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**AVOIDING TOUGH POLICY CHOICES IN AN INFLUENZA PANDEMIC:
THE ROLE OF KETTL'S ROCKET SCIENCE MODEL IN PUBLIC HEALTH**

A Thesis

Presented to

the Faculty of the Josef Korbel School of International Studies

University of Denver

In Partial Fulfillment

of the Requirements for the Degree

Masters of Arts in International Development

by

Danny Lambert

August 2010

Advisor: Randall Kuhn

Author: Danny Lambert
Title: Avoiding Tough Policy Choices in an Influenza Pandemic: The Role of Kettl's Rocket Science Model in Public Health
Advisor: Randall Kuhn
Degree Date: August 2010

Abstract

The security and social inequality approaches to public health present distinct answers to policy objectives relative to a pandemic. However, each approach leaves us with tough choices between the most valued objectives. I demonstrate how the networked approach, which Kettl's Rocket Science Model (RSM) exemplifies, does not leave us with such choices. Furthermore, I connect the epidemiological concepts public health practitioners apply toward communicable disease pandemics to RSM concepts. Finally, drawing on the disease parameters of a worst-case scenario influenza pandemic, I demonstrate how the networked approach helps public health practitioners expand capacity such that tough choices are unnecessary.

Acknowledgements

I appreciate Professor Kuhn's contributions to this thesis, particularly the time he spent contemplating the thesis' direction and planning with me. I am also thankful for Professor Conant's and Professor Laird's insights. My parents, Nancy Roth and W. Clair Lambert, have always supported my endeavors, and, along with my brother Matthew Lambert, have always shown me unconditional love.

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Chapter One: Introduction

The SARS Pandemic: A Wicked Problem

Rumors began spreading in Guangdong province, China. It said a communicable disease was spreading (BBC, 2003). Still, provincial officials did not publicize what was happening for three months. Chinese officials are hesitant to publicize events that threaten economic growth, according to Li Xiguang, professor of communications at Tsinghua University (Pomfret, 2003). This failure is in addition to a health system that has underfunded public health efforts to control epidemics of known communicable diseases (Banister, 1998, p. 1004). Such under-funding significantly compromised China's ability to respond to a new epidemic, SARS (Schwartz & Evans, 2007, p. 199-200).

SARS continued spreading without any official response. Meanwhile, John Cheng traveled from Guangdong to Hanoi, Vietnam. He came into a Hanoi hospital suffering from a critical condition, including a raging fever and his lungs filling with fluid. Dr. Carlo Urbani, who attended Mr. Cheng, could not identify the disease. Although Mr. Cheng was young, the disease had developed quick. He seemed to be suffering from a virus, but no drugs seemed to work (BBC, 2003).

Mr. Cheng transmitted the virus to Dr. Urbani, whose health also deteriorated quickly, according to Dr. Julie Hall. While treating Mr. Cheng, Dr. Urbani realized he confronted a disease he did not know. He reported the disease to the World Health Organization (WHO), who sprang into action, utilizing its plan to curtail communicable disease outbreaks. Still, they learned about the new disease too late to stop its spread. It

had already spread to Hong Kong, China (BBC, 2003), where it transmitted to nearly 350 people in a single location (Russell, 2003).

From Hong Kong, SARS jetted across the world like billiards balls spreading across the table after a break. Within six months after Chinese authorities identified SARS in Guangdong, it spread to the U.S. and Europe, with suspected cases in Canada, Indonesia, the Philippines, Singapore, Thailand, and Vietnam. By April, the disease had become prevalent enough in Toronto, Ontario, Canada that the WHO issued a travel warning (BBC, 2004). By the end of the outbreak, it had spread to six continents, having the largest effects in China, Canada, Hong Kong, Taiwan, Vietnam, Singapore, and the U.S. (Nature).

Despite their initial failures, once the Chinese government officially acknowledged SARS' presence, it mounted a serious and in many respects effective response to it. In a surge surveillance effort, the Chinese Centers for Disease Control and Prevention trained designated community members to identify potential cases of SARS in their Shaanxi province towns. These community members knew about the comings and goings of their community such that they could check any member returning from a SARS epidemic region for symptoms. These community members, in turn, notified the township hospital of any potential cases (Schwartz & Evans, 2007, p. 211). Efforts such as these lead the authors I cite to conclude that while the government's capacity was necessary to contain SARS, it alone was not sufficient (Schwartz & Evans, 2007, p. 196).

One can draw many lessons from the SARS pandemic. The efforts of the Chinese Centers for Disease Control and Prevention and their community partners suggests one

lesson is communicable disease epidemics require government public health agencies to have a surge capacity that relies on actors outside a single organization. Indeed, Donald F. Kettl thinks SARS was a *wicked* problem, writing irrespective of a particular country. In his book, *The Next Government of the United States: How Our Institutions Fail Us and How to Fix Them*, he suggests these types of problems meet the criteria for his Rocket Science Model (RSM) (Kettl, 2009). (I will refer to this work as *The Next Government 2009* because a previous work of Kettl's includes the phrase, "The Next Government" in the title). Policy problems appropriate for the RSM meet two criteria. One, they require collaboration among multiple organizations across what Kettl calls the plates of privatization, federalism, and globalization. Two, they necessitate adaptive solutions (Kettl, 2009, p. 180). Instead of government attempting to solve such problems with one organization, the RSM utilizes multi-organizational networks (Kettl, 2009). The RSM is a model in the public management theory of new governance.

Wicked problems allow for little reaction time (Kettl, 2009, p. 93). Chinese officials did not promptly react to SARS, an inaction for which they later apologized (BBC, 2004). In contrast, in March and April 2009 the Mexican government met their obligation to promptly report a potential public health emergency to the WHO under the International Health Regulations (IHR). Prompt reporting and continuous communication facilitated the process of reacting to what would become the aH1N1 pandemic (Katz, 2009). When I refer to aH1N1, I refer to the 2009-2010 pandemic. I do not want to confuse this with the 1918-1919 influenza pandemic, another form of the H1N1 influenza virus.

Furthermore, failures associated with wicked problems in one place “ripple throughout the system” (Kettl, 2009, p. 93; Kettl, 2006a, p. 14-15, 19). SARS may have spread to other countries regardless of the Chinese response. Still, the speed of their response gave SARS a window to spread without public health practitioners taking public education measures, a critical action that necessarily involves the population knowing about the presence of a disease. What is more, SARS caused economic and social disruption. It caused tourism in affected countries to slow and some production facilities to suspend operations when employees fell ill. Governments closed down schools, hospitals, and some borders. They also placed the infected in quarantine (WHO, 2003, p. 78). In 2009, the global recession and the aH1N1 pandemic caused tourism income, an important part of the Mexican economy, to fall by 15.1 percent (CNN Expansión, 2010). Pandemics involve extra medical costs, are a destabilizing force for financial markets, and cost governments revenue (Economist, 2009, p. 71).

Moreover, wicked problems involve high costs. (Kettl, 2009, p. 93-94). I mentioned the high economic and social costs SARS inflicted, spreading to different social sectors. SARS imposed its high economic and social costs in less than two years (e. g. Almomento, 2009). I have suggested why pandemic influenza is a wicked problem.

Finally, these costs can spread quick and far (Kettl, 2009, p. 93-94). The Mexican press began reporting the affects of aH1N1 only a month after public health officials discovered the virus (e. g. Almomento, 2009). There are multiple epidemiological parameters that qualify a pandemic be suitable to new governance.

Pandemic Influenza

Multiple disease parameters collectively qualify pandemic influenza to be suitable for new governance, and serve as a basis to highlight how it is a wicked problem. First, pandemic influenza is amenable to symptom-based public health measures because a small enough portion of its transmissions occurs prior to symptoms. For influenza in general, the proportion of transmission occurring prior to symptoms ranges between over 20 percent to under 60 percent (Fraser, Riley, Anderson, & Ferguson, 2004, p. 6147). This means influenza's latent period ends before its incubation period. A communicable disease's latent is the period between the entry of an infection into the host and the onset of initial infection. A communicable disease's incubation period is the period between the initial infection and the onset of clinical symptoms (Webb, Bain, & Pirozzo, 2005, p. 261). Because influenza's latent period lasts a shorter amount of time than the incubation period, influenza spreads pre-symptomatically.

In contrast, public health practitioners cannot combat polio with symptomatic measures because the disease only expresses symptoms in 1 in 1,000 cases, paralysis (Needham & Canning, 2003, p. 88). The strategy for such diseases is prevention. This fact does not provide a forum to talk about the disease as a wicked problem. Still, it demonstrates diseases amenable to the RSM tend to be symptom-based.

Second, pandemic influenza comes in a novel form. When someone discovers a novel, deadly disease and it is spreading, public health practitioners experience a certain amount of justifiable fear. They lack critical information about the epidemiological parameters of the disease, limiting their ability to tailor interventions. This means they

cannot make decisions to pursue public health measures that involve significant economic and social trade-offs. This occurred in the beginning of the aH1N1 pandemic (Fraser et. al., 2009, p. 1560). SARS and HIV/AIDS are different from aH1N1 because, when the first appeared, they were completely new to humanity. aH1N1 is a novel form of a disease that has existed for centuries.

Furthermore, the population lacks immunity to a novel disease. Specific to influenza, the population lacks immunity to the disease because of antigenic shift (Bartlett & Hayden, 2005, p. 460), a concept I will cover later. Still, novel virus are sufficiently similar to existing influenza viruses that some would have immunity. For example, aH1N1 is sufficiently similar to past influenza viruses that it caused lower mortality (death) among the elderly than one would expect from a novel strain (Hancock et. al., 2009, p. 1945).

Moreover, public health practitioners cannot immediately resort to vaccination the primary means of controlling influenza for six months (Noah & King, 2005, p. 122). Like with immunity, this is because of antigenic shift. The aH1N1 pandemic of 2009 was a slight exception to this, with China beginning mass vaccinations five months after the pandemic began (AFP, 2009) and the U.S. beginning mass vaccinations a month after China (CBS and AP, 2009).

What is more, the size of the stockpile of antiviral drugs that would be available depends on several factors, and thus it is not easy to predict its size. The Centers for Disease Control and Prevention (CDC) claims the Strategic National Stockpile is sufficient to supply treatment “in several large cities at the same time” (CDC, 2009d).

Still, judging the credibility of the claim, one must take three factors into consideration. First, public health agencies have limited resources to address pressing demands other than pandemic influenza, which I will review. Second, antiviral drugs have a limited shelf life (IOM, 2008a, p. 33). Third, the widespread efficacy of antiviral drugs for pandemic influenza is uncertain (IOM, 2008a, p. 20-23). For example, aH1N1 is resistant to adamantanes (CDC, 2010b). An article published a year after the beginning of the aH1N1 pandemic reports uncertainty remains about the effectiveness of oseltamivir treatment against the disease because little clinical data exists about its effectiveness. Still, the existing evidence suggests it is beneficial (Reddy, 2010, p. ii35). State representatives cited the second and third reason in expressing reluctance to stock antiviral drugs (IOM, 2008b)¹. Within weeks of the aH1N1 pandemic beginning, the Department of Health and Human Services (HHS) had so few antiviral drugs available it needed to replenish supplies (Lowes, 2009). Concerning the disease as a wicked problem, a novel influenza has more time to spread than other forms of influenza because public health practitioners cannot immediately and responsibly prescribe some solutions and vaccines are not immediately available. The disease's spread increases the broad societal costs.

Third, pandemic influenza has a nature of transmission making it amenable to fast, sustained human-to-human transmission. It is able to do so because it spreads through casual contact. This is unlike HIV/AIDS, whose transmission is primarily intimate contact. A contact is an action that may lead to communicable disease

¹ I originally found this information in IOMa, 2008, p. 99-100. This referred me to transcript of the first meeting of the Committee on Implementation of Antiviral Medication Strategies for an Influenza Pandemic. The audio files on the right-hand side of the website I cite in the text are the transcript of that meeting, although the title of the website I cite reflects the second meeting.

transmission. An important measure of how fast a disease spreads is the reproduction number (R_0). The R_0 is the number of cases generated from a primary infection of disease in a susceptible population. It measures “the intrinsic transmissibility of an infectious agent” (Fraser et. al. 2004, p. 6146). Its three factors include the number of contacts, the infectivity of a disease, or probability of infection per contact, and the duration of infectivity (Dietz, 1993, p. 23). Infectivity is “the ability of an organism to invade and multiply in a host” (Webb et. al., 2005, p. 260). A host is someone or something that carries a disease.

An R_0 of less than or equal to one will produce only minor outbreaks “with a probability 1 of extinction” (Dietz, 1993, p. 24). An R_0 over one means “there is a positive chance of a large outbreak affecting nearly the total population” (Dietz 1993, p. 24). Yang and colleagues classify the pandemic transmissibility of an agent by the R_0 , into low, medium, and high pandemic transmissibility. They estimate the R_0 of aH1N1 to be between 1.3 and 1.7, a low to medium pandemic transmissibility (2009a, p. 730). A disease spreading quickly narrows reaction time and causes failure to spread faster.

Furthermore, influenza’s infectious period lasts fairly long, an average of 3.8 days (Cauchemez, Carrat, Viboud, Valleron, & Böelle, 2004, p. 3469). This would not matter so much if not for the fact one can still operate with a reasonable degree of normalcy when sick, which facilitates people going into public with influenza. This gives the disease the opportunity to spread to others. One of factors limiting smallpox’s spread was the almost immediate on-set of symptoms that sent its hosts to bed with infection

(Koplow, 2003, p. 15). It is assumed aH1Na's infectious period is similar to seasonal influenza (AMA, 2009).

Moreover, as I have mentioned, influenza can spread pre-symptomatically. Thus, some people transmit the disease without having any sign they are even sick. Because aH1N1's infectious period is still unknown, one cannot say what the percentage of pre-symptomatic transmissions are. Concerning the disease as a wicked problem, pandemic influenza has the ability to spread fast and far due to its ability to spread through casual contact, its infectious period, the ability of the disease to spread pre-symptomatically, the ability of hosts to function with a reasonable degree of normalcy, and its novel nature, a concept I will address in the next reason why influenza is amenable new governance.

