in June 2003, but Vietnam’s Ministry of Agriculture and Rural Development (MARD) Deputy Minister Bui Ba Bong declared that since the government had been able to control the original outbreak it would have been illegal for him to publically announce the possibility of an epidemic. The more commonly accepted reason for the delay in reporting was that government officials were worried about the negative effects on the tourist industry (Vu 2009).

of the nation's poultry is produced in backyard farms, the socio-economic cost of this culling was catastrophic (McLeod and Guerne-Bleich 2006). Various estimates have measured this loss at between \$69-\$108 per affected household – an amount that many households never recovered from (McLeod et al. 2004; Otte et al. 2008). Since this time, Vietnam has continued to suffer some of the heaviest economic losses from H5N1 of any country in the world. Vietnam is second only to China in countries reporting outbreaks of the disease among poultry (see **Table 2**) and ranks third worldwide in terms of reported H5N1 illnesses and human fatalities (WHO October 15, 2015).

The effects of H5N1 across the social, political, and economic networks of Vietnam, have made the country a focal point for large international actors' interventionist attempts, policies, and funding. Vietnam ranks first among the top ten recipient countries with \$115 million in total H5N1-related aid commitments from foreign donors (\$1.35 per capita, compared to \$0.57 for Indonesia and \$0.27 for Egypt) (Vu 2009). Thirteen bilateral donor countries, several multi-donor trust funds, multilateral donors such as the World Bank and the Asian Development Bank, and regional organizations such as the Association of Southeast Asian Nations (ASEAN) and Asia-Pacific Economic Cooperation (APEC) have contributed more than \$200 million towards management of the virus. In addition, a host of bilateral and multinational organizations, including the FAO, WHO, OIE, and CDC have provided sustained technical support for virus control (NSCAI 2006). In 2005, there were over 800 H5N1-related donor missions to Vietnam, largely uncoordinated, from over 25 different international organizations (UK House of Lords 2008).

This unparalleled influx of multinational aid and agencies might lead us to expect Vietnam to follow the path of other countries undertaking the management of global infectious

diseases. Scholarship and actor-network analyses from resource-poor, disease-prone settings across the globe tend to focus on dominant actors' (multinational organizations) displacement of state authority (Pfeiffer and Chapman 2010) in creating "republics of NGOs" (Farmer 2001, 118). These studies suggest that, when public health disasters meet deteriorating state infrastructures, the massive infusions of transnational funds and organizations create an "unruly mélange" of actors pursuing different health priorities through divergent and often contradictory approaches (Buse and Walt 1997). Further, because of inequalities in funding, personnel, and infrastructure, it is often the multinational NGOs whose priorities take precedence over those of state agencies (King 2004; Pfeiffer and Nichter 2008) or the socio-economic needs of the marginalized poultry farmers. And, as predicted by feminist scholars (Star 1991; Singleton and Mitchel 1993; Singleton 1996; Harding 2008), the marginal actors are rendered invisible in these actor-networks.

But Vietnam's experience represents a different case. Two-thirds of Vietnam's population is rural farmers, 95% of whom own fewer than 50 birds (Delquigny et al. 2004). They are clearly a marginalized group of actors in the country's dominant socio, political, economic, and technical networks. But they aren't powerless and invisible and can serve as a least-advantaged-actor entry point in this network. It is possible to trace their actor-networks by adding a historical context. Like their counterparts in China, Vietnamese villagers in the northern provinces were coerced into giving up their lands and joining rural cooperatives in the 1950s (Kerkvliet 2005). After national reunification in 1975, the government tried to collectivize the farms in the southern provinces but met with massive resistance that was joined by previously collectivized farmers in the northern and central provinces. For example, in the late 1950s, farmers protested by neglecting to care for communal land and tools (Scott 1976). When the

economy worsened in the late 1960s through the 1970s, some northern and central Vietnamese villagers altered production arrangements by expanding their private plots and refusing to turn their animals over to cooperatives (Fforde 1989; Kerkvliet 1995; Vickerman 1984). This passive, persistent, and widespread resistance eventually forced Vietnam's ruling Communist Party (VCP) to abandon collective farming schemes by the 1980s. The tension between farmers (who historically supported the ruling Party) and the VCP can still be seen today around issues of land rights, infectious disease control,²⁰ and local governments' abuses of power.

This same passive but persistent resistance can be found in the actor-network that begins with the marginalized farming community versus more typical dominant-actor-focused network analyses described above. In his analysis of the H5N1 crisis coverage by Vietnam's three largest daily newspapers, *Tuoi Tre (Youth)*, *Thanh Nien (Youth Newspaper)* and *Nong Thon Ngay Nay (The Countryside Today)* between 2003 and 2008, Vu (2009) observed that the rural farmer actor-networks were dominated by stories of sensational accounts of farmers' losses and corruption, mismanagement, and incompetence of local government officials (including veterinarians) charged with administering the Vietnam's H5N1 control policies. The latter accounts were further corroborated by Porter's (2012, 2013a; 2013b) unique 14-month, in-country ethnographic work that examined this subject. In a country where the media remains closely monitored and controlled by the government, government-produced propaganda remains the primary source of public information. These stories were unprecedented and can be seen as an attempt by the government to both publically support the farmers while privately developing

²⁰ Since 2006, Vietnam has also been dealing with an epidemic of Foot and Mouth Disease (FMD). The challenges of eradicating FMD closely parallel those of H5N1, such as, inadequate control of animal movement and border control, massive infusion of international donor and NGO involvement, inadequate veterinary skills, and widespread passive resistance to, and lack of support for, central policies at the local farming level (Kompas et al. 2015).

policies that moved away from such a heavy reliance on backyard poultry.²¹ For example, when confronted with massive protests over lack of compensation for the forced culling, MARD Deputy Minister Bui Ba Bong declared, “To say that the provinces lack money is incorrect because the central government has permitted the use of budget funds to pay for culling at the rate of 15,000 VND per bird [roughly \$.65 USD per bird]...If there are delays or difficulties, it is because local officials do not carry out the rules correctly” (*Nong Thon Ngay Nay*, November 17, 2005).

The stories shown in **Box 1** (adopted from Vu 2009, 28) are typical but they can also be seen as

internal justification for Vietnam’s unprecedented move in October 2005 to launch a

Box 1

“Look to the Sky and Cry to God” was the title of an article that opened with the story of a family that had been known as successful farmers in a rural community in Da Nang. In the house, the journalist found the late-term pregnant wife and her mother who was over 70 years old, each sitting in a corner weeping as four government trucks took away their still healthy 3,170 chickens to an incinerator for culling. The husband was wandering about the house “like a shadow.” (*Nong Thon Ngay Nay*, February 6, 2004).

In another article entitled “Farmers Agonized Because of Debt,” the focus was on farmers who could not sell their healthy chickens while sinking more deeply into debt every day. These farmers voluntarily registered their chickens for culling, but “many burst into tears when seeing their fortunes turned into smoke. Tens and hundreds of millions of VND worth of their chickens were gone overnight. Fifteen thousand VND [roughly \$0.67] for a chicken culled was like a drop in the ocean of debt facing these farmers” (*Nong Thon Ngay Nay*, November 18, 2005).

²¹ In an interesting twist on the commonly produced US narratives about trade-dumping practices, the Vietnamese media exposed the fact that US poultry producers were dumping frozen poultry in Vietnam. This was poultry the United States was unable to sell elsewhere due to widespread trade restrictions levied against it resulting from the 2015 HPAI endemic. The United States was found to be dumping frozen poultry at a third of the US supermarket cost – and less than the cost of producing the same poultry in Vietnam (*VietnamNet*, August 16, 2015). This media exposure resulted in a temporary ban on US frozen poultry imports, but it was also seen as a wake up moment for Vietnam’s broader push for free trade agreements with Western countries – a push that was heavily promoted by both the international donor community and the United States.

The sadly ironic point of this story is that Vietnamese farmers were justifiably complaining that the US poultry dumping was preventing them from paying back their own bank loans taken out to cover their H5N1 losses. Unlike the United States where the government compensates poultry farmers for 100% of their H5N1-based losses (Greene 2015), the Vietnamese government still only compensates poultry farmers for approximately 10-15% of their losses depending on location, bird, circumstances, etc. (Riviere-Cinamond 2005). This impoverished compensation scheme forces farmers into frequently ruinous bank loans, making the farmers highly susceptible to even small movements in poultry prices. As a result, the US chicken dumping scheme forced many of the small farmers into bankruptcy (*VietnamNet*, October 7, 2015).

comprehensive nationwide vaccination campaign for all birds (Henning et al. 2009). Despite being one of the poorest countries hit by the H5N1 epidemic, after its failed initial mass culling approach that proved so costly and unpopular, it elected to go with a vaccination based approach – the most expensive possible approach to disease control. No other country, including the US, has opted for as extensive a vaccination approach as Vietnam has, largely because of the cost. But despite substantial foreign aid to fund the vaccines and a tough comprehensive execution strategy, Vietnam has not performed better than its neighboring countries (which continue with mass culling policies) in keeping H5N1 from coming back. In fact, Vietnam continues to have the second highest number of reported H5N1 outbreaks of any country in the world, after Indonesia (Durand et al. 2015).

By following the backyard farmer actor-network, this isn't an unanticipated consequence. As noted above, despite being marginalized, Vietnam's rural small farmers are not powerless as a group. Just like the weapons they employed to reverse the government's collective farming policies, their weapons to fight the government's H5N1 policies were based on local tacit knowledge and an understanding of how to use local government officials' ignorance and corruption to their advantage. Common practices of the farmers' massive resistance included buying and selling baby chicks despite a government ban, selling and eating sick poultry to recoup losses from forced cullings, hiding poultry from veterinary officials, grossly undercounting flock sizes and deaths, failing to report bird deaths, throwing away vaccines after promising to use them, stealing back their own chickens from the government, and widespread poultry smuggling (Hickler, 2010; Ifft, 2011; Porter 2012; *Tuoi Tre*, October 3, 2012).²²

²² Hinchliffe and Bingham (2008) wrote about very similar experiences in Egypt when the government and military tried to kill all the back yard and rooftop poultry in Cairo in 2006. In spite of heavy fines and penalties enforced by

A USAID-funded survey of duck farmers on 33 farms in 6 provinces in May 2008 showed that farmers rarely communicated with government veterinary officials except when these officials came to vaccinate their ducks, and then the farmers normally hid as many of their birds as they thought they could get away with. Farmers did not inform local authorities immediately about the death of ducks, they only did so when it occurred in very large numbers. One surveyed farmer responded, “I don’t want to pay for veterinarians²³ as they do not have real experience like me. There is no need to inform anyone.” Another said, “If the authorities compensate, I will inform them. Otherwise, I will throw [the dead ducks] into the river or bury them...why should I tell anyone? To let them laugh at me?” (*TNS Vietnam* 2008). A subsequent more extensive study done two years later across 600 chicken, duck, and mixed farms in six provinces (*TNS Vietnam* 2010), showed similar widespread distrust of the government’s H5N1 vaccination program and its administering officials. For example over 70% of the farmers

the military, many householders hid their birds and rushed sick birds to the market to try and generate some income. Nonetheless, officials killed over 34 million poultry, causing riots in the streets, the collapse of large sectors of the food economy, and the loss of the supplemental income – mostly by women. The only winners in this process were the large poultry conglomerates, like the Cairo Poultry Company who expanded their operations after the mass culling. However, seven years later H5N1 remains endemic in all sectors of the Egyptian poultry industry and Egypt has the highest number of confirmed human cases of H5N1 influenza in the world and the second highest number of deaths from H5N1 influenza (*Egypt Independent* May 25, 2015; WHO July 17, 2015).

²³ The veterinarian profession in Vietnam does not have the same stature that it has in Western countries. In Vietnam it only requires one year of schooling and government veterinarians who work in the rural areas typically make the equivalent of \$50/month (Porter 2013b). In fact, one newspaper article referred to the process of getting a veterinary certificate as the equivalent of buying vegetables, and this was in Ho Chi Min City that boasted the toughest commitment to fighting the H5N1 epidemic, “Giay kiem dich ban nhu ... rau,” [Veterinary certificates sold like ... vegetables], (*Thanh Nien*, August 17, 2005). As a result, government veterinarians typically charge personal fees for compulsory services, like administering H5N1 vaccines or recording bird deaths that are supposed to be free. As a result, government veterinarians are frequently targets of corruption charges (*Tuoi Tre*, March 17, 2014). A standard measure of a Vietnamese farmer’s success is his or her ability to pay for a non-government veterinarian who is universally more trusted and respected (*TNS Vietnam* 2010).

The professional competencies of the veterinary staff at the central Party level is considered very high by international standards, but there is a significant gap between the central Party level and the rural level that actually administers the H5N1 program. Low levels of compensation and professional requirements have been frequently cited as one of the driving causes of the program’s failures (OIE 2010b). Deficiencies in the veterinary profession and their contribution to failures to control the H5N1 epidemic were officially acknowledged in the government’s 2011 five-year plan to control H5N1 (MARD 2011).

admitted they did not report dead birds in their flocks or outside their farms, and of the 30% who felt the need to report, the majority said they would only tell the head of their village, not a government official (TNS Vietnam 2010, 73). This is an extraordinarily high percentage of willful violations (and probably underreported at that) of an action that is compulsory and carries harsh penalties if violated under Vietnam's H5N1 eradication policies (*Sài Gòn Giải Phóng [Liberated Saigon]*,²⁴ December 26, 2014), but indicative of the farmers' widespread passive resistance activities. (See **Figure 1-3**.) Additionally, there is a strong undercurrent of anti-Western sentiment that runs throughout the farmers' resistance since they see their government's policies as being directed by the West. For example, one farmer said, "I can eat with my chickens and sleep with my chickens and never get sick. You Americans invented this bird flu problem" (Porter 2012, 1)

Obviously, a counter-narrative driven by equity, justice, and social responsibility issues was not the narrative that the donor community's "poster boy" (Harvard Vietnam Program 2008, 3) wanted to publicize. As a result, official government policies, supported by the foreign donor community, the WHO, and other international organizations reinforced the political interests of Vietnam's national/international elite. This powerful nexus pushed a particular approach that involved mass culling and comprehensive vaccination, and projected a narrative of success to the nation and the world (Vu 2009). Once the epidemic continued to spread though, particularly after 2004, small farmers were totally left out of the policy making process. Compensation for culling was delayed and insufficient, in part because many provinces were not willing to provide the 50% matching funds as the central government ordered, or because they compensated only farmers who owned larger stocks (Riviere-Cinnamond 2005, 12).

²⁴ *Sài Gòn Giải Phóng* is the official media outlet of the VCP.



In Vietnam, the subjects of government posters are often reflective of problems that cannot be officially acknowledged. In this case, government officials knew that they had a problem with under reporting sick and dead poultry to veterinary authorities. In the poster, one farmer tells another farmer, “I always immediately notify the veterinarian when my chickens and ducks show strange symptoms.” The other farmer replies, “If we were all like you, the whole neighborhood would be thankful.” The poster implies that there is a moral responsibility to the village and fellow citizens to report. Just as importantly though, note that the poster is provided by USAID and not the Vietnamese government. This is purposefully done to imply an importance and authority to the message that transcends that of the local government.

Figure 1-3. Poster Praising Farmers for Reporting HPAI H5N1 Symptoms to Veterinary Authorities (Porter 2013b, 138).

Following the predominant storylines of WHO, small farmers were blamed for the disease in official propaganda and became the targets of sectorial “restructuring.” Initially, the government tried to accelerate plans for “concentrated poultry production” to better ensure biosecurity at the request of the international donor community. Although I can find no official documentation supporting this claim, the *Nong Thon Ngay Nay* newspaper reported that central officials wanted rural farmers to stop raising poultry through a government plan to reduce the number of poultry farmers from 8 million to 2 million (May 4, 2005). Additionally, some provincial governments (with international donor support) proposed forcing small holders out of poultry keeping altogether by cutting off their compulsory veterinary services or by denying the already meager compensation for culled birds to increase the proportion of compensation available to big commercial farms that suffered H5N1 poultry losses (Thieme and Guerne-Bleich 2007). By 2010 though, the Vietnamese government had given up on those plans and refocused its efforts at improving poultry biosecurity at the backyard level, and on expanding the poultry vaccination program based on development of an indigenous poultry vaccine manufacturing capability.

Thus as we have seen, H5N1 does not have to remain a black box. It can be opened to expose a number of marginalized actors and intermediaries, each one providing some of the attributes associated with the disease. The virus and the animal provide the symptoms of the disease, the networks of farmers, agricultural, social and political practices, and the environment provide the means by which the disease spreads. There have been a number of excellent studies on ways to minimize the potential increased poverty impacts of the H5N1 black box once it is opened (Rushton et al. 2005; Epprecht et al. 2007; Roland-Holst et al 2008). Not unsurprisingly, given the experience described above in Vietnam, they all stress the importance of considering

equity in any policymaking designed to control the disease so as to not increase the poverty of those living in the black box. As Scoones and Foster observed in their study of H5N1 and international policy processes, “Those who have suffered most from avian flu are small-scale poor backyard chicken farmers who rely on their birds for their own, often precarious, livelihoods. To date, the uncompensated impact of veterinary measures [mass culling] imposed have far outweighed the impacts of the virus itself on such flocks” (2008b, 8).

Farmer (1996; 1999) and Farmer with Amartya Sen (2003) have pointed out that structural inequalities define health policy and intervention. Others have also pointed out that since the colonial era, medical intervention and colonial conquest have been very much part of the same endeavor (McLeod and Lewis 1988; Anderson 1996). In the following section, I explore the wider political and public health economy of the international response to H5N1 as a human disease that brings up sharp ethical dilemmas and uncomfortable truths for those dominant actors who would prefer more narrow political and technical framings.

Public Health Narrative (disease to crisis)

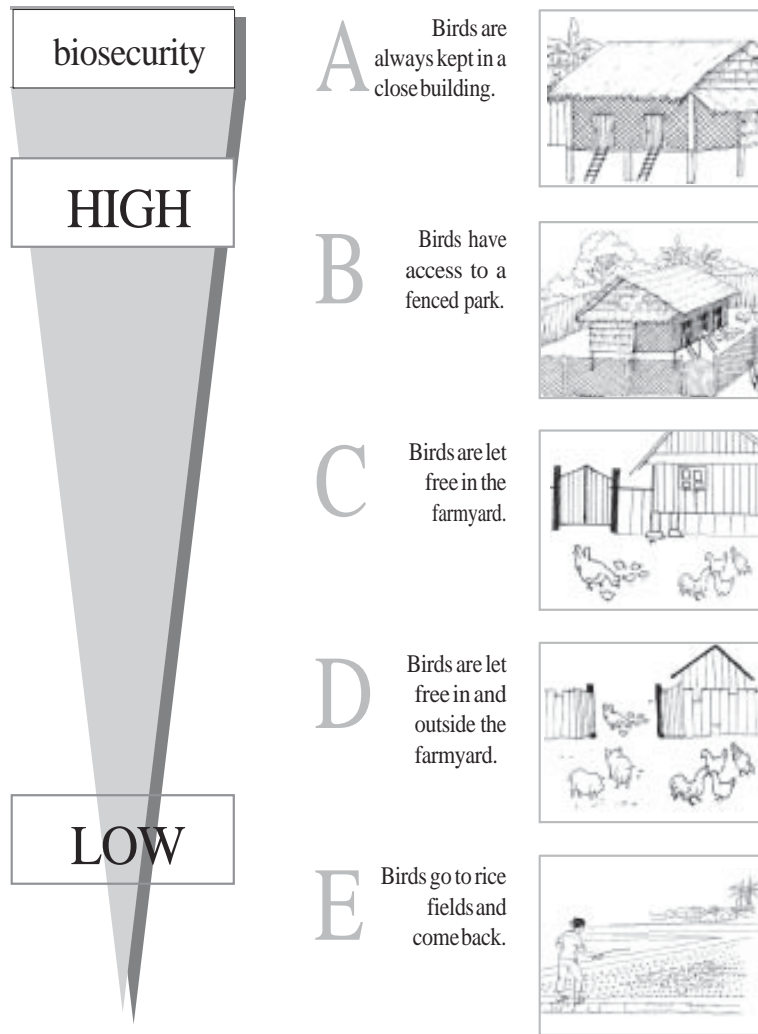
Since the H5N1 virus transgressed the species barrier in Hong Kong in 1997 and infected 18 people, six of whom died (Claas et al 1998; Subbarao et al. 1998), its story has also been inexorably linked to a complex network of public health actors (scientists, doctors, technical experts, politicians, policy makers, security analysts, humanitarian activists, and private and public multinational and multilateral organizations) that define and direct the virus's various routes of infection. Foucault often used biomedical and social responses to epidemics as a way to illustrate the production of disciplinary apparatuses (Foucault 2003) with attention to place and time as a further method for highlighting the securitization phenomenon of disease in society. Foucault observed, for example, that in modern societies diseases are framed as infiltrators on the basis that by their "birthright, forms and seasons they are alien to the space of society" (2003, 17). The otherness created by these infiltrators provided a powerful metaphor for constructing the public health narrative. The humanization of the H5N1 virus as it moved from being a nonhuman agent in the bird flu narrative to its human assemblage as a transagent in the public health narrative can be directly linked to Foucault's ideas about the ways social hegemony is created through a complexification of society (Foucault 2003, 17-18).

The marginalized human and non-human actors who played such a significant role in the bird flu narrative are barely visible in the public health narrative, although it is their blood and tissue that fuel the translations of the public health narrative. In this narrative, heterogeneous yet unaffiliated actors are linked in such a way that the virus not only redraws the boundaries between humans and non-humans, nature and society, but also redraws the taken-for-granted boundaries between nation states and societal arrangements. The interesting thing about this

narrative is that the dominant actors are public health officials who are generally unconcerned with animal diseases or the linkages between animal health and human health.

As Scoones and Forster point out, "...many in the public health community have little knowledge or interest in the animal origins of the disease [from the H5N1 virus]. It is the public health consequences that are, for them, the major concern" (2008a, 22). Similarly, in discussing the possibilities of H1N1 and H5N1 reassorting in poultry during the 2009 H1N1 (swine flu) pandemic, Anthony Fauci director of the National Institute of Allergy and Infectious Diseases said, "it's widespread in humans so who cares if it is in turkeys?...that's a Department of Agriculture issue" (McNeil 2009). But the reverse disinterest between the veterinary community and the public health community also held true further amplifying the silos constructed by these narratives. In a remarkable lack of disinterest in any public health narrative, in 2005 the poultry industry's major concern over the possibility of a human pandemic was that the H5N1 virus would then have a greater opportunity to cross back into poultry in more countries than it otherwise would – causing unnecessarily more infections in poultry and economic losses in the poultry industry (Capua and Alexander 2004; Smith 2005; Mabbett 2005).

The obvious question is why do strong actors and not those most affected by H5N1 dominate this public health narrative? The answer can partially be found in the fact that until 2011, the WHO promoted a singularly simple story about H5N1 in support of the public health narrative: wild birds act as a reservoir of H5N1 and their migrations are what allows H5N1 to move freely across continents. Interactions between wild birds and domestic birds in open backyard settings can then spread the virus to the domestic birds, and from there it can reassemble and mutate to cross the species barrier to humans (WHO 2005; 2006). (See **Figure 1-4.**)



This image was published in guides developed by the FAO and the animal health agencies of Vietnam and Cambodia. There are two important considerations here. First, the guides were only made available to veterinary paraprofessionals (local government animal health officials), not the poultry owners. This ensured the guides were used as government tools to promote and interpret their policies – albeit, through a mistrusted and unrespected medium. Secondly, the guides reinforced the official WHO, FAO, and OIE policies that said poultry kept in buildings were safer than backyard flocks. While Levels E and D (shown here) were the predominate form of raising poultry in these countries, only large corporate poultry industries could afford Level A biosecurity.

Figure 1-4. Graphic Depicting the Highest and Lowest Methods of Maintaining Biosecurity (FAO, Agronomes et Ve'terinaires Sans Frontie`res [VSF-CICDA], and Department of Animal Health, Socialist Republic of Vietnam 2006, 15).

This simple story had profound implications beyond its public health intentions. Following a simple infection story, an equally simplified story of biopower emerged: “control is easiest in large commercial farms where birds are housed indoors, usually under strictly controlled sanitary conditions, in large numbers. Control is more difficult under poultry production systems in which most birds are raised in small backyard flocks scattered throughout rural and peri-urban areas” (WHO 2006, 2). This control story promoted the positions of major poultry producers and the associated policy, government, and economic actors within their

networks at the expense of the backyard farmers. It promoted the geographies of poorly regulated animal husbandry, slaughter, and live poultry markets as the source of a potential human H5N1 pandemic; geographies which coincidentally were both the major migratory flyways and the poorest areas of the global South, particularly in Africa and southern and southeast Asia. And, it ignored alternative stories, until it could no longer ethically do so, that showed H5N1 was being spread in ways other than migratory routes – by humans and agricultural and transportation technologies.

For example, the influential study by Michel Gauthier-Clerc et al. (2007) showed that H5N1 was primarily spread by human activities, through the large-scale farming and marketing of poultry and their associated infrastructures, including the veterinarian communities. The WHO also ignored the numerous studies examined by Greger (2006) that show H5N1 rarely evolves from its normal low pathogenic variety to the highly pathogenic form in poultry kept outdoors.²⁵ Recall that outbreaks of highly pathogenic H5N1 were rare until the advent of intensified poultry farming systems that now confine 10,000 or more birds in a single building. As Perry Kendall, chief medical officer of health for British Columbia said when discussing the 2004 Canadian outbreak of H5N1 that resulted in the culling of 19 million birds, “[y]ou’ve got 10,000 birds all in a small shed, packed in together – they act like a Petri dish” (quoted in Greger 2006, 329).

²⁵ Even the term “rarely” is contested. David Swayne is the USDA's leading avian influenza researcher and director of the USDA's chief poultry research laboratory. He has authored more than 100 scientific publications on avian influenza. According to Swayne, there has never been a recorded emergence of the H5N1 virus in any backyard flock or free-range poultry operation. (For a comprehensive listing of Swayne’s scientific publications, see <http://www.ars.usda.gov/pandp/people/people.htm?personid=5507>). Additionally, according to avian influenza expert Dennis Alexander of the UK's Central Veterinary Laboratory, with the possible exception of an outbreak in free ranging South African ostriches (Sabirovic 2004), highly pathogenic influenza H5N1 viruses have "never been known to arise in an outdoor [poultry] flock" (Alexander 2005, 4).

The source for the WHO story can be traced to the original cases of human infection in Hong Kong. These infections were highly unusual in that they were the first known instances of the H5N1 virus jumping directly from its host species (poultry sold in wet markets [live poultry markets]) into a human (Ligon 2005). Due to the aggressive actions (described above) of Margaret Chan, Hong Kong's Director of Health, the virus's public health threat was temporarily stalled; prompting some experts to believe a potential pandemic was halted by her actions (Greger 2006).²⁶ However, the virus returned six years later once again jumping the species barrier to humans in Hong Kong and Vietnam in 2003, resulting in the deaths of all four infected individuals. In 2004, another 46 people were infected with the virus, 17 in Thailand and 29 in Vietnam, 32 of whom died as a result of their infections (Capua and Alexander 2007, 365). The extremely high mortality rates from these two years prompted the WHO to issue a report in January 2005 stating that the threat of influenza pandemic from H5N1 was imminent and could result in the deaths of 2 to 7 million people in the best-case scenario (WHO 2005, 42). A number of other similar studies by highly regarded infectious disease experts similarly reported that the world was on the verge of an influenza pandemic that could dwarf the global health impacts of the 1918 Spanish flu (Webby and Webster 2003; Chen et al. 2004).

²⁶ The outbreak of the H5N1 virus in Hong Kong coincided with its handover to the People's Republic of China on July 1, 1997. Between April and December 1997, the virus was recorded throughout Hong Kong, with the first deaths reported in May 1997, despite robust militarized efforts to stop its spread. In December, on Margaret Chan's orders, every bird in Hong Kong was killed over a seven-week period (Sims, et al. 2003). The Chinese government was challenged by the H5N1 outbreaks to prove they could effectively govern a former British colony. With international attention focused on both the handover and the outbreak, the Chinese government elected to take a hands-off approach to managing the outbreak, leaving Hong Kong officials to deal with the situation on their own. It is interesting that since 1997 no other country or city has taken the bold, albeit draconian, step of completely eradicating its entire bird population to stop the virus's spread (Parry 2007). It is my speculation that the 1997 Hong Kong experience was a one-off situation that would not have occurred without the broader context of the unique political situation created by the China handover.

While attempts to control the H5N1 virus through militarized enforced mass culling of backyard poultry continued to wreak economic devastation on the world's poorest communities, the global North largely defined the virus as a public health concern with strong pandemic crisis potential and therefore directed the majority of its resources towards policies and technologies that seek to secure its own borders. In spite of the fact that only 449 deaths (WHO July 17, 2015) have occurred from the virus in almost 20 years, the US, the WHO, and other international public health organizations have spent billions of dollars in research and preparedness for an H5N1 pandemic (Lam, Franco, and Schuler 2006; Franco 2008; Sell and Watson 2013). The investment has only served to reinforce their securitized agendas.²⁷ As medical anthropologist Daniel Halperin (2008) has pointed out, global health organizations self-consciously avoid investment in basic public health infrastructures, e.g., food, vaccines, clean water, prenatal care, and family planning, despite the awareness that such investments would significantly reduce mortalities from infectious diseases. In his analysis of the world's largest public health donors, Halperin concluded that few see themselves as global funds that fund local health. Thus,

²⁷ For example, in response to the WHO's announcement on the pandemic potential of H5N1, on November 1, 2005 President George Bush announced that the US would spend \$7.1 billion on H5N1 pandemic preparation. This included: \$1.2 billion to buy enough doses of the H5N1 vaccine then being tested to protect 20 million people; \$2.8 billion to develop cell-culture technologies to provide enough vaccines for all Americans within six months of a pandemic; \$1.8 billion for antiviral drugs for first responders; \$583 million for developing "effective pandemic emergency plans"; and, \$251 million to help "Asian" countries develop their own H5N1 training programs and surveillance systems (Bush 2005a).

Given this massive vaccine-based program, it is not difficult to understand why many critics have been highly critical of WHO's pandemic assessments and the undue influence of the vaccine manufacturers on policy making (Enserink 2010). In 2007, at least 16 companies globally were working on an H5N1 vaccine (WHO 2007a). But it is also worth noting that as of 2015, a commercial H5N1 vaccine for humans still does not exist. In 2008, China developed a vaccine for its national stockpile (CIDRAP April 3, 2008). In 2013 the FDA approved the first experimental vaccine for H5N1 for use in the national stockpile, not for commercial purposes (FDA November 22, 2013). Promising clinical trials in humans are currently (2015) being conducted in Vietnam without international pharmaceutical support (*VietNamNet Bridge* April 24, 2015). The Vietnamese experience however is illustrative of the difficulties in developing an effective locally produced H5N1 vaccine as their trials began seven years ago in 2008. Beyond these declared activities, it is believed that Iran may have developed its own H5N1 vaccine using viral samples obtained in an agreement with Indonesia in 2007 during the period of time in which Indonesia was only selectively sharing its samples (Shoham 2013). See footnote 33 for more on this topic.

unsurprisingly “for the WHO, the overall [H5N1] narrative is firmly centered in the outbreak mode...a potential major public health emergency on a par with 1918, or worse” (Scoones and Forster 2008a, 23). The WHO further codified the relation between public health, security, and preparedness with a strategic framework it referred to as “global public health security” (WHO 2007b, ix)²⁸ to implement the 2005 revised International Health Regulations (IHR) (WHO [2005] 2008). In doing so it sought to reconfigure traditional approaches to health by altering the previous spatial and temporal frames of health. The report emphasized “global public health security” (WHO 2007b, ix) that is a space distinctly different from “individual health security” and nation-state organizations of public health. In this space, the previous temporal space of preventative infectious disease measures is altered so that policy makers take actions even without immediate threats based on the presumptive assumption that all health threats can become pandemics and threats to the nation-state if not stopped at their source. The 2006 “Pandemics and All Hazards Preparedness Act” (PAHPA), Public Law No. 109-417, provided the legislation necessary to implement President Bush’s H5N1 flu pandemic preparation and further expanded the WHO report’s reconfigurations of the spatial and temporal frames on preemptive preparedness with an increasing political emphasis on the close association between

²⁸ This report was the first major report issued by the WHO under the direction of Director-General Margaret Chan. In many ways, it reflected her personal experiences as the Hong Kong Director of Health in stopping the spread of H5N1 as well as her highly controversial interventions in stopping the continued spread of the SARS virus for which she was forced to resign from her position in Hong Kong (Kwok 2009; Sipress 2009). It also reflected her political experiences in the political-economic tradeoffs that have characterized the predominant culling/vaccine approaches to controlling H5N1 that have generally served to benefit the powerful dominant actors writing the global response to H5N1 (Keck 2008; Hinchliffe 2015). Hallmarks of these experiences can be found in her forwarding letter to the report in which she states, “[i]n a significant departure from the past, IHR (2005) move away from a focus on passive barriers at borders, airports and seaports to a strategy of proactive risk management. This strategy aims to detect an event early and stop it at its source – before it has a chance to become an international threat...[s]uccessful implementation of IHR (2005) serves the interests of politicians and business leaders as well as the health, trade, and tourism sectors”(WHO 2007b, vii).

public health and security.²⁹ This association was dramatically stirred just a year before when President Bush announced that he would ask Congress to give him the authority to enforce quarantines to stop the spread of H5N1 with the military (Bush 2005b).

The precedent for the strong assemblage of the actor-networks that quickly coalesced around the zoonotic transformation of the H5N1 virus from an animal virus to a global pandemic crisis threat can be found a decade prior to the virus emerging in Hong Kong. Challenged by the seemingly sudden appearance of HIV/AIDS as a major public health crisis, Stephen Morse chaired and organized the now infamous 1989 NIAD/NIH Conference on Emerging Viruses (for which he originated the term and concept of emerging viruses/infections).³⁰ Morse convened the conference “to consider the mechanisms of viral emergence and possible strategies for

²⁹ While many critics have faulted the US and WHO’s neoliberal-based approaches to public health (Wilson, Tigerstrom, and McDougall 2008), even experts who understand the relationships between social issues and health have found it challenging to adequately offer an alternative global framework. For example, Nobel Laureate, Joshua Lederberg noted the political and economic difficulties governments have in making complex tradeoffs between poverty, deteriorating health infrastructures, and security. While he acknowledged “world health is indivisible...and that we cannot satisfy our most parochial needs without attending to the health conditions of all the globe” (1996, 244), he was not able to offer anything more than modest proposals for change. His suggestions were admittedly “selfishly motivated” and limited to protecting the United States from possible infectious disease rather than addressing the necessary underlying causes of global political, social, and economic change.

Health activist, Paul Farmer, has also addressed the difficulties of adequately developing global frameworks that balance social issues and health. For example, putting a much finer point on the subject than Lederberg, he asks, “Are World Bank policies related to the spread of HIV? What is the relationship between international shipping practices and the spread of cholera from Asia to South America and elsewhere in the Western Hemisphere? How is genocide in Rwanda related to cholera in Zaire?” (Farmer 1996, 261). Reflecting on the work of Eisenberg and Kleinman (1981), Farmer offered a partial answer to these questions and an approach to developing a global framework, “[a] critical framework would not...diminish the role of the biomedical sciences in the theory and practice of medicine but supplement them with an equal application of the social sciences in order to provide both a more comprehensive understanding of disease and better care of the patient. The problem is not ‘too much science,’ but too narrow a view of the sciences relevant to medicine” (Farmer 1996, 267).

Wald summed up the challenges of responding to complexities of emerging diseases in noting, “[g]lobal health analysts do not agree on the nature of these problems [H5N1 and EIDs], much less on the solutions, nor even on the definitions of social justice and global poverty” (2008, 268).

³⁰ While Morse is generally credited with coining the term, Nicholas King and others (King 2004; Harper and Armelagos 2010) have noted that the term “emerging diseases” can be identified in the medical literature back to the 1960s. King also cites the following publications as foreshadowing the concerns expressed at the 1989 conference: Evans (1966), Cassell and Smillie (1969), Basch (1978), and Krause (1981).

anticipating, detecting, and preventing the emergence of new viral diseases in the future” (Morse and Schluederberg 1990). At this conference³¹ and in his subsequent work, Morse (1990; 1991; 1992; 1993a) viewed emerging infections as a result of a confluence of demographic and technological changes, international commerce and travel, the breakdown in public health infrastructures in many places in the world, and microbial adaptation.

For the purposes of this paper though, the most notable aspect of Morse’s work was his identification of “civilization” as both the cause of emerging infections as well as the source of their solutions. Predating the WHO’s 2007 alteration of the spatial and temporal frames of health and drawing on the work of Evans (1966) “instant-distant infections,” Morse invoked different spatial frames to describe the causes, consequences, and points of intervention. Morse further offered that “by altering viral traffic patterns, the introduction of modern agricultural or industrial technologies in one location – local causes – might produce an international epidemic or pandemic – global effects” (King 2004, 66). Addressing “global public health security” entailed policies, laboratory work, and surveillance and monitoring systems in locations different and apart from the actual geographical location of the disease outbreaks.

The otherness of this narrative was essentially codified by the 1992 National Academy of Science’s Institute of Medicine’s report, *Emerging Infections: Microbial Threats to Health in the United States* (Lederberg, Shope, and Oaks 1992). The report provided a blueprint and political rationale for building a network of US-based institutions to address emerging infections in terms of American public health and national security. Its recommendations fell into four broad

³¹ Morse edited and published all the papers from this conference in *Emerging Viruses* (1993b). As Lederberg notes in his chapter of Morse’s papers, “the present examination is virtually without precedent” (3) noting the unique depth and breadth of the conference participants’ backgrounds and expertise. In this regard, Morse was foreshadowing by a decade not only an understanding of the social, political, medical, and economic complexities of the infectious disease actor-networks but also the resultant securitization and otherness that would come to define H5N1 in the context of global public health.

categories that US government agencies and international health organizations used to frame their emerging disease campaigns: surveillance, training and research, vaccine and drug development, and behavioral change. In 1998, the CDC released its second comprehensive plan, *Preventing Emerging Infectious Diseases: A Strategy for the 21st Century*, that closely followed the National Academy of Science 1992 report. In 2002, the CDC released its follow-up plan that even more explicitly linked public health with security, *Protecting the Nation's Health in an Era of Globalization: CDC's Global Infectious Disease Strategy*. This report said, “[p]romoting international cooperation to address emerging infectious diseases is a natural role for the United States...The United States can continue to lead from its strengths in medical surveillance and technology to help protect American and global health” (CDC 2002, 16).

As one biosecurity expert put it when referring to the H5N1 pandemic threat, and unwittingly paraphrasing Foucault, “pandemic outbreaks are a threat to national security, and may be a tool of bioterrorism. Protecting against pandemics requires strict immigration control, control of movement and travel, border security and strong surveillance systems...restrictions of choice and suspension of rights may be necessary. This may require the intervention of police/security forces” (Scoones and Foster 2008b, 5-6). Similarly, former director of HHS Tommy Thompson linked America’s public health security with preemptive policies that moved the campaign against viral infections overseas through “America’s mission of compassion abroad.” In his policy address to the State Department, Secretary Thompson said, “it is my privilege to run a department that performs a critical role in America's mission of compassion abroad. Public health knows no borders and no politics. In recent memory alone, we have seen AIDS leap from Africa into our own cities; we have seen SARS spread with shocking rapidity from southern China to North America; we have seen the West Nile virus somehow cross the

Atlantic, and we have seen that a key to controlling tuberculosis in the United States is controlling it in potential visitors from abroad...To fight this disease [SARS], US health officials worked in places like China, Singapore, Thailand, Taiwan, and Vietnam. We swiftly undertook several measures designed to turn the tide and defeat the epidemic before it became a serious threat on US soil” (Thompson 2003, 31).

Reflecting the increased securitization of public health, these reports and policy statements used militarized terms such as “combating,” “fighting,” and “defeating” frequently to describe activities that would have otherwise been described in more traditional civilian public health terms.³² In commenting on the militarization of language to stop infectious diseases, including H5N1, Melinda Cooper observed that, “war is no longer waged in defense of states, or even human life, but in the name of its biospheric dimension, incorporating epidemiology and the evolution of all forms of life” (2006, 129). This decade-long campaign successfully reformulated the otherness of “local” health interests that Morse first described into US terms of security. This reformulation ensured that responsibility for “global public health security” would now fall to US laboratories, biotechnology firms, pharmaceutical manufacturers, and experts. As Fidler argued, “reglobalization of public health is well underway and the international politics of infectious disease control have returned” (2001, 81). Moreover, the language of health security held “contagious communicative power” (Orr 2006) because it gave scientists, journalists, health officials, and politicians a singular way of articulating existing concerns about the porosity of global borders without addressing the underlying social, economic, and justice complexities of porous borders.

³² Military metaphors have a long history in the public health world that predates the American policy turn to health securitization. For example, see Emily Martin’s (1995) *Flexible Bodies* on the use of militarized terms to describe the ways society views the human body’s immune system.

As a way of introducing the most visible rebellion to this US-centric securitized framing of infectious disease politics, Foucault's reflection that the exercise of medical knowledge is by its very nature a political act reflecting the power of the state is germane. He argued that, "the struggle against disease must begin with a war against bad government" (1994, 33) and that "[t]here is, therefore, a spontaneous and deeply rooted convergence between the requirement of political ideology and those of medical technology" (Foucault 1994, 38). In December 2006, Indonesia turned the tables on the US-centric narrative by accusing the WHO, CDC, US military, and the global pharmaceutical industry of colluding to develop a biological weapon and associated vaccine using Indonesian strains of H5N1 (Supari 2008, 19, 21, 35, 157-159).³³

³³ Frank Smith (2014) has written an exhaustively researched paper on this topic tracing the 40-year history of the US role in Indonesian politics through its Naval Medical Research Unit (NAMRU-2) located in Jakarta, Indonesia (the US has similar labs in Cairo, Egypt [NAMRU-3] and Lima, Peru [NAMRU-6]). While the US Navy's Jakarta lab mostly remained an invisible actor throughout the international furor that surrounded Indonesia's actions, its political history and role in shaping and directing Indonesian politics was at the heart of the controversy. These activities were conducted under the guise of "medical humanitarianism" (Lowe 2010, 156) drawing on the political, governance, and power projection concepts of "health diplomacy" (Basch 1978; Kickbusch et al. 2007). And, most certainly the lab had a long positive humanitarian history of working with Indonesia on diseases such as, malaria, cholera, measles, SARS, and influenza. So, it was normal that Indonesia would ask the lab for assistance in identifying a new virus in 2006, which at the time, was thought to be SARS since Indonesia had previously refused to officially acknowledge the existence of H5N1 for political and economic reasons. The Director of Thailand's Social and Health Institute in the Ministry of Public Health, Komatra Chuengsatiansup (2008) has specifically accused the government of corruption based on the large poultry industries (Thailand is the fourth largest poultry producer in the world) and their family connections with government officials as the primary reason for the initial secrecy and denial of H5N1. Once the virus became public though, the Indonesian government killed 60 million ducks and poultry birds, primarily belonging to small backyard farmers. The result being that after the cullings, many rural farmers were left in economic ruin while the major poultry producers were compensated for their losses and rebuilt their farming systems with government support. (See footnote 22 for a discussion of a very similar experience in Egypt.)

But, through the actions of NAMRU-2 lab, the Indonesian H5N1 samples actually wound up at the CDC and subsequently at the Los Alamos National Laboratory (hence Supari's accusation of biological weaponization) for genetic sequencing. From the nuclear weapon development laboratories at Los Alamos, the samples and their associated genetic data were then passed on to an Australian pharmaceutical company, Commonwealth Serum Laboratories, for potential development of a vaccine. Until Supari broke with US-Indonesian bi-lateral policies on biosecurity and made the virus's journey from Indonesia to Australia public, few were even aware of the lab's existence or its international public health role in working with the H5N1 virus. As a result of the ensuing political and diplomatic scandal and potential violations of WHO guidelines on sharing samples without permission, once Supari went public with her accusations the US was forced to shut down the lab in 2010. The lab was quietly reconstituted with very little publicity in 2013 in Singapore and rebranded as the Naval Medical Research Center-Asia.

Reflecting a complete distrust of US policies and public statements, when US Secretary of Defense Robert Gates said that, “it [responding to the biological weapon suggestion] was the nuttiest idea I’ve ever heard” (Nurhayati 2008), Indonesia’s Minister of Health, Siti Fadillah Supari exercised Indonesia’s sovereign right to stop sharing virus samples with WHO. She went on to claim that the pharmaceutical industry was also planning to use Indonesian strains of the H5N1 virus to develop a patented vaccine that would be sold at prohibitive cost to Indonesia despite the fact that Indonesians were disproportionately at risk for infection (Supari 2008). She further argued that Indonesia withheld the virus samples because virus sharing was unjust when the supplying country could not be guaranteed equitable access to vaccine and antiviral treatment from the developed countries that primarily manufactured these products on the basis of the viruses freely given (Sedyaningsih et al. 2008). In essence, Indonesia redefined the issue casting both the WHO and the US in the role of “bad government” while at the same time as we will see below that was exactly how the US framed Indonesia.

In refusing to share viral samples, Indonesia was in violation of the WHO IHR (2005) laws on openly sharing virus samples for the benefit of the global community.³⁴ Reflecting

³⁴ Even this frequently used statement about Indonesia’s actions, exposes a complexity of actor-networks not readily visible or normally described. Prior to the IHR (2005) rules on sharing and reporting, there had been a long standing practice, dating back to 1951, for states to voluntarily share their influenza virus strains with all WHO collaborating laboratories through the Global Influenza Surveillance Network (GISN) (Davies 2012). IHR (2005) was WHO’s attempt to legislate this long-standing voluntary practice. But the rules for IHR (2005) did not come into implementation until after Indonesia’s refusal to share and report their outbreaks of H5N1 and its associated samples. So, Supari correctly argued that technically Indonesia was not initially in violation of international rules even though H5N1 had been first diagnosed in Indonesia in 2003 (Forster 2009).

Additionally, although Indonesia was the most vocal in its refusal, it was not alone in failing to report and share data and samples related to H5N1 in the early outbreak years (2003-2007) for three primary reasons. First, states were not legally required to do so for the first three and a half years of the H5N1 outbreaks, so governments were only complying with their formal legal obligations (Lee and Fidler 2007, 220). Second, the financial costs associated with confirming H5N1 outbreaks, especially the destruction of poultry stocks and associated farming livelihoods, posed a major deterrent to reporting (Scoones and Forster, 2010). Third, these financial costs also created additional political costs by devastating already vulnerable communities and placing intense pressure on governments to compensate and provide reassurances to save affected industries (Forster 2009; Safman 2009, Vu 2009; Herington 2010,). Despite these barriers, the literature has characterized the reporting behavior of

Foucault's conceptualizations of governmental exercise of biopower and population security, Indonesia's actions and Supari's conspiracy theories were widely characterized as a reckless endangerment of global health security (Holbrooke and Garrett 2008; Stevenson and Cooper 2009). On the other hand reflecting back to the bird flu narrative, Stefan Elbe argued that US policies "securitized" the H5N1 virus through a political process that presented the virus as an existential threat, making what had previously been a non-controversial public health issue into an exceptional potential pandemic threat. "The securitized response to H5N1 provoked a chain of events that would end up putting substantial pressure on existing forms of international public health cooperation" (Elbe 2010, 481). Indeed, Supari directly challenged the securitization of avian influenza at a global level when she declared that "the current unfair access to vaccines worsens the global inequality between the rich and the poor, between the global North and the South – and I think that is more dangerous than a pandemic" (quoted in Walsh 2007).

Once Indonesia exposed the inequities and social injustices of what had previously been seen as a routine virus-sharing mechanism between countries around the world, other countries began asserting their own claims of viral sovereignty. In particular, India, Brazil, and Nigeria were highly vocal in their claims of viral neo-colonialism by the global North (Vezzani 2010). Additionally, in May 2008 the 112-member Non-Aligned Movement (NAM) came out in support of the idea of virus ownership placing the GISN at risk (Brammer et al. 2009) at the

affected states as falling into one of the three categories: those that positively complied (Vietnam, Laos, and Cambodia), those that did so reluctantly (China and Thailand) and those that outwardly challenged WHO's authority and its mandated duty and share (Indonesia and Thailand) (Davies 2012). Contrary to the criticism leveled on Indonesia and other countries on the failures and delays to meet international norms developed on US concepts of health securitization, many scholars who have objectively assessed the domestic actor-networks of these countries have concluded that the delays were primarily the result of internal domestic infrastructure and capacity failures rather than overt political intentions to deceive the international community or their internal domestic audiences about the extent of the H5N1 outbreaks (Boltz et al. 2006; Ear 2009; Coker et al. 2011; Curley and Herington 2011).

Sixty-first World Health Assembly (WHO 2008b). In fact, the sharing activities of the GISN were temporarily suspended in 2008 (WHO Regional Committee for South-East Asia 2008). NAM's recommendations were realized in the WHO's Inter-Governmental Meeting on Pandemic Influenza Preparedness in November 2008 (WHO 2008c). Ultimately though, Indonesia's claims generated almost five years of deliberation by WHO and its member states. These deliberations culminated in the 2011 *Pandemic Influenza Preparedness Framework*, which acknowledges a state's sovereign rights to its indigenous biological resources and encouraged pharmaceutical companies to engage in contractual benefit-sharing arrangements with virus-supplying countries. The WHO report is the first international document to officially recognize a national government's authority over viruses in its territory.

The WHO's projected 2005 H5N1 pandemic never occurred but it left in its wake over 120 individual country pandemic preparedness plans (UNSIC/World Bank 2007) that have been cited as a sign of success and progress in global public health security. As "boundary objects" (Star and Griesemer 1989)³⁵ they sit at the nexus between the US- and WHO-framed global public health security initiatives and the health and security of each of their respective populations. Within the actor-network of the transagent narrative they are black-boxed objects linking their respective public health and government ministries with the health and security of their respective populations. Thus, given the generally understood potential for a H5N1 crisis to greatly exacerbate existing social and economic inequalities, these plans should reflect not only the associated public health issues but also the social justice issues associated with those most

³⁵ I am drawing on Star and Griesemer's extension of Latour (translation) (1987) and Callon's (*interessement*) (1986) definitions to describe objects that "inhabit several intersecting social worlds...satisfy the informational requirements of each of them...[and] are plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (Star and Griesemer 1989, 393).

vulnerable to pandemics.³⁶ Lori Uscher-Pines et al. (2007) set out to open these black-boxed plans to see how they compared to the Bellagio Group's³⁷ *Checklist for Pandemic Influenza Preparedness and Response Plans*. See **Box 2**.

As a general summary, Uscher-Pines found that “countries were more likely to develop policies to protect and compensate those who may *become* [emphasis in original] disadvantaged by a pandemic (or the threat of a pandemic) than those who are likely to suffer disproportionately because they are already disadvantaged” (2007, 37). Not unsurprisingly Scoones and Forster, who conducted

a similar analysis, found the plans to be “long, turgid documents, developed from templates

Box 2

The Bellagio Group's Checklist for Pandemic Influenza Preparedness and Response Plans*

In the development, refinement, and testing of regional, national, and local pandemic influenza preparedness and response plans, governments and relevant institutions should:

1. Identify and enumerate both those groups who are traditionally disadvantaged and those who are likely to be disproportionately affected by preparations for an influenza pandemic, response to pandemic, and by a pandemic itself.
2. Engage disadvantaged groups and/or their representatives in the planning process.
3. Identify and address the special needs of disadvantaged groups in the context of recommendations and policies to prepare for and respond to an influenza pandemic.

* Bellagio Group at:

<http://www.bioethicsinstitute.org/wp-content/uploads/2012/12/Influenza-Checklist-English1.pdf>. Accessed November 16, 2015.