Forth, pandemic influenza may cause a high level of mortality. This is partially a function of the disease's novelty and its quick spread. It is also a function of the virus' virulence. Virulence "is the ability of an organism to produce serious illness and is measured by the proportion of those who are infected...who develop severe overt disease" (Webb et. al., 2005, p. 260). Virulence, in turn, is sometimes measured by the case-fatality ratio (Webb et. al, 2005, p. 260). The case-fatality ratio is "the proportion of people with a given disease that die from it in a period" (Webb et. al., 2005, p. 50). See Figure One. The HHS classifies a pandemic's severity by the case-fatality ratio. As Figure One also demonstrates, the 1957 and 1968 pandemics had case-fatality ratios between .1 and less than .5 percent. The 1918-1919 pandemic's case-fatality ratio was 2 percent or over. Various authors have provided estimates of aH1N1's case-fatality ratio (see Swedish, Conenello, & Factor, 2010, p. 108-111 for a discussion of these). More

time may be necessary before researchers can provide a more accurate estimation. That said, most illnesses from aH1N1 have been mild (Peiris, Poon, & Guan, 2009, p. 171). Concerning pandemic influenza as a wicked problem, widespread excess mortality is the ultimate cost of failure.

Figure One: Case-Fatality Ratio and HHS Pandemic Severity Index

The Case Fatality Ratio
 Number of People Who Die from a Disease

 Number of People with a Disease
 Adopted from Webb et. al., 2005, p. 50

The HHS Pandemic Severity Index

Characteristics	Pandemic Severity Index				
	Category 1	Category 2	Category 3	Category 4	Category 5
Case Fatality Ratio (percentage)	<0.1	0.1 - <0.5	0.5 - <1.0	1.0 - <2.0	≥ 2.0
Excess Death Rate (per 100,000)	<30	30 - <150	150 - <300	300 - <600	≥600
Illness Rate (percentage of the population)	20 - 40	20 - 40	20 - 40	20 - 40	20 - 40
Potential Number of Deaths (based on 2006 U.S. population)	<90,000	90,000- <450,000	450,000- <900,000	900,000- <1.8 million	≥1.8 million
20 th Century U.S. Experience	Seasonal Influenza (Illness rate 5-20%)	1957, 1968 Pandemic	None	None	1918 Pandemic

HHS, 2007

An influenza pandemic is likely, if not inevitable (Leese & Tamblin, 1998, p. 551). The aH1N1 pandemic was the first in 40 years. Justifiable concern about it surrounded the unknown answers to the disease parameters I mentioned, including the percentage of pre-symptomatic transmissions, the R_0 , the incubation period, and its

virulence. While aH1N1 was not very severe (Enserink & Cohen, 2009, p. 1607), the 1918-1919 H1N1 influenza pandemic caused approximately 50 million deaths worldwide (Tauenberger & Morens, 2006, p. 15). While the likelihood of pandemic influenza's occurrence does not have significance for the problem being amendable to new governance per se, it does make pandemic influenza a policy priority worth focusing on. Policy-makers have certain objectives relative to pandemics. I will begin embedding this thesis in a policy debate by explaining five policy priorities and how the security and social inequality approaches address them.

Policy Objectives and Unsatisfactory Answers

Policy Objectives

There are five policy objectives relative to a pandemic. The first is to minimize mortality. There are four epidemiological goals relevant to communicable disease pandemics related to this objective, plus the goal that pursuing one of these does not hurt any other. They include surveillance, reducing the infectivity of the disease, treating patients, and reducing the number of contacts.

Public health practitioners conduct surveillance, "the continuous monitoring of the occurrence and distribution of diseases and other conditions of ill health, and their determinants" (Webb et al., 2005, p. 77). It includes collecting, analyzing, and interpreting the relevant data. Surveillance informs them to a disease's distribution, incidence, and prevalence. Public health practitioners want to know these disease parameters so they can know where to activate interventions against the disease. In the

case of novel diseases, they need to know of the existence of a new disease such that the relevant actors can begin a global response (Webb et. al, 2005, p. 77).

Furthermore, public health practitioners wish to reduce a disease's infectivity. This is part of R_0 , the probability of infection per contact. Treating infected patients, either with curative or palliative treatment, is another priority. Treating infected patients narrows the duration of infectivity, also part of R_0 . Finally, public health practitioners wish to reduce the number of contacts. Reducing the number of contacts is the final aspect of R_0 .

The second policy objective is proportional macro costs. Funding any policy priority comes at some material cost: government will fund one policy priority less or charge tax-payers more. Furthermore, concern over pandemics comes at some priority cost to other public health priorities, especially in the environment of limited funding the U.S. public health system exists in (Scutchfield & Last, 2003, p. 115).

The third policy objective is to ask the population for proportional micro costs, which policy-makers call for in order to limit the number of contacts. These include economic costs, such as slowing trade and shutting down business not essential to survival. These also include social costs, such as restricting the civil liberties of the infected or potentially infected and shutting down public gatherings.

As I have mentioned, there is an important amount of unknown information when a novel disease emerges. Therefore, knowledge of what a proportional cost consists of is only partial. It is important these costs are proportional because sacrificing them is inherently painful. Furthermore, micro costs perceived to be disproportional will not have

the degree of compliance public health practitioners desire. Moreover, demands for micro costs perceived as disproportional reduce the amount of trust the population has in those asking for sacrifices. For example, in 1976 the U.S. government took drastic policy action to mitigate an influenza pandemic they feared would rival the 1918-1919 H1N1 pandemic. Although the policy action consisted of vaccination, not the type of micro costs I mentioned, the threat did not materialize. Public health agencies lost credibility as a result (Neustadt & Fineberg, 1983).

The fourth policy objective is the desire for programming that bureaucrats can manage. The fifth policy objective is the desire for programming that bureaucrats can hold accountable.

What the policy priorities are depends on the severity of the pandemic, i.e. how transmittable the disease is and the case-fatality ratio. In the beginning of the pandemic, public health practitioners will only have clues to what these are (see Fraser et. al. 2009 for the initial disease parameters of aH1N1). Still, given the uncertainty and the heavy political and humanitarian implications mortality brings, I believe saving lives is the first priority.

Preserving proportional macro and micro costs does not necessarily conflict with this priority. With precise application of public health investigation and decision-making, the right public relations campaign, and a little bit of luck, the public health agency will ask the public for appropriate types of precautions and sacrifices, the appropriate degree of them, and the public will comply. The long-term consequences of matching the right solution to the problem include public compliance during the next, possibly worse

pandemic. Because these sacrifices cost everyone (the public, public health practitioners, business, politicians, and others), proportional macro and micro costs are the second policy priority.

The management and accountability of programs are always important. A public health agency's programming becomes ineffective, costly, and perhaps even unethical without them. Still, the nature of the management and accountability difficulties stem primarily from the nature of problems and their solutions, making such challenges unavoidable no matter which approach one chooses.

The security, social inequality, and RSM approaches each provide answers to these objectives. Each has particular advantages and disadvantages. I will continue laying the foundation for the RSM approach by describing the former two approaches. I leave a description for the RSM, however, for after I describe new governance and the RSM.

Unsatisfactory Answers

The security approach recognizes the salience of public health for political and governance concerns, and holds both security and public health benefit from incorporating concerns from the other field. Still, antagonistic frameworks exist that disagree on the meaning of security and the unit of analysis (Fidler, 2007, 43). The frameworks I will discuss contrast the traditional security paradigm that defines security as the absence of armed conflict (Elbe, 2008, p. 125) and focuses exclusively on relative military force. They encompass other policy problems posing an immediate, direct, and destructive threat (Price-Smith, 2001, p. 118), especially to a state's material power and well-being (Fidler, 2007, p. 45). The frameworks view pathological viruses as external

threats with the potential to wreck havoc on the world population and global economy (e.g. Price-Smith, 2002). They therefore justify urgent and extraordinary policy responses, such as Enemark, 2009 assumes. I focus on these frameworks because most of the literature referring to the security approach uphold such assumptions.

Asserting that security and public health benefit from each other (Fidler, 2007, 43), the security approach claims security to enhance public health, therefore saving lives. The security approach offers specific strategies to mitigate a communicable disease pandemic. Still, Enemark argues the security approach may create reliance on methods and institutions that are not necessarily compatible with public health (2009, 200). While Enemark makes an interesting point, I will argue in Chapter Four that a pandemic of what I will refer to as a worst-case scenario pandemic requires security forces. The security approach is adept at supplying such forces.

Concerning the extent to which the security approach creates macro costs, the expense of deploying security-based tactics for public health tasks depends on the tactics a government employs, i.e. the approach is not inherently expensive or inexpensive. Claiming protecting public health is a matter of security is a tactic public health practitioners have utilized to gain more funding (Enemark, 2009, p. 195). Concerning whether the approach compromises other public health priorities, the literature tends to focus on communicable disease (Fidler, 2007, p. 49). Many developed and developing countries have public health profiles characterized by heavy burdens of non-communicable disease. McInnes fears the security approach ignores these and other burdens that, while not having much to do with security, have very much to do with

public health (2004, p. 168). Still, there are decision-trees some authors propose to judge whether a particular event constitutes a security risk. These decisions-trees allow for the possibility of communicable disease, non-communicable disease, or a bioweapon constituting a security risk (Fidler, 2007, p. 52). Because the securitization approach calls for drastic measures, the appropriateness of such measures becomes of especially important. Inappropriate measures risk deepening the mistrust minorities have of public health agencies. I will explain how minority communities have low trust for public health agencies in the next chapter.

Another concern about the security approach is the micro costs associated with it. Concerning issues of trade and travel, Enemark fears states operating under the security approach will unnecessarily close off trade and travel by shutting national borders (2009, 204). In the U.S., the proponents of the 'new normalcy' promote the idea of a consistently insecure world as a matter of everyday existence. This approach helps justify the securitization of public health (Hooker & Ali, 2009, p. 101). Hooker and Ali fear the ideological undercurrents of securitizing public health has the potential to naturalize violations of civil liberties (2009). While the process of the securitization of public health does not jettison concerns about human dignity, securitization does create tension with the human dignity agenda (Fidler, 2007, p. 45).

There are no particular benefits or concerns of the security approach to the management or accountability of public action. Having discussed the security approach, it is necessary to discuss the social inequality approach.

The social inequality approach advocates for a distinct approach to health. It calls attention to the structural inequalities, both domestic and global, that cause groups of socio-economic privilege to live longer and healthier lives than those with less (or no) privilege at all levels of income (Marmot, Friel, Bell, Houweling, & Taylor, 2008, p. 1661). Still, the approach does not exclusively concern itself with income. It addresses health discrimination against women (i.e. Sen, 1998, p. 10-14) and racial/ethnic minority groups (Sen, 1998, p. 15-17). Because these differences are avoidable through reasonable action, such differences amount to health inequality, a type of social injustice (Marmot et.al., 2008, p. 1661). While not focused particularly on communicable disease, this framework has relevance for pandemics. Instead of the micro-level approach of standard epidemiology to explain why communicable disease spreads (Farmer, 1996, p. 265), Farmer takes the position that social inequality plays a fundamental role in communicable disease outbreaks. Evidencing this claim, he cites an article (Epstein, 1992) and a book (Packard, 1989, p. xvi) (Farmer, 1996, p. 267).

There is little debate narrowing inequalities causes lower mortality in the event of a pandemic. Efforts to improve health in general also improve the minority group's resilience in the event of a pandemic, something that can only benefit the rest of the population. Furthermore, general improvements to health benefits that population in the inter-pandemic period, something that also benefits everyone. Still, the approach cannot prevent a pandemic from occurring altogether. Once it occurs, the approach does not have any specific answers for how to deal with the pandemic, save to continue advocating for the marginalized.

Concerning the extent to which the social inequality approach competes with other macro priorities, the approach does not have any particular social agenda with which to compete. The approach certainly helps strengthen ties with minority communities and does not neglect communicable disease, non-communicable disease, or injuries and accidents.

Still, the focus of the approach is quite broad. It conceives health as a fundamental result of all social and economic policies (Marmot et. al., 2008, p. 1661). Especially as a country achieves long standards of living and makes significant progress toward minimizing health inequality, eliminating the gap that remains between groups becomes expensive, with a broad range of issues still to address. Society performing efficiently is another virtue that sometimes works synergistically with equity; other times, the two virtues compete (Blinder, 1987, p. 15-31). I mentioned that the social injustice of the approach stems from the inequalities being avoidable through reasonable action (Marmot et. al., 2008, p. 1661). The efficiency/ equity competition highlights a circumstance in which the approach does not define the difference between reasonable and unreasonable action to narrow health inequality.

There is nothing specific to the social inequality approach advocating for micro sacrifices to mitigate a pandemic. If anything, the approach would keep a keen eye on any sacrifice the government asks for in order to assure it does not burden the socially disadvantaged in any unjust manner. Still, while not specifically associated with the approach, human rights law condones limiting certain rights, specifically to “prevent

disease or injury or [provide] care for the sick or injured” (Siracusa Principles, 1985, p. 6).

There are no particular benefits or concerns of the social inequality approach to the management or accountability of public action.

The advantages and disadvantages of the two approaches leave an important question unanswered: how do we avoid tough choices between the first three policy objectives? Each approach forces policy makers to make these choices. Between the disproportional response of the security approach and the high cost and no particular secondary response of the social inequality approach, there is no ‘centralist’ or ‘third’ way of combining the best elements of both approaches. The two approaches are largely incompatible. To the extent they are compatible, they would not create a system that provides an effective, and potentially proportional and equitable system.