³⁶ One of the continually persistent myths proposed primarily by the United States to rationalize its public health securitization policies is that an influenza pandemic would strike equally across all classes of society. “Infectious diseases are a continuing threat to *all* [emphasis added] persons, regardless of age, sex, lifestyle, ethnic background, and socioeconomic status” (CDC 1998). But we know from recent disasters such as Hurricane Katrina and the Indian Ocean tsunami that people who are already economically and socially disadvantaged will suffer a pandemic's greatest burdens (Fordham 1999; Biermann 2006; Rofi, Doocy, and Robinson 2006; Enarson 2012; David and Enarson 2012). Murray et al. (2006) estimate that if a pandemic similar to the 1918 Spanish flu occurred today, 96 percent of the deaths would occur in the global South. Additionally, analyses of the 1918 Spanish flu deaths globally show that the lower social classes and oppressed groups had substantially higher mortality rates than the dominant or ruling populations (Sydenstricker [1933] 2006; Mills 1986; Phillips 1990).

³⁷ Although the WHO (2007c) held that pandemic influenza planning should include social justice demands of groups characterized by severe poverty or by features that contribute to subordinate social status and power, such as gender, race, ethnicity and religion, their *Checklist for Influenza Pandemic Preparedness Planning* makes no mention of this. To address this gap, an international panel of experts in public health, animal health, virology, medicine, public health policy, economics, bioethics, law, and human rights met in Bellagio Italy in July 2006 (Muula 2007; Usher-Pines et al. 2007). The meeting resulted in a “Statements of Principles” and series of concrete checklists that encourage policy makers to take the interests of the disadvantaged into account as an essential component of avian and pandemic influenza planning (Bellagio Group 2006). These principles and checklists have since become the gold standard by which all nation state pandemic influenza preparedness plans are now compared in terms of their considerations of social justice.

elsewhere [primarily from WHO and other international health organizations]... creating a false sense of security...that most certainly will not happen in practice” (2008a, 34). Unfortunately, even as H5N1 influenza pandemic preparedness officials in the global North are touting these plans as symbols of success, they are also serving as false symbols of security for the majority of the world’s population who will be most severely affected by a potential H5N1 pandemic.

As symbols of pandemic security, the plans implicitly feed the outbreak narrative discussed in the following section. They are symbols of an unquestioned reliance on science that the language of the outbreak narrative promotes. They are also self-serving reassuring symbols of survival for the dominant most powerful actors should they become disadvantaged by “the coming plague.” They implicitly ensure there will be no significant social reconfigurations in the wake of an H5N1 influenza pandemic by myopically focusing on the relationship of the H5N1 virus to medical science, government and military actors, and state structures of governance.

Outbreak Narrative (crisis to [de]stabilized networks)

Studying the controversies over exactly how to define and characterize pandemics is a good way to understand not only what is driving developments in response to H5N1, but also how these developments stabilize (or not) their associated actor-networks. A long-standing approach to empirical studies in STS has been to study moments of controversy. Latour notes that the more intense controversies become, the more allies the participants bring in, and the more technical they become. Settlement of the controversies requires “bringing friends in” and enrolling human and nonhuman allies (1987, 31). The more allies that can be brought into the network in support of a statement the more fact-like it becomes.

For example consider these “friends” enrolled in the outbreak narrative at the height of WHO’s H5N1 pandemic concerns, two extremely powerful voices on a global platform: “An outbreak could cause millions of deaths, destabilize Southeast Asia, its likely place of origin, and threaten the security of governments around the world” (Obama and Lugar 2005). In this opinion piece of the *New York Times*, then Senator Obama and Senator Lugar were adding their political voices to the scientific policy voice expressed a few months earlier by the CDC Director Julie Gerberding, who was speaking the AAAS Annual Meeting on the topic of where science meets society: “Today, [H5N1] avian influenza is the single biggest threat the world faces...this is a very ominous situation for the globe” (CIDRAP 2005; AAAS 2005). And, arguably the world’s leading expert on avian influenza, Robert G. Webster, simply asked, “When will it [H5N1] acquire sustained human-to-human transmission?” (Webster et al. 2006, 7). From an actor-network sensibility, what is interesting about the H5N1 controversy is the assemblage of actors enrolled to make the outbreak narrative case. As French and Mykhalovskiy (2013) observed in their actor-network analysis of the H1N1 “pandemic that wasn’t” (Miller 2010), to make the case

for an outbreak narrative, many heterogeneous actors – both human and nonhuman – had to be marshaled in an extended network to settle the controversy over the virus’s pandemic status. These extended networks went beyond the actual spatial and temporal distributions of the virus itself.

These spatial and temporal distributions can be seen most evidently in results from studies done by the FAO on the knowledge-attitude-practices surrounding H5N1 across the nine countries in Africa and Asia hit most severely by the virus. The FAO concluded that “poor communities and poultry farmers perceive the risk of avian influenza infections from H5N1 as very low in relation to other competing priorities...the ‘international community’ on the other hand and especially the media and the on-line community seem to be seized with outbreak narratives and disaster metaphors, conjuring up a politics of fear and blame” (2009b, 1).³⁸ According to Scoones and Forster (2008a), an overarching outbreak narrative whose features create a particular style of policy and politics dominate the international response to H5N1. And, outbreak narratives have consequences. As Wald noted, outbreak narratives can be directly related to survival rates and contagion routes; promote or mitigate the stigmatizing of individuals, groups, populations, and locales; change economies; influence how scientists and lay public understand infections; how they imagine the threat; and why they act so fearfully to some diseases but not others (2008, 3). All of these characterizations can be seen in the way governments, global organizations, scientists, and activists sought to stabilize their actor-networks in support of the outbreak narrative.

³⁸ For example, while deaths from H5N1 number in the single digits in these countries, deaths from the diseases of poverty, such as drug resistant tuberculosis, diarrheal diseases, measles, malaria, and intestinal infections number in the tens of thousands (WHO 2008a). Yet, they are not the subjects of outbreak narratives in the global North because they lack the specter of invading the Northern boundaries.

In today's world, the media – in all its forms – has a major role in constructing the biopolitics inherent in the language of outbreak narratives. For example, in 2004 there were 13 news articles in the major Western press outlets that linked the possibility of pandemics with H5N1. By contrast, in 2005, there were more than 300 and that number has steadily increased to more than 600 in 2015.³⁹ These articles are replete with disaster metaphors conjuring up politics of fear and blame. In tracing this process, King (2004) argues that the global North was primed for the outbreak narrative through the highly popular works of Richard Preston (1992; 1994) and Stephen Morse (1993b); both hypothesized that minute microbial changes in viruses could have global cataclysmic consequences. For example, while interviewing Morse for his 1992 article in the *New Yorker*, Preston asked him whether an emerging virus “could wipe out our species.” Morse cautiously speculated on the possibility of an aerosolized form of HIV causing a pandemic of “AIDS flu”: “The human population is genetically diverse, and I have a hard time imagining everyone getting wiped out by a virus...But if one in three people on earth were killed – something like the Black Death in the Middle Ages – the breakdown of social organization could be just as deadly, almost a species-threatening event” (Preston 1992, 80-81). Preston used these types of apocalyptic speculations to reframe a small successfully contained localized outbreak of Ebola in monkeys into a narrowly averted global pandemic disaster. The *American Scientist* selected both Preston and Morse's books as two of the “100 or So Books That Shaped a Century of Science” (Morrison and Morrison 1999). In addition, Laurie Garrett's book, *The Coming Plague: Newly Emerging Diseases in a World Out of Balance* (1994), which was published contemporaneously with Preston's book, gave her work a larger audience than she might have otherwise had. In the following year, Hollywood released the movie *Outbreak*, which

³⁹ These numbers are based on my search of the Google News archive using a combination of keywords for the years, 2004, 2005, and 2015.

opened at number one (Natale 1995) and was loosely based on Preston's work. Coincidental with the release of *Outbreak*, Ebola was reported in the village of Kikwit, Zaire, now the Democratic Republic of Congo (CDC 1995). This Ebola outbreak received significant news coverage in the United States and seemingly confirmed and justified the movie's alarmist speculations.

This news coverage exploited the uncertainty of when, and not if, other emerging viruses, like H5N1, might mutate from being an animal disease to a disease that would rampage through the human population, fueling the rhetoric of fear in the public imagination. There were a number of critics (Gladwell 1995; Budiansky 1995; Schwartz 1995) who argued that the media-driven "viral panic" or "viral paranoia" coverage was drowning out the real social, economic, and justice issues of emerging diseases. For example, Malcom Gladwell argued that the United States was "in the grip of paranoia about viruses and diseases," and blamed the entertainment industry for promoting the paranoia. Similarly, media scholar Susan Moeller (1999) argued that the "Ebola Standard" which disproportionately values highly contagious diseases with horrific symptoms, regardless of their actual prevalence, governs media's disease coverage. But the outbreak narratives had been unleashed and primed for the H5N1 pandemic threats a decade later.

Nerlich and Halliday (2007) have argued that the H5N1 outbreak narrative can be traced to the first article on the probable person-to-person transmission of H5N1 between two or, potentially, three women (a mother, her daughter, and the mother's aunt) in Thailand in the *New England Journal of Medicine* (Ungchusak et al. 2005). As they note, the article "seems to have been seminal in stirring press interest [in H5N1]" (2007, 53). In my opinion though, it was the accompanying editorial by Klaus Stöhr, who was the Coordinator of the Global Influenza

Program for the WHO, which was the seminal touchstone. In his editorial, Stöhr wrote, “the warning signal has been clearer than ever since 1968, when the last pandemic occurred, and there is an unprecedented opportunity to intensify worldwide preparedness” (2005: 405). And, “[t]he emergence of human cases of avian influenza H5N1 virus infection in Asia is an unprecedented warning and has given the world more time to prepare than anyone might have expected” (2005: 406). In a follow-up interview, Stöhr said, more than a billion people could fall ill in a [H5N1] pandemic, with 2-7 million deaths” (Stafford 2005).

Stöhr’s pandemic alarms were immediately picked up by the *New Scientist* in its Daily News (January 21, 2005) and added to its ongoing coverage of the H5N1 outbreaks in Vietnam. The article by Ungchusak et al. and Stöhr’s editorial were also picked up and commented on in the *British Medical Journal* (Gottlieb 2005) which further extended the outbreak narrative and was only the immediate precursor of hundreds of subsequent articles in both the scientific, public health, policy, and popular media that continued the H5N1 outbreak narrative. Lastly, in a similar coincidence of timing with Preston’s work a decade earlier, Mike Davis’ best seller, *The Monster at Our Door: The Global Threat of Avian Flu* (2005) used the personal stories of the same three woman in the Ungchusak et al. article to sensationalize and extend the H5N1 outbreak narrative. The Ungchusak et al. article, by itself, was actually a fairly obscure scientific article on genetic sequencing of autopsy samples, extremely limited in scope, and could have never served as the launching pad for a global outbreak narrative. It required Davis’ more popularized version that artfully ignored the local dimensions of the scientific results described in the Ungchusak et al. paper to extend the story of three people’s personal tragedies to a global dimension in an outbreak narrative.

In the epilogue to *Contagious*, Wald (2008) writes a stinging rebuke to Garret's (1994) distortion of the Alma-Ata principles (WHO/UNICEF 1978) in framing the outbreak narrative of emerging diseases, especially H5N1.⁴⁰ Whereas the Alma-Ata principles declared that primary health care and social and economic justice should be the foundation of international health care, Garret blithely dismissed these principles with the even more urgent "contemporary conditions of the frantic, angry place in which human beings are microbial prey" (1994, 618). Garrett concluded her book with the militarized language that became the standard vernacular for subsequent outbreak narratives warning, "our predators [emerging diseases]...will be victorious if we, *Homo sapiens*, do not learn how to live in a rational global village that affords the microbes with opportunities. It's either that or we brace ourselves for the coming plague" (1994, 620). Wald counters, "in place of the global analysis of poverty and expanded definition of health offered in the *Declaration of Alma-Ata*, instead of the vocabulary of human entitlement and global responsibility and the accompanying policy recommendations that would implement structural change locally and globally, Garrett offers predatory, border-crossing microbes" (2008 268).

Wald's characterization is more than critique though; it goes to the very essence of the complex actor-network assembled to promote the outbreak narrative that in turn exemplifies a particular style of biopower. This discourse is characterized by public fear and worry that

⁴⁰ In September 1978, the WHO and UNICEF co-sponsored a conference on public health in the city of Alma-Ata in the former Soviet Union (now Almaty, Kazakhstan). Representatives from 134 countries, 67 international organizations, and dozens of NGOs attended the conference. The conference produced an unprecedented document known as the *Declaration of Alma-Ata* on "health for all" which called for economic and social development as a pre-requisite to the attainment of health for all. It also affirmed the correlation between economic and social development and world peace through promotion and protection of primary health as a human right. At the end of the conference when the declarations were being read, WHO director-general Halfdan Mahler said, "[I]ots of people had tears in their eyes. We never thought we would come this far. That was a sacred moment" (quoted in Fleck 2008, 746). For comprehensive first-hand accounts and historical analysis of the conference, see Litsios (1978) and Fleck (2008).

permeates the public and media discourse. It marginalizes the global South and involves a public health-based construction of “the other.” It promotes Northern anxieties about globalization and fears that diseases are now literally only hours and a plane ride away. But it also supports authoritarian governments in the global South who selectively adopt aspects of the global North’s centralized public health models to maintain power (Hall and Taylor 2003). Constructing and enforcing this actor-network are the dominant organizational actors who implement the policies of disease control, surveillance, and control and the scientific experts who construct and justify their imposition and authority.

While we have yet to see the outbreak narrative in practice for H5N1, we have seen it in practice with the most recent Ebola virus. For example, since December 2013 we have watched this narrative play out with the Ebola crises in which a disease “out of Africa” threatened a world of mobile people and microbes, reaching its tentacles out to affect the powerful global North (Wald, 2008; Dry and Leach, 2010). But, this was also the outbreak narrative that – fueled by a handful of cases in the United States and Europe – finally stirred policy makers in the global North into action, mobilizing a large-scale and militarized international response,⁴¹ belated investments in experimental treatments, vaccines, and investments in basic public health infrastructures destroyed by years of civil wars and conflicts (Leach 2015).

⁴¹ See Kamradt-Scott et al. (2015) for a comprehensive analysis of the military’s role in responding to the Ebola crisis.

Conclusion

The story of the H5N1 journey is very much the story of Solzhenitsyn's observation that what we consider important, painful, and endurable depends on whether or not it is rolling up on our threshold. As such, the H5N1 journey is laden with otherness and efforts to maintain the illusive comfort and security of otherness – qualities of well being not available to those in the counter-narratives. It is also very much the story of Paul Keim's 2012 observation about why should we, in the privileged position of the global North, be telling the rest of the world what to do. And, it is very much the story in Secretary Califano's reflections about how do we determine whose *ways of knowing* as well as whose *ways of being* are more important "especially when knowledge is speculative." The conflicts inherent in each of these three intertwined observations and reflections are more than epistemic conflicts between ways of knowing. They are the fault lines of justice in ways of being between health and disease, wealth and poverty.

In the bird flu narrative, we saw how dominant actors, both at the global and state levels, sought to prevent the spread of the H5N1 virus in poultry through political policies and veterinary practices that ignored the social and economic costs to the marginalized actors most directly affected by their actions. In the public health narrative, we saw how another set of actor-networks formed when the H5N1 virus jumped the species barrier and became a global public health crisis. And lastly we explored how the outbreak narrative has come to overlay the first two narratives in the global North to promote a sense of security and "otherness" to ensure the H5N1 virus remains a part of the global South, and does not invade its Northern borders.

In each of these narratives security and power has been linked to the control of knowledge production and distribution. But there is also hope in these narratives that their

counter-narratives, which expose the relationships between health, poverty, inequality, and underdevelopment, will produce more just results – ironically, when viral fear actually touches the global North. For example, returning to the recent Ebola crises in the outbreak narrative, for all practical purposes, the global North was not enrolled to respond to the 25,000 cases and over 10,000 deaths in Guinea, Liberia, and Sierra Leone (CDC 2015b) until a single person returned to the United States with the disease and died. In fact, Margaret Chan, director-general of the WHO, recently acknowledged as much in discussing the WHO’s delayed response to the Ebola outbreak in an interview with *Science* (Kupferschmidt 2015). The Ebola response sadly echoed the 1999 US response to West Nile. The West Nile virus was first diagnosed in 1937 in Uganda and since has spread to all continents, killing thousands of people with its 10% mortality rate including a major outbreak in Romania in 1996. However, it wasn’t until three people died in a New York City hospital, that the virus was accurately diagnosed in the United States (Hayes et al. 2005). As an official from the USDA complained at the time, “the West Nile fiasco faded away from public consciousness without changing business as usual” (Jerolmack 2013, 207), so it wasn’t surprising that the Ebola crisis also caught the global North off guard.

These actions, albeit late, show that when the viral threat becomes real, dominant actors can be enrolled to disrupt, democratize, and develop more socially just responses. Hess et al. (forthcoming) have argued, “that there is room for a tool-kit that can help the knowledge-making activities of the STS field to become more analytically robust and can offer politically relevant insights and analyses by attending to the problem of structural inequality.” There is an urgent need for robust integrated investigations of “structural inequalities,” particularly those highlighting the relationship between health, poverty, inequality and underdevelopment.

Similarly, global health activist Paul Farmer (with Amartya Sen 2003; with President Bill Clinton 2013) has argued a counter-narrative that reflects the goals of Alma-Ata are not incompatible with global health reform. According to Farmer it is the “structural violence”⁴² of denied opportunities, economic deprivation, violent despots, and international organizations that harm the health of billions of people who are so distant to the North they used to be referred to as living in a “third world.” Moreover, Farmer goes on to argue that it is incumbent on academic experts to use the privilege conferred by their power and independence to articulate specific relationships between human rights with health and disease. It can no longer be acceptable to simply benefit from the largess of the H5N1 outbreak narrative while avoiding the “structural inequalities” and “structural violence” of inequities. As Crane observed in his study of a well-intended but failed Ugandan health care project that was conducted as a North-South academic partnership, “researchers in Northern academic positions benefit from the opportunities afforded by global inequalities” (2013, 169). Clearly, Farmer is placing a heavy burden on the academic expert but when that burden is balanced against the role they have already played in developing and promoting the H5N1 narratives, possibly that burden becomes less heavy.

⁴² Paul Farmer (2003; 2004) has drawn the concept of structural violence firmly into medical anthropology, extending it to discuss adverse events such as genocide, human rights violations and epidemics, and more generally, to drive home the point that inequitable socio-political and economic structures are at the root of emerging infectious disease. But, the term dates back at least as far as Johan Galtung’s (1969) usage to describe the effects of negative social structures characterized by poverty and social inequality, including racism and gender inequality. The term acknowledges the harms and damage exerted unequally, systematically, indirectly and often in a manner that comes to be taken for granted, including those associated with health. Extending the latter harm, Gilligan defined structural violence as, “the increased rates of death and disability suffered by those who occupy the bottom rungs of society, as contrasted with the relatively lower death rates experienced by those who are above them” (Gilligan 1997, 194).

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Knowledge Justice: an alternative approach to resolving the H5N1 dual-use dilemma

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Keywords: H5N1, HPAI, highly pathogenic avian influenza, pandemic, social justice, bioterrorism, bioethics, social construction of technology, tacit knowledge, dual-use dilemma, dual-use research of concern

Acronyms and Abbreviations

BSL	Biosafety Level
CDC	Centers for Disease Control and Prevention
COMEST	World Commission on the Ethics of Scientific Knowledge and Technology
DHS	Department of Homeland Security
DNA	deoxyribonucleic acid
DOJ	Department of Justice
DURC	dual-use research of concern
ECDPC	European Centre for Disease Prevention and Control
FAO	Food and Agriculture Organization of the United Nations
FBI	Federal Bureau of Investigation
GOF	gain-of-function
H5N1	Shortened reference to HPAI A(H5N1) which refers to highly pathogenic avian influenza virus of type A; subtype hemagglutinin type 5 and neuraminidase type 1
HHS	Department of Health and Human Services
HSPD	Homeland Security Presidential Directive
MSF	Médecins Sans Frontières
NIAID	National Institute of Allergy and Infectious Diseases
NIH	National Institutes of Health
NRC	National Research Council
NSABB	National Science Advisory Board for Biosecurity
OBA	Office of Biotechnology Activities
SARS	Severe Acute Respiratory Syndrome
STS	Science and Technology Studies
UN	United Nations
UNCED	United Nations Conference on Environment and Development
WHO	World Health Organization

Abstract

There have been controversies recently in the life sciences over how to articulate meaningfully and universally agreed upon principles of addressing dual-use research. The controversies are centered on the question of how to balance the desire for open publication of scientific research with the nation's security. This conundrum is known as the dual-use dilemma. Using the ongoing highly publicized H5N1 avian influenza virus research studies as a touchstone for their larger unaddressed and invisible social justice questions, this paper introduces the concept of *knowledge justice* to describe a new way of thinking about justice when knowledge questions are framed in a way to obscure justice issues. This paper examines how the tools of Science and Technology Studies (STS), especially tacit knowledge, can be applied to counter arguments that frame the H5N1 debates in the mantle of security. It also examines why the discourse of bioethics has been lacking in its ability to ask questions on the rightful ownership of knowledge when confronted with unchallenged presumptions of security. Both examinations are useful in avoiding the technical and political framings that reduce debates on research to arguments of securitized binaries while allowing for a more globally inclusive discussion of justice.

“It is as if I had been looking at a fishbowl – the glide and flick of the golden scales, the green tip, the bolt of white careening back from the gills; the castles at the bottom, surrounded by pebbles and tiny, intricate fronds of green; the barely disturbed water, the flecks of waste and food, the tranquil bubbles traveling to the surface – and suddenly I saw the bowl, the structure that transparently (and invisibly) permits the ordered life it contains to exist in the larger world” (Morrison 1992, 17).

Introduction

With apologies to Toni Morrison’s (1992) brilliant fishbowl metaphor to describe the hidden constructions of race, the question of security has become the transparent container of the social and scientific structures in this country. The bowl transparently both constrains and protects. It constrains the water from flowing out, but it also constrains the amount of water the bowl can contain. It protects the fish from dying by jumping out of the water and onto the floor, while preventing them from swimming freely. The bowl also allows us to observe the fish from afar, detached, and unengaged without the messiness of getting wet and swimming with the fish.

Since 9/11, the question of security has become so ubiquitous in our society that like the fishbowl few even question or see its presence. For example, “[a]chieving the proper balance between self-governance by the scientific community and government regulation that will permit the critical advancement of the life sciences *while seeking to protect against bioterrorism* [emphasis added] represents a significant challenge, but one that must be met to achieve national and global security” (Atlas and Dando 2006, 276). Or, “[w]ith *increasing awareness of bioterrorism threats* [emphasis added] and the next pandemic predicted by experts...” (Tyshenko 2007, 365). But for the purposes of this discussion of justice, security is also the reality that both frames and shapes the dual-use dilemma into the transparent binary that flourishes where non-messy simplifications are preferred over complex analysis. Security defines the contradictory

binary that grounds the dual-use dilemma in its inescapable debate of good versus bad. This framing misses or obscures crucial ethical insights but also results in questions that require a different hermeneutical framing to resolve.

Bruno Latour (2004) took STS scholars to task for allowing themselves to be drawn into a debate of facts rather than matters of concern. Latour suggested that the STS community was overly focused on debunking facts by demonstrating their social constructions, but in doing so allowed themselves to be drawn into debates over whether scientific facts existed as such. His challenge to the STS community to consider *matters of concern* was a way of reframing what the debates about scientific construction are actually about. His suggestion was to “add to” matters so that reality is perceived as constructed through concerns, not just facts. In the case of the H5N1 debates,¹ it’s not that the debates are partial facts, but that they are artifacts created through a framing process that excludes other ways of understanding the potential concerns at stake in that exclusion. I argue that those potential concerns are matters of justice. Rather than debating the facts of the dual-use dilemma and thus uncritically accepting the dilemma as a fact, I argue that the dual-use dilemma is heavily laden with technical and political framings that disguise the question of who counts as a subject of justice. To paraphrase Latour, matters of fact do not solely define the reality of H5N1,² nor do they represent its complete experience.

¹ Throughout this paper, I use the term “H5N1 debates” as shorthand to encompass the spectrum of political, security, and scientific discourse that began in the Fall of 2011, when the NSABB recommended censorship of Drs. Fouchier and Kawaoka’s papers prior to their publication, and continues to today.

² Throughout this paper, I use “H5N1” as shorthand for its scientifically correct reference: Highly Pathogenic Avian Influenza (HPAI) A virus, subtype H5N1, or HPAI A(A5N1); where the A stands for the genus of influenza, H5 stands for the fifth of several known types of the hemagglutinin protein, and the N1 stands for the first of several known types of the protein neuraminidase.

If we view the facts of the dual-use dilemma as also matters of concern, not just matters of technical facts subject to continuous unresolved debate, their inherent questions of justice are immediately exposed: the rightful, albeit invisible, ownership, use, and beneficiary of the knowledge claimed by both sides of the dilemma. Addressing this matter of concern requires a response as forceful as that offered by those who only see the answer to the dilemma residing in matters of fact. To return to our metaphor, experts, policy makers, and scientists debate the fishbowl as matters of fact: the dual-use dilemma that both constrains and protects. Justice requires us to question the fishbowl's very existence as a matter of concern.

This paper introduces the concept of *knowledge justice*³ as a conceptual framework for understanding the socially constructed eight-year translational arc of the H5N1 virus from being a subject of traditional indigenous healing practices in a remote jungle village of Indonesia to a subject of highly complex statecraft at the center of the dual-use dilemma in the United States. The term “dual-use dilemma” generally refers to research in the biological and other sciences that has the potential to be used for bad as well as good purposes. There are three intersecting traditional ethical dilemmas within dual-use research. First, a dilemma is created by the research itself since it is premised on promoting good in the context of its potential for also causing harm. It is also a dilemma for the researcher because of the potential actions of others who might use the original researcher's work for malevolent reasons. And it is a dilemma for governments who must decide to fund the research within the tradeoff of concern for the security of their citizens as well as their health (Miller and Selgelid 2008). So, the question becomes how do we apply

³ In the development of this concept, Gerring (1999) was extremely useful in identifying criteria necessary for concept formations in the social sciences.

principles of justice to an environment of competing interests of knowledge rather than inequities of knowledge, or which justice principles apply and which don't? Is there a utility of justice that hasn't been explored that can be useful in offering an alternative voice to resolving the dual-use dilemma?

Premised on the assertion that the dual-use dilemma should be both a question of ethics and justice, I develop the idea that knowledge can be used to avoid the technical and political framings⁴ that disguise the question of who should count as a subject of ethics and justice when policy makers are confronted with thorny problems that position science and security in opposition to one another. Giving a concept like knowledge justice an equal seat at the policy table currently stacked with competing interests of policy, security, and science could potentially open spaces for alternative ways of thinking and responding to research that is global in its execution, application, and consequences.

In 2015, we find ourselves with a convergence of current events that have highlighted the need for social scientists to engage the dual-use dilemma with new critical approaches. The scientific world has split into two polarized camps comprised of life scientists, social scientists, policymakers, and security experts publically debating the advisability and biosecurity issues of ongoing H5N1 research. In one camp, there is the Cambridge Working Group

⁴ In using the term, "framings," I am drawing on the work of STS scholar Kathleen Vogel (2013) and critical justice theorist Nancy Fraser (2010). Vogel introduces the concept of technological frames that "select and privilege purely technical factors without consideration of the social dimensions that constitute how technologies are designed, developed, and used in a particular state or non-state context" (2013, 18). In her concept of technological frames, Vogel applies Bijker et al. ([1987] 2012) social construction of technology framework to the question of technology and bioterrorism. Fraser introduces the notion of "the politics of framing" to help identify the boundary-setting dimensions of economic, cultural, and political justice that effectively serve to shut out the global poor or "non-citizens" in the global North conversations with transnational implications.

(<http://www.cambridgeworkinggroup.org>) that opposes the research on the grounds of biosafety risks and advocates for more restrictions on the availability of related research. In the other camp is Scientists for Science (<http://www.scientistsforscience.org>), which supports the research on the grounds of its public benefit potential.⁵ Each group has several hundred active members. There have also been recent highly publicized failures in biosafety protocols at the Centers for Disease Control (CDC) and other research labs (Young 2014; Nocera 2014; CDC 2015). And, the Ebola crisis in Africa exposed the inherent tensions between a state's right to security and the ethical, legal, and societal issues of life sciences research and humanitarian aid with transnational implications (CDC 2014; MSF 2014).

While none of these events are directly related, their indirect temporal conflation across the scientific, policy, and social environments reinforces the critical need for an alternate voice of justice that can slip between the horns of the dual-use dilemma. The current dual-use dilemma in the global North research and policy community over H5N1 research is not sustainable or practical and creates increasing opportunities for unintended consequences of large systems failure in the global South, whether they be social, economic, or cultural. Additionally, as we saw in the Ebola crisis, large systems failures in the global South have a tendency to boomerang back to the global North. In the following three sections, I explore the intersecting dimensions of security, ethics, and justice that are found in the H5N1 debates.

In the first section, *The H5N1 Debates and Myth of Easy Replication*, I explore how the policy makers and technical experts have framed the H5N1 from the very beginning to produce the current environment in the related science and security policies. I briefly trace the avian

⁵ In the spirit of full disclosure, I am a signatory supporter of the latter campaign.

virus's journey from its first appearance in 1996 in China to its position as a global pandemic threat and the laboratories of the world's two leading virologists, Drs. Fouchier and Kawaoka. Along the way, the virus was both the subject of bioterrorism in the United States as well the subject of intense public health interest in countries like Vietnam that suffered tremendous economic and social losses from the virus. The pandemic threat was framed initially by unquestioned acceptance of the World Health Organization's (WHO) methodologies for calculating mortality rates. It was subsequently framed by a normative acceptance of a linear deterministic model of technology that presumed published scientific research was always easily reproducible. Both framings are fertile ground for STS scholarship, especially on tacit knowledge, to expose the flaws their arguments.

In the next section, *Bioethics of Silence*, I explore the relationship of these framings to a lack of serious ethical reflection on the subject of H5N1 and the dual-use debate. As bioethicist Michael Selgelid has pointed out, "it is noteworthy that most of the debates about the dual-use dilemma have primarily involved science and security experts rather than ethicists...bioethicists have had relatively little to say about security in general, or the dual-use dilemma in particular" (Selgelid 2009, 722). In this section, I point to two considerations when examining the bioethics community's general silence on the subject of dual-use in the life sciences, especially since 9/11. The first consideration reflects the actions of a "risk society" when confronted with unknown fears. The second reflects the coincident growth of corporate university structures, funded by the unprecedented reprioritization and increase in life sciences research funding, with the slowly emergent transition of the bioethics field away from its historical technology-centric orientation.

The silence in the bioethics community provides a segue to the final section, *The Thorny Problem of Justice and Securitized Knowledge*, in which I develop the concept of knowledge

justice to extend existing justice theory as an alternative approach away from the existent technical and political framings in the dual-use dilemma. My conceptualization of knowledge justice is an integrative approach drawing on the existing theoretical underpinnings of John Rawls, Nancy Fraser, and David Schlosberg. At its core, the dual-use dilemma is a contestation of knowledge and exists because it is based on utilitarian principles. Hence, addressing the dual-use dilemma as a matter of justice requires an alternative framework of justice that Rawls provides through his doctrine of fairness. I argue that knowledge is a primary social good to be distributed fairly. But whereas Rawls saw the distribution of fairness between two parties, the dual-use dilemma has framed knowledge to exclude an important third party – those silent implicated actors. Thus, if knowledge is a social good and there is an unrecognized silent party deserving an equal seat at the table, Fraser’s thoughts on the injustices of misrepresentation, maldistribution, and misrecognition are very useful. She argues that justice for these three dimensions cannot be achieved in a nation-state framing, and that the frame itself becomes a question of justice. While Fraser would have us dismiss the dual-use dilemma frame all together as being the original source of knowledge injustice, I argue that it exists and must be accommodated. To this end, I’m drawing on the plurality of Schlosberg’s environmental justice theory. As long as cultural and institutional aspects of justice are addressed in dealing with policy issues, environmental justice theory accommodates a plurality of governance structures – *whatever works is what works best*. The dual-use dilemma is still framed as a technical and political question of the nation-state, but I offer that a concept of knowledge justice can be a useful way out of its current paralysis while offering a consideration of justice to those most in need of the H5N1 knowledge.

“The increasing tendency to conflate disaster response and warfighting is among the most marked and alarming legacies of September 11” (Kathleen Tierney 2005, 119).⁶

The H5N1 Debates and Myth of Easy Replication

The fear of global influenza pandemic has been palpable in the consciousness of the global North since the Spanish influenza of 1918. Pandemics stir deep-rooted fears and can quickly modify human behavior. Indeed, there is a very long tradition in western literature dating back to Greek literary texts, such as Homer’s *Iliad*, Sophocles’ *Oedipus the King*, and Thucydides’ *History of the Peloponnesian War*, that talk about the uncontrolled fear of contagion and its influence on society.⁷ When Jack London wrote *The Scarlet Plague* ([1912] 2008) about a society gripped by fear from a plague spreading so quickly that scientists were not able to find a specific treatment in time to stop the epidemic, he could just as easily have been referring to the actions of contemporary societies in response to the SARS outbreaks in 2003, the Ebola outbreaks in 2014, or the H5N1 virus in 2005.

In 2005, the World Health Organization (WHO) elevated the H5N1 virus to the top of its global pandemic threat list, announcing that it had the potential to kill many more people than the Spanish influenza of 1918. This pandemic concern led the NIH to commission independent studies from the world’s two leading virologists at that time, Dr. Ron Fouchier (Erasmus Medical

⁶ In her scathing criticism of the *9/11 Commission Report*, STS scholar and disaster expert, Kathleen Tierney decried the militarization of every aspect of the United State’s response to 9/11. Echoing the securitization of the H5N1 debates that shut down alternative interpretive voices, Tierney observed that “military analogies are now pervasive in discourse...the assumption that uniformed service personnel are best able to manage domestic crises is now embraced at the federal level (118).”

⁷ There are many excellent overviews on the topic of society and pandemics, e.g., Jared Diamond. 1997. *Guns, Germs, and Steel: The Fates of Human Societies*. New York: Norton; William McNeill. 1998. *Plagues and Peoples*. New York: Anchor Books; Mark Harrison. 2004. *Disease and the Modern World: 1500 to the Present Day*. Cambridge, UK: Polity; Alfred Crosby. 2009. *Ecological Imperialism: the Biological Expansion of Europe, 900-1900*. Cambridge, UK: Cambridge University Press.

Center in Rotterdam) and Dr. Yoshihiro Kawaoka (University of Wisconsin, Madison) to see if they could mutate the H5N1 virus in the lab in such a way that it could potentially be aerosolized for transmission between mammals in much the same way that the common influenza virus is transmitted. Prior to this point, there were no known cases of aerosolized H5N1 transmission between humans or other mammals. Drs. Fouchier and Kawaoka were trying to demonstrate how the virus might mutate in the lab to better understand how it could also potentially perform the same mutation organically in nature. But more importantly, if they could first demonstrate the mutation in the lab, it would give the world health communities additional advance surveillance techniques and the basic scientific research necessary to develop a vaccine in advance of an outbreak.

In 2005, the H5N1 virus was considered a public health issue in the countries hit hardest by its effects (e.g., Vietnam) and remains so until this day. Likewise, in the United States it was *not* considered a dual-use issue or of any interest to a potential bioterrorist, only a public health issue. But by the time Drs. Fouchier and Kawaoka were ready to publish their research findings over five years later, their research sparked an unprecedented controversy in the global life sciences, security, and policy communities that continues to this day.⁸ In 2011, the United States was a decade into its War on Terror and in the intervening six-year period, the H5N1 virus had ceased to be a public health issue in the United States and had become the nexus of a broader bioterrorist discourse in the life sciences and an agent of dual-use. As Ulrich Beck noted the fear of “terrorist risk leads to an extreme expansion of the domain of dual-use goods that serve both civil and military purposes” (2009, 15).

⁸ Both the *Science* and *Nature* journals have devoted extensive coverage to this ongoing controversy. Excellent comprehensive timelines and links to all their related published articles can be accessed at: <http://www.sciencemag.org/site/feature/data/hottopics/biosecurity/index.xhtml> (*Science*); <http://www.nature.com/news/specials/mutantflu/index.html> (*Nature*).

In the following section, I briefly summarize the H5N1 debate. I then devote the remainder of this section to an analysis of why and how fears of pandemic and bioterrorists have shaped H5N1 debates. My analysis draws on STS scholarship that focuses attention on the social context and character of scientific and technological knowledge, tacit knowledge, work, and artifacts. By bringing STS scholarship to bear on the H5N1 debates, we begin to expose the flaws and weaknesses in many of the normative statements about H5N1. This exposure, in turn, opens the lens to allow a broader dialogue that sets the stage for considerations of knowledge justice that we will return to later in this paper.

The highly pathogenic H5N1 virus was first isolated in 1996 in farmed geese in Guangdong province in China (Webster et al. 2006) after a large number of geese became mysteriously ill and died within 48 hours. Within a year, the H5N1 virus had made its way from the province's rural farms to the poultry farms and live-animal markets in Hong Kong. (See **Addendum A.**) This strain of bird flu distinguished itself from other previously known bird flu viruses, which are common in wild ducks and geese but are mostly "low pathogenic," meaning they do not usually cause illness or kill large numbers of host birds. This new highly pathogenic strain of H5N1 virus demonstrated an ability to readily jump from wild waterfowl to domesticated poultry and kill large numbers of the infected birds within 48 hours (WHO 2012a).

In a failed attempt to stop the spread of the virus, in 1997 Hong Kong health officials ordered Hong Kong's entire poultry population culled. More than 1.5 million birds were killed over three days. Over the next 15 years, the H5N1 virus spread to 73 countries, killed or forced

the culling of more than 400 million domestic poultry and caused an estimated US\$20 billion in economic damage across the globe (FAO 2012).

The first human infections of the H5N1 virus occurred in 1997 in Hong Kong from the same strain of the virus that caused the first outbreak in Hong Kong poultry. During this first outbreak, 18 people developed severe respiratory disease caused by the virus, and six died. Health officials determined that close contact with live infected poultry was the source of human infection in Hong Kong. More importantly though, the Hong Kong outbreak was also the first evidence that the H5N1 virus had mutated allowing transmission directly from birds to humans (WHO 2012a).

Since the first reported human deaths in Hong Kong, the WHO has reported that more than 400 people have died from being infected by the H5N1 virus and over 800 have been infected with the virus. (See **Figure 2-1.**) Since it was first identified, human cases of the H5N1 virus have been reported in 15 countries. While the case numbers are small in absolute terms, the WHO's mortality percentages are significant to our discussion. To date, 2006 has been the worst year in terms

Country	Cases	Deaths
Azerbaijan	8	5
Bangladesh	7	1
Cambodia	56	37
Canada	1	1
China	52	31
Djibouti	1	0
Egypt	346	116
Indonesia	199	167
Iraq	3	2
Lao People's Democratic Republic	2	2
Myanmar	1	0
Nigeria	1	1
Pakistan	3	1
Thailand	25	17
Turkey	12	4
Vietnam	127	64
Total	844	449

Figure 2-1. Confirmed Number of Human Cases for H5N1 Virus Reported to World Health Organization, 2003-2015 (WHO July 17, 2015)

of absolute number of human deaths from the H5N1 virus (79 deaths out of 115 human cases; a

69 percent death rate), but 2008 had the highest mortality rate percentage (33 deaths out of 44 cases; a 75 percent death rate). In 2011, 53 per cent of people who contracted the H5N1 virus died (WHO 2012a). While the annual mortality percentages vary, the generally accepted number is ~60% mortality rate (WHO 2011; HHS 2012; ASM 2015).⁹ These very high mortality percentages were the initial primary cause for the widely held pandemic concern over the H5N1 virus, and the subsequent concern that bioterrorists would coopt Drs. Fouchier and Kawaoka's research publications to manufacture their own variants of the virus as a weapon of mass destruction, or that the virus would escape from the lab causing a worldwide contagion. The WHO mortality percentages have been typically compared to the 1918 Spanish flu pandemic which killed an estimated 50 and 100 million people worldwide between 1918 and 1919, but only had a ~2.5% mortality rate while other influenza pandemics have had <0.1% mortality rate (Johnson and Mueller 2002; Taubenberger and Morens 2006).

In the fall of 2011, two independent teams of researchers led by Drs. Fouchier and Kawaoka announced plans to publish the results of their H5N1 research showing how the virus could become aerosolized through a small number of mutations and passed between ferrets. These announcements sent shock waves through both the scientific and international biosecurity communities. Up until this point, scientists had not been able to develop a new strain of the virus in the laboratory that could be aerosolized and transmitted between mammals, and it was generally considered impossible to achieve (Peiris et al. 2007; Hunt et al. 2011; Maines et al. 2011).

⁹ See Van Kerkhove (2013) for a literature review of the H5N1 case mortality rate studies.

On December 20, 2011 the NSABB, charged with protecting the nation from dangerous biosecurity threats, took the unprecedented action of recommending that the journals *Nature* and *Science* refrain from publishing the full Fouchier and Kawaoka manuscripts, even though their research had been publically funded by NIH (NSABB 2011). Formed in 2004 as an agency within NIH, the NSABB had previously been a relatively silent, ineffectual organization focused on developing criteria for DURC, scientific codes of conduct, and developing tools for identifying DURC.¹⁰ Until the Fouchier and Kawaoka papers, the NSABB had never recommended that any research be censored.

After deliberating for five weeks and interviewing both Fouchier and Kawaoka, the 23 NSABB members voted unanimously to recommend the two journals redact key parts of the manuscripts, allowing the sensitive portions to be made available to researchers on a need-to-know basis. In suddenly deciding to reverse its long standing practice of noninterference, Paul Keim, chairman of the NSABB, said, “The short-term of the negative consequences of restricting experimental details seemed small in contrast to the large consequences of facilitating the replication of these experiments by someone with nefarious intent” (Keim 2012, 1). The basis for the NSABB’s recommendation was that open publication of the research could potentially cause grave public harm under its definition of DURC. Specifically, the NSABB recommended that the “general conclusions be published, but that the manuscripts not include the methodological and other details that could enable replication of the experiments by those who would seek to do harm” (NSABB 2011).

Three months later, on March 30, 2012, the NSABB reversed its decision on partial

¹⁰ For a comprehensive analysis and discussion of the NSABB’s history and significance to this paper, see Dana A. Shea (2007), *Oversight of Dual-Use Biological Research: The National Science Advisory Board for Biosecurity*.

editorial board's decision to censor and recommended full publication of both papers claiming, “[n]ew evidence has emerged that underscores the fact that understanding specific mutations may improve international surveillance and public health and safety” (NSABB 2012a). The intervening months prompted many in the scientific community to wonder if “we were having another Asilomar moment” (Enserink 2011).¹¹ In other words, was the scientific community in need of a reset on its ability to address the public’s concerns as well as its ability to demonstrate a capacity to self-govern?

The NSABB’s initial 2011 censorship recommendation elevated a topic to the broader public that had previously only concerned the public health, veterinarian, and virologist research communities. This newfound visibility created an international media firestorm of controversy and caught the scientific community off guard. The media response echoed Roger Brent’s (2005), former president of the Molecular Sciences Institute, earlier characterization of the media’s response to biotech news events as being, “unsophisticated about biotech science, extremely vulnerable to spin, and possessing a notoriously short attention span” (4). For example, *The New York Times* referred to Drs. Fouchier and Kawaoka’s research as “An Engineered Doomsday” (2012a), and the H5N1 virus was subsequently termed the “doomsday” virus, or “superbug” in the much of the popular media (MacKenzie 2011; *New York Times* 2012b; Specter 2012; Greenfieldboyce 2012). Most news organizations generally followed the editorial tone set by a Gizmodo post headline that read, “Engineered Avian Flu Could Kill Half the World’s Population” (Philipkoski 2011). The public controversies had an echo of the Human Genome Project over 20 years earlier that saw well-intentioned potentially beneficial science

¹¹ The shorthand term “Asilomar moment” refers to the 1975 conference that established voluntary scientific guidelines and limits for conducting recombinant DNA experiments which has come to symbolize scientists’ attention to the public’s concerns and their ability to self-govern (Capron and Schapiro 2001).

stigmatized as morally bereft science and reframed in the public debate as the object of derision, vicious opposition (Reardon 2005). The international media coverage, led by the United States, almost immediately framed the controversy in the context of bioterrorism and therefore also a subject of securitization and censorship. The controversies were also framed as yet another example of irresponsible science, providing fuel to politicians that sought to use the debate to support their positions on fighting terrorism (Sensenbrenner 2012a; 2012b; Lieberman 2012; Collins 2012).

Outside of the media and politics, the scientific community and world health organizations tried to offer a competing narrative and frame the controversy in the context of the public's right to all scientific research, citing the greater public good when weighed against the extremely small risk of potential harm (WHO 2012b; ECDPC 2012). There were also a few, including members of the NSABB, who tried to voice the obvious broad social justice questions, such as who should decide when, how, where, and whether such research should be conducted when scientific research crosses boundaries of sovereignty. But these voices were drowned by the louder voices of alarm and panic over predictions of a potential bioterrorist attack.

For example, lost in the H5N1 debates were the rest of world's concerns about the virus as a matter of public health. The stark contrast between the securitized orientation and the public health orientation of the debates can be seen in a correlation of the search terms "H5N1" and "censorship" in ten major languages on Google Trends. This trend correlation shows how the debate became framed by extremes: censorship in the United States (reflecting the bioterrorism concern), and research in Vietnam (reflecting the desire for openness). (See **Figure 2-2.**) In the first few months of the NSABB announcement people in Vietnam (which has the highest death rate due to H5N1 on a per capita basis of any Asian country (UN 2013) were searching the

Internet for information on the H5N1 virus research and were more interested in searching for information about research itself. This was in contrast to those in America who were more interested in searching for information about censorship of the H5N1 virus research.

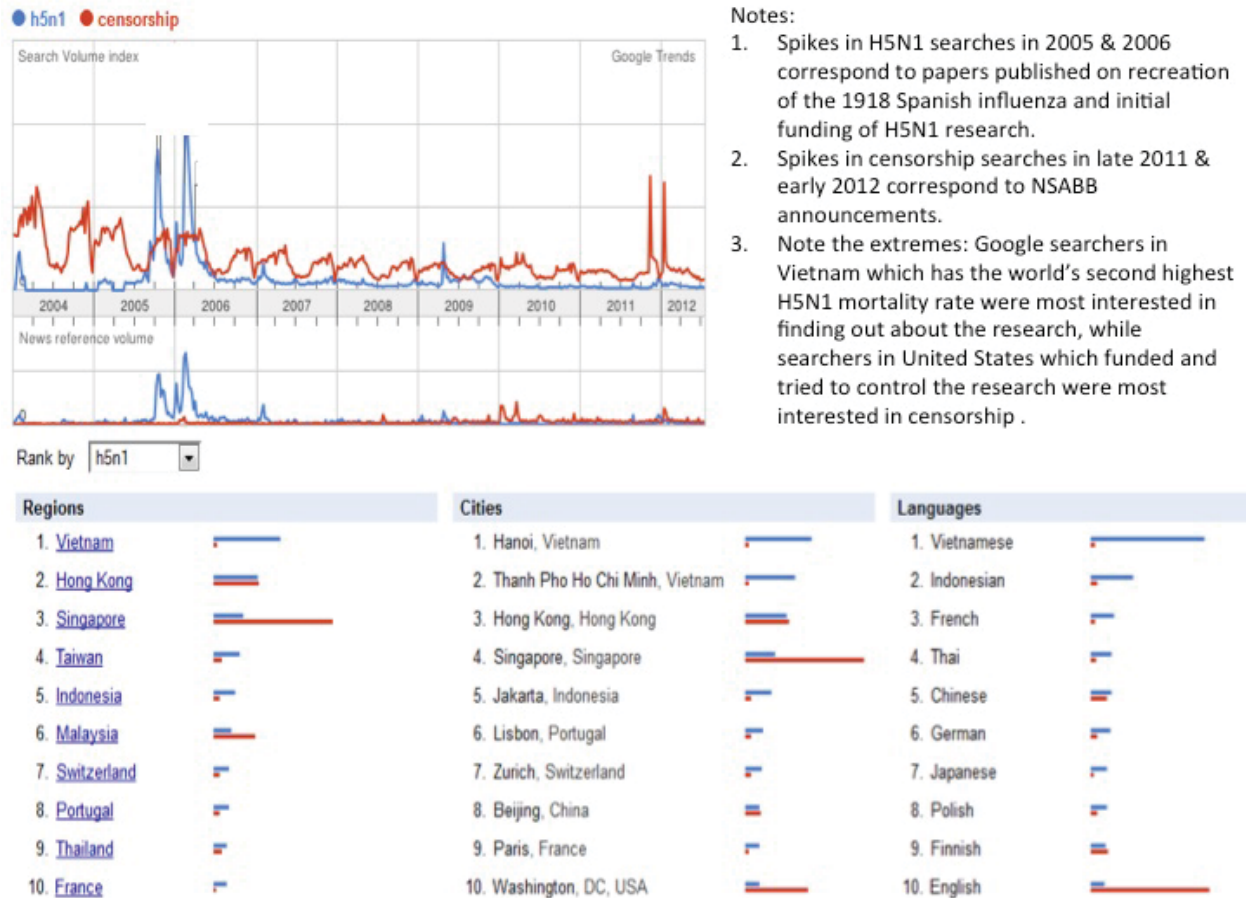


Figure 2-2. Correlation of the frequency of search terms “H5N1” and “Censorship” Between 2004-2012.

While there are several explanations for the geographical differences in search patterns, one explanation most certainly reflects the immediacy and reality of the H5N1 virus in Vietnam, whereas in America the H5N1 virus debate had become conflated with bioterrorism and the need for censorship to prevent terrorists from having access to the H5N1 research. A further indicator of these stark differences came in the February 2012 report from the European Centre for

Disease Prevention and Control (ECDPC). Reflecting both the European Union's position as well as many countries in the global South, the ECDPC took a strong stand on the subject in a lengthy report stating, "It would advocate for open publication of the findings" (2012, 2).

On February 16, 2012 the WHO convened a conference to debate this issue. There were 22 conference participants including Drs. Fouchier and Kawaoka and others immediate scientific and professional knowledge of the research. Most importantly, representatives from countries where H5N1 is currently circulating were also present for the first time in the debates. This WHO conference overwhelmingly recommended that both articles be published in full (WHO 2012b).

From this point, events began to move very quickly. A few days later, the NIH asked the NSABB to reconsider its position. On March 28, 2012, the White House published the *Policy for Oversight of Life Sciences Dual Use Research of Concern* through the NIH that called for regular review of research funded or conducted by the government on 15 pathogens and toxins. H5N1 virus research was at the top of the list (NIH 2012, 3). On March 30, 2012, the NSABB reversed its position and recommended full publication of both papers after determining the research was not as dangerous as originally thought, that redaction and distribution of the research on a need-to-know basis was impractical, and that censorship might undermine the Biological and Toxin Weapons Convention of 1975 which prohibited the use, possession, and production of biological weapons (NSABB 2012b). Kawaoka's paper was published in *Nature* on May 2, 2012 (Kawaoka et al. 2012) and Fouchier's paper was published in *Science* on June 21, 2012 (Fouchier et al. 2012). In explaining the NSABB's position to reverse itself and recommend full publication of the papers, Paul Keim, Chairman of the NSABB, said, "Why should the NSABB

be telling the world what to do? Why has not the world already had these discussions and debates?" (Keim 2012, 2).