In the second chapter, I will create a context for my answer to this question and the rest of the document. I will explain the necessary information about epidemics and pandemics with special reference to influenza, the public health context in which the above debate occurs, the essential aspects of new governance, the RSM, the role of NGOs and faith-based organizations, and the RSM answer to creating an effective and potentially proportional and equitable system. In the third chapter, I will relate the networked approach to the epidemiological goals I mentioned for communicable diseases in general. In the fourth chapter, I will relate the epidemiological goals to pandemic influenza, pointing out it presents unique challenges. I conclude with policy recommendations.

Chapter Two: Background Information

Epidemics, Pandemics, and Influenza

Epidemics and Pandemics

Both epidemics and pandemics refer to a significant increase in the dispersion of a disease. The terms differ by the geographical area they portray. An epidemic is “the occurrence in a community or region of a number of cases of an illness in excess of the usual or expected number of cases” (Tulchinsky & Varavikova, 2000, p. 175). A pandemic is the “occurrence of a disease over a very wide area, crossing international boundaries, affecting a large portion of the population” (Tulchinsky & Varavikova, 2000, p. 175). Several characteristics differentiate seasonal and pandemic influenza. I. Table One describes them.

Table One: Distinguishing Seasonal and Pandemic Influenza		
	Seasonal Influenza	Pandemic Influenza
Occurrence	Outbreaks occur in predictable seasonal patterns	Occur rarely
Immunity	Some immunity due to previous exposures	No previous exposure; little or no pre-existing immunity
Threat to Health	The very young, elderly, and those with certain health conditions are at risk	Healthy adults face increased risk
Health System	Can usually meet public and patient needs	May be overwhelmed
Vaccine	Available for the influenza season	Probably not available in the early stages of a pandemic
Mortality	Approximately 36,000	Possible much higher
Societal Cost	Modest	Potentially Severe
Adapted from HHS, 2010		

The Influenza Virus.

Influenza viruses are classified based on their specific nucleoprotein and matrix protein antigens into three types, A, B, and C. “Type A influenza viruses are further

classified into subtypes based on the antigenic characteristics of their specific antigens, haemagglutinin (HA) and neuraminidase (NA)” (Webster, Laver, Air & Schild, 1982, p. 115). Antigens are “a substance, usually a protein, that the body recognizes as foreign and that can elicit an immune response” (Mosby’s, 2002, p. 111). An epitope is a group of amino acids located on the surface of the antigen. They are “an antigenic determinant that causes a specific reaction by an immunoglobulin” (Mosby’s, 2002, p. 618).

Type A influenzas have been responsible for the major pandemics of the 20th Century (Webster et. al., 1982, p. 115) and 2009 (CDC, 2009c). The RNA genome of influenza A is comprised of eight gene segments. Separate RNA segments encode the HA and NA (Hay, 1998, p. 42). From this information, I will assume influenza A virus will cause the next pandemic. Two viruses of a specific subtype designation may vary (Webster et. al., 1982, p. 115). For example, while one novel H1N1 subtype caused the 1918-1919 pandemic, another novel subtype of H1N1 caused the 2009 pandemic.

Antigenic shift is the capacity of pandemic influenza to reassort RNA segments when a host has a co-infection of human and avian influenza. This usually occurs in animals because humans do not transmit avian influenza to each other. When reassortment occurs, a virus may have surface antigens against which humans do not have neutralizing antibodies. In addition to the ability to spread via casual contact, such insusceptibility to antigens facilitates transmission (Scholtissek, Hinshaw, & Olsen, 1998, p. 140-141). Such a shift occurred in 2009 with the novel aH1N1 influenza virus (CDC, 2009b).

Antigenic drift occurs when the HA antigen gene mutates. This leads to “an accumulation of amino acid sequence changes that alter the antigenic sites in such a way that they no longer recognized by the host’s immune system” (Webster et al., 1982, p. 118). An influenza A virus has five antigenic regions. There is a low probability of mutations in several antigenic sites. Because “a single antibody recognizing any one of the five antigenic regions may be sufficient” (Daly, Wood, & Robertson, 1998, p. 168) to neutralize the virus, antigenic drift does not have much potential to cause a new epidemic strain, given that the host has antibodies that recognize several epitopes (Daly et al., 1998, p. 168). Antigenic drift is reason the influenza vaccine must be reformulated every year (Noah & Krug, 2005, p. 122). The U.S. public health system manages the problem of seasonal and pandemic influenza in the context of other significant challenges, which I will now describe.

Public Health

Definition

Before providing a policy solution, it is important to couch the answer in concepts fundamental to public health. The Institute of Medicine (IOM) defines the field according to its mission, substance, and organizational framework. The mission is the “fulfillment of society’s interest in assuring the conditions of in which people can be healthy” (IOM, 1988, p. 40). The field’s focuses “on society as a whole, the community, and the aim of optimal health status” unites the field (IOM, 1988, p. 39). The field has grown beyond, but still includes, control of disease pandemics (IOM, 1988, p. 38).

Public health is “public” because it involves organized community efforts, not simply isolated individual efforts. For example, treatment of lung disease and warning the public about the dangers of smoking would have been insufficient to achieve the degree to which smoking has been reduced in public places. Laws and restrictions on smoking in public places, the product of organized efforts, were also necessary. Furthermore, the field seeks optimal health for the entire community. This is the sum of community-wide health benefits and the individual health status of individuals (IOM, 1988, p. 39).

Concerning “health,” the IOM draws on the WHO’s conception of health (IOM, 1988, p. 39). The WHO defines health as the “state of complete physical, mental, and social well-being” (Venediktov, 1998, p. 79). It includes but is not limited to the absence of disease (Venediktov, 1998, p. 79). This holistic conception of the field serves as motivation to extend community efforts “beyond the narrow concerns of special interests and the boundaries of any one professional discipline” (IOM, 1988, p. 40).

Concerning the public health’s substance, it is “organized community efforts aimed at the prevention of disease and the promotion of health” (IOM, 1988, p. 41). Public health duties have expanded from sanitary measures and communicable disease control to encompass physical, mental, and social dimensions. One factor suggesting the utility of new governance is the need for collaboration among a wide range of professionals for even a relatively narrow view of public health encompassing disease prevention and control, health promotion, and environmental measures (IOM, 1988, p. 40).

The field's practitioners come from a wide range of disciplines, representing a plurality of backgrounds and educations. Still, there is a common commitment to preventing "the dependency associated with disease and injury" (Pickett & Hanlon, 1990, p. 122). Furthermore, epidemiology, "the basic science of public health" (Robbins, 1985, p. 440), continues to be useful to understanding the causes of disease, disability, and mortality, which populations are at risk, how to protect these populations, and prevent disease (Robbins, 1985, p. 440). Epidemiology unites the profession (IOM, 1988, p. 41). Epidemiology is "the study of the occurrence and distribution of health-related states or events in specified populations, including the study of the determinants influencing such states, and the application of this knowledge to control the health problems" (Porta, Greenland, & Last, 2008, p. 81).

Concerning public health's organizational framework, the field encompasses "both activities undertaken within the formal structure of government and the associated efforts of private and voluntary organizations and individuals" (IOM, 1988, p. 42). Not only does public health encompass a wide range of disciplines, it encompasses a wide range of actors. Sometimes the actors behind public health efforts are obvious, as when one drinks purified water. At other times, it is less obvious, as when one sees an advertisement against recreational drug use that a public health agency created by paying a marketing business to develop.

Public health in general and preparedness for emergencies like an influenza pandemic is primarily local (Turnock, 2009, p. 448). State and local health agencies provide public health services most directly (Gensheimer et al., 2002, p. S63). Schneider

points out that states have primary constitutional responsibility and authority for public health (2006, p. 37). Many local health departments are responsible for day-to-day public health activities. Some receive the bulk of their funding from the state, while others receive little from the state. If they receive money from the federal government, it may come directly or indirectly through the states. They typically respond to the mandates of other levels of governments to the degree to which the federal or state government funds them (Schneider, 2006, p. 36-37). Such an organizational structure reflects the governmental structure of the U.S. (Pickett & Hanlon, 1990, p. 122).

The fact that local public health agencies respond to state public health agencies to varying degrees complicates making general statements about federalism to the extent that federalism deals with the relationship the state and local government. When the state agency dictates what the local agency will do, a command and control governance model is more relevant to how the state and local public health agencies coordinate. The involvement of the local agency would probably be dictated by an agreement between federal and state authorities. When the local agency has more autonomy or responds more to the federal government, a command and control governance model is less relevant to how state and local public health agencies coordinate. The state agency has less authority to command the local agency.

Pickett and Hanlon believe utilizing a single organization to solve public health problems is not appropriate. A variety of organizations house public health's functions. The problems inherently require trans-organizational approaches. Even the public health agency utilizes a variety of methods and rationales to achieve a certain goal. Organizing

all relevant services into a single organization would interrupt service systems (1990, p. 557). Now that I have defined public health, it is important to investigate the general areas of what the field does.

Functions

In public health, assessment leads to policy development, which leads to assurance, are the functions of public health. “These functions correspond to the major phases of public problem-solving: identification of problems, mobilization of necessary effort and resources, and assurance that vital conditions are in place and that crucial services are

Figure Two: Functions of Government in Public Health



Adapted from IOM, 1988, p. 43

received” (IOM, 1988, p. 43). Figure Two suggests the process is cyclical, with evaluation of the process informing assessment.

Assessment is the community diagnosis of health, and encompasses all the activities that lie therein. It is an inherently public function because it is supposed to, to the extent possible, consider all the relevant information and be based on objective factors. Public agencies are obligated to provide this type of analysis. Furthermore, public decisions are made in the context of limited resources. Government is a central

mechanism to compare competing proposals equitably. The quality of government's ability to do so is significantly affected by the quality of information it has. Finally, the public sector has a responsibility to develop the base of knowledge through which policy decisions are made (IOM, 1988, p. 44).

Policy development is "the process by which society makes decisions about problems, chooses goals and the proper means to reach them, handles conflicting views about what should be done, and allocates resources" (IOM, 1988, p. 44). Government provides this process with overall guidance, the responsibility to protect the public interest, and alone has the ability to provide binding answers (IOM, 1988, p. 44).

This thesis' function is policy development because it proposes five policy objectives, how three alternatives relate to those objectives, and proposes one be adopted, possibly in conjunction with another alternative. Kettl proposes the RSM because the problems that they are appropriate for require a type of governance distinct from the vending machine, "in both policy design and public management" (Kettl, 2009, p. 178). In chapters three and four, I will explain how epidemiological concepts associated with communicable disease pandemics relate to the RSM and how pandemics meet the RSM's criteria.

Concerning a general theme related to policy development and networks, I do not believe networks require public health agencies enact them in all the manners I will argue it is relevant in order to be effective. To make an analogy, a "Cafeteria Roman Catholic" is a Roman Catholic who believes in the fundamental teachings of the Church. However,

the follower does not agree with the Church on some specific issues, such as whether the Church should permit a woman to become a priest.

Without commenting on the legitimacy of “Cafeteria Roman Catholicism,” local public health agencies may choose it is only feasible for them to be “Cafeteria Rocket Scientists.” That is to say, it may only be feasible for them to utilize certain aspects of the RSM as it is relevant to communicable disease pandemics because it is only feasible for them to prepare for communicable disease pandemics to a certain extent. That said, selecting only certain aspects of the model may fundamentally weaken the model’s utility. The RSM depends on network of organizations willing to collaborate in a network. If certain key organizations or a certain number of organizations are not willing to cooperate, then the network’s utility may be diminished to the extent that it is not worth organizing to begin with. While this is an important issue, the point at which the RSM is not useful because the necessary or a sufficient number of members are not involved is beyond the scope of this thesis.

The assurance function is necessary to assure services are provided “to reach agreed upon goals, either by encouraging private sector action, by requiring it, or by providing services directly” (IOM, 1988, p. 45). The assurance function requires exercising authority, a responsibility that can only be delegated to government (IOM, 1988, p. 45). Assurance includes making sure legislation is implemented and maintaining statutory responsibilities. More specifically, it includes developing an adequate response to crises and making sure a level of service is maintained to attain an intended outcome, given available resources and techniques, guaranteeing “certain health services” (IOM,

1988, p. 45), and upholding accountability with the public, among other responsibilities (IOM, 1988, p. 45). The IOM recognizes the appropriateness of allocating public health responsibilities among multiple public agencies. Still, in order to assure public health, there must be a focal point of ultimate responsibility and accountability (IOM, 1988, p. 437).

Few Resources and Competing Priorities

While the mission and subsistence of public health enjoy wide support, public health departments often do not. Public confidence in the value and effectiveness of public health department activities is low. While some criticism of some public health departments may be warranted, public health depends on “redefining and restoring the role of health agencies at all levels of government to a position of respect” (IOM, 1988, p. 41-42).

The public health infrastructure suffers from inadequate capital expenditure, short staffing due to high attrition rates and uncompetitive salary levels. Furthermore, there has been a neglect of population-based health services at the expense of increased access to care for individuals. In a similar problem, reliance on public health departments to provide patient care has compromised the resources dedicated to core public health functions (Scutchfield & Last, 2003, p. 115). Public health agencies have dismantled critical public health services due to the erosion of resources (Gensheimer et. al, 2002, p. S63).

Furthermore, there are considerations related to the epidemiological and demographic transition. Abdel Omran proposed the epidemiological transition. The

theory explains patterns of health and disease and their “demographic, economic, and sociologic determinants and consequences” (1971, p. 510). As a society progresses along the transition, the health burden changes as mortality is caused less by communicable disease and more by non-communicable disease (Orman, 1971, p. 510). Part of the reason the health burden shifts to non-communicable disease is because people’s life expectancy increases. People live long enough to develop non-communicable disease.

In the first stage, the mortality rate is high and fluctuating, “thus precluding sustained population growth” (Orman, 1971, p. 516). Life expectancy ranges between 20 and 40 years. In the second stage, the mortality rate declines and “the rate of decline accelerates as epidemic peaks become less frequent or disappear” (Orman, 1971, p. 516). Life expectancy raises to 30 to 50 years. In the third stage, the mortality rate continues declining and stabilizes at a low rate. Life expectancy exceeds 50 years. Non-communicable diseases pose a greater health burden (Orman, 1971, p. 516-517).