The H5N1 debates came at a time when the United States was entering its second decade in the War on Terror that had changed the government policies towards science, which had stood since the early post-WWII days when the social contract for science was inviolate. Prior to 9/11, policies governing the life sciences were largely reflective of the four essential elements of all postwar science policy: the unique partnership between the federal government and universities for the support of basic research; the integrity of scientists as the recipients of federal largesse; the easy translation of research results into economic and social benefits, and the institutional and conceptual separation between politics and science. The events of 9/11, however, conflated with the subsequent anthrax attacks in the US mail, intensified the ruptures already noted in the linear narrative of science and technology by other STS scholars (Jasanoff 1990; Gibbons et al. [1994] 2010; Sarewitz 1996). The new tenet was that if given a chance, bioterrorists would continually seek to conscript basic life science (presumably only US funded life science) for social harm, and therefore biosecurity concerns became the prevailing discourse to the exclusion of alternative considerations. However, as I assert below, there were three important signs that this tenet could be challenged: an unquestioning acceptance of the WHO's research methodologies and results; an inconsistent application of policies governing the research publication; and a deterministic securitized discourse based on the myth of easy scientific replication.

The H5N1 debate can be largely traced to the WHO's original 2005 projection that H5N1

in humans has a ~60% mortality rate. Prior to 2005, H5N1 was viewed as a potential public health influenza issue (or, a veterinary issue), but after the WHO's announcement the discussions, policies, and media coverage focused only on the mortality numbers in humans. These numbers took on what Porter (1995) referred to "totemic significance" or numbers with unquestioned authority. It wasn't until after almost a decade of the War on Terror that the scientific world began questioning the science behind the WHO's ~60% number.¹² As Morens and Taubenberger have noted, "[f]or over a decade, we have heard predictions that avian influenza H5N1 may be nearing pandemicity and that the pandemic will be catastrophic when it arrives. These predictions derive from a belief that H5N1 may be only a few mutations away from full adaptation to transmissibility and from its allegedly high propensity to kill 60% of everyone effected" (2015, 1364).

The first study to question the WHO's case count methodology was conducted in Thailand (Ungchusak et al. 2005). The study was based on a cluster of three infections that started with an 11-year-old girl who fell ill in September 2004. She lived with an aunt while her mother worked in a distant city. Both the aunt and the mother, who came home to care for the girl, got sick; the mother and daughter died. All three clearly had H5N1. A throat swab confirmed it in the aunt and the virus was found in tissue from the mother. But the hospital mistakenly thought the girl had dengue fever. By the time they realized these were three H5N1

¹² In order for a case of H5N1 infection to be confirmed by WHO, a person must have an acute, febrile respiratory illness (temperature >38C/100.3F) with known H5 exposure in the 7 days preceding symptom onset and have molecular confirmation of H5 infection by a WHO-approved laboratory (WHO 2006a). This definition does not allow for asymptomatic infections and essentially requires that a person actively seek medical help at a hospital that is equipped to draw samples and ship them to an approved laboratory. Given that rural populations in the global South are the most commonly affected by H5 viruses, it seems unlikely that even a small fraction of the total number of infected cases has been accounted for under the WHO surveillance system. Also, the fatal cases that have been reported are most likely to have been caused by mega-doses of H5 inhaled by the patients who are living in close contact with infected poultry. Transmission involving small doses of virus (as observed under regular aerosol transmission conditions) may not result in symptoms (Palese and Wang, 2012).

cases, the daughter had died and her body was cremated. The WHO counted this as two cases, not three, reporting 100% mortality in this single cluster, instead of the correct 66%. Although this study was published in the *New England Journal of Medicine*, it drew little attention and certainly didn't influence the way the WHO continued to conduct its H5N1 case counts. Moreover, I can find no similar studies for another six years.¹³

Similarly, in 2010 the FAO-OIE-WHO jointly published the summary of a small meeting of technical experts in 2008 to examine “why only certain humans have been infected with H5N1 in the face of massive exposure in some communities” (FAO-OIE-WHO 2010, 1). This was the first official acknowledgement that something might be amiss in the ~60% number. The committee concluded that it was “not possible to predict what specific combination of mutations would be required to transform H5N1 into a pandemic virus. It was also not possible to predict whether H5N1 would retain its high mortality if it were to become easily transmissible among humans” (FAO-OIE-WHO 2010, 4). The committee urged experts and policy makers in both the veterinarian and public health communities to not focus on WHO's single high mortality number and its pandemic implications. They concluded that avian influenza viruses (H5N1 and other subtypes) are continuously circulating and evolving in unknown ways with unknown effects to both animals and humans and that a singular focus on one virus could be detrimental to the larger question of poor influenza surveillance in most of the world. However, like the Ungchusak et al. earlier article, this report drew little attention either within the WHO or other technical and

¹³ In an interesting example of the media sensationalism around H5N1, Mike Davis, author of the best seller *The Monster at Our Door: The Global Threat of Avian Flu* (2005), based the Preface with his account of this same family cluster and while he referenced the Ungchusak et al. study, he ignored the significance of the study's findings in miscounting the actual numbers of cases. In an attempt to personalize a pending pandemic, Davis says “The threat of avian influenza – a plague-in-the-making that the WHO fears could kill as many as 100 million people in the next few years – is perhaps most movingly exemplified by the story of Pranee Thongchan and her daughter Sakuntala [referring to the mother and daughter in the Ungchusak et al. study] (4).”

policy communities.

The first major scientific study to question the logic of the WHO's case count methodology was conducted by virologist Benjawan Khuntirat, from the US Armed Forces Research Institute of Medical Sciences in 2011. Khuntirat's team studied 8500 rural Thai villagers who lived in close daily contact with their poultry across eight regions of Thailand with recent H5N1 poultry infections. They concluded that the H5N1 virus mortality number was about 1.3%. They also found that as many as 9% of the rural Thai population had been subclinically infected (no physical symptoms) by the H5N1 virus (Khuntirat et al. 2011).

Similarly, Taia Wang, Michael Parides, and Peter Palese (2012) of Mount Sinai School of Medicine analyzed the 20 largest studies of rural farmers across Southeast Asia and concluded that the mortality numbers might be in the 0.2% to 5.6% range, but certainly orders of magnitude less than WHO's percentages. As they noted, "H5N1 viruses would be of no interest to the NSABB if not for the case mortality rate of more than 50% that is currently reported according to the WHO definition" (Palese and Wang 2012, 2212).

More recently, in the largest and most authoritative major study to date, published in the *Journal of Infectious Diseases*, Gomma et al. (2015) have called the entire WHO regiment for calculating mortality rates into question and have suggested that the true numbers may be 1 death for every 580,000 cases of human H5N1 infection; equivalent to less than a 0.0002% lethality rate and orders of magnitude less than either the lethality percentages of the 1918 Spanish flu or other influenza pandemics. Their three-year study in Egypt (which has experienced a higher H5N1 infection and fatality rate than any other country since 2009) was the first to use a large poultry-exposed population and a controlled poultry-unexposed population of rural farmers

across multiple occurring seasons since veterinarians have long known the H5N1 infestations in poultry follow a seasonal pattern. Morens and Taubenberger (2015) independently analyzed the results of the Goma et al. study and compared it with five other less extensive studies from China, and also concluded that a single death in approximately 580,000 cases of H5N1 infection was probably realistic. Additionally, their findings were remarkably similar to another not quite as extensive study conducted on Nigerian poultry workers at the same time by Nigerian virologists (Okeye et al. 2014).

The second missed sign was the inconsistent application of policies governing H5N1 research that failed to recognize the global nature of H5N1 research and its non-securitized importance to other countries. In the middle of the H5N1 debates in the United States, Chinese researchers published two studies that used almost identical GOF techniques as Drs. Fouchier and Kawaoka to create aerosolized variations of the H5N1 and H7N1 viruses that were transmissible in mammals (Y. Zhang 2013, Q. Zhang 2013).¹⁴ Hualan Chen of China's National Avian Influenza Reference Laboratory in Harbin, China led both studies, published in the journal *Science*. In a remarkable contrast to the negative treatment Drs. Fouchier and Kawaoka received in the media just one year earlier, the journal *Nature* named Chen one of the top 10 scientists in the world for her work with H5N1 viruses (Butler 2013).

Even more recently, Drs. Fouchier, Kawaoka, and 20 co-signers (2013a; 2013b)

¹⁴Gain-of-function (GOF) research generally refers to genetically engineering an increased transmissibility, virulence, or host in a range of pathogens. The intent of GOF research is to try and create in the laboratory enhanced pathogens prior to their natural mutation process in the wild to improve public health surveillance capabilities and the ability to potentially create vaccines in advance of an epidemic. With specific regard to the Obama Administration's temporary ban on GOF research, Francis Collins, Director of the National Institutes of Health stated, "For purposes of the deliberative process and this funding pause, 'GOF studies' refers to scientific research that increases the ability of any of these infectious agents to cause disease by enhancing its pathogenicity or by increasing its transmissibility among mammals by respiratory droplets (NIH 2014)."

announced their intention to build on their earlier H5N1 research to demonstrate how the newly isolated and highly lethal H7N9 virus could also become aerosolized and transmitted between mammals under certain conditions. Dr. Perez (Sutton et al. 2014) of University of Maryland, also recently announced that he had in fact successfully demonstrated that possibility. And then in the same month, Dr. Fouchier (Linster et al. 2014) also published new research that showed the H5N1 virus could be mutated and aerosolized even more quickly than previously demonstrated. Both of these articles were approved by the NSABB prior to publication, there was no media sensationalizing the bioterrorist implications of these studies, and there were no political calls for their censorship.

The question then becomes, how can research on the same subject using similar techniques be of interest to bioterrorists in 2011 and therefore subject to potential censorship, and yet two years later be seen as unrestricted legitimate research? The inconsistent application of policies governing this research introduces the final and in many ways, most important missed sign that could have exposed flaws in the H5N1 debates. As STS scholars Sonia Ben Ouagrham-Gormley and Shannon Fye have pointed out, the unasked question which undermines the entire dual-use dilemma, and H5N1 debates in particular, is “under what conditions could these experiments be reproduced, if at all, by malevolent actors using only published data?” (2014, 1). The H5N1 debates were based on an unchallenged assumption of technological determinism that projected a bioterrorism threat that was well beyond the capability of even the Soviet Union’s 20-year state sponsored bioweapons program.¹⁵

¹⁵ For a comprehensive analysis and comparison of the Soviet Union’s bioweapons program in relation to the H5N1 debates, see Sonia Ben Ouagrham-Gormley (2014), *Barriers to Bioweapons: The Challenges of Expertise and Organization for Weapons Development*. In her book, Ben Ouagrham-Gormley argues, “the challenge of developing biological weapons lies not in the acquisition but in the use [expertise and knowledge] of the material and technologies required for their development (2).”

Engaged STS scholarship from its history of laboratory studies would have immediately noted that hidden laboratory idiosyncrasies, that aren't published in research findings but contribute to experimental success, frequently prevent replication elsewhere. Fears that Drs. Fouchier and Kawaoka's papers could be replicated by bioterrorists "ignored the fact that science is a cumulative process where knowledge is acquired and built through many years of personal and collective experimentation...it is neither easily acquired nor easily transferred, and even less so by means of published articles" (Ben Ouagrham-Gormley and Fye 2014, 2). STS scholars Harry Collins and Michael Lynch noted the same phenomenon 30 years earlier in their laboratory studies when they concluded that for some scientific tasks, even highly skilled practitioners are not able to competently carry out a task without prior training in the specific lab that wrote the published technique because of particular local, personal dimensions of scientific and engineering practice (Collins 1985; Lynch 1985).

In another example of how the irreproducibility argument was never connected to the Drs. Fouchier and Kawaoka papers, at the same time these debates were occurring the NIH was also rethinking its approach to reproducibility. In 2011, it revealed that much of its funded research could not be reproduced and that it was developing new guidelines to improve the experimental reproducibility in the life sciences. For example, in 2011 the drug company Amgen reported that it failed to reproduce 89% of the findings from 53 major cancer-related papers. In 2012, the pharmaceutical company Bayer in Germany reported that it could not validate the results of two-thirds of its own preclinical studies (Wadman 2013). These studies were only the most recent confirmations of the "reproducibility crisis" that began after John Ioannidis's influential 2005 work, which showed most medical research findings were false and the experiments that produced those false findings could not be reproduced.

In another example that demonstrates myth of reproducibility that is even more relevant to this paper is the fact that scientists at the Soviet Union's Kazakh anthrax production plant were unable to successfully produce the anthrax weapon developed by another facility within the Soviet bioweapons program. This failure came in spite of having access to over 400 pages of documents describing the anthrax production process and ample access to the original technologies (Ben Ouagrham-Gormley and Vogel 2010).

Moreover, engaged STS scholarship would have readily noted that the results of neither of Drs. Fouchier and Kawaoka's papers could have been reproduced without the tacit knowledge and expertise of a large team of postdocs, graduate students, and lab technicians who actually conduct the day-to-day enterprises of all complex research projects for many years prior to the final research reports. For example, while Dr. Fouchier's actual experiments took four years to complete, it took 10 years to set up the lab and prepare the experiment (Carvajal 2011). In both studies, it was these junior scientists and technicians who saw the first signs that they had created new strains of the H5N1 virus that were transmissible from one ferret to another through sneezing and coughing. For Ron Fouchier's team in Rotterdam, it happened in late June 2011, when a test suggested that a ferret housed in a cage adjacent to an infected one had traces of the H5N1 virus in its airways. "We were very excited," Herfst [a postdoc under Fouchier] said. "When we showed it to Ron though, he just said: 'Calm down, and do it again. It may be an error' " (Enserink 2012).

The significance of the combination of unique laboratory conditions and expertise to research outcomes was also demonstrated by the University of New York-Stony Brook virologists who synthesized poliovirus in 2002. They repeatedly emphasized the importance of maintaining "sameness" in their laboratory routines, materials, and technicians. This poliovirus

synthesis hinged upon a well-documented and seemingly simple, but highly volatile and nearly irreproducible process. To cope with these uncertainties, for 13 years Stony Brook laboratory personnel adopted a ritualistic approach to their work, insisting on using the same equipment, technicians, ingredients, laboratories, and processes (Ben Ouagrham-Gormley 2013). Proof of the importance of laboratory-unique conditions, was that one of the post-docs who spent 6 years in the New York laboratory on the poliovirus could not subsequently replicate his own work once he returned to his home laboratory in Belgium (Vogel 2013).

In two additional recent examples, the Reproducibility Project: Cancer Biology and the Many Labs Replication Project graphically demonstrated just how difficult it is to reproduce highly complex biological scientific research (Kaiser 2015). The Reproducibility Project is currently trying to replicate the key findings of the 50 most important cancer research projects conducted and published between 2010-2012 in scientific peer reviewed journals. The project's leader, cancer biologist Elizabeth Iorns, noted "amassing all the information needed to replicate an experiment and even figure out how many animals to use proved more complex and time-consuming than ever imagined. Principle investigators had to dig up unpublished notebooks and raw data files, track down long-gone postdocs and graduate students, and the project became mired down in working out material transfer agreements with universities to share plasmids, cell lines, and mice" (Kaiser 2015, 1413). The project's experience is repeatedly demonstrating the necessity of constant long-term communication between the scientists, lab technicians, postdocs, graduate students, administrators, instrument manufacturers, and biologic material suppliers between the replication labs and the original research labs, even before attempting to reproduce the findings. Simply reading the original researchers' published studies was not even a starting point towards reproducibility. As one participating scientist put it, "you can't give me and Julia

Child the same recipe and expect an equally good meal” (Kaiser 2015, 1412). After two years of work, including participation by many of the original researchers, and extensive funding from the Arnold Foundation, the project has yet to replicate a single experiment. The Many Labs Replication Project (Klein et al. 2014) has had some success in reproducing 10 of 13 psychological studies, but at a tremendous cost that far exceeded the original research costs. Their replication studies were only successful after the collaboration of 36 scientific research groups, working in 12 countries, and conducting experiments on 6,344 volunteers.

STS scholar Kathleen Vogel examined the H5N1 debates through a different lens, the intelligence community’s perspective, and concluded their original advice to the NSABB in 2011 was flawed: “US intelligence analysts did not have adequate social and material resources to identify and evaluate the tacit knowledge, or know-how, that underpins dual-use experiments such as those in the H5N1 case” (Vogel 2014a, 41). As a result, intelligence analysts and policy makers focused their attention on the potential acquisition of technical facts while failing to take into account other important methods of knowledge acquisition, such as tacit knowledge. Building on the earlier tacit knowledge work of STS scholar Harry Collins (1985; 2001), Vogel noted that tacit knowledge is a form of scientific knowledge that is not reproducible only to material factors or pieces of explicit information, but involve important conceptual, sensory, and hands-on knowledge. The importance of this tacit knowledge is one of the most significant mitigating arguments to the linear determination arguments that have been consistently made to justify the securitization of the life sciences, e.g., while it may take 10 years in a lab today, it will only take weeks in a garage tomorrow (Vogel 2014a).

As Tierney noted at the beginning of this section, in the United States’ search for security against terrorists, the military and matters of security have become increasingly integrated with

other political and social institutions. Rappert, Balmer, and Stone made this same observation, but added this new securitized landscape has remained of “peripheral concern to the STS community” (Rappert, Balmer, and Stone 2008, 731). While some in the STS community have applied the scholarship of tacit knowledge and social construction to open the lens on the dual-use debates by drawing into question the normative assertion of scientific replication, the H5N1 debates remain largely a debate of technical facts. This technical framing excludes those not privileged to the technical knowledge thus presenting an ethical dilemma over the rightful ownership, production, and access to knowledge that I address in the following section.

“Hard times are coming, when we’ll be wanting the voices...who can see through our fear-stricken society and its obsessive technologies to other ways of being” (Ursula Le Guin [1975] 2004).¹⁶

Bioethics of Silence

May 22, 2006. In a remote jungle village, Kubu Sembilang, of the Karo Regency in North Sumatra Province of Indonesia, Dowes Ginting, age 32, died from an H5N1 virus that had successfully managed the difficult mutation from birds to humans (WHO 2006, Gale and Anjani 2006). During the previous two weeks, Ginting had watched the virus kill his brother, two sisters, and three children while undergoing the prescribed treatments of antiviral drugs and Tamiflu. When he too began coughing and developing fever, Ginting feared he too would succumb from the medical treatment, and fled from the hospital back to his ancestral village. Fears by the international health organizations that he was patient zero of a pending global pandemic made Ginting the most wanted man in Indonesia. Over the next three days after fleeing the hospital, he put his survival faith in Suherman Bangun, a local shaman. Bangun applied a regime of red beetle juice that he spat over his body and a mixture of cooking oil and *beras kencur* (pounded rice and ginger) that he rubbed into Ginting’s muscles.

On the morning of the fourth day, Ginting succumbed to the same virus as his relatives. His death and those of his family members were the first recorded instance of the H5N1 virus being passed from a bird to a human and then on to another human. Or, in the Ginting family case, from a chicken to one family member working in a poultry market and then from her to eight other family members...seven of the nine Ginting family members died within two weeks of the initial bird-to-human H5N1 virus transmission (Sipress 2009).

When Drs. Fouchier and Kawaoka’s H5N1 research became public in 2011, the scientific, policy, and security communities framed their research in the language of bioterrorism immediately casting it into the dual-use dilemma. The debates surrounding the research’s publication centered on the presumed ease by which terrorists could use their research for malevolent purposes. There was no discussion in the bioethics or justice communities over who should decide when, how, where, or whether such research should be conducted. Nor was there

¹⁶ From Le Guin’s “Speech in Acceptance of the National Book Foundation Medal for Distinguished Contribution to American Letters.” Available at http://www.ursulaklequin.com/UKL_info.html.

any discussion about the ethics and considerations of justice over scientific research that crosses nation state boundaries. In fact, it was only recently that the NSABB acknowledged that there might be an ethics component in its deliberations over the H5N1 debates (Selgelid 2015). The bioethics community's silence over the H5N1 debates reflected the research of other scholars (Angrist 2009; Lunshof et al. 2008) on the previous failures of the bioethics community to address the social constructions of the human genome project. While these scholars focused on the need to frame bioethics in the genome project as an issue of justice, in this section I explore two additional considerations when examining the bioethics community's silence on the subject of dual-use in the life sciences since 9/11. The first consideration reflects the actions of a "risk society" when confronted with unknown fears. The second reflects the coincident growth of the corporate university structures, funded by the unprecedented reprioritization and increase in life sciences research funding, with the slowly emergent transition of the bioethics field away from its historical technology-centric orientation, such as reproductive technologies.

The H5N1 debates offer a unique intersection of influenza pandemic fears and uniquely deterministic American fears of bioterrorists continuously seeking new weapons of mass destruction. Both sets of fears are set against the larger backdrop of the exhaustion that sociologist and legal scholar Boaventura de Sousa Santos claims to "haunt the Western, Eurocentric critical tradition that manifests itself in a peculiar and diffuse uneasiness expressed in multiple ways: irrelevance, inadequacy, impotence, stagnation, and paralysis" (2014, 19). For the purposes of our discussion, this uneasiness and paralysis can be viewed both as a general failure of the bioethics community to move beyond a Western focus of autonomous individuals as well as a failing to question the normative assumptions underlying the securitized research decisions and funding prioritizations that were made in the name of biodefense.

In 2006 Doves Ginting fled an Indonesian hospital in fear of the Western treatments that he believed had just killed six members of his family. He fled back to his ancestral village in the jungle, placing the trust of his health and security in the familiar and known: local medical practices and practitioners, far removed from the rarified global North world of biosafety level laboratories and debates over the securitization of H5N1 knowledge. What made Ginting and his family special was that they were thought to be the first confirmed case of a predicted mutation in the H5N1 virus (WHO 2006b) allowing for human-to-human transmission that could lead to a global pandemic (Chen et al. 2004). All previous human deaths from H5N1 had been the result of extended direct bird-to-human contact (WHO 2005). At the time, biostatistician Ira Longini and advisor to the WHO and CDC noted, “It’s a good example of what the beginning of a pandemic outbreak might look like. You would expect familial or hospital-based outbreaks and clusters” (Gale and Anjani 2006).

Ginting’s disappearance from the hospital immediately set off international health alarm bells in the WHO and CDC over the fear of potential global contagion. These alarm bells had been primed for going off previously when the WHO announced that a pandemic created by H5N1 mutating from transmission between birds to transmission between humans could cause 5-150 million deaths worldwide (Nabarro 2005). This would create a global pandemic on the order of the 1918 “Spanish Flu” pandemic that caused an estimated 50-100 million deaths (Johnson and Mueller 2002; Taubenberger and Morens 2006). But Nabarro wasn’t alone in his predictions. Most contemporary infectious diseases experts also believed that the world was on the verge of an influenza pandemic (Webby and Webster 2003; WHO 2004; 2005).

Against this backdrop of H5N1 pandemic fear, the War on Terror was in full operation creating its own vocabulary of bioterrorism designed to instill fear. The United States was hunting for Saddam Hussein's nonexistent biological weapons production facilities. Closer to home, the Department of Justice (DOJ) and FBI were hunting for the perpetrator(s) of the anthrax laced letters that killed five Americans and hospitalized 17 others, the only deaths in US history from a bioterrorist attack (Tucker 1999). In April 2004, the (2002, n. pag.) issued "Biodefense for the 21st Century" otherwise known as Homeland Security Presidential Directive 10 (HSPD-10) which stated, "biological weapons in the possession of hostile states or terrorists pose unique and grave threats to the safety and security of the United States and our allies" (White House 2004). And then-Senator William Frist who served as Senate Majority Leader from 2003-2007 and co-sponsored the Bioterrorism Preparedness Act of 2001, said in 2005, "The greatest existential threat we have in the world today is biological...an inevitable bio-terror attack [would come] at some time in the next 10 years." Frist went on to call for a project in size and scope of the Manhattan Project, which developed the atomic bomb during World War II (Mishra 2005). And, of course, the now infamous "Fink Report" (2004)¹⁷ which precipitated and shaped much of the subsequent H5N1 bioterrorism dual-use debate, stated in its

¹⁷ In 2002, the National Academies convened the Committee on Research Standards and Practices to Prevent the Destructive Application of Biotechnology chaired by Dr. Gerald Fink of Massachusetts Institute of Technology (MIT). The committee was charged with considering ways to minimize threats from biological warfare and bioterrorism without hindering the progress of life sciences research. The Committee's 2004 report, *Biotechnology Research in an Age of Terrorism*, developed seven recommendations (including establishment of the NSABB) to ensure responsible oversight for biotechnology research with potential bioterrorism application. The significance of the Fink Report to this discussion is its definitions of seven classes of experiments that might warrant extra discussion or review prior to their publication, known as dual-use research of concern (DURC). These experiments include: those that would demonstrate how to render a vaccine ineffective, would confer resistance to therapeutically useful antibiotics or antiviral agents, would enhance the virulence of a pathogen or render a nonpathogen virulent, would increase transmissibility of a pathogen, would alter the host range of a pathogen, would enable the evasion of diagnostic/detection modalities, or would enable the weaponization of a biological agent or toxin. These experiments were presented without context, particularly with regard to what terrorist organization might be interested or capable of conducting these experiments, and defined a logical progression of linear determination in life sciences research that has subsequently been proven false.

opening summary:

The great achievements of molecular biology and genetics over the last 50 years have produced advances in agriculture and industrial processes and have revolutionized the practice of medicine. The very technologies that fueled these benefits to society, however, pose a potential risk as well — the possibility that these technologies could also be used to create the next generation of biological weapons. Biotechnology represents a “dual-use” dilemma in which the same technologies can be used legitimately for human betterment and misused for bioterrorism (1).

In July 2008 congressional testimony, Jeffrey Runge, an assistant secretary at the Department of Homeland Security (DHS), claimed that, “The risk of a large scale biological attack on the nation is significant. We know that our terrorist enemies have sought to use biological agents as instruments of warfare, and we believe that capability is within their reach” (Runge 2008, 2).

Runge went on to say, “[w]e have determined that al-Qaeda seeks to develop and use a biological weapon to cause mass casualties in an attack on the homeland. Our analysis indicates that anthrax is a likely choice; and a successful single-city attack on an unprepared population could kill hundreds of thousands of citizens” (Runge 2008, 3).