The crude mortality rate is a fraction. The number of people who die in a period is in the numerator and the average number of people in the population is in the denominator (Webb et al., 2005, p. 42-43). The crude birth rate is also a fraction. The number of live births in a period is in the numerator. The average number of people in a population in a period is in the denominator (Krumme, 2002). See Figure Three for both.

The demographic transition is a model describing changing birth and mortality rates over time. It is divided into four stages (Montgomery) with important underlying trends characterizing each. Fertility and mortality determine population growth (Lee, 2003, p. 176). As a society progresses along the transition, mortality declines due to

communicable disease control. Preventative medicine, public health measures, and personal hygiene are also factors. Furthermore, improvements in the availability of food quantity fortifies the body's ability to resist disease, among other important benefits (Lee, 2003, p. 170-171).

Fertility rates decline as a society moves across the transition (Montgomery). The general fertility rate is the number of births per women between ages 15-44. It is often expressed as the number of births per 1,000 (Hernandez, p. 243). See Figure Three. The decrease in mortality is partially responsible for this decline (Lee, 2003, p. 173). Whether contraceptive technology contributes to fertility decline is "hotly debated" (Lee, 2003, p. 174). Most economic theories of fertility function under the assumption that couples wish to have a certain number of children that survive. Children involve higher opportunity

Figure Three: Crude Mortality Rate, Crude Birth Rate, and General Fertility Rate

Crude Mortality Rate
Number of Deaths in a Period

Average Number of People in the Population in a Period
Adapted from Webb, et. al., 2005, p. 42-43

Crude Birth Rate
Number of Live Births in a Period

Average Number of People in the Population in a Period
Adapted from Mausner & Bahn, 1974, p. 135

General Fertility Ratio
Number of Live Births

Number of Women Between 15-44 Years Old
Adapted from Hernandez, p. 243

costs as labor becomes more productive and children spend more time in school responding to a rise in return to education (Lee, 2003, p. 174).

Systemic changes in the age distribution are an integral part of the demographic transition, and are not very well understood (Lee, 2003, p. 180). Still, enough is understood to know that as a society moves along the demographic transition, a large percentage of the population lives to ages that permit them to develop degenerative, non-communicable disease that involve complex, expensive treatments. These diseases create significant demands on the medical and public health systems alike.

To Address Communicable Disease Pandemics?

In such a situation, should significant resources be allocated toward emergencies? Concerning public health's lack of resources, Horton says that while bioterrorism funding has increased public health budgets, he thinks it is likely that bioterrorism budgets will probably come at significant opportunity costs, including cutting into welfare programs for the elderly and uninsured and the CDC's non-bioterrorism spending (2003, p. 216 & 218).

The choice of whether to spend limited resources on routine or non-routine public health problems is, to a limited extent, false. Baker and Koplan point out public health benefits have a dual-purpose nature: resources dedicated to address one specific problem are useful to address another. They give the example of how prevention and control of West Nile virus can be utilized to address an influenza pandemic (2002, p. 23).

Preparedness for public health emergencies, done properly, is an important aspect of an effective public health system, not an end in and of itself. Indeed, local public

health authorities improving emergency preparedness reported the efforts improved virtually all their functions and services. Still, while federal officials have emphasized this dual-purpose, “federal actions have not always been consistent with federal rhetoric” (Turnock, 2009, p. 450).

Concerning the epidemiological and demographic transition, which suggest shifting funding away from communicable disease in general and pandemics specifically is quite justified for the U.S., the events of the past decade suggest our public health system takes a great risk by deemphasizing communicable disease pandemics too much. Since 2000, the West Nile virus, monkeypox, SARS, and aH1N1 have all been matters of serious public health concern. Gaining initial traction in the U.S. during the late 1970s and 1980s, HIV/AIDS has posed such a serious threat that it has fundamentally altered the public health landscape.

The heart of the debate lies in what precisely is “too much” de-emphasis of communicable disease pandemics, given quite limited resources. This thesis does not aim to resolve such a debate. Still, it does aim to demonstrate the usefulness and challenges of new governance when public health practitioners engage pandemics.

New Governance

Key Concepts

Why “Governance?” Why “New?”

The RSM is a model in the new governance theory. Lester M. Salamon identifies two defining features of the theory. First, the theory utilizes “governance” instead of “government.” He utilizes this difference to emphasize the collaborative nature of public

problem solving, specifically government’s reliance on third party actors, as Table Two demonstrates. As Kettl points out, “every major policy initiative launched by the federal government since World War II...has been managed through public-private partnerships” (1993 p. 4). Salamon credits George Frederickson with helping him develop his concept of governance (2002, p. 43).

Table Two: Share of Government-Funded Human Services			
Field	Proportion of Services Delivered By:		
	Non-profits	Business	Government
Social Services	56%	4%	40%
Employment/Training	48	8	43
Housing/community development	5	7	88
Health	44	23	33
Arts/culture	51	Less than .5	49
All	42	19	39

Adapted from Salamon, 1995, p. 88

Fredrickson defines governance utilizing four aspects. Governance describes a range of actors, linked and engaged in public action. Such a concept provides a superior paradigm with which to comprehend the interactions in networks (1997, p. 84-85). Furthermore, governance considers both policy creation and implementation, including the stakeholders involved in the process. Moreover, some contributions limit themselves to considering the work occurring “in and among both vertical and horizontal networks of organizations” (1997, p. 86). Governance, in contrast, “accounts for the multi-dimensional-organizational setting in which contemporary leaders and policy entrepreneurs carry out policy implementation” (1997, p. 86). What is more, governance implies legitimacy, acceptability, importance, dignity, and a positive contribution to public action. Bureaucracy and government “may be despised” (1997, p. 87).

Unfortunately, government relies on these partnerships while their administrators have little intellectual foundation on which to rely (Kettl, 2009, p. 200). This is because classic public administration remains focused on the internal workings of public agencies (Salamon, 2002, p. 6). The theory utilizes “new” to suggest these collaborative approaches must be addressed in a coherent manner, one that explicitly seeks to understand the opportunities and challenges these relationships involve. The challenge is comprehending and managing the implications of government’s deep reliance on third parties (Salamon, 2002, p. 8). The five principle concepts of new governance suggest how this understanding can progress.

Tools

New governance has five key concepts, each of which contrasts with classic public administration. First, the tools or instruments utilized to pursue public action are the unit of analysis, instead of programs or agencies. New governance studies the commonalities among types of tools, regardless of the field in which public actors utilize tools (Salamon, 2002, p. 9-10). Salamon defines tools as “an identifiable method through which collective action is structured to address a public problem” (Salamon, 2002, p. 19). Because each tool has its own “operating procedures, skills requirements, and delivery mechanism, indeed its own ‘political economy’” each tool has different implications for public management (Salamon, 2002, p. 2).

Such an approach is distinct from classical public administration. Classic public administration assumes publically authorized and funded programs are carried out by a

public agency. Such an assumption is out of touch with the proliferation of indirect tools (Salamon, 2002, p. 29). I will distinguish direct and indirect tools after defining tools.

Salamon distinguishes three aspects of his definition. Tools have defining and design features. These are common, defining features that make tools “identifiable.” Design features embody a tool, and make it distinguishable from a tool of the same type. So while all grants-in-aid are a type of tool, “different grant programs can vary in the level of specificity with which they define eligible purposes,...how funds are distributed,” and other features (Salamon, 2002, p. 19).

Moreover, tools structure action such that they are institutions in the sense of the new institutionalism school, which regards institutions as “regularized patterns of interaction among individuals or organizations.” Salamon says his usage of institutions is close to that of Douglas C. North (Salamon, 2002, p. 19). North says are institutions “regularities in repetitive interactions among individuals” and customs and rules that present individuals with certain incentives and disincentives (1986, p.231). They provide individuals with a degree of certainty over outcomes. They enforce customs and rules either through self-enforcement or by third party policing and monitoring (North, 1986, p.231). Tools define “who is involved in the operation of public programs, what their roles are, and how they related to each other” (Salamon, 2002, p. 19-20).

Finally, tools structure collective action responding to public problems. Government and other entities are involved (Salamon, 2002, p. 20).

Tools vary by the degree they are direct or indirect. Generally, directness is the extent to which the same government entity authorizes, finances, and delivers a public

action (Salamon, 2002, p. 27). “Indirect tools parcel these various functions out to various other parties” (Salamon, 2002, p. 28). As third parties become involved in these functions, “the more organizationally distinct and autonomous these third parties are from the authorizing body” (Salamon, 2002, p. 28). This gives them greater discretion over these functions. The more discretion they enjoy, the more indirect the tool is (Salamon, 2002, p. 28). There is no distinction between the directness of a tool whether these functions are parceled to another government or a private entity (Salamon, 2002, p. 1-47)

Table Three demonstrates how separate entities may be involved in financing and delivering a tool. It is a variation of Salamon’s work. I added “International” because the federal government relies on international third parties, whether these are international organizations or other countries. Furthermore, this conception better reflects the RSM, which conceives public action resting on three underlying forces, or plates, as I will explain later: privatization, federalism, and globalization (Kettl, 2009, p. 130 & 136). I will identify which cells this thesis involves when I connect epidemiology and the RSM.

Tools are complex, ‘packages’ with different elements. “They are a type of good or activity...”; “a delivery vehicle for that activity...”; “a delivery system, that is, a set of organizations that are engaged in providing the good, service, or activity...”; and “a set of

Table Three: Finance and Delivery of Public Action			
Delivery	Finance		
	International	Public	Private
International	I*	Pub/I	Pri/I
Public	I/Pub	Pub*	Pri/Pub
Private	I/ Pri	Pub/Pri	Pri*
Adapted from Salamon, 2002, p. 27-28			

rules, whether formal or informal, defining the relationship among the entities that comprise the delivery system” (Salamon, 2002, p. 20).

Tools are more general than programs. Programs may embody a single tool or a suite of tools, “applying them to the circumstances of a particular field or problem” (Salamon, 2002, p. 20). The same tool may be used for different programs, applying similar pressures and with similar operation requirements. Still, they are less general than policies. Policies are “essentially collections of programs operating in a similar field or aimed at some general objective” (Salamon, 2002, p. 20). Policies may utilize a single or multiple tools (Salamon, 2002, p. 20).

Tools choices are technical, political, and operational choices. Concerning them as technical choices, I have noted that tools define the actors and their roles. The actors and their roles themselves are critical factors in the outcome of the implementation process. The tool focus builds on the insight of implementation studies that the process of program design continues after legislative enactment to the implementation phase (Salamon, 2002, p. 10-11).

Concerning tools as political choices, the tool focus also builds on the implementation school in that it emphasizes the importance of the process determining how policies are carried out. Tools choices give “some actors, and therefore some perspectives” an advantage in determining implementation (Salamon, 2002, p. 11).

Concerning tools as operational choices, “different tools involve different management tasks and therefore require different management knowledge and skills” (Salamon, 2002, p. 11). Particular tools involve particular management knowledge and

skills on behalf of the bureaucrats implementing them. New governance literature exists to provide the body of literature relevant to such knowledge and skills (Salamon, 2002, p. 11).

Networks

Second, networks are the organizations on which new governance focuses. Indirect tools create interdependencies between public agencies and third party actors, creating networks (Salamon, 2002, p. 11). Furthermore, they play a major role structuring networks because they define which actors will participate and the roles they will play (Salamon, 2002, p. 13). In the process of forming networks, government gains important allies. However, it also loses direct control over how its programs operate (Salamon, 2002, p. 11). This is in contrast with classic public administration, which seeks to understand the internal operations of public agencies (Salamon, 2002, p. 12) embedded in hierarchies (Salamon, 2002, p. 11) who operate isolation (Brass, Galaskiewicz, Greve, & Tsai, 2004, p. 795).

New governance builds on network theory to explain challenges in policy implementation that networks involve. Because the relationship is one of interdependence, no party has the ability to enforce its will. This is the case even when principals and agents share basic goals (Salamon, 2002, p. 13). The new governance approach adds a clearer understanding of the commonalities among networks, including the particular management challenges that certain relationships are likely to involve (Salamon, 2002, p. 13-14).

In *The Next Government 2009*, Kettl calls government leveraging complex programs without direct control of service delivery the Mildred paradox. Mildred, Kettl's late mother-in-law, received excellent medical care that was publically funded by Medicare and privately implemented. To the extent the Social Security Administration manages Medicare, they do so indirectly (Kettl, 2009, p. 9-11). Such a situation creates the Mildred corollary: in the process of Mildred's care, no one was in charge. Responsibility in new governance is diffuse (Kettl, 2009, p. 11-12).

However, Kettl does not intend to say public agencies are not responsible for public problems. Kettl explains how CDC Director Dr. Julie Gerberding realized her organization had ultimate responsibility for results responding to the SARS pandemic. However, she realized she did not have the authority to produce or control the results directly (Kettl, 2005, p. 14).

New governance also builds on principle-agent theory to address the challenges public agencies in networks face. Public agencies in third party arrangements, the principal, must be careful of third parties, the agents, gaining leverage over them. Agents typically have more information about their actions with the discretion they possess. This gives agents the ability to escape their duties and "subjecting the principals to the 'moral hazard' of having to rely on agents" whose competence and diligence they do not fully know. Although principals can seek information to undercut agent leverage, this information comes at a significant cost (Salamon 2002, 12-13).

The language of new governance can imply all actors within a network have equal status. Gray summarizes the dynamic of power in collaborations. While she says parties

must be dependent on each other, power inequalities can exist (Gray, 1989, p. 119). She then explains how power dynamics unfold in various stages of the collaboration process (Gray, 1989, p. 121-130). Kettl argues the presence of a lead actor, with a public agency in that role, is essential to ensure the public interest remains paramount (Kettl 2009, 212-213).

The language can also suggest the paradigm is leading a blissful and complete replacement of old forms of managing public problems with a new one. Kettl sees a more important role for hierarchy in public problem solving. Public agencies are “holding companies for expertise” when wicked problems occur (Kettl, 2009, p. 211).