Other examples of the general tenor include successive reports and special commissions emphasizing the threat of bioterrorism that were released during the fall of 2008. In October 2008, the *Washington Post* reported that unidentified “senior military officials and national security experts say major threats before and after the elections include an al-Qaeda strike on the United States . . . as well as a terrorist attack involving nuclear, biological or chemical weapons (Tyson 2008).” In September 2008, the Partnership for a Secure America released its evaluation of US efforts to prevent nuclear, chemical, and biological terrorism since 2005, and maintained that “a nuclear, chemical or biological weapon in the hands of terrorists was the single greatest threat to our nation” (Spencer 2008). Also in September, the congressionally mandated Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism

previewed its report. The commission's co-chair, former Senator Robert Graham stated, "My own assessment at this point is the more likely form of attack is going to be in a biological weapon" (Gorman and Crawford 2008). Terrorist expert for the Congressional Research Service Audrey Cronin's (2003) opinion that it was highly unlikely any terrorist organization would have the resources or motivation to mount a biological attack on the United States was certainly the exception during this period and largely ignored.

The vocabulary of bioterrorism, especially the unquestioned acceptance of its existence, and the securitization of research in the life sciences that could have a potential dual-use was strong enough to silence most counter discourse. The question then becomes why the silence in the bioethics community, or, why didn't the bioethics community take up the inherent questions of ethics in the dual-use dilemma, or question the ethics of the policies resulting from the bioterrorism vocabulary? Brian Rappert (2010; 2013; 2014) has been one of the few scholars to take on these questions. As he notes, "the ethics discussion about the multiple potentials of the life sciences [referring to the dual-use debates] have been characterized by silences and absences" (2013, 349). Bioethicist Michael Selgelid has repeatedly offered that the dual-use dilemma in the life sciences is inherently a dilemma of ethics (2007; 2009; 2013; Selgelid et al. 2009; Selgelid et al. 2011). As he notes, "[i]ssues regarding responsibilities, harms, benefits, and values – and, ultimately, what ought to be done – are exactly the kinds of things that ethics is about" (2013, 7). And while Selgelid may be correct, the difficulty with his conception is that it implies a universal understanding of these issues that are often seen in conflict with the current dominant US security orientation that includes bioterrorism as a normative assumption of dual-use in the life sciences. The ethics of dual-use are not universally shared in places, primarily the

global South, where bioterrorism is viewed as a Western problem and dual-use is an unaffordable luxury when compared to more pressing local priorities (Bezuidenhout, 2014). As ethicist Henk ten Have (2013) noted, the field of bioethics needs to go beyond a Western-centric focus on human beings as autonomous individuals, and emphasize the interconnectedness of human beings and the interrelations between human beings and the environment, through additional principles such as solidarity, social responsibility, and benefit-sharing. Similarly, legal scholar Rebecca Tsosie (2007) has argued that this US dominant form of ethics is built from concepts of individual ownership, privacy, and property that presume a particular set of cultural values and make it hard to recognize the values and lives of many. So despite the seemingly inherent ethical nature of the dual-use dilemma, particularly with regard to its implications for the global South, the dilemma has been conceptualized as either a security or technical problem that the bioethics community has been reluctant to engage (Kuhlau et al. 2012; Kuhlau 2013).

I began the discussion above with a brief story of personal fear caused by the H5N1 virus in a remote village of Indonesia in 2006 and a brief summary of the fear of both influenza pandemic and bioterrorists, as a part of the War on Terror, that erupted into the public conscious with the H5N1 dual-use debates in 2011. In the first story, fear was stoked by believing that family members were dying from Western medicine, and in the second, fear was stoked by the conflation of influenza pandemic and the attacks on 9/11 combined with the anthrax attacks a week later. What links these two stories is the production of fear produced by the H5N1 virus as it got swept up into the bioterrorism discourse along with all dual-use life sciences during the War on Terror.

Psychologist and risk theorist, Paul Slovic, has written a great deal on the effects of fear on society (Slovic et al. 1980; Slovic 1999; Slovic and Weber 2002) noting its volatility as a political commodity. He notes, that “[society] appears to react more strongly to infrequent large losses of life than to frequent small losses” (Slovic et al. 1980, 209). Slovic identified dread as a higher-order characteristic of risk, which correlates closely with a strong societal desire for risk reduction. In an example of how social psychology theory was also used to frame the H5N1 pandemic fears, in 2002 WHO echoed Slovic’s characterization noting, “[t]he higher the dread factor levels and the higher the perceived unknown risks, the more people want action to reduce those risks, including stricter government regulation and legislative controls” (WHO 2002, 32).

Andrew Price-Smith distinguishes between “outbreak events” and “attrition processes” (2002, 15-16). Outbreaks of bubonic plague (India in 1994) and Ebola (Zaire in 1995; Guinea, Sierra Leone, and Liberia in 2014) generated widespread fear and panic, mass out-migrations, military quarantines, and considerable economic damage. By these definitions, we can also include the near simultaneous outbreak events of 9/11 and the anthrax attacks in this category that produced irrational fears of additional imminent bioterrorist attacks. In fact, Ulrich Beck (2009) specifically referred to 9/11 as a “cosmopolitan event,” or the type of event that creates a sense of solidarity based on a unified understanding of a specific risk that concentrates the minds of people, the media, and politicians.

The immediate result of 9/11 and the anthrax attacks appeared to be a concentration of the fear of the unknown on society. And, while the US government was able to immediately locate the physical source and perpetrators of 9/11 and respond with military action, it was unable to identify the perpetrators of the anthrax attacks for six years resulting in a prolonged period of fear-induced irrationality. The result was a large increase in government spending to

fight what was thought to be the most probable next terrorist attack, a bioterrorist attack, combined with a series of new regulations and policies to securitize the potential of these bioterrorist threats. Beck (1992) predicted this policy response in discussing the effects of modernity on society as the systematic ways societies deal with hazards and insecurities. Similarly, Anthony Giddens (1999) predicted the same effect in discussing the role of fear, and resultant sense of risk, can have on societies when they become preoccupied with the future and their own safety.

While it is unknown whether or not anyone in the Bush Administration understood securitization or risk theory, its actions mirrored those put forth earlier in the work of Buzan et al. (1998). According to these authors, the designation of a security threat is primarily a political exercise undertaken by policy makers: “It is a choice to phrase things in security...terms, not an objective feature of the issue” (211). For threats to count as security issues, they must be distinguished from issues that are merely political. They have to be “staged as existential threats to the referent object by a securitizing actor who thereby generates endorsement of emergency measures beyond rules that would otherwise bind” (211). And, while they further noted, “avoiding excessive and irrational securitization is...a legitimate social, political and economic objective of considerable importance” (208), fear can have a powerful distorting effect on these goals and lead to either intentional or unintentional framings that shut out dissent and produce silence. Smith et al. (2006) addressed the effect fear and these framings can have on the ethics process when they noted that the unknowns of infectious diseases, or the unknowns of malevolent actors using biological agents for harm, have a powerful ability to engender fear and “often lead to rapid, emotionally driven decision making...even when these decisions challenge generally accepted ethics principles” (21).

Security analyst Ben Friedman (2011) took on this subject, extending the work of legal theorist Cass Sunstein's *Laws of Fear: Beyond the Precautionary Principle* (2005) in describing the biased information that Americans received about bioterrorism throughout the first 10 years of the War on Terror. He noted that a continuous focus by politicians and the media on terrorism led the public to overrate national security dangers in general. Inflated fear created a permissive environment for the overreaction to bioterrorism. For example, a July 2007 Gallup poll found that 47 percent of Americans were very or somewhat worried that they or someone in their family would become a physical victim of terrorism. Although less than the almost 60 percent of Americans who felt this way in late 2001, the number had remained constant for the five years from 2002-2007. Similarly, that poll also found that 47 percent of Americans thought a terrorist attack was very or somewhat likely in the United States in the next several weeks (Gallup 2015).¹⁸ It is important to remember that at the time, the political and expert discourse that was influencing the public's opinions generally interpreted "a terrorist attack" to be "a bioterrorist attack" as noted in this Congressional testimony in 2008 by three top DHS officials:

The Nation continues to face the risk of a major biological event that could cause catastrophic loss of human life, severe economic damages and significant harm to our Nation's critical infrastructures and key resources...The threat of bioterrorism has not subsided, and the impact of a large-scale bioterrorism event, such as the widespread dissemination of an aerosolized form of anthrax or other deadly biological pathogen, would have a serious effect on the health and security of the Nation (Hooks, Myers, and Stiefel 2008, 1)

¹⁸ For a cross-cultural perspective on this subject see Feigenson et al. (2004) and Brian Jenkins (2008). Feigenson et al. found that Americans perceived terrorism to be a far greater threat to themselves and others than SARS. At the same time, Canadians perceived SARS to be a far greater threat to themselves and others than terrorism. And yet the public's fears in both countries were orders of magnitude higher than the statistical reality of either. In a similar cross-cultural comparison of fear, Jenkins found that when American nuclear scientists were asked what was the likelihood within ten years that terrorists would detonate a nuclear weapon, the median answer was 10-20 percent likely; the reply from European nuclear scientists was less than 1 percent likely.

A study conducted by Margarita Dolgitsers of Columbia University (2007) found only ten articles in the MEDLINE database of over 21.6 million records from 5,639 publications (Lindberg 2000) that addressed the ethics of dual-use research in the context of bioterrorism in the life sciences. Of these ten articles, seven recommended self-regulation within the scientific community as the best way to minimize the ethical risks posed by dual-use research potentially being available to bioterrorist (reflecting one of the key tenets of the Fink Report in that the life sciences should rely on self-governance as opposed to governmental mechanisms of censorship). None addressed the ethics of reducing funding for basic life sciences for known endemic diseases to increase funding for research on pathogens that presumably bioterrorists would want to use.

My own research mirrors Dolgitsers' findings. In a review of *The American Journal of Bioethics* from 2001-2015, I found eight articles that addressed the subject of bioethics in relationship to bioterrorism out of a total of 5,258 articles during this period of time. These eight articles were clustered between 2003-2006, which is a significant time period as I discuss below. And, only three of the eight articles (May 2005; Schwab 2005; Selgelid 2005) addressed the ethical issues of increasing funding for biodefense work at the expense of funding for known endemic diseases.

The STS discipline is replete with examples (Latour 1987; Winner 1986; MacKenzie and Wajcman 1999; Bijker, Hughes, and Pinch [1987] 2012) of society's influence on scientists and engineers, and the bioethics community is not immune from the same effect. For the past 15 years, the fear of bioterrorism has been palpable in the national consciousness. The vocabulary of bioterrorism, especially the unquestioned acceptance of its normative existence, and the securitization of research in the life sciences that could have a potential dual-use have been

strong enough to silence counter discourses. Questions associated with bioethics and bioterrorism in the same sentence were simply unasked.

As a result, we find a wide spectrum of academic disciplines repeating the government's bioterrorism assessment, and unquestioningly accepting the normative assertion that all life sciences were subjects of interest to bioterrorists. In one of the most influential publications of the period, highly regarded academics Ronald Atlas from University of Louisville and Judith Reppy from Cornell University reinforced the Bush Administration's position on bioterrorism "in the current paradigm, all infectious disease research is potentially relevant to bioterrorism and may be implicated in controversies over the motivation and possible uses of the research" (Atlas and Reppy 2005, 52). Gerald Epstein, Deputy Assistant Secretary for Chemical, Biological, Radiological, and Nuclear Policy at DHS, noted that infectious disease research has become "contentious research" because it may generate information "that could have immediate weapons implications" (Epstein 2002: 398). Seven years later, he was still using the same language, "[t]he distance between a laboratory and a very large consequence event is a lot shorter in biology than in any other field" (Drexel 2009).

Concurrent with the actions of a "risk society," the decade following 9/11 saw an unprecedented increase in funding for bioterrorism defense. The political framings in public policy produced by the anthrax attacks were an economic windfall to a university community struggling along with the rest of the country in the economic recession during the first decade of the 21st century. For example, in 2002, Princeton University President, Shirley Tilghman, jointly hosted a symposium with Jack Killen, assistant director for biodefense research at the National

Institute of Allergy and Infectious Diseases (NIAID) in NIH. In her opening remarks, she said, “Universities can assume—indeed have an obligation to assume—a lead role in addressing the critical and complex scientific, technological, societal and policy challenges posed by this growing [international bioterrorism] threat” (Tilghman 2002). At that symposium, Killen said, “federal spending on biodefense had been steady at about \$50 million annually prior to the anthrax terrorism that claimed five lives last year. In the current fiscal year, spending jumped to \$274 million, and the budget is expected to reach \$1.75 billion in 2004 and remain at that level indefinitely” (2002). Killen was only referring to NIAID’s portion. The annual biodefense budget has averaged about \$5.6 billion from 2001-2014.¹⁹

There was one remarkable revolt in the life sciences community during the early days of the War on Terror against the Administration’s prioritization of funding in the life sciences in support of its policies to fight bioterrorism. With the USA Patriot Act of 2001 and the Public Health Security and Bioterrorism Act of 2002 2001-2002, the Bush Administration announced that it would reprioritize its funding to primarily support research on six pathogens considered to be high on the bioterrorist list of desirable weaponized opportunities. (See **Figure 2-3.**)

¹⁹ Tracking biodefense funding is a notoriously difficult process, which is why media reports, journal articles, and government documents have such widely varying numbers (e.g., the GAO (2013) reported that the United States had spent \$3.6 billion on biodefense from 2010-2013 while *Forbes* (2011) reported that the United States spent \$5.9 billion in 2010 alone. The primary reason for the difficulty is that biodefense funding is spread across multiple departments, agencies, and projects and typically not identified as a standalone Program Element line item in any department or agency. Based on my own budget analysis though, I think the annual biodefense budget analysis reports from the University of Pittsburg Medical Center (UPMC) Center for Health Security in Baltimore are the most authoritative comprehensive annual analyses of biodefense spending. Their 2014 report, *Federal Agency Biodefense Funding, FY2013-FY2014*, and all previous annual reports back to 2001, can be found at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3778993/>.

On March 4, 2005, the journal *Science* published an open letter to Elias Zerhouni, Director of NIH, which was signed by 758 researchers across a broad section of university life science departments. In this letter, the researchers protested NIH's diversion of funds to these six pathogens.²⁰ "The diversion of research funds from projects of high public-health importance to projects of high biodefense but low public health importance [such as Glanders]²¹ that were considered highly desirable for bioterrorists, represents a misdirection

Disease	Avg. Annual US Cases 1996-2003
Disease from Six Biological Warfare Agents Given High Funding Priority by Bush Administration	
Plague	0
Glanders	0
Melioidosis	0
Anthrax	3*
Brucellosis	103
Tularemia	122
Disease from Other Pathogenic Micro-organisms Given Lower Funding Priority	
Ehrlichiosis	591
Legionellosis	1,334
Meningococcal Infection	2,290
Streptococcal Infection, Drug-Resistant	3,083
Streptococcal Infection, Invasive	4,371
Pertussis	8,252
Tuberculosis	17,403
Borreliosis	17,542
Shigellosis	22,567
Syphilis	38,007
Salmonellosis	42,457
Gonorrhoea	346,765
Streptococcal Infection	685,508
*22 cases total, including 5 deaths; all in 2001 (Amerithrax) Source: Appendix 1, "Public Health Relevance of Prioritized Bioweapons Agents, Data for 1996-2003," February 28, 2005, posted on <i>Science Magazine</i> Online, www.sciencemag.org/cgi/content/full/307/5714/1409c/DC1 .	

Figure 2-3. Disease Cases vs. Priorities for Pathogens Research

of NIH priorities and a crises for NIH-supported microbiological research" (Altman et al. 2005, 1409). While there were no overt ethical discussions in the letter, the message was clearly founded on the ethics of investing funds in diseases that were essentially non-existent at the expense of those that were already causing disease-related morbidity and mortality in the United

²⁰ The number of grants awarded by NIAID for biological warfare agents increased 1500% (33 [1996-2000]; 497 [2001-January2005]). The number of grants awarded to study non-biological warfare model microorganisms decreased 47% (490 [1996-2000]; 289 [2001-January 2005]). The number of grants to study non-biological warfare pathogenic microorganisms decreased 27% (627 [1996-2000] to 457 [2001-January 2005]). Source: Appendices 2 & 3, "Public Health Relevance of Prioritized Bioweapons Agents, Data for 1996-2003," February 28, 2005, posted on *Science Magazine* Online, www.sciencemag.org/cgi/content/full/307/5714/1409c/DC1.

²¹ Glanders is an infectious disease that primarily affects horses. It is a rare disease that usually occurs in people who have frequent contact with infected horses. There has been no known human-to-human transmission of the disease in the United States (CFSPH 2015).

States. However, bioethicist Abe Schwab (2005) did specifically concurrently address this issue, in one of the three articles I referenced above, in arguing for a need to avoid this seeming “focalism” in the aftermath of acute-event scenarios, since such a focus severely limits non-bioterror-defense-related research.

NIH and NIAID essentially ignored the letter, replying that the scientists’ numbers were wrong and misleading (Fauci and Zerhouni 2005). And, while this exchange of letters created some noise in the scientific community with editorials in journals for and against Zerhouni’s actions (Marks 2006), it quickly died down as dollars for biodefense research for the newly prioritized list of pathogens began to flow to the university community. On September 4, 2003 the NIH awarded \$350 million in five-year grants to eight university consortia to set up biodefense research centers focused on high priority pathogens (NIAID 2003a).²² On September 30, 2003, NIAID awarded \$120 million each to Boston University and University of Texas Medical Branch at Galveston for construction of two National Biocontainment Laboratories to BSL-4 level.²³ At the same time, NIAID awarded between \$7 and \$21 million each to nine other universities to build BSL-3 and BSL-2 laboratories (NIAID 2003b).²⁴ HHS Secretary Tommy Thompson said, “These awards to build high-level biosafety facilities are a major step towards being able to provide Americans with effective therapies, vaccines, and diagnostics for diseases

²² The eight winning consortia were led by: Duke University, Harvard Medical School, New York State Department of Health, University of Chicago/Northwestern University, University of Maryland, University of Texas Medical Branch at Galveston, University of Washington, and Washington University.

²³ A biosafety level is the level of biocontainment precautions required to isolate dangerous biological agents in an enclosed laboratory facility. The levels of containment range from the lowest biosafety level 1 (BSL-1) to the highest at level 4 (BSL-4). In the United States, the CDC is responsible for publishing these requirements (CDC 2009).

²⁴ The nine universities were: Colorado State University, Duke University, Tulane University, University of Alabama at Birmingham, University of Chicago, University of Medicine and Dentistry of New Jersey, University of Missouri, University of Pittsburgh, and University of Tennessee.

caused by agents of bioterror” (2003b). On September 8, 2005, NIAID awarded another \$87 million to build four additional BSL-3 level labs “to further strengthen the nation’s biodefense” (NIAID 2005).²⁵ These construction funds were in addition to the research funding for biodefense that Killen referred to above.²⁶

I opened this section with a quote by author Ursula Le Guin and would like to close with a reference to her brilliant short story, *The Ones Who Walk Away from Omelas* ([1975] 2004). In her story, citizens of Omelas live in a utopian society of unimaginable happiness and freedom fueled by the perpetual misery of a single child, locked away in filth and darkness. But for some unknown reason, people keep silently walking away from Omelas to some unknown place. Her story has been frequently cited as the extreme example of utilitarian justice, but I would also offer that it serves as a metaphor for the inherent tension between ethics of the individual and ethics considered as part of social structure and public conduct. While the War on Terror may have dampened or been coincident with unasked ethical questions over the prioritizing of research for the privileged few at the expense of the many, we are not doomed to living in Omelas. As a society, we can walk away to an unknown place that considers justice a transcendent idea to security-driven binaries. In the following section, I offer a new way of thinking about justice that can move us beyond the political framings of a “fear-stricken society and its obsessive technologies to other ways of being.”

²⁵ The four universities were: George Mason University, Tufts University, University of Louisville, and University of Hawaii.

²⁶ The actual amount has averaged \$1.54 billion from 2001-2014. See footnote 19 for budget sourcing.

“The boundaries of nation states are increasingly permeable by all kinds of flows. Nothing can bring back the hygienic shields of colonial boundaries. The age of globalization is the age of universal contagion.” (Michael Hardt and Antonio Negri 2000, 136)

The Thorny Problem of Justice and Securitized Knowledge

In the months immediately following the events of 9/11 and the anthrax attacks, Wiebe Bijker (2002) observed that the STS agenda had been largely agnostic on the political issues related to the application of STS insights. He described the need for a new type of STS scholar, the public intellectual, to take on the problems of concrete cases, like terrorism and democracy. This public intellectual would follow a pragmatist philosophy, draw on STS to provide theoretically informed and empirically grounded insight, and embrace a contextual universalism to formulate general ideas from these concrete cases. Subsequent STS scholars, especially those working in the new political sociology of science (NPSS) framework (e.g., Scott Frickel and Kelly Moore 2006; Moore et al. 2011) have voiced similar concerns over the need to move beyond the traditional STS agenda by meeting “new challenges posed by the changing and political and economic realities that structure the sciences of today” (Frickel and Moore 2006, 5). This call is also consistent with recent scholarship on the production of ignorance in science that renders justice invisible by competing interests. For example, Brian Rappert notes that much of the dual-use dilemma “can be characterized as taking place in conditions of ignorance – that is in conditions characterized by limitations in both information and methods of assessment” (Rappert 2014, 6). Similarly Scott Frickel and Michelle Edwards have observed that, “ignorance emerges directly from within the rules, procedures, and protocols that define and structure regulatory-based risk assessments” (Frickel and Edwards 2014, 215) that define the dual-use dilemma.

I offer that a new concept of social justice, knowledge justice, can be useful to Bijker's call to duty for these new STS public intellectuals as they "move out of their scholarly confines and translate their experiences and insights into politically relevant interventions" (2002, n. pag.) while avoiding the traps of institutionalized and structured ignorance production. My development of a knowledge justice concept draws on the existing theoretical underpinnings of work from John Rawls, Nancy Fraser, Iris Young, and David Schlosberg who reflect the evolutionary maturity of justice theory away from utilitarianism towards a more comprehensive notion of justice requiring a global perspective. My theoretical approach is based on the work of several applied justice theorists (Markovsky 2010; Markovsky et al. 2008; Wagner 2007) who have encouraged development of new integrated synthetic theories of social justice that build on components of existing theories and reformulate them to solve emergent practical problems. As Markovsky et al. have noted, "we should strive for theories of ever-increasing breadth, depth and parsimony" (346). Wagner (2007) offered that a general theory of society is "chimerical," and that it is both desirable and possible to strive for more relevant modest scales by integrating two or more theories within the justice area.

In the spirit of theory synthesis, the concept of knowledge justice builds on and integrates aspects of three primary streams of justice theory. First, the political liberalism of justice theorist John Rawls ([1971] 1999; 1985; 2001) accepts that in a modern constitutional democratic state there are going to be many conflicting and incommensurate conceptions of what good means. Feminist scholar and critical justice theorist Nancy Fraser (2010) provides us with a three-dimensional view of justice that allows us to broaden the topic of justice beyond the nation state

or, “Keynesian-Westphalian”²⁷ frame which forces us to consider the question of the frame as a question of justice. Fraser also provides us with the concept of “abnormal times” to describe ways of interpreting justice in our contemporary world. And, lastly the concept of knowledge justice draws heavily on the activist work of environmental justice scholar David Schlosberg (2009) who readily accepts a contextually-based plurality of justice theories while eschewing singular universal theories of justice that in practice tend to be exclusionary, paternalistic, and privileged.

Before exploring each of these three theories and their contribution to a knowledge justice concept, it is first necessary to address the obvious question of a justice theory’s role in the dual-use dilemma’s normative state of contested equality in power relations. For example, Rawls ([1971] 1999) would have us address inequities of fairness from the “original position” that neutralizes power inequity. Political philosopher Iris Young (1990a; 1990b) would have us focus on elimination of domination and oppression to highlight the effect of power inequities. Fraser would have us “integrate the egalitarian ideals of the redistribution paradigm” (1997, 204). Schlosberg (2009) maintains that injustice is produced by inequitable distribution, lack of recognition, limited participation, and a critical lack of capabilities that are reflective of inequities in power relationships.

²⁷ Although Fraser coins this phrase without definition, it appears she is using it as shorthand reference that conflates two predominate 20th century worldviews. Keynesian economics has been the standard economic model of the global North since the 1930s. Originally developed by Maynard Keynes as a contrary theory to classical economics dating back to Adam Smith’s 18th century free market economy theory, or the metaphorical “invisible hand,” Keynes theorized that governmental interventions were justified during times of crises or mistakes in the private economy. These interventions are typically seen in the form of monetary actions by the central bank and fiscal policy actions by government to stabilize the economy. The principle of Westphalian sovereignty is based on the 1648 Peace Treaty of Westphalia in which the major European powers agreed to respect the territorial integrity of each other’s boundaries. It is the foundational principle in international law that each nation state has sovereignty over its territory and domestic affairs, that no country can interfere with the domestic affairs of another country, and that all states (no matter how large or small) are equal under international law.

So, the question becomes what is the role of justice and how do we apply principles of justice to an environment of competing interests of power rather than inequities of power. It would initially appear that the dual-use dilemma is a state of contested power between security experts and scientific experts, not in the context of conditions of inequities in distribution, recognition, representation, or fairness. However, as we will explore in this section, these inequities do exist if we broaden the lens to examine the political and technical framings that produced the dual-use dilemma, thereby making justice a legitimate framework for addressing the dilemma.

Any discussion of justice must acknowledge the importance of Rawls to the present day justice scholarship and the concept of knowledge justice is no exception. Rawls originally published *A Theory of Justice* in 1971 and returned to it throughout his life in various lectures and papers to clarify or expand on points made in his original work. In one of those return explorations, Rawls took on his critics who felt that his original work was based on philosophical or metaphysical claims of universal truths or notions about the “essential nature and identity of persons.” As he states, “the idea is that in a constitutional democracy the public conception of justice should be, so far as possible, independent of controversial philosophical and religious doctrines...the public conception of justice is to be political, not metaphysical” (Rawls 1985, 223).

In this sentence, we see the initial kernels of justice that apply to the H5N1 dual-use dilemma. First, in the US post 9/11 world the doctrine of security has become just as powerful and pervasive as any philosophical and religious doctrine. The modern foundational relationship

between the state and security was first observed by Foucault in *Discipline and Punish* (1995) and then continued in his 1977-1978 *Security, Territory, Population: Lectures at the Collège de France* (2007). Foucault's early conceptualizations have continued to inform critique on the relationship between security and the state in the post 9/11 world (Welch 2008; Kiersey and Stokes 2013). It is a very short mental leap between the Foucault panopticon, as a disciplining mechanism of generalized surveillance that improves the exercise of power, to the post 9/11 new economy of power based on the rise of global satellite-based surveillance as an equally pervasive discipline-mechanism (Gilliom and Monahan 2013; Monahan 2010; 2011). If we accept that security doctrine is just as important in the post 9/11 world as was Rawls's earlier philosophical and religious doctrines, we can accept its role in the development of a knowledge justice concept.

Rawls's notion of justice as fairness is articulated in two prioritized key principles. In what has become known as the Greatest Equal Liberty Principle, Rawls's first principle asserts that humans have basic liberties that are inalienable, and that no government has the right to infringe upon or remove these liberties from its citizens (Rawls [1971] 1999, 227). In his second principle, or what has become known as the Equity Principle, Rawls lays the groundwork for the distributive justice component of his theory of justice (Rawls [1971] 1999, 227).

The Equity Principle is constructed with two non-severable clauses. First, in the Fair Equality of Opportunity clause, he gives priority of the notion that all "offices and positions" should be open to any individual regardless of social background, ethnicity, or sex. In the second clause we find the Difference Principle that regulates inequalities. Rawls permits inequalities so long as they work to the advantage of the worst off by asserting that since Fair Equality of Opportunity takes priority, any just actions would always benefit the least advantaged members

of society, rather than the most advantaged. Rawls asserts that these two principles should be used to regulate the basic institutions of the state and society that are responsible for securing our basic rights, liberties, equalities, and opportunities. In reinforcing his primary argument, these principles should be enacted in a way that is entirely independent of either religion or philosophy. In what Rawls calls, “Kantian constructivism,” the application of these principles neither asserts nor denies any religion or philosophy. His hope is that by avoiding these controversies, members of society can find a mutually agreed upon solution to justice beyond the tradition of the social contract which gave rise to these controversies in the first place, or at least agree that “free and uncoerced agreement” is possible.

Let’s consider Rawls’s Greatest Equal Liberty Principle in the context of our discussion. He maintains that liberty may not be restricted except to secure the maximum liberty possible under concrete circumstances. And he stresses that limitations on liberty and inequalities of freedom cannot be justified on the ground that they promote the general interest by affording, say, a higher standard of living or a greater sense of security. In contrast, utilitarians are committed only to serving their self-defined general welfare, not to securing equal or maximum liberty. Accordingly, utilitarians can readily justify restrictions on the freedom to openly publish scientific research or other restrictions on the distribution of scientific research. This is the crux of how Rawls's conception of justice stands in conflict with utilitarianism. It also diverges significantly from utilitarianism even without his Greatest Equal Liberty Principle. The general interest (to which utilitarianism is committed) might require that the good of some persons be sacrificed in order to serve the greater good of others, but Rawls's Difference Principle would not permit this. According to Rawls, social inequalities are permissible only if everyone benefits

from them: if a person is worse off than others are, justice is done only if he is never the less better off than he would be without the inequality.

At this point, it is also important to address Rawls's rebuttal of utilitarianism and its role in our justice conceptualization. The dual-use dilemma *only* exists because it is based on the utilitarian principle of maximizing good at the expense of the fewest, but only insofar as the good refers to US interests and the fewest actually encompasses the majority of the world. In other words, this securitized skewed notion of utilitarianism is part of the framing problem. Therefore, addressing the dual-use dilemma requires an alternative framework for utilitarianism that starts from a position of dialogue, equity, and compromise versus the current position of exclusion, inequity and rigid boundaries.

To put his theory into practice, Rawls introduces a “device of representation,” or thought experiment, which he calls “the original position,” to describe the first step in finding a position of cooperation between free and equal persons. The original position is a hypothetical construct that seeks to avoid the notion that someone with more advantages can coerce someone with fewer advantages into agreeing to an unfair contract. In one of the more controversial aspects of his theory, Rawls introduces the “veil of ignorance” to implement the original position so that neither party can know of the strengths, weaknesses, ethnicity, gender, religion, philosophy, or assets of the other party and thereby all can arrive at a decision that is based solely on considerations of justice. Rawls states, “we introduce the idea like that of the original position because there is no better way to elaborate a political conception of justice for the basic structure from the fundamental intuitive idea of society as a fair system of cooperation between citizens as free and equal persons” (Rawls [1971] 1999, 238).

In spite of its anti-utilitarian position, it is difficult to see the applicability of Rawls's hypothetical construct to a problem like the dual-use dilemma for two reasons. First, a concept like knowledge justice is activist-based at its core, requiring agreement of purpose and definition behind the veil. Rawls does not address the possibility of legitimate disagreement between competing interests and principles behind the veil (Muldoon et al. 2013) which Amartya Sen illustrated with the example of three children arguing over who gets to have a flute. Each child represents a legitimate philosophical position and the mere fact that a child holds a given position is not evidence of action in a self-interested manner. In these sorts of moral disagreements, we find that one or more actors can disguise their self-interest as moral indignation, or as in our case, patriotic or nationalistic duty. This may or may not be conscious. Individuals can honestly believe that they are fighting for a broader consideration of justice without realizing that they prefer a conception of justice that just so happens to favor people in their position (Sen 2009, 12-15). In the case of the dual-use dilemma, this is even more acute since the dilemma is not even considered a matter of justice, but as a matter of self-interest that seeks to trade off or balance out issues of security with knowledge.

Second, Rawls notes that actors in the original position behind a veil of ignorance will want to make certain that no matter what physical, mental, economic, or social condition they have in society, they will get a fair share of the necessary things they need to make a good life for themselves. He calls these necessary things primary social goods: rights and liberties, powers and opportunities, income and wealth, and conditions for self-respect. This notion of fairness is more useful to our purposes as a society constructed on this basis of fairness will ensure that the primary social goods are distributed equally unless an unequal distribution of any or all of these values is to everyone's advantage

In the case of the dual-use dilemma, I argue that knowledge is the primary social good to be distributed fairly, but not necessarily just between the parties of the dilemma but to the invisible actors outside of the dilemma who have no voice due to the original framing of the dilemma. As we will discuss below, Fraser's "all-subjected principle" provides further justification for inclusion of those implicated actors who were silent and not present but affected by the action (Clarke 1998). These actors are neither behind the veil of ignorance nor a party to its construction. As Schlosberg notes, "theories of justice may strive to take place behind a veil of ignorance or impartiality, but actual injustices do not – hence the need to address the cultural and institutional aspects of justice in dealing with policy issues" (2009, 41).

Thus, the concept of knowledge justice draws from Rawls's *Theory of Justice* two very powerful starting points. The first is the simple notion that justice is a legitimate way of interpreting and addressing the dual-use dilemma. Just as we have already discussed that the dual-use dilemma is inherently an ethical dilemma, so too can we also say that is inherently a justice dilemma. Similar to the situation discussed previously with the bioethics literature, the STS literature is largely silent on the application of justice to the dual-use dilemma. And, as noted in the Introduction, even STS scholarship with its focus on questioning power and contesting values, equity, and participation has been largely silent on the role of justice when confronted with intractable thorny securitized problems in the life sciences. The power of introducing the notion of justice is that it moves us out of the dual-use binary and opens the dilemma to a broader interpretation that includes additional considerations at the individual and state levels. As we shall discuss below, when combined with another theory of justice, considerations of justice at the global level based on knowledge constructions broaden the interpretive lens even further.

Second, adopting Rawls's foundational position of anti-utilitarianism provides an alternative lens for describing the dual-use dilemma, which is currently framed through a utilitarian model. We cannot continue to debate matters of fact in the dual-use dilemma and arrive at either an ethical or just answer that offers a way forward. Witness the most sophisticated debate in the last two years on the risks of H5N1 research: in a series of articles offering point-counterpoint arguments of "likelihood-weighted consequences" between Marc Lipsitch of Harvard's Department of Epidemiology joined with Thomas Inglesby of the University of Pittsburgh's Medical Center (Lipsitch and Inglesby 2014, 2015), Lynn Klotz (Klotz and Sylvester 2014; Klotz 2015) of the Center for Arms Control and Non-proliferation, and Ron Fouchier (2015a, 2015b) neither side moved the H5N1 dual-use dilemma one inch towards a resolution. Like Latour's STS scholars who were limiting the debate to matters of fact, both groups of scientists conclusively proved it is impossible to multiply an unknown probability of a pathogen laboratory escape or an unknown probability of bioterrorist misuse by an unknown probability of pathogen onward transmission to the global pandemic level and arrive at a known level of acceptable risk or technical solution.²⁸

In a 1998 interview with Richard Preston of the *New Yorker*, noble laureate Joshua

²⁸ Likelihood-weighted consequences (LWC) analysis is one of the standard methods of assessing unknown risks that was used in these debates of technical facts. LWC are defined as the product of the probability of the consequences times the consequences: $LWC = (\text{probability of the consequences}) \times (\text{consequences})$. For example, using LWC analysis Klotz (2015) calculated that if Drs. Fouchier and Kawaoka mutated H5N1 virus escaped from the lab it could kill over a hundred million people at a cost of \$8.5 trillion dollars in the United States alone. These numbers were based on the following equation: $LWC = \text{mortality burden} = (\text{basic probability of release}) \times (\text{probability release leads to pandemic}) \times (\text{number of pandemic fatalities})$, or stated in symbols: $\text{mortality burden} = p_1 \times S \times N_f$.

The basic probability of release, p_1 , is defined as the probability of release from a single lab in a single year. The probability that release leads to pandemic, S , has three components: the probability, T , that the infected lab worker commutes by public transportation; the probability, I , that the lab worker infects a stranger during his/her commutes; and the probability, $1-F$, that the infection does not fade out so a pandemic is seeded. Thus, $S = T \times I \times (1-F)$. The number of pandemic fatalities, N_f , is based on a (hypothetical H5N1 mortality rate of 10%) \times (15% of total population infected) \times (world population of 7.0 billion).

Lederberg, long-time thought leader and advisor to the government on matters of biological defense said, “There is no technical solution to the problem of biological weapons. It needs an ethical, human, and moral solution...there is no other solution” (Preston 1998). When Lederberg made this statement, he was not thinking of the dual-use dilemma, as we know it today, and was referring to biological weapons in the Cold War paradigm, but the premise that there is no technical solution to the equivalent question of bioterror and the H5N1 dual-use dilemma is still valid.

If Rawls provides us with the legitimacy to apply the concept of justice to the thorny problem of knowledge securitization, then Fraser’s (2010) most recent thoughts on the role of justice in our contemporary world offers the foundation for thinking about knowledge as a primary social good that is equally subject to the injustices of misrepresentation, maldistribution, and misrecognition as any other good from Rawls’s original list. In doing so, Fraser draws inspiration on the major fault lines exposed in the post Cold War era between the “privileged and the humiliated” as described by Kofi Annan (2001) in his Noble Prize speech:

Today's real borders are not between nations, but between powerful and powerless, free and fettered, privileged and humiliated. Today, no walls can separate humanitarian or human rights crises in one part of the world from national security crises in another.

As Fraser notes, the framing of disputes about justice within the context of nation state borders generally assumed sovereign boundaries defined at the end of World War II that prevailed until the end of the Cold War. Over the 25 years since though, the resultant new geopolitical instabilities have brought new demands of social justice outside the context of the nation state (Fraser 2007; Goodin 2008; Held 2002; Sassen 2008), requiring new ways of thinking about

justice.

In terms of thinking about the dual-use dilemma, what is particularly important and at the heart of Fraser's work is an evolution of her earlier two-dimensional (economic models of distribution-cultural models of recognition) thinking of justice (Fraser 1996) to an expanded three-dimensional view of political justice that includes representation. As she notes, the political dimension does not take precedence, all three dimensions "stand in relations of mutual intertwinement and reciprocal influence" (Fraser 2010, 165). Echoing Steven Lukes' three-dimensional classification of power that includes the "power to decide what is decided" (Lukes [1974] 2005, 111), we have a framework to contest and challenge the justice questions of capacity to influence public debate and authoritative decision-making. A focus on the third dimension of political representation found in the formal structures of the nation state exposes the power relations rooted in the nation state's economic structure and the status order.

This expansion to a third dimension of justice allows us the latitude to broaden the topic of justice beyond the nation state frame that "is now considered by many to be a major vehicle of injustice" (Fraser 2010, 20). Doing so, forces us to consider the question of the frame itself as a question of justice. As Fraser says, "How can we integrate struggles against maldistribution, misrecognition, and misrepresentation within a postwestphalian [nation state] frame?" (Fraser 2010, 21). Or, in the case of the dual-use dilemma, it is the US securitized nation state frame that is limiting the debates to only those matters of fact within its border in spite of the globalized nature of the H5N1 effects.

This opens the discussion to two current trends in global justice theory that Fraser has described as "affirmative" and "transformative" in earlier writings (1996; 2005). Those who espouse the "affirmative politics of framing" may question the political framing but still seek to

resolve questions of justice either within the boundaries of a territorial state or through language of national sovereignties (Miller 2008; Tamir 1993; Walzer [1983] 2008; Tully 2009). For these theorists, the principle of the nation state is the appropriate framework for addressing the “who” of justice based on the collective political membership and institutional structures that correspond to the unique characteristics of each individual state.

The transformative approach that is more useful to our conceptualization of knowledge justice offers that the state-territorial may not be adequate to thinking about the “who” of justice in a global context because they are no longer simply citizens of a single nation state. The transformative approach introduces the “how” of justice, or “third-order species of political injustice” and the notion of meta-political misrepresentation that “arises when states and transnational elites monopolize the activity of frame-setting, denying voice to those who may be harmed in the process, and blocking creation of democratic arenas where the latter’s claims can be vetted and redressed” (Fraser 2010, 26). Fraser offers that the reflexive nature of participatory parity can be very useful in allowing us to move back and forth between the “what” of justice as well as the “who” and “how” in grasping the question of the frame as “the central question of justice in a globalized world.”

The last thoughts on justice that we can borrow from Fraser (2008) to build a concept of knowledge justice are her rhetorical tools for thinking about justice in abnormal times. Echoing Latour’s (1993) thoughts on the falsity of modernity’s dualistic distinctions, Fraser offers that possibly “normal justice,” i.e., shared ontological assumptions about claimants and agency, shared social-theoretical assumptions about the space in which questions of justice can arise, and shared understanding of the social cleavages that harbor injustices, is historically an abnormality. Such a period of shared understanding probably never existed, while “abnormal justice” is the

historical norm. Either way, there is little disagreement in the justice community that we are now living in abnormal times characterized by freewheeling debates over justice that lack structure, agreement of contested claims, and meta-political questions of framing, all occurring simultaneously against a global backdrop of failed states, rogue state actors, neoliberalism and capitalism, the continued explosion of new forms of communications, and the War on Terror.

Reflecting back on our discussions above, we can quickly see how the concept of abnormal times plays out in the H5N1 debate. Biosecurity experts in the United States are attempting to contain knowledge produced by certain forms of research on H5N1 under the presumption that such knowledge could be useful to bioterrorists in unleashing a pandemic attack on the United States. However, in the rest of the world H5N1 research is primarily a matter of agricultural economics and public health concerns. Open access to research publically funded by the NIH initially in 2005 (Fouchier et al. 2012; Kawaoka et al. 2012), using H5N1 virus strains originally from Indonesia, would appear to be an obvious matter of uncontested normal justice discourse. Yet, the technical and political framings produced by the dual-use dilemma obscure the very shape of the controversy so that it becomes a field of explicit struggle over technical facts rather than a discourse of justice.

The abnormalities produced by this struggle are not entirely random. The first node of abnormality reflects an absence of a shared view of the “what” of justice. For example, in normal justice discourse there is a common understanding of the allocation of divisible goods. In our example though, global South claims of access to H5N1 knowledge, aimed at nonsecuritizing the knowledge that maintains distributive injustice, collide with US claims of state and territorial knowledge security. As the dual-use debates over the H5N1 research in the past couple of years has shown, there is no political forum to understand this inherent injustice or

even recognize that a matter of justice may be involved. For example, at the NSABB's meeting on October 22, 2014 Chairman Stanley described the board's meeting objective and agenda for the coming year in response to the White House's cancellation of funding for further H5N1 studies, "...launch a deliberative process to assess the potential risks and benefits associated with certain life sciences GOF studies [referring to the H5N1 studies]. The issue of GOF studies has polarized the scientific community and the goal of the NSABB is to find a way forward" (NSABB 2014, 2). Note the framing of the problem that implies the solution can only be found through additional technical studies without recognition of even the possibility of alternative ways of approaching the problem.

The second node of abnormality reflects the lack of a shared understanding of the "who" of justice. At issue here is, who counts as a subject of justice in the H5N1 debates. We are currently locked into a struggle between security experts and policy makers seeking to securitize and territorialize knowledge and globalization activists and scientists seeking to broaden access to knowledge that could potentially benefit those with the most immediate need. Moreover, there is no agreement about who is entitled to address claims of rightful access or ownership of the knowledge; about where and how such claims should be adjudicated; and about who is obligated to address them, if and when the claims can ever be agreed upon.

The third node of abnormality reflects the lack of a shared understanding of the "how" of justice. In other words, what are the procedural forums for resolving disputes about the "what" and "who"? As Fraser notes, in normal justice, these questions don't arise as the "what" and "who" are not in dispute. In our example, the NSABB with support from the NAS has been given the responsibility of developing regulations and policies that govern future forms of H5N1 research and give equal (ostensibly) considerations to both security and open research concerns.

However, these policies are not binding beyond the US borders nor are they reflective of the global H5N1 debate. But most importantly, they do not include deliberative considerations of either ethics or justice, only securitized constructs of risk-benefit.

Outside the United States, the WHO has attempted to find common procedural grounds for developing frameworks for acceptable future forms of H5N1 research. One could argue that the WHO has a more global perspective on the subject than the NSABB. But as it demonstrated in 2013 in its first attempt to address the “how” of the H5N1 debate, its deliberative considerations were primarily dominated by concerns of the global North that still obscure questions of “what” and “who.” Lastly, it is important to point out that there is an alternate non-Western axis that is seeking to address the question of “how” and *is* giving considerations to the “what” and “who.” China, Vietnam, and Indonesia are vigorously pursuing comparable H5N1 research without the framings produced in Western dual-use debates in a technological research race against the economic and social injustices produced by the devastating impact of H5N1. These three countries have suffered the most from the H5N1 virus and so one might argue that privileged Western knowledge securitization concerns, based on theoretical possibilities, is simply not an option they can entertain.

We can now see the five foundational elements that shape the broad contours of the knowledge justice concept and its applicability to the thorny social problem of the dual-use dilemma. First is the fundamental acceptance that questions of justice are an appropriate way of thinking about ways of resolving the dual-use dilemma. Second, knowledge justice is anti-utilitarian and views knowledge as a primary good to be distributed fairly even to those that are not a party to the production of that knowledge due to political framings, but are affected by it. Third, knowledge justice is global in its scope and therefore considerations of justice must

transcend self-serving nationalistic exclusionary frames that lead to maldistribution, misrecognition, and misrepresentation. Inherent in this statement is acceptance that the “what,” “who,” and “how” matter and must be considered as intertwined complementary elements that are not severable. Fourth, knowledge justice is predicated on social considerations of abnormal times. It is not justice as an object of research but as an object of the activism required by the characteristics of abnormal times. Finally, as an activist theory knowledge justice is inclusive of plurality in recognition of the multiple frames that must be individually successfully accommodated to avoid possible exclusionary framings at any one level that can produce second and third order levels of injustice. It is important to point out though, that as a pluralistic approach to justice, knowledge justice is also inclusive of the securitization discourse – not as the currently dominant and exclusive discourse, but one of many discourses that may be legitimate depending on the time-and-place context or point of view.

Thus, the concept of knowledge justice adds two additional equally important foundational elements of justice from Fraser to the previous starting points we adopted from Rawls. Thinking back to Annan’s speech, the first element is recognition that justice is fundamentally a global question not constrained to territorial borders. It is no longer morally permissible to blindly accept political framings that limit questions of justice to predetermined definitions of “what” to equally constrained definitions of “who” within an increasingly anachronistic definition of nation states’ boundaries. However, barring a major global disruption, geographical borders will continue to define physical boundaries of nation states. The concept of knowledge justice does not seek to either ignore these boundaries or redraw them. However, it does acknowledge that there are increasingly new social questions, like the rightful ownership of globally important scientific knowledge, that transcend border guards and fences,

and answers that are not realistically confined to physical boundaries. These questions require new forms of thinking and not retooling previous answers to these questions if we are to see that questions of justice begin with an understanding of the political frame.

Borrowing conceptualizations and language on globalization, connectivity, and fundamental human rights from Castells (1996) and Escobar (1995; 1998), Fraser notes that subjects like the biopolitics of climate, disease, drugs, weapons, and biotechnology which determine who will live long and who will die young are questions of justice so fundamental to human well-being that the structures that perpetuate injustice through political framings belong not in “the space of places,” but in “the space of flows.” A concept like knowledge justice is centered in a space of flows to avoid the injustices committed by framing the dual-use dilemma in the space of places. In other words, the space of flows is that stage of human action whose dimensions are created by dynamic movement, unconstrained by nation state boundaries. Without continual movement towards justice we fall back into the static conditions of the space of places. Equally important, that movement takes place through human action and creates the specific social conditions for our everyday lives.

The second foundational element the knowledge justice concept adopts is Fraser’s notion of abnormal justice to provide an appropriate contemporary framework for thinking about justice beyond traditional first-order questions of justice that under normal justice discourse have been confined to questions of distribution and recognition. What constitutes a just and equitable distribution of wealth and resources? Or, what counts as reciprocal recognition or equal respect? These first-order questions of justice fall short in their depth and breadth when confronted with the H5N1 dual-use dilemma’s global political contestations of “moral standing, social cleavage, and agency of redress” (Fraser 2008, 396). Almost by definition, the attempted securitization of a

global knowledge by the United States has placed the subject squarely within Fraser's understanding of some of the characteristics of abnormal times: contested superpower hegemony, global governance, and transnational politics.

Inherent in Fraser's notion of abnormal justice and particularly relevant to questions of justice in the H5N1 dual-use dilemma is the "all-subjected principle" that allows us to transcend the self-serving language of exclusionary nationalism. For example, to analogize Ferguson's (1999) sub-Saharan African's rightful access to justice, the peasant backyard poultry farmer in Indonesia who has been involuntarily disconnected from the global H5N1 knowledge production as a result of rules imposed by governance structures on the other side of the world must count as a citizen of justice, even if that citizen is not officially recognized as participating in that knowledge production. To deserve considerations of justice, an individual need not be a visible accredited participant in government structures, only affected by them.

Fraser's all-subjected principle with its recognition of the plurality of governance structures to militate against universal one-size-fits-all framings of justice is a transparent segue to the third stream of justice theory that the concept of knowledge justice draws from: the plurality inherent in environmental justice theory. Schlosberg takes on the question of justice through the lens of social movements, and specifically, environmental justice. As he says, "What, exactly, is the 'justice' of environmental justice?" (Schlosberg 2009, 3). In doing so, he comes at the question of justice not from the traditional theoretical discussions of justice of Rawls and Fraser, but from the reconfigured lens of justice as it is played out in practice in activist movements. This is particularly relevant to our conceptualization of knowledge justice as applied to the H5N1 dual-use dilemma because it requires that recognition of appropriate framings of justice must accommodate both a plurality of governance structures, i.e., local-,

national-, and global-levels, as well as the activist's pragmatic acceptance of the plurality justice theory that says, *whatever works is what works best*.

Through this activist lens, justice is not defined as an object of research, by a debate on the distribution of goods in a society, or "attempts at singular, monist, unitary definitions of justice" (Schlosberg 2009, 171), but begins with a more inclusive framework built on a balance of interlinked elements of distribution, recognition, participation, and capability functioning in a highly pluralistic manner that is contextually based. As Schlosberg notes, the fact that environmental justice movements have no issue with successfully adapting and using a variety of definitions of justice, many times simultaneously, should cause theorists to rethink the value of plurality. Inherent in Schlosberg's discussion of plurality is a recognition and acceptance of equality between competing, at least in academic theorist circles, theories of justice. Or, to borrow a Euclid paraphrase used by Amartya Sen, "There is no royal road to geometry." As Sen notes, there is no royal road to evaluation of economic or social policies, referring to policies associated with theories of justice. "A variety of considerations that call for attention are involved, and evaluations have to be done with sensitivity to those concerns" (Sen 1999, 85).

Recognizing however that plurality runs contrary to deeply engrained and vested theories of justice, Schlosberg defends the plurality of environmental justice theory with a discussion of Peter Wenz's early writings on environmental justice noting that Wenz finds plurality a welcome feature at both the theoretical and practical level. In setting the foundation for the environmental justice theoretical frameworks, Wenz offers, "it is simply important to comprehend different peoples' interpretations of justice, as it helps us to understand and tolerate others" (1988, 2). Similarly, Michael Walzer ([1983] 2008) defends a pluralistic approach to justice theory in noting that not only are different things valued differently by different people, but also that these

differences will determine their distribution criteria. Walzer introduces the idea of the “distributed sphere” to address the fact that social meanings of objects, procedures, and principles are historical and will change over time and therefore, conceptions of justice are limited in time and place. Walzer’s writings are particularly important to a knowledge justice concept as facts, their interpretations, and applications are highly contextual, temporal, and elusive.

Additionally, a number of other early justice theorists have stressed the importance of plurality (James [1909] 1977; Lyotard 1984; Berlin 1990; McClure 1992; Mouffe 1996; Hardt and Negri 2000; Miller 2003; Connolly 2005). With the exception of Jean-Francois Lyotard though these theorists have not directly linked the focus on pluralism with definitions of justice. Lyotard insists that singularity and consensus on theoretical definitions are both outmoded and suspect, and that justice is neither. For example, metanarratives such as Marxism and capitalism, that once served as unifying visions of humanity have given way to a post modern world comprised of factional groups defined by continuously evolving cycles of local narratives of justice. For Lyotard, heterogeneity is central to understanding the future of justice.