Furthermore, public agencies manage many problems that should be performed by one organization in a predictable routine (Kettl, 2009).

Surveillance for any significant disease requires reliance on private, public, and, in the case of reporting the disease to the WHO, global partners. Public agencies are central to the partnership between these entities. Specific to pandemic influenza, the CDC relies on health care providers, hospitals, universities, state and country public health laboratories, state health departments in general, and vital statistic offices. (CDC, 2010e). This is in addition to bilateral and multilateral efforts to strengthen surveillance capacity (HHS, 2005, p. F-34), I presume spearheaded by an HHS agency.

Public and Private Entities

Third, new governance emphasizes collaboration between public and private entities instead of competition. Such collaboration is a “desirable byproduct of important complementarities that exist among sectors” (Salamon, 2002, p. 14). Nonprofit and

business partners have particular benefits they can offer the public sector, assuming bureaucrats manage networks properly. This emphasis contrasts with classic public administration and privation theories, which posit a tension and a sharp divide between public and private entities (Salamon, 2002, p. 14).

In the case of pandemic influenza, the government offering antiviral drugs and vaccines involves the federal government distributing them to state and local governments as I mentioned describing Table Three.

Administration

Fourth, classic public administration focuses on public agencies. It employs command and control tactics to manage hierarchy. The privatization school downplays the need for administrative management. New governance, on the other hand, emphasizes the need for the public management of indirect tools utilizing negotiation and persuasion as the dominant management approach (Salamon, 2002, p. 15 & 44). “Instead of issuing orders, public managers must learn how to create incentives for the outcomes they desire from actors over whom they have only imperfect control” (Salamon, 2002, p. 15). Managers must be able to persuade network members that their idea/project is worthy of participation because of mutual benefit and/or a larger cause (Agranoff & McGuire, 1999, p. 29).

The performance of much public actions depends on the ability of public agencies to manage indirect tools because the extent to which public agencies produce public action themselves is shrinking and the extent to which public agencies rely on third parties to produce public action is growing. Government management now encompasses

both direct and indirect production of public goods. Each involves a distinct nature of managing production (Kettl, 2002, p. 490-491). The RSM requires bureaucrats to leverage how third party actors employ tools in a manner that is both effective and accountable. This task requires “great subtlety and skill” (Kettl, 2009, p. 178). Still, the oversight to govern indirect tools is not adequate (Kettl, 2009, p. 94).

Given this and Salamon’s acknowledgement of the challenges involved in third party relationships, new governance is not just as a theory encouraging collaboration with third parties because of the opportunities present in certain situations. The theory is partially reactive, attempting to provide a framework for government to manage third parties (Salamon, 2002, p. 8). Even Carolyn Hughes Tuohy, who is cautious about government utilizing third parties in health care, says, “To a certain extent, conceiving of governments as actors within complex networks simply constitutes a recognition of reality” (2003, p. 210).

Unfortunately, government has embraced a strategy of indirect tools with little evidence about what doing so involves (Milward & Provan, 2003, p. 2). Policymakers often show little interest in how to manage third party relationships, little knowledge of how to manage these relationships, and assume government’s relationship with third parties will be self-executing. However, no private company would assume the same about its third party relationships (Kettl, 2002, p. 491).

Third party relationships entail difficult accountability challenges. Diffuse political authority is the sources of these challenges. “Third party providers have independent bases of political power and potentially conflicting goals and interests”

(Posner, 2002, p. 525). Public agencies must rely on bargaining in which third parties often have leverage in policy formulation and implementation (Posner, 2002, p. 525).

Specifically, third parties have political resources that affects which goals the partnership chooses and how they are implemented (Posner, 2002, p. 524); the ability to participate voluntarily, or the ability to accept or reject participation in the program (Posner, 2002, p. 525-526); and often times they have a monopoly over the means of production (Posner, 2002, p. 526-527). Paul Posner cites Kenneth J. Arrow's book on principal-agent theory (2002, p. 527). Third party relationships are principal-agent relationships in which agents benefit from access to hidden information principals do not have. In such a situation, the principal cannot verify whether the agent utilizes this information in the principal's interest (Arrow, 1991, p. 39).

Finally, complex implementation chains preclude the ability of public actors to manage and evaluate programs in isolation from other initiatives. These initiatives are interconnected (Posner, 2002, p. 527-528). Posner emphasizes the importance of choosing the proper tools, as these are critical for proper performance and management (Posner, 2002, p. 533).

Substantial management and accountability challenges exist for government's third party relationships. So far, new governance has provided incomplete answers. I have mentioned the degree to which new governance focuses on tools and their implications for management. Yet the research on tools remains scant (Kettl, 2009, p. 200). Although Kettl offers nine accountability tactics for utilizing the RSM, he admits

the list is partial. “All of them combined still leave important questions unanswered” (2009, p. 227-232).

While I have not found a specific example concerning pandemic influenza relevant to these strategies, Goldsmith and Eggers attribute some failures in the Medicare program to skewed incentives. Doctors and hospitals select the insurance companies that process the claims and oversee the program. The Medicare program compensates contractors according to a fixed price for each claim they process, giving them an incentive to lower cost; the Medicare program gives contractors insufficient incentive, however, to detect fraud and abuse. Contractors spend .0007 percent of their claims-processing budget on this activity (2004, p. 130-131).

Skills

Fifth, negotiation and persuasion involve enablement skills instead of management skills. While the management skills classic public management and new public management emphasize are appropriate to manage hierarchy, enablement skills are those required to “engage partners arrayed horizontally in networks, to bring multiple stakeholders together for a common end in a situation of interdependence” (Salamon, 2002, 16). These include activation, orchestration, and modulation skills (Salamon, 2002, p. 16-18). While these are important aspects of new governance, I will not focus on this point further because this thesis does not focus on managing networks.

Agranoff and McGuire say public managers in networks must know who has the resources and have the knowledge and skill to tap them (2000, p. 28). Furthermore, they say because networks often involve members from different fields, network managers

“must know something about the work of different professions and occupations” (2000, p. 30).

While I have not found a specific example concerning pandemic influenza relevant to these skills, I have found one concerning public health. The HHS is a large, decentralized organization with disparate functions and 300 programs (Radin, 2000, p. 22). HHS Secretary Donna Shalala describes the organization as composed of units “that have their own history, needs, cultures, and constituencies” (Radin, 2000, p. 8).

The Public Health Service (PHS), is, in effect “a functional rather than an organization unit” of the HHS (Turnock, 2009, 169). Key PHS agencies include the Health Resources and Services Administration, who provides medical services for underserved populations; the Food and Drug Administration (FDA), who ensures the safety of food, cosmetics, products, medicines, and medical devices; and the Substance Abuse and Mental Health Services Administration, who strengthens the nation’s health care capacity to treat substance abuse and mental illness, among others (Turnock, 2009, 169-173). The CDC is also a part of the HHS, and I describe some of their functions in this thesis.

Whether or not such a structure is desirable, it creates challenges to benefiting from cross-unit collaboration. HHS Secretary Donna Shalala introduced a flatter (as opposed to hierarchical) organizational structure to the HHS. This coincided with Vice President Al Gore’s National Performance Review “which advocated flat organizations built around efforts to empower line officials” (Radin, 2000, p. 8).

One example of the attempt to create such a structure is Management Issue Lunches, which convenes all top management officers in each organization to informal meetings for discussion of issues and idea exchange on a monthly basis. The meetings allow participants to “make announcements and provide updates on current developments; a few topical issues are discussed, usually on the basis of presentations from the appropriate department staffer; and time is provided for members to raise issues that were on their minds” (Radin, 2000, p. 18). Still, the participants do not make decisions at these meetings (Radin, 2000, p. 18).

As a result, the venue gives participants the opportunity to deal with management issues at a conceptual level, top management officials the opportunity to discuss issues in a ‘safe’ environment, and program officials a department-wide perspective of the issues discussed (Radin, 2000, p. 20).

The Assistant Secretary for Management and Budget is the convener and chair of the sessions (Radin, 2000, p. 18), utilizing facilitation skills to establish interconnections between formerly more disparate units. As a testament to the Lunches’ success, participants have taken responsibility for many activities (Radin, 2000, p. 18). While the reader may think it odd I choose to feature an example of collaboration across one organization instead of multiple ones, I advise the reader to keep in mind that communication within one organization can become stove-piped to the extent that its different units have little idea what the others are doing. A university in which different departments do not communicate to the detriment of the cross-disciplinary academic collaboration that could be occurring between members of different departments is an

example somewhat analogous to the challenge HHS confronts, and which the Lanches address. A review of the concepts behind new governance, however, is not sufficient to justify why one should invest in the theory.

Why New Governance?

The new governance approach is necessary because problems are too complex for government to manage alone and government must grant other critical actors a role at the table in order to enforce its will. Furthermore, the theory attempts to provide the intellectual framework to comprehend and manage government's dependence on third parties, along with coherently addressing the challenges they pose (Salamon, 2002, p. 8).

A problem being too complex for government to handle on its own (Salamon, 2002, p. 8), which therefore involves third party actors, is sufficient to justify employing new governance. For example, if the Federal Emergency Management Agency (FEMA) were to produce all the services necessary for an effective disaster response itself, it would be a mega-public agency involving enormous waste (Kettl, 2009, p. 25).

The faster a problem develops, the more likely it is to outstrip the capacity of a single organization. The more likely a problem is to outstrip the capacity, the more appropriate new governance is. Slowly developing problems are easier for a single organization to build routines around because their occurrence is easier to foresee. For example, problems in the school system normally develop gradually.

A problem that develops quickly, such as a powerful bomb that is set off without warning, a hurricane, and epidemics, allow little preparation specific to the precise nature of its occurrence. One may or may not be able to predict its occurrence generally,

depending on the problem. No one can predict whether Chicago, Illinois will suffer a terrorist attack. On the other hand, everyone knows another hurricane will hit Miami, Florida someday. In the first example, the event's occurrence is not predictable. Although the second event's occurrence is predictable, no one can predict it with any precision much time in advance. The precise nature of either example would be very quick to develop.

Government lacks the authority to enforce its will because it relies on indirect tools that grant third parties discretion over the functions relevant to policy (Salamon, 2002, p. 27-28), I as described earlier. The Mildred paradox and Mildred corollary (Kettl, 2009) re-emphasize these points.

For some policy issues, government cannot provide services directly because it is illegal to do so or doing so is met with strong normative opposition. Treating the mentally ill who do not pose a threat to themselves or others is an example (Milward & Provan, 2003, 10-11). In the case of the mentally ill who do not pose a threat to themselves, the preference for a tool creates the network (Provan & Milward, 1991; Provan & Milward, 1995; Weiss, 1990). The next section discusses how problems and the solutions government proposes for them are often disharmonious.

Mismatch

Problem and Solution Match.

Kettl explains how problems and government's solutions often mismatch in *The Next Government 2009*. The Progressives created what Kettl calls the vending machine model for government to produce the services it delivers (2009, p. 30) in a vertical

hierarchy (2009, p. 107). The vending machine is most appropriate for problems “that recur in regular patterns...those best solved through routine strategies..., and those whose most important pieces fit relatively well inside a single organization” (2009, p. 180). He also points out the vending machine model is appropriate even if it is necessary for one organization to coordinate with another in some steps (2009, p. 180).

Kettl’s argument recommending the vending machine model for routine problems is a circular, as stated. He says the vending machine model, which necessarily relies on routines, is best for those problems “best solved through routine strategies” (2009, p. 180). Without a charitable interpretation, he essentially says routine strategies are best for those problems best solved with routine strategies (2009, p. 180).

He also recommends the RSM for problems “whose patterns make it hard to develop stable routines” (Kettl, 2009, p. 180). Interpreting his argument charitably without fundamentally changing it, I propose that the criterion that is the focus of these last two paragraphs should be: the vending machine model is appropriate for problems whose patterns make it easy to develop stable routines.

Concerning the vending machine model, programs and agencies are the basic unit it analyses (Kettl, 2009, p. 220). Government organizes agencies in vertical hierarchies that work in isolation (Kettl, 2009, p. 107). Such an approach promotes coordination of the complex tasks by allowing supervisors to organize the bureaucracy according to work that needs to be done and allocating work in a chain of command (Kettl, 2006b, p. 371).

The model works mechanistically: policymakers enact legislation, assigning the tasks to a government agency. The agency enacts the legislation, doing nothing save for

what the legislation specifically authorizes. Bureaucrats implement the legislation within the narrow boundaries of their position (Kettl, 2009, p. 107-108). In order to increase the government's effectiveness while preventing the abuse of power, implementation relies on fine-tuning (Kettl, 2009, p. 109-110) standard procedures applied in predictable patterns to problems that occur on an expected schedule (Kettl, 2009, p. 220). When the machine malfunctions, the solution is to tinker with the machine's mechanisms, changing the routines one applies to predictable problems. Failing that strategy, the White House and Congress build a new machine (Kettl, 2009, p. 110).

The model attempts to insulate the system from individual failings (Kettl, 2009, p. 220), such that one bureaucrat can replace another. The predictability of the machine makes managing it a straightforward task (Kettl, 2009, p. 110). When the operation of an organization consists of applying the same methods to the same problems, figuring out what needs to be done only requires technical knowledge mixed with deductive reasoning skills.

However, mechanisms of the machine have become more intricate than one might think from the outside (Kettl, 2009, p. 30). The mechanisms that produce government services are, in large part, indirect. Instead of an isolated machine that produces all of government's services, the machine's mechanisms rely on a complex array of arrangements with parties outside the machine who produce a large portion of government's services. Because government relies more on indirect tools, the breach between the model and government's operating realities has become larger (Kettl, 2009,

p. 111). The strategy devised to enhance coordination fails because much of the work to be done occurs not in the chain of command but outside the public agency.

Problems in how government agencies work often stem from how governments agencies interconnect. Still, many reformers see government agencies as isolated organizations. They rely on prescriptions based on the assumption that government agencies function in isolated, vertical hierarchies, when in fact agencies have become embedded in networks that necessitate distinct management skills. This causes them to “fix the wrong problem, fail to fix the right problem, and magnify government’s performance problems” (Kettl, 2009, p. 111-112).

Strategies that share power with other levels of governments and private actors are a shift from the model (Kettl, 2009, p. 141). Doing so without a grasp on what these third party relationships imply challenges the model’s ability to “ensure effective and accountable government” because it strains the rule of law devised to perform these functions (Kettl, 2009, p. 141). This, in turn, implies challenges for the programs’

performance and responsiveness (Kettl, 2009, p. 141). I summarize Kettl’s belief that certain models of governance more effectively address certain problems in Table Four.

Sending Social Security checks is a routine problem appropriately managed with the vending machine model. The

Table Four: Matching Strategies and Problems		
Strategy	Problem	
	Routine	Non-routine
Traditional/ technical/ hierarchical	Social Security Checks	Pennsylvania Interstates
Nontraditional/ adaptive/ networked	Keystone Cops	Mildred
Adapted from Kettl, 2009, p. 99		

Social Security Administration distributes millions of checks or direct deposits to their recipients utilizing a routine applied uniformly. Success lies in executing and refining a routine (Kettl, 2009, p. 99-100) because the problem occurs in expected patterns, has a pattern for which it is easy to develop a routine, and fits comfortably in a single organization (Kettl, 2009, p. 180).

It is inappropriate to employ adaptive solutions to routine problems. The *Keystone Cops* is a movie series that featured police officers applying complex solutions to problems that obviously were best solved by a straightforward solution. While they were created to provoke a good laugh, they demonstrate that, for routine problems, adaptive solutions are unnecessary and inefficient (Kettl, 2009, p. 98).

However, the vending machine is inappropriate for non-routine problems. In February 2007, a winter storm hit Pennsylvania that dumped snow, sleet, and freezing rain for hours, leaving the road to become “ice rinks” (Kettl, 2009, p. 103). Because the Pennsylvania Department of Transportation thought the snow would absorb the freezing rain, they did not plow the road. Tractor-trailers began jackknifing on the Interstates (AP, 2007).

The state police told emergency management officials that they were handling the problem. However, traffic began accumulating on the roads, clogging 150 miles of interstate highway with nowhere to move or exit because the state police and traffic officials did not coordinate to close the highway. Furthermore, “the emergency management system broke down, and no one knew who many people were stuck” (Kettl,

2009, p. 103-104). Moreover, “the National Guard was eight hours late in distributing emergency supplies” (Kettl, 2009, p. 104).

An investigation characterized the state’s response as having insufficient communication and coordination. The agencies involved did not have common reporting or documentation procedures (James Lee Witt and Associates, 2007, p. 26). Furthermore, the investigation found there was no central gathering point for public information (James Lee Witt and Associates, 2007, p. 26). Moreover, key state officials lacked knowledge of their emergency responsibilities (James Lee Witt and Associates, 2007, p. 4). State agencies inadequately communicated their actions with local emergency management and police (James Lee Witt and Associates, 2007, p. 28). Finally, and perhaps most pertinently for this thesis, the investigation found there was inadequate interagency planning, as state agencies did not understand how to coordinate with each other (James Lee Witt and Associates, 2007, p. 27-28).

There are circumstances in which government addresses non-routine problems with adaptive, networked solutions. Mildred had Alzheimer’s, a constantly changing condition that has unique manifestations in each patient (Kettl, 2009, p. 7). An essential reason Mildred received excellent medical care was because intertwined organizations, all indirectly connected “at most” (Kettl, 2009, p. 6), coordinated their care to Mildred’s changing needs without the benefit of anyone being truly in charge (Kettl, 2009, p. 12). The lackluster response to the winter storm in Pennsylvania is largely an example of how agencies at the same level of government failed to coordinate (James Lee Witt and Associates, 2007, p. 27-28). Yet Salamon says that direct tools are ones authorized,

funded, and/or delivered by “essentially the same government entity” (Salamon, 2002, p. 28). Given the need for collaboration between different agencies of the same level of government, there is a need to interpret Salamon’s definition such that collaboration between different agencies of government also involves indirect tools. That he does not explicitly exclude the possibility of this interpretation (Salamon, 2002) lends weight to this position. There is one more aspect to the mismatches government confronts.

Boundary Mismatch

Kettl also addresses the mismatch between how policy-makers address public action and the realities that public action entails. Kettl argues boundaries define “what organizations are responsible for and what powers and functions lie elsewhere” (Kettl, 2006a, p. 10). Boundaries serve several functions: they shape the meaning of a problem, the responsibilities of government officials, what is inside and outside government, the identity of government, and how government relates to its citizens (Kettl, 2009, p. 32).

Boundaries are defined by an organization’s mission, resources, capacity, responsibility, and accountability. The mission defines what the policy purpose of the organization is and is not. An organization’s mission, in turn, “creates a claim on resources” (Kettl, 2006a, p. 16). The amount of resources an agency gets signifies the degree to which government prioritizes an issue. The organization’s structure organizes capacity. Debate about how to do so are ‘how to resolve the cross-pressures on government bureaucracies’ and “how to best create the reservoir of expertise that is required to fulfill the organization’s mission” (Kettl, 2006a, p. 16). Intra-organizational boundaries, a part of the responsibility boundary, coordinate how bureaucrats are suppose

to contribute to the mission and what they cannot do. Accountability encompasses all the other boundaries. Bureaucrats can only do what they are explicitly authorized to, and “are politically accountable to policy makers for their actions” (Kettl, 2006a, p. 16).

Hierarchy attempts to provide the solution for these issues; however, it fails to do so because there are complex and interrelated problems (Kettl, 2006a, p. 14) that require “cross-boundary strategies for communication” (Kettl, 2006a, p. 15). A single agency cannot control or manage a problem of significance (Kettl, 2009, p. 34). A pandemic is an example of a problem boundaries cannot effectively handle (Kettl, 2006a, p. 12-13). The mismatch of boundaries and problems, in turn, causes the performance of public agencies to suffer (Kettl, 2006a, p. 13).

Boundaries are inadequate because political tensions “muddy administrative boundaries” (Kettl, 2006a, p. 13). Boundaries are rooted in a political consensus of administrative pragmatism. “Political cross-pressures...have vastly increased the challenges for the nation’s administrative system” (Kettl, 2006a, p. 13).

Furthermore, government relies more on administratively complex tools. These are the indirect type that require “more coordination of more organizations in the public, private, and nonprofit sectors,” essentially networks (Kettl, 2006a, p. 13). Networks are important because almost every policy problem of significance relies on such interorganizational, intergovernmental, or intersectoral partnerships to some degree. The 2003 monkeypox epidemic, for example, required the CDC to coordinate with public health officials in several states (Kettl, 2006a, p. 13).

Finally, the consequences of wicked problems spread across the responsibility of agencies and jurisdictions, have an interrelated and cascading nature, impose enormous costs with broad consequences if they are not addressed, and “virtually by definition, challenge existing organization and political boundaries” (Kettl, 2006a, p. 13). The wickedness of these problems is enhanced by the interdependent solutions that attempt to address them (Kettl, 2006a, p. 13). Such a situation demands a different approach to governance.

The Rocket Science Model

Introduction

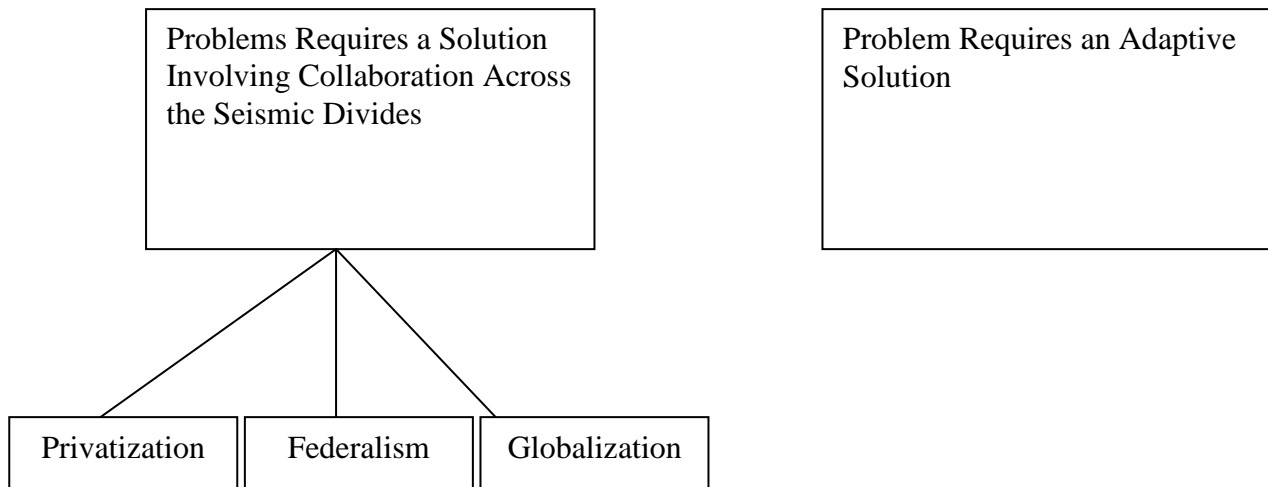
Kettl proposes that the RSM or leveraged governance for problems that do not fit the vending machine model. This model focuses on utilizing networks to align the partners that indirect tools make use of (Kettl, 2009, p. 178).

The RSM is appropriate for problems that meet three criteria: first, it is appropriate for problems that have patterns that make establishing stable routines difficult. Moreover, it is appropriate for problems that require administrators to employ adaptive solutions. Finally, it is appropriate for problems that require collaboration among multiple organizations across what Kettl calls the seismic divides (Kettl, 2009, p. 180). Because the RSM wishes to employ adaptive solutions, it relies heavily on individual insights of leaders to manage collaboration. The goal of the model is to build capacity flexible enough to deal with unpredictable issues (Kettl, 2009, p. 220).

I consider the first two criteria the same because solutions must be routine or adaptive and thus non-routine. The character of solutions may change and be at any point

in time routine or adaptive to a certain extent on a theoretical continuum. If it is difficult to develop a stable routine, then an adaptive solution is the only viable option. See Figure Four. Kettl's explanation references an earlier description of five leaders who displayed rocket scientist qualities, or skills the model values, when addressing non-routine problems (Kettl, 2009, 186-210).

Figure Four: RSM Criteria



Author's interpretation, based on Kettl, 2009, p. 180

Adaptive Solutions

Adaptive solutions are ones tailored to the problems at hand (Kettl, 2009, 186-210). They focus on results, not structure and procedure (Kettl, 2009, p. 210). Still, Kettl commends two of the five leaders for instituting routines, ones that were novel and adapted to their situation. The Oklahoma City Bombing displaced federal workers from their offices. They did not want the Post Office to forward their mail. LeAnn Jenkins of the Federal Executive Board arranged a special pick-up service at the post office that

permitted federal employees to pick up their mail at a special window with their government identification (Kettl, 2009, p. 199).

In Iraq in 2007, U.S. Army Captain Travis Patriquin convinced U.S. armed forces to build personal relationships with local Iraqis and conform to their culture. As a result, U.S. soldiers became more effective identifying enemy combatants and ultimately restore order to the Al Anbar region (Kettl, 2009, p. 205-208).

In the event of a novel disease pandemic, medical and public health practitioners know the information they have to find. They desire this information because they wish to install what are essentially public health routines to prevent excess mortality. Only in the case of a novel form of contact would their response be wholly adaptive.

These routines are adaptive, however, because the routines installed vary by disease and change according to the severity of the pandemic. Furthermore, the public health priorities of the inter-epidemic period take a second priority as public health practitioners install interventions that they only utilize in a pandemic situation. There is still one aspect of the RSM criteria I have yet to discuss.

Seismic Divides

The seismic divides or plates are the underlying forces on which public action rests. They include privatization, federalism, and globalization (Kettl, 2009, p. 135-136). All three plates meet and occasionally shift. They have shifted such that government must collaborate with other organizations across the divides to meet their public policy goals (Kettl, 2009, p. 129-175).

Privatization is the relationship between public institutions and private organizations, whether these are for-profit or non-profit (Kettl, 2009, p. 136). This plate has changed such that public organizations must collaborate with private organizations to accomplish their public policy goals (Kettl, 2009, p. 142-146). Kettl gives the example of the Department of Transportation, which eased congestion by utilizing “their public resources...to leverage the private system” (Kettl, 2009, p. 144). Bureaucrats have the challenge of matching traditional and market-based accountability systems to the appropriate relationship. Specific to public-private partnerships, they must rely on “the law of contracts and the power of economic incentives” (Kettl, 2009, p. 145).

Federalism is the “the relationship between the national, state, and local governments” (Kettl, 2009, p. 136). This plate has changed such that higher levels of government must collaborate with lower levels of government to accomplish their public policy goals. In the case of FEMA’s remediation work of the 1990s, director James Lee Witt’s strategy was to create partnerships with communities to mitigate hazards. He did so by offering grants to communities willing to identify hazards, prioritize risk reduction steps, decide the most effective steps in building the partnerships necessary to mitigate hazards, develop communication strategies to broaden those partnerships (Kettl, 2009, p. 147-148).

Globalization is “the role of the United States in the world- the relationship between American and other forces (political, economic, and social) that shape global life” (Kettl, 2009, 136). This plate has changed such that a competent job on the part of

government domestically necessarily involves collaborating with foreign partners to accomplish goals that ultimately affect U.S. citizens (Kettl, 2009, p. 151-156)

While my new governance introduction focuses on the importance of indirect tools, Kettl also includes the concept of wicked problems. Deviating from an earlier conception of wicked problems that I described earlier (Kettl, 2006a, p. 13), he describes wicked problems as having three characteristics. As I mentioned, wicked problems allow little reaction time, are characterized by failures in one place that may “ripple throughout the system,” spreading quickly, and can involve high costs that “can spread quickly very far” (Kettl, 2009, p. 93-94). Kettl utilizes ‘wicked’ and ‘non-routine’ problems interchangeably (Kettl, 2009).

When I connect wicked problems to epidemiological concepts later in Chapter Three, I describe them as having four characteristics: little reaction time, broad reach of failure, high costs of failure, and the quick, far spread of failure. This is a deviation from how Kettl originally conceives the characteristics of wicked problems. I divided Kettl’s third characteristic, problems involving high costs that “can spread quickly very far” into two: high costs of failure and the quick, far spread of failure. I believe high costs and the quick, far spread of failure are separate, even if related, concepts.

Another deviation is interpreting Kettl’s assertion that failures in one place may “ripple throughout the system,” spreading quickly (Kettl, 2009, p. 93-94) as being a broad reach of failure. I interpret the system as the social system, broadly defined. Kettl gives the examples of small levee failures leading to the flooding of a city (New Orleans, Louisiana during Hurricane Katrina) and the ability of a few terrorists to sneak weapons

past a few security checkpoints leading to a massive homicide and a nation being injured (those who executed the September 11, 2001 attacks) (Kettl, 2009, p. 93).

For each of these characteristics, Kettl cites the interconnectedness of the system as the primary reason for wicked problems having their destructive, quickly cascading nature. This is true whether he cites the interconnectedness of “the system” in general for little reaction time, the interconnectedness of “the government system” for failure in one place spreading quickly, or “the government system-indeed, of all society” for high costs that spread far quickly (Kettl, 2009, p. 93-94). Collaboration across the seismic divides requires certain skills.

Rocket Science Model Skills

The RSM rests on seven key principles, the skills of a rocket scientist. The first skill is to “focus on results” (Kettl, 2009, p. 210). The procedures and structures that implement policy are often important. However, the mission, not procedure or structure, should drive behavior (Kettl, 2009, p. 210). In rocket science, both the literal type that allows NASA to launch space shuttles and the figurative type that can be used for a wide range of policy problems, the management system “focuses on a well-defined mission” and is set up such that managers have clear responsibility to produce results (Kettl, 2009, p. 185). When I refer to ‘rocket science,’ I refer to the figurative type. Still, utilizing flexible solutions requires administrators to follow “the law of what ought to be done and how it is to be done” (Kettl, 2005, p. 20).

The second skill is to “seek results through interrelated partnerships” (Kettl, 2009, p. 210). Non-routine problems require inter-organizational partnerships because no one

organization can control them alone (Kettl, 2009, p. 210). Furthermore, “rocket science requires creating teams that draw together the forces required, and leading them toward results” (Kettl, 2009, p. 211). Each of the leaders who displayed rocket scientist qualities worked through interrelated partnerships to solve their respective problems (Kettl, 2009, p. 186-210).

Perhaps the most impressive partnership that Kettl features is the integrated incident command post created by Christopher Combs of the Federal Bureau of Investigation and Check Gibbs of the Arlington Country, VA Fire Department after the Pentagon was attacked on September 11, 2001. It included seven organizations relevant to the response plus emergency responders from neighboring communities. Familiarity of the command post members with each other allowed the team to respond quickly. While one may take such an occurrence for granted as simply what should happen, it is worth noting that the police and firefighters in New York, New York were not communicating with each other after the World Trade Center was attacked on the same day (Kettl, 2009, p. 203-204).

The third skill is to “use information to facilitate communication” (Kettl, 2009, p. 211). Good communication is central to building partnerships. Furthermore, in each description of a rocket scientist, “communication was the most important mechanism for defining the strategic direction and coordinating action to reach this goal” (Kettl, 2009, p. 211). After the nation’s airspace was shut down after the September 11, 2001 attacks, federal, state, and local officials coordinated with local law enforcement on the East Coast to deliver supplies to the hospitals treating victims (Kettl, 2009, p. 204-205).

The fourth skill is to “rely on bureaucracies, as holding companies of expertise” (Kettl, 2009, p. 211). Rocket science relies on public agencies as a place where rocket scientists are nurtured, resources are held, and the appropriate strategy is assembled when non-routine problems occur. Each of the leaders Kettl references “used their existing bureaucracies, with their structures, processes, and routines, as repositories of essential resources” (Kettl, 2009, p. 211). Furthermore, as I will detail shortly, the seventh skill proposes public agencies have a special role to play in protecting the public interest (Kettl, 2009, p. 212-213). The RSM seeks to institutionalize “leadership, management, and coordination mechanisms that are, by their very nature, not institutional” (Kettl, 2009, p. 186).

The expertise public agencies hold is critical for the RSM’s success because the model is quite dependant on “the quality of individuals in key positions” (Kettl, 2009, p. 220). This issue is relevant to public health surveillance. Some diseases are so rare that they do not create a demand for laboratory diagnosis in a market. Yet there is a public health need to retain the ability to survey them because they may emerge (Avery, 2000, p. 332).

The fifth skill is to “create relationships of trust before they are needed” (Kettl, 2009, p. 211). The inter-organizational partnerships that different organizations form “depend critically on interpersonal relationships” (Kettl, 2009, p. 212). Exercises and training among those who will collaborate are essential because these activities form the relevant relationships (Kettl, 2009, p. 211). Jenkins credits the relationships federal

executives from different agencies had already formed before the Oklahoma City Bombing with their ability to adjust to unusual circumstances (Kettl, 2009, p. 201).

The sixth skill is to “steer resources” (Kettl, 2009, p. 212). “Leverage over these partnerships comes from nudging resources- money, information, and people- in ways that strengthen the incentives for collaboration. Rocket science depends on focusing the right resources in the right places in the right times” (Kettl, 2009, p. 212). Furthermore, for leveraged governance, Kettl proposes a new system of accountability (Kettl, 2009, p. 215-240).

The seventh skill is to “lead by making the public interest drive complex partnerships” (Kettl, 2009, p. 212). Especially relevant in the context of complex partnerships, an essential role of government is to ensure partnerships promote the public interest. In public-private partnerships, a government agency must play the lead role to ensure the public interest remains paramount. In inter-governmental partnerships, the challenge is to balance federal, state, and local power because there may very well be competing visions of the public interest (Kettl, 2009, 212-213). In partnerships that extend beyond international boundaries, “an insistence on sovereignty can destroy the partnership” (Kettl, 2009, 212-213).

In an example of how two levels of government can have differing visions of the public interest (Kettl, 2009, p. 212), Ramsey Green of the New Orleans, Louisiana School District confronted the challenges of FEMA desiring to replace school supplies that the storm damaged with supplies just like it, include books. This obligated the school district to itemize each item (Kettl, 2009, p. 209). Green and his colleagues created a

request to FEMA with four broad categories of items with a commodity code “that provided FEMA officials with an audit trail” (Kettl, 2009, p. 209-210) The request ultimately created a \$50 million check from FEMA (Kettl, 2009, p. 210).

In the context of a communicable disease pandemic, it would be wise for public health agencies to communicate specifically with populations that mistrust government. As I propose in the next section, nonprofit organizations can help them meet this challenge.

The Role of Nonprofit Organizations

The literature on communicable disease pandemics often overlooks the potential role of nonprofit organizations in the responding to communicable disease pandemics. Many groups, whether they are ethnic or political, mistrust government such that they may not comply immediately with governmental messages aimed at mitigating such a problem.

Certain ethnic groups do not trust that public health measures would be fair during a public health emergency. Eisenman et. al. study the relationship between the independent variables of self-reported race or ethnicity and gender (among other independent variables) and the dependent variable of perceived fairness on the part of local public health authorities (Los Angeles County, California’s public health system, in this case) in the event of a bioterrorist attack (2004, p. 148). They found statistically significant differences between the degree of trust different ethnic groups place in local health authorities, with Afro-Americans demonstrating the least amount of trust, followed by Asian/Pacific Islanders, Latinos, and whites (2004, p. 149). The difference between

genders was significant at the .10 p-value level, but not at the .05 level, with women being less trusting (2004, p. 150).

African-Americans are suspicious of the medical system. Many think doctors treat patients differently based on their race (Jacobs, Rolle, Ferrans, Whitaker, & Warnecke, 2006, p. 644). They fear physicians and interns experiment on them in the course of their medical care (Corbie-Smith, Thomas, Williams, & Moddy-Ayers, 1999, p. 540; Jacobs et al., 2006, p. 644-645). Concerns about participation in medical research included honesty on the part of physicians about the risks and procedures. Furthermore, they suspect the potential benefits of such research will not benefit other African-Americans due to racial discrimination and poverty (Corbie-Smith, et al., 1999, p. 540).

Concerning response to emergency messages, Perry and Mushkatel conduct a survey of Abilene, Texas, Mt. Vernon, Washington and Denver, Colorado's residents about the amount of trust different ethnicities place in disaster warnings from the mass-media. The population size and the disaster that occurred in each location were distinct (1986, 10-19). Mexican-Americans treat the media as a reliable source, especially Spanish language broadcasts. Anglos are more skeptical, thinking media sensationalization makes differentiating a real emergency from sensationalization difficult. African-Americans are also less trustful of the media, thinking the media does not focus on issues pertinent to their communities or the preservation of their communities (1986, p. 33). African-Americans who decided not to evacuate New Orleans, Louisiana before Hurricane Katrina cited racism and inequalities as a reason (Elder et al., 2007, p. S124).

Different ethnicities in the Perry and Mushkatel survey place different levels of confidence in relatives and friends. Data from Abliene and Mt. Vernon demonstrate Mexican-Americans place more confidence in social networks than Anglos (1986, p. 33-34). Data from the same disasters demonstrate African-Americans place more confidence in friends and relatives than Anglos (Perry & Lindell, 1991, p. 64). All ethnicities in the Denver disaster claimed friends and relatives to be credible. Still, the thesis that Anglos tend to place less confidence in friends and relatives than minorities is strengthened by the fact that the Denver disaster, a nitric acid spill, involved many visible cues that something drastic was amiss (Perry & Mushkatel, 1986, p. 15-17 & 33-34).

The contributions I cited does not consider the number of people who are in the U.S. as undocumented migrants, groups that mistrust government and its motives, and those whose English ability is limited. Their compliance of the first two groups would be difficult to gain because they are suspicious of public action. The message may simply not reach the latter group because of their language ability and the implications of that language ability for integration into mainstream society. In many places, the language problem is tougher than simply translating the message into one or even two other languages because places like New York, New York and Denver are home to such a wide variety of immigrants. Many of these immigrants are tied into non-profits or faith-based organizations, such as Denver's African Community Center or Centro Humanitario and Buddhist congregations.

Community non-profit organizations, especially charities and faith-based organizations with deep ties with minority ethnic communities, may be key partners in

communicating with these populations. Establishing trustful relationships with these types of organizations, which may include addressing broader public health issues these communities face, gives public health agencies more credibility when they would ask such organizations to spread the word the pandemic is a credible threat. Messages targeted at a social network would have to be simple, as complex messages that spread from person-to-person tend to lose their original meaning. Still, simply receiving the message that a communicable disease is spreading in the community from a trusted source may be essential to sending a more complex message fast at a later date. That said, if the public health agency is communicating the message to population whose language it cannot speak, a more sophisticated message to such organizations may be more appropriate.

In the event of very transmissible, high case-fatality pandemic, government will gradually gain these groups' compliance as the information outlets they trust or public alarm convinces them that a pandemic is a legitimate problem no matter which approach to pandemic communication the government uses. By successfully coordinating the right actors, the RSM has the potential to gain these communities' compliance faster. Utilizing NGOs and faith-based organizations are an example of how public health practitioners can utilize networks to expand capacity to meet the policy objectives I outlined earlier.

The RSM as an Answer to the Policy Objectives

By planning for surge capacity in the inter-pandemic stage, scaling up the network when the pandemic begins, and collapsing it when the pandemic ends, the RSM is the solution to achieving the most valued policy objectives. An effective RSM network

coordinates all the actors necessary for an effective response. I will identify the actors and general aspects of how the network coordinates them in the following two chapters.

Concerning the first policy objective, saving lives, the RSM helps save lives by scaling up the capacity to reduce contacts, including providing a consistent message, restricting public encounters, contact tracing, and, if necessary, conducting quarantine and killing animal vectors. It also saves lives by coordinating the necessary actors to distribute antiviral drugs and a vaccine, limiting a disease's infectivity. Distributing antiviral drugs also helps treat patients. These actors may include the police, fire department, or military because civil disturbance is a possibility.

Concerning the second policy objective, proportional macro costs, Jensen and Kennedy note new governance specifically seeks to create efficient, cost-effective programs (2005, p. 235). In the context of poor funding and serious competing priorities, asking public health agencies to produce all the services necessary for an effective disaster response itself would not be plausible, due to the waste such a task would create (Kettl, 2009, p. 25). Nothing fundamental to networks challenges a public health agency's ability to tackle other public health priorities. Indeed, the flexible capacity networks can provide may decrease the degree to which a pandemic response completes with such priorities. Still, the priorities of the public health agency will be the determinate factor in how its pandemic programming challenges other public health priorities.

Concerning the third policy objective, asking the population for proportional micro costs, nothing fundamental to networks demands public health agencies extol

disproportional demands on society to reduce the number of contacts, or activities that can spread disease. The priorities of the public health agency will determine this.

Thus, networked approach, which can be combined with the security or social inequality approach, does not demand tough choices among the first three policy objectives. What prevents it from being an obvious choice are the incomplete answers new governance provides to the management and accountability of public programs utilizing third parties. I discussed these aspects of new governance I discussed earlier. Management and accountability are the fourth and fifth policy objectives, respectively.

Public health agencies have experience with such third relationships, working with international (e.g. Schneider, 2005, p. 150-151), private (e.g. Schneider, 2005, p. 44-46), and government partners at other and the same level of government (e.g. Schneider, 2005, p. 36-44). While a detailed discussion of the public health agencies' adeptness working with these types of relationships is outside the scope of this thesis, it may be telling that the literature with specific concerns about new governance and public health crisis is thin. Cook and Cohen, 2008, p. 457 are concerned utilizing police and fire department may be tricky because they are not used to supporting roles. Tuohy, 2003 has concerns about new governance and medical care. Faced with a deadly, growth threat and several epidemiological unknowns, public health practitioners may prioritize objectives one through three and rely on the partial answers new governance offers to policy objectives four and five. I will now attempt to illustrate how a public health response to a pandemic relies on relationships with third parties.

Chapter Three: The Connection between Communicable Disease Epidemiology and the RSM

Introduction

For the RSM to be relevant to communicable disease pandemics, its concepts must connect to epidemiological concepts public health practitioners apply toward such occurrences. Both the RSM and the relevant epidemiological concepts have potential outcomes they wish to achieve, have certain goals that guide public action toward reaching that outcome, and certain tasks to complete toward reaching those goals. I begin the chapter with a discussion of how the epidemiological and RSM concepts meet, dividing the explanation into four connections: surveillance, infectivity, treatment, and contacts. Furthermore, Kettl creates certain criteria that segregate the problems most relevant to the RSM. In order to distinguish influenza pandemics from other health problems, I finish the chapter with a discussion of how pandemics in general meet these criteria.

In the process of explaining the connections, I assume public health authorities are responding to a disease that has a low R_0 and low case-fatality ratio. The disease would be similar to aH1N1 in these respects, so I will supplement my description with information from that pandemic. Influenza is transmitted person-to-person via inhaling aerosols with the virus. Still, I intend for this chapter to be about communicable disease in general. Thus, I will highlight specific aspects of a disease spread by other means.

Epidemiological Concepts and the RSM

As I mentioned, there are four connections between the RSM and epidemiological concepts. Table Five demonstrates these connections. Because filling it out while doing justice to the concepts would create a table too cumbersome for one page, I will explain the content of the table’s cells in paragraph form. The matching colors demonstrate the concepts I hope to match.

On the epidemiological concepts side, the potential outcomes are the characteristics of a communicable disease pandemic with which public health practitioners concern themselves. The goals are the general principles of what public health agencies must do to prevent or mitigate these problems. The tasks are the specific duties of public health agencies to ensure the potential outcomes become a reality. I mentioned the epidemiological side first because it is the nature of the problem that should dictate which governance model a public health agency utilizes. I also include indicators to signify how public health agencies can measure their performance relative to the epidemiological principle.

Table Five: Connecting Epidemiological and Rocket Science Model Concepts							
	RSM Concepts			Epidemiological Concepts			
	Tasks	Goals	Potential outcome	Potential outcome	Goals	Tasks	Indicator
Connection One: Surveillance							
Connection Two: Infectivity							
Connection Three: Treatment							
Connection Four: Contacts							

On the RSM concepts side, the potential outcomes are characteristics of wicked problems as Kettl describes in *The Next Government 2009*. The goals are organizational structures that public agencies must form to prevent or mitigate these wicked outcomes. In the goals sections, I will point out the type of collaboration necessary (cross-sectoral and/or cross-jurisdictional). In the process, I will locate the relevant collaboration on Table Six. I model Table Six after Table Three. The types of activity I emphasize are different from Table Three, however. In Table Six, I distinguish between the actors directing an activity and the actors implementing it. While I could have focused on finance and implementation, who directs an activity is more relevant to surge capacity. So the reader does not feel compelled to refer to this chart again, she or he may wish to remember I place the type of agency directing the activity first, followed by a forward slash and the type of agency implementing the activity. (For example, I identify some activities as Pub/Pri). The exception to this is when a public agency directs and implements an activity. Whether or not the relationship involves distinct organizations, I identify such relationships as Pub*. Relationships involving direction and implementation by the same type of entity may also involve indirect tools. I excluded the “private” column because such actors do not direct public health measures.

Table Six: Direction and Implementation of Public Action Towards a Pandemic		
Implementation	Direction	
	International	Public
International	I*	Pub/I
Public	I/Pub	Pub*
Private	I/Pri	Pub/Pri

Distinguishing organization types that have public and private elements (i.e. health care providers and universities) by their public and private aspects, as I will do, may be little more than intellectual

exercise. Still, the exercise does not hurt the relevance of this thesis as long as I respect the fact different organization types have different implications for governance.

Furthermore, I will identify whether or not direct tools are used, consistent with the concept that directness is the extent to which the same government entity authorizes, finances, and delivers a public action (Salamon, 2002, p. 27).

It is important to keep in mind Kettl does not necessarily endorse the RSM for problems involving some inter-agency coordination. He does endorse it for problems requiring careful coordination across the seismic divides (2009, p. 180). While there may be no handy criteria to differentiate when the vending machine model and when the RSM is appropriate, there can be a theoretical continuum in which the RSM becomes more appropriate as more third party partnerships are necessary. Given Kettl's moderate skepticism of procedure (2009, p. 210) and the degree to which he prizes leadership (2009, p. 186 & 220), Kettl may value giving leaders discretion concerning when and how to apply the RSM.

The tasks are the seven rocket science model skills I discussed in the RSM section of Chapter Two. I will point out which ones are especially important for achieving the goals. All of the connections require agencies to focus on results and to seek results through interrelated partnerships. I have not found literature on focusing on results, so I will not detail how it is relevant. Furthermore, because I will deal with how interrelated partnerships are important in goals section, there is no need to repeat my findings. While all the tasks also require agencies to assure the public interest is paramount, it is worth detailing which aspects are important in the connections section.

This is because which aspects are important to assuring the public interest varies by the type of connection. I assume the public health agencies, the HHS at the federal level and the state and local public health agencies at their respective levels, are the lead agencies in the partnerships I describe. Having explained my strategy, I will begin making the connections.

The Four Connections and Pandemics

Connection One: Surveillance for Pandemics

Surveillance in the U.S. is an embodiment of the RSM. It relies on a network of third parties connected by voluntary partnership from the local to global levels. As I will demonstrate in the following explanation, it is a consistently functioning system whose epidemiological potential outcomes, goals, and tasks now match the RSM. One can attribute weaknesses in surveillance to a lack of funding and public health agencies outsource essential aspects of public health surveillance (Garrett, 1994, p. 604-607). Still, while third party actors may be helpful, even essential to an effective surveillance, it is essential a public health agency retain certain functions (Avery, 2000).

On the epidemiological side, public health agencies confront the potential outcome of not knowing whether a disease is circulating, changes in the disease, how much mortality it is causing (CDC, 2010e, p.1), its spatial dispersion, and how fast it is spreading. The sooner they know a problem exists, the soon they can achieve their goal of addressing the problem (Stoto, 2007, p. 63) or prioritizing another. Surveillance is the means by which public health agencies know these answers; it is their goal.

In the U.S., public health agencies conduct this activity collaboratively. Although surveillance has evolved to cover a wide range of legitimate public health concerns, its original purpose was to detect communicable disease outbreaks (IOM, 2007, p. 3). The indicators for the quality of the surveillance system are the under-reporting rate and how surveillance systems compare. The under-reporting rate is the percentage of disease incidents that occur in a community that public health officials do not know about (see Majowicz, 2005, p. 180). How surveillance systems compare is a function of their under-reporting rate and up-to-the date information (Webb et. al., 2005, p. 78).

On the RSM side, the potential outcomes are the high cost of failure, the quick, far spread of failure, and limited reaction time. Excess mortality is the high cost of failure. It is a result of not knowing where to implement which interventions. If a disease is spread by an activity that is characterized by a high number of contacts and an activity has a high probability of infection per contact, the disease will spread quickly. Travel in the U.S. is characterized by the need and convenience of fast international and domestic travel. This is to the country's disadvantage when an epidemic occurs because if a host with such a disease travels to somewhere in the U.S. and is contagious, there is a high probability he or she will transmit the disease to that new area quickly. Limited reaction time is another potential outcome. Surveillance boosts the amount of time a public health agency has to implement these interventions or alerts the agency to implement the interventions immediately.

Surveillance in the U.S. depends on public cross-sectoral and cross-jurisdictional partnerships. While states and localities provide surveillance directly, they share this

information with each other through the CDC. Surveillance is an activity requiring coordination at the national level (Gensheimer, et al., 2002, p. S63). Concerning cross-sectoral partnerships, local public health agencies, health care providers, and others are required to report disease incidence to the state health department. The health care providers may be private or public (IOM, 2007, p. 6). The relationship between private health care providers and state public health agencies is located in Pub/Pri and relies on indirect tools. The relationships between public health care providers and state public health agencies is located in Pub* and relies on indirect tools.

Concerning cross-jurisdictional partnerships, state public health agencies also conduct their own surveillance, collect the data from local health departments and physicians, and analyze both (GAO, 2004b) They relay this information to federal entities, especially the CDC (Gesheimer et al., 2002, p. S65). The CDC also conducts its own surveillance (Schneider, 2006, p. 40). Concerning attempts at surge surveillance, the HHS stipulates it may intensify surveillance for influenza “once a novel strain detected abroad exhibits sustained human-to-human transmission” (HHS, 2005, p. S1-5). Specific recommendations depend on the epidemiology of the virus (HHS, 2005, p. S1-5). I assume the same would occur for a novel disease. For example, the CDC advised state and local health agencies to enhance surveillance for evidence of a bioterrorist attack on September 11, 2001 (Henderson, 2003). Furthermore, when two California children became ill in the beginning of the aH1N1 pandemic in the U.S., the CDC issued an alert to doctors in two California counties bordering Mexico (Fox, 2009).

Federal agencies “fund domestic and international networks of disease surveillance laboratories that develop diagnostic tests and conduct disease diagnostic research” (IOM, 2007, 3-4). Furthermore, federal agencies are required to collaborate with foreign partners, reporting certain diseases to the WHO under the International Health Regulations (IRH). The IRH is, among other important features, a legally binding global surveillance initiative (Fidler & Gostin, 2006, p. 86-87). The relationship between state and federal public health agencies is located in Pub* and relies on indirect tools. The relationship between federal agencies and the WHO is located in I/Pub and relies on indirect tools. When state or federal agencies conduct their own surveillance, the activity is located in Pub* and relies on direct tools.

Concerning the tasks, surveillance requires agencies to utilize information to facilitate communication, which in turn forms the basis of the surveillance aspect of the partnership I described. Communication is “the central organizing force” Kettl claims it is (Kettl, 2009, p. 211). Concerning another task, public agencies are central to surveillance. I mentioned how outsourcing it compromises its quality (Garrett, 1994, p. 605-606). As such, public agencies are the holding companies of expertise.

Public agencies also play a central role as lead agencies to protect the public interest because the plates of privatization, federalism, and globalization are relevant. Concerning privatization, state public health agencies rely on health care providers for their surveillance information. The public interest is only threatened when they do not provide such information or provide inaccurate information. Still, this may be relevant in the context of a pandemic, when the relevant private organizations may think priorities

other than providing surveillance information are more pressing. Federalism may create differing views of what the public interests is because certain states may place a different priority for surveillance than the federal government. If Oregon is experiencing a deadly epidemic, the priority they give to forwarding information may not match the CDC's anxiousness to receive that information. Concerning globalization, federal agencies assist surveillance efforts in foreign countries. In another point, federal countries such as the U.S. may have trouble complying with the IHR because the fragmentation in federalist systems makes the situation such that national governments are ultimately dependent on cooperation with regional authorities (Wilson, McDougall, Upshur, Joint Centre for Bioethics SARS Global Health Ethics Research Group, 2006, p. 31). The U.S. requested a clause acknowledging "the unique governance structures" of federalist systems be placed in the IHR (Wilson et. al., 2006, p. 32). When the WHO denied the request, the Department of State (DoS) responded it would implement the IHR in a manner "consistent with our federal system of government" (DoS, 2005). The voluntary nature of participation of state public health agencies reporting the nationally notifiable communicable diseases has implications for the ability of the U.S. to participate in the IHR. The CDC may have to employ negotiation and persuasion tactics to convince these agencies to participate.

Concerning creating relationships of trust before they are needed, the infrastructure for surveillance efforts must be in place before a pandemic begins, even if public agencies intensify surveillance once they detect a pandemic. The infrastructure consists of relationships between local and state public health agencies, state agencies

and the federal government (especially the CDC), and the federal government and the WHO. What is at issue for a pandemic is if they know each others' capabilities well enough that they can effectively scale up surveillance. The HHS and state agencies must assure that the organizations with narrower jurisdictions have the means and competence to conduct surveillance.

The public health system has the structure in place to provide timely information on disease, hampered by a lack of funding. The system already being a network, a networked approach has nothing special to contribute for surveillance, save to offer advice on how to manage third party relationships. With knowledge about the informational backbone of public health, focusing on the programming public health agencies perform with such information creates a more complete picture of the field.

Connection Two: Pandemic Infectivity

On the epidemiology side, a public health agency is concerned about the infectivity of a disease. As I mentioned, this is part of R_0 , the probability of infection per contact. The potential outcome of failing to address this aspect of a pandemic is hosts having a higher probability of infection per contact. Reducing the probability of infection per contact reduces transmission. Thus, reducing the probability of infection per contact is the goal of public health agencies. The task involved in reducing the infectivity include producing and distributing treatment and/or vaccines that reduce infectivity (I refer to treatment that does not require medical expertise, that one can administer in a pill). The indicators for infectivity are the number of infections per contact and the secondary attack rate. The secondary attack rate is the number of infections that develop “among

susceptible contacts of an infected case” (Webb et. al, 2005, p. 260). See Figure Five. Yang and colleagues estimate the secondary attack rate for aH1N1 is 27.3 percent (2009b, p. 2).

<p>Figure Five: Secondary Attack Rate</p> $\frac{\text{Number of Infected Cases}}{\text{Susceptible Contacts of an Infected Case}}$ <p>Adopted from Webb et. al., 2005, p. 260</p>
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On the RSM side, the potential outcomes are the high cost of failure and the quick, far spread of failure. The high cost of failure for not reducing infectivity is excess mortality. The purpose of reducing the probability of transmission is to limit