More recently however, legal scholar Rebecca Tsosie (2007) has introduced the notion of *intercultural justice* that implicitly links pluralism with justice. This form of justice calls on us to question values embedded in institutions of science and the law, and seeks to build institutions that can respond to differences in values, and to lives that fall outside of dominant visibilities. Tsosie’s argument resonates well with the pluralistic argument Sen makes in his work on poverty. Sen argues that to address the problem of poverty, and to create a more just and equitable world, we must not just deploy concepts (e.g., poverty and income), we must ask after their very formation, and understand what assumptions and values they build into our ways of

knowing and changing the world. As he writes, “[t]he practical world is a constant source of conceptual challenges, and it is right that we should try to reassess our concepts and ideas in the light of the manifest problems that empirical work identifies” (Sen 2006, 30).

With this acceptance of the future understanding of justice, the concept of knowledge justice adds one additional foundational element from the environmental justice theory’s defense of plurality. Schlosberg notes that to understand the ‘justice’ in environmental justice, we must accept the empirical reality of plurality, dismiss attempts at universal definitions, and understand and accept plural conceptions and discourse of justice in movements.

Conclusion

STS scholarship has been largely silent on the contestations of values, equity, and participation in the questions of justice. And with the exception of a handful of STS scholars the discipline has been largely silent on these same contestations when confronted with the language of terrorism even though it has been the dominant discursive frame of politics, society, science and technology in the United States since 9/11. Similarly, justice scholarship has also been silent on addressing how the terrorism frame has altered and shaped these same contestations. The knowledge justice concept proposed here is intended to be a starting point to address the failings in both fields of scholarship. It is proposed as a framework to aid in formulating a different set of questions, than those currently being posed, as a way out of the current H5N1 dual-use dilemma. It is proposed as an initial framework for STS scholarship to begin seeing the broader “matters of concern” in science and technology. Lastly, it is proposed as an integrated framework of justice that can be applied to address some of the most pressing topics of our time that have far more to do with who will live long and who will die young than the current vocabulary of bioterrorism in the H5N1 debates.

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Appendix A: Timeline of Selected Major Events

Spread of H5N1 Virus

1996	H5N1 virus first discovered in farmed geese in Guangdong Province, China.
1997	H5N1 virus reported in poultry in Hong Kong. First human infections are reported in Hong Kong; 18 confirmed human infections and 6 deaths.
2003	First report of H5N1 virus in poultry in Republic of Korea.
2003 -2015	H5N1 spreads to poultry in 73 countries; 840 confirmed human infections and 447 deaths.

NSABB and Origins of Mammalian-Transmissible H5N1 Virus Research

2005	NSABB reviews two papers reconstructing the 1918 Spanish influenza virus genome. It recommends full publication of both.
2006	National Institute of Allergy and Infectious Disease, part of the National Institutes of Health, Blue Ribbon Panel publishes a report prioritizing research into H5N1, which leads to research funding for Drs. Fouchier and Kawaoka.
2007	NSABB publishes its first proposed dual-use guidelines, <i>Proposed Framework for the Oversight of Dual Use Life Science Research</i> .

H5N1 Virus Publishing Controversy

September 12, 2011	Dr. Fouchier announces that he has created an aerosolized mammalian-transmissible form of H5N1 virus.
November 30, 2011	NSABB recommends papers by Drs. Fouchier and Kawaoka be redacted before publishing with only certain researchers having access to full materials and methods.
January 20, 2012	39 of the world's leading influenza researchers announce a voluntary 60-day moratorium on H5N1 research to allow more time for deliberation. (This moratorium remained in effect until February 1, 2013.)
February 17, 2012	WHO recommends both papers should be published in full.
March 28, 2012	Office of Biotechnology Activities publishes <i>Policy for Oversight of Life Sciences Dual Use Research of Concern</i> .
March 30, 2012	NSABB reverses earlier position and recommends full publication of both papers.
May 2, 2012	Dr. Kawaoka's paper is published in the journal <i>Nature</i> .
June 21, 2012	Dr. Fouchier's paper is published in the journal <i>Science</i> .

Appendix B: Literature Review

This paper is centered at the nexus of three previously unconnected bodies of literature: the dual-use dilemma, specifically with regard to the recent controversies over the publication of research on the H5N1 virus and its role in the bioterrorist (War on Terror) discourse; bioethics discourse on the relationship of bioterrorism and the dual-use dilemma; and theories of social justice. The following literature review is categorized to correspond to the three main sections of this paper. It is based on the foundational literature used in the development of the assertions in this paper, but by no means addresses every one of the more than 200 literature sources used.

H5N1 Debates and the Myth of Easy Replication

The foundation for the H5N1 debates can be traced back to the Fink Report (2004) that was the first document to raise the possibility that the type of life science research discussed in this paper should be considered dual-use. However, it wasn't until of Drs. Fouchier and Kawaoka first attempted to publish their H5N1 research in 2011 that the dual-use theory was tested. Since that point, there have been over 3000 published articles debating the merits of their research within the context of a dual-use political frame. From a public health perspective, the WHO is the primary collector of global data on H5N1. It publishes extensive monthly and annual reports in both raw data formats as well as consolidated and interpreted summaries organized by country and region. The majority of scientific and technical research on H5N1, including non US research, is published in journals: *Science*, *Nature*, *mBio*, *Journal of Infectious Diseases*, *Virology*, *New England Journal of Medicine* and *Cell*.

Several STS scholars have recently begun to question the normative assertions found in the bioterrorist threat of dual-use technologies. For example, Kathleen Vogel (2008; 2013; 2014a; 2014b) has built on the social construction work of Wiebe Bijker, Thomas Hughes, and

Trevor Pinch ([1987] 2012), Winner (1986), and MacKenzie and Wajcman (1999) to show how the concept of technology frames select and privilege purely technical factors without consideration of the social dimensions that constitute how technologies are designed, developed, and used. In doing so, Vogel draws into stark reality the fallacies of many arguments made by bioterrorist security experts. Similarly, Sonia Ben Ouagrham-Gormley (2013; 2014) has extended the investigations of tacit knowledge by Harry Collins (1985; 2001) and Michael Lynch (1985) to puncture holes in the myth of easy replication in scientific research that has been such a foundational normative assertion in the bioterrorist vocabulary.

The technical framing of the H5N1 debates has also recently come under challenge in the scientific literature (Ungchusak et al. 2005; Khuntirat et al. 2011; Wang, Parides and Palese 2012; Okeye et al. 2014; Gomaa et al. 2015; Morens and Taubenberger 2015). These studies have all brought into question the WHO's original case methodologies and results.

Bioethics of Silence

There is an admittedly normative assumption underlying my development of this section, as well as the next section on justice, that matters of ethics and justice in the global South should matter to the global North. And because they matter, they should be an integral dimension of policies and critical thinking in the global North, especially on subjects of transnational importance, like H5N1. In this regard, the recent work of Boaventura de Sousa Santos (2014) suggests, not unlike Bruno Latour (2004), that Eurocentric ethics critique has run out of steam, or is “exhausted” and in need of reorientation. Similarly, the works of Arturo Escobar (1995; 1998) and Manuel Castells (1996) point to the importance of considerations of globalization, connectivity, and fundamental human rights that should inform any discussion global bioethics.

Several bioethics scholars, Frida Kuhlau (2013), Brian Rappert (2010; 2013; 2014) and Michael Selgelid (2007; 2009; 2013) have pointed out the paucity of bioethics discourse on matters of dual-use in the life sciences, particularly on subjects like H5N1 that have also been framed in the bioterrorist vocabulary. Additionally, Laurel Smith-Doerr (2008; 2009) has conducted a number of studies on the ineffectiveness of bioethics education in the life sciences that contributes to a general apathy towards the subject.

Throughout the first decade of the War on Terror, the WHO's H5N1 pandemic predictions were coopted by policy makers, politicians, and experts to support the assertion that bioterrorists were seeking to use H5N1 as a weapon of mass destruction (Runge 2008; Tyson 2008; Spencer 2008; Gorman and Crawford 2008; Hook, Myers, and Stiefel 2008). Extending the work of risk scholars Ulrich Beck (1999; 2009) and Anthony Giddens (1999), a number of scholars have examined the role of fear on society (Slovic et al. 1980; Slovic 1999; Price-Smith 2002; Buzan, Waeber, and Wilde 1998; Smith et al. 2006). These scholars have shown that fear of the unknown on a society can produce a sense of risk in society that can silence its development of critical theory. For example, even in the face of mounting evidence that the fears of bioterrorists were wildly exaggerated for political purposes (Feigenson, Bailis, and Klein 2004; Jenkins 2008; Leitenberg 2010; Hayden 2011; Friedman 2011), the bioethics field has not rigorously addressed the implication of these political framings on life sciences research.

In part, this can be ascribed to the bioethics tradition of principlism with its traditions in Western theology and philosophy discourse (Jonsen 1998; Beauchamp and Childress [1979] 2012) that is not designed to take on the question of terrorism in the context of bioethics and the needs of the global South. For example, the Belmont Report (HHS 1979) has long been considered the arbiter of what constitutes the ethical and just practices in the life sciences with

regard to the individual (Anspach 2010). But as Mamo and Fishman (2013) have noted, the Belmont Report also served as the framework for highly critical STS scholarship on cases such as the intentional injection of syphilis in Guatemalan men and women during 1946-1948 by the US Health Services to study the course of the disease (Reverby 2011). The result has been that some scholars like Collier and Lakoff (2005) and Pickersgill (2012) have argued that bioethics provide the prevailing regime of scientific governance. Nicolas Rose (2006) has argued that bioethics has become routinized with the practices of biosciences. While others (Strathern 2000; Kelly 2006; Reardon 2005; 2013) have expressed increasing concern that the field of bioethics has become an institutionalized process of enforcing and conforming to regulatory law.

This is not to say that the bioethics field has been constrained by only principlism. There are other streams of thought in the bioethics community including utilitarianism (Harris 1975; Singer 1979), virtue ethics (Nussbaum 1988; 1990; Oakley [1998] 2009), and feminist bioethics (Tong 1993; Wolf 1996; Rawlinson 2001). Collectively, all of the approaches have produced ample literature on research ethics, including the ethical implications of genetic research and biotechnology across a myriad of topics from cloning to women's health in the global North.

But, none have focused on the bioethical tradeoffs of justice, morality, and security inherent in the life sciences dual-use dilemma, especially as they relate to the global South. Louise Bezuidenhout (2014) has offered that this silence can be largely attributed to a global North interpretation of dual-use in the life sciences that automatically links the principle of harm and the vocabulary of bioterrorism, and excludes the possibility of contextually different interpretations in the global South of key ethics principles, such as harm and beneficence. Similarly, Rebecca Tsosie (2007) has argued that the US dominant form of ethics is built from

concepts of individual ownership, privacy, and property that presume a particular set of cultural values and make it hard to recognize the values and lives of many.

As a result, the bioethics field has paid little attention to the way individuals are situated in social relations (Borry et al. 2005; Fox 1974; 1989). Thus, the field continues to emphasize the ethical conduct of scientific research rather than the ethics of producing and disseminating scientific knowledge (Douglas and Savulescu 2010). In fact, my review of all the topics that the President's Council on Bioethics took under consideration from 2001-2009 showed no discussion of the dual-use dilemma.¹ The council's topics of concern centered on questions of aging, cloning, children, death, genetics, human dignity, organ transplants, stem cells and health care. As ethicist Henk ten Have (2013) noted, the field of bioethics needs to go beyond the focus on human beings as autonomous individuals, and emphasize the interconnectedness of human beings and the interrelations between human beings and the environment, through additional principles such as solidarity, social responsibility, and benefit-sharing.

Thorny Problems of Justice and Securitized Knowledge

While STS scholars have built a discipline, in part, by questioning power and engaging scientists, policy makers, and social activists on contestations of values, equity, and participation, they have not assigned justice an explicit role in the foundational STS concerns of expertise, politics, democracy, and participation (Hackett et al. 2008, 3). Thus, my knowledge justice concept draws on the existing theoretical underpinnings of work from John Rawls ([1971] 1999;

¹ President George W. Bush chartered the President's Council on Bioethics on November 28, 2001, just two months after the attacks of 9/11. Its charter expired in 2009. The Council was widely panned for being a politicized ethics-legitimizing body for the President's controversial scientific policies and limited in its scope of ethical inquiry. But as Adam Briggie (2009) has noted, the truth was far more complex in this boundary organization as it sought to "thicken and enrich public bioethics discourse (Kass 2005, 224-225)" in an environment of competing political and scientific interests.

1985; 2001), Nancy Fraser (1996; 1997; 2005; 2007; 2008; 2009; 2010), Iris Young (1990a; 1990b), and David Schlosberg (2009) who reflect the evolutionary maturity of justice theory away from utilitarianism towards a more comprehensive notion of justice that requires a global perspective and recognition of the realities of knowledge securitization in society. Additionally, several applied justice theorists (Markovsky 2010; Markovsky et al. 2008; Wagner 2007) have encouraged development of new integrated theories of social justice that build on components of existing theories and reformulate them to solve emergent practical problems. John Gerring (1999) has stressed the importance and application of standards of criteria when formulating new concepts.

The modern foundational philosophical relationship between the state and security was first observed by Foucault (1975; 2007) and extended with the work of Michael Welch (2008) and Nicholas Kiersey and Douglas Stokes (2013). Steven Lukes ([1974] 2005) likewise took on the question of the state and security through his three-dimensional classification of power. More recently, Christopher Hobson, Paul Bacon, and Robin Cameron have noted the increasing shift away from the traditional nation state concept of security towards thinking of “people as primary referent for understanding security” (2014, 2). Similarly, in describing the relationship between securitization and surveillance Torin Monahan and Jennifer Mokos (2013) have observed that an important dimension of the securitization process is the creation of compelling narratives that justify new technological systems. This mythical dimension relies on what Mike Crang and Stephen Graham (2007) call “technological fantasies” that position emergent technological systems as necessary, and effective, responses to dire threats.

Similarly, Fraser’s (2010) most recent thoughts on the role of justice in a hyper-securitized world offers the foundation for thinking about knowledge as a primary social good

that is equally subject to the injustices of misrepresentation, maldistribution, and misrecognition. As she says, “An adequate theory of justice in our time must be three-dimensional. Encompassing not only redistribution and recognition, but also representation, it must allow us to grasp the question of the frame as a question of justice” (Fraser 2010, 21).

The H5N1 dual-use dilemma can be seen within the context of a modern post-Cold War world that has resulted in new geopolitical instabilities requiring new demands of social justice outside the context of the nation state. Almost 70 years ago, Hannah Arendt noted that despite talk of universal human rights, such rights depended on one’s recognition by a state. These states were not run by general principles of justice (e.g., human rights for all), but rather “ever changing circumstances” that were kept out of view through “carefully organized ignorance” (Arendt [1948] 1979, 244).

Justice theorists Robert Goodin (2008), David Held (2002), and Saskia Sassen (2008) have all addressed this subject and their ideas are useful in broadening and contextualizing a global perspective of justice. However, it is helpful to understand the arguments of justice theorists who still hold on to the notion that the nation state remains the best political framing for addressing the “who” of justice based on the collective political membership and institutional structures that correspond to the unique characteristics of each individual state. David Miller (2008), Yael Tamir (1993), Michael Walzer ([1983] 2008), and James Tully (2009) have all offered variations on the nation state argument which asserts that questions of justice remain the sovereign role of the state, institutional structures, and collective international state political memberships.

Lastly, environmental justice theory is an activist concept that is inherently pluralistic. Through this activist lens, justice is not defined as an object of research, a debate on the

distribution of goods in a society, or “attempts at singular, monist, unitary definitions of justice” (Schlosberg 2009, 171), but begins with a more inclusive framework built on a balance of interlinked elements of distribution, recognition, participation, and capability all functioning in a highly pluralistic manner that is contextually based. A number of justice theorists beginning with Amartya Sen (1999; 2006) have stressed the importance of plurality. Peter Wenz (1988) stresses the importance of comprehending different peoples’ interpretations of justice. Michael Walzer ([1983] 2008) introduces the idea of the “distributed sphere” to address the fact that social meanings of objects, procedures, and principles are historical and will change over time and therefore, conceptions of justice are limited in time and place. Jean-Francois Lyotard (1984) insists that singularity and consensus on theoretical definitions are both outmoded and suspect, and that justice is neither; heterogeneity is central to understanding the future of justice and a foundational assertion of my concept of knowledge justice. Lastly, legal scholar Rebecca Tsosie (2007) has introduced the notion of *intercultural justice* that also links pluralism with justice. This form of justice calls on us to question values embedded in institutions of science and the law, and seeks to build institutions that can respond to differences in values, and to lives that fall outside of dominant visibilities.

As noted at the outset of this literature review, this paper is centered at the nexus of three previously unconnected bodies of literature in STS scholarship. Therefore, in linking these three bodies of literature through a case study like the H5N1 debates, it is not surprising that gaps appear. The political and technical framings of the dual-use dilemma are centered on questions of security and policy response. The bioethics community still largely views questions of ethics in the life sciences through a largely Western-centric lens of the individual. And, the

predominant theories of justice that shape dual-use policy are a securitized US version of utilitarian principles. The literature in each of these three areas shows the need for more interdisciplinary approach that moves beyond debates of technical facts and securitized policy responses to a “three dimensional” discussion over ways knowledge is produced and distributed ethically and fairly across nation state borders.

Appendix C: Sources and Methods

This paper analyzes the production of knowledge in the context of the H5N1 debates and dual-use research set against the backdrop of the War on Terror. I have used three primary sources for policy, legislation, and regulatory sources on H5N1 dual-use. The NSABB and NIH websites provide comprehensive archives on all related regulations, supporting documentation, meeting minutes, and press releases. The Federal Register also maintains a comprehensive database of all proposed and enacted federal rules and regulations. All referenced policy and regulatory documents have come from one of these three sites. I have also drawn on various sources for congressional testimony, ranging from specific committee websites, such as the House of Representatives Committee on Homeland Security and Senate Homeland Security and Government Affairs Committee, specific congressional member websites, such as Congressman Jim Sensenbrenner, as well as the Government Publishing Office's archive of Congressional Hearings and the online Congressional Hearings archives of the National Archives.

Since the H5N1 virus first made the transition from birds to humans in 1997, the World Health Organization (WHO) has been the primary collector of global data on H5N1. It publishes extensive monthly and annual reports in both raw data formats as well as consolidated and interpreted summaries organized by country and region. This paper draws on the data from 10 of these reports spanning a period of time from 2002-2015 to describe the normative world health policy position that H5N1 represents a potentially pandemic virus.

H5N1 research is typically published in one of five journals: *Science*, *Nature*, *mBio*, *Journal of Infectious Diseases*, and *Virology*. Although by no means exclusively as shown by other referenced research publications, such as the *New England Journal of Medicine* and *Cell*, these journals comprise the largest data set of scientific literature that I drew upon for this paper.

For example, the more than one dozen articles from the journal *Science* that are cited in the Reference section were drawn from 368 published articles in the journal from 1997 to today. Additionally, both scientific journals, *Nature* and *Science*, have covered the H5N1 debates exhaustively and maintain extensive archives of related primary research, commentary, correspondence, and publications. I have drawn on both archives to develop a comprehensive picture of the H5N1 debates.

The initial phase of the methodological process was problem-oriented, and I identified several issues relevant to the dual-use dilemma, e.g., the normative claims of H5N1 as a pandemic threat and as a tool of interest to bioterrorists. By analyzing these claims in relation to tools and concepts from STS, bioethics, and justice scholarship, I have sought to approach this paper from multiple viewpoints. My analysis generated a number of normative claims that are by no means comprehensive as they are products of selected literature sources. Nevertheless, they are the result of explorations of arguments and norms with respect to their relevance, strength, adequacy, and meaning.

I then used an analytical philosophical method to explain concepts and theories of justice by drawing attention to their constituents, assumptions, and implications. I applied these arguments to develop a new concept of justice, knowledge justice, based on the work of several applied justice theorists who have encouraged development of new integrated theories of social justice by using reformulated components of existing theories to solve emergent problems.

The research presented in this paper is based on reviews and analyses of available literature (primary and secondary sources) relevant to my area of research, along with attendance and participation in various related public forums. Because of the uncertainty about outcomes and impacts that permeate the H5N1 dual-use dilemma, my reasoning takes its position in

arguments from anticipated consequences and dilemmas (Walton 2006). That is to say, it is possible to “slip between the horns of a dilemma” (315) by citing a third alternative. The normative positions in this paper therefore relate to balancing the values of knowledge and justice that are rarely visible or given consideration in critiques of the dual-use dilemma.

CONCLUSION

As I write the conclusion to this dissertation, the Zika virus, named after the Zika forest in Uganda where it was originally isolated in 1947, has captured the headlines (Dick, Kitchen and Alexander 1952). Here in the United States, the virus has seemingly coming from nowhere and without historical context. The global North's dominant actors in the Zika epidemic are already writing the narratives of otherness, security, and outbreak. At the same time, the counter-narratives of poverty, inequalities, and biopolitical gendered misogynistic dominations by the church and state over women's bodies are also being written. And echoing the West Nile and Ebola virus histories, although the Zika virus was the suspected source of the Brazilian epidemic of microcephaly in newborns as early as May 2015 coincidentally it wasn't until the Zika virus found its way to the United States in January 2016 that it became a subject of public concern by the CDC and WHO.

On February 1, 2016, the WHO declared the Zika virus was a Public Health Emergency of International Concern – only the fourth time the WHO has declared such an emergency (WHO 2016). In its announcement, the WHO stopped short of advising pregnant women to not travel to Brazil and other Zika-endemic countries, although the CDC did on January 15, 2016 (CDC 2016). The WHO's advisory has caused many critics to contend that the organization was pandering to the Brazilian government because any such recommendation would have a serious economic impact on the upcoming summer Olympics. Only time will tell if the WHO's reluctance was politically motivated or scientifically based.

With or without a travel advisory, the importance of WHO's declaration should not be underestimated. First, it is important to remember that Dr. Margaret Chan, Director-General of

the WHO, who declared the Zika emergency is the same person who also ordered the immediate slaughter of a million and a half birds in Hong Kong to stop the spread of the H5N1 virus. As I described in this dissertation, Dr. Chan's decision in 1997 was highly political and loudly criticized by both the Chinese government and her contemporary Hong Kong authorities. But her decision ultimately proved critical to stopping the global spread of H5N1 for six years.

Additionally, the increased mosquito control efforts that will result from the WHO's emergency declaration will have the unintended consequence of also reducing incidents of other deadly mosquito-borne zoonotic viruses, such as, malaria and dengue fever, that remain endemic in Central and South America. Lastly, many women's rights advocates are hoping the WHO's emphasis on the Zika crisis will shine a renewed spotlight for change in countries throughout Central and South America – countries that average more than a 60% unplanned birthrate (as compared to the United States' 37% which is one of the highest in the global North) – and yet have punishing anti-abortion laws, laws that severely limit access to women's access to contraceptives, and policies that actively deny women basic reproductive information and education (Singh, Sedgh, and Hussain 2010). The hope is that change will occur in the same way that the twin disasters of rubella and thalidomide in the late 1950s and early 1960s opened the doors for improvements in women's reproductive rights in the United States (Reagan 2012).

As I have shown throughout this dissertation, effectively addressing the spread of emerging infectious viral diseases in a socially just way cannot be reduced to facile arguments of linear determinations or moral judgments. It requires an objective understanding of how disease narratives are produced. It also requires that we identify the actors who are controlling the definition, production, and dissemination of knowledge and the resultant influence on policy

actions. And, it requires an understanding that there is always a relationship between knowledge and justice in these conversations.

As I describe in the Introduction to this dissertation, 20 years after its discovery H5N1 is still with us today, but not in the ways predicted. First, the 2005 global pandemic never occurred. However, the numbers of deaths in China from its cousin the highly pathogenic H7N9 virus (another avian influenza virus whose transmission routes to humans is not well understood) in the last two years have already surpassed those of the H5N1 virus, creating a new pandemic concern (Dennis 2015). Second, after more than a hundred peer reviewed H5N1 GOF-related studies since the first studies by Drs. Fouchier and Kawaoka, the predicted threat of bioterrorists using this route of easy access to published knowledge combined with advances in life sciences technologies has proven unfounded – replaced by other forms of terrorism that are far more palpable and real in the Western conscious. And, lastly now that the H5N1 virus has found its way to the United States, it has proved far deadlier to birds in large corporate farms than to those of poor backyard farmers in the global South who were originally thought to be the primary purveyors of the virus.

I conclude this dissertation with three thoughts, for future STS scholarship, which I believe are useful to further exploration of today's Zika crisis and the unknown emergent viral crises yet to come. First, it is fundamental for STS scholarship to always seek to expose the weaknesses in narratives of technological and viral determinism when there are corollary resultant counter-narratives of inequities and social injustices. As we have seen in this dissertation, dominant narratives have very real policy and human wellbeing implications of biopower that can drown out counter-narratives that have a greater social justice purchase.

Second, it is vital for STS scholars to always question and engage with nation-state policies of viral security that seek to erect borders of otherness – or as Wiebe Bijker said, to take on the problems of concrete cases, like terrorism and democracy. As I have shown in this dissertation, these borders don't provide viral security, and have only proven to produce hardships for those unfortunate enough to be on the other side.

Lastly, for those STS scholars who explore pathways of injustice and infectious disease, it is important to remember that there is always a historical underlying causation of Paul Farmer's "structural violence." This violence is currently manifesting itself in the Zika infested *favelas*, or slums, of Brazil that lack clean water and sanitation due to centuries of government policies that favored the country's wealthy. Structured violence is socially constructed, and therefore can be unconstructed, but the process begins with scholarship that exposes the weaknesses in narratives written to protect privileged populations who are at least risk of infectious disease at the expense of those much larger populations who are most at risk. In many ways, the global North failed in its attempts to contain the H5N1 virus because it saw the virus only as a threat – a viral actor requiring domination – and not as a question of knowledge and historically embedded structures of violence that required justice-inspired policies. If that lesson can be learned from the H5N1 virus's journey, then there remains hope the lesson won't be repeated.

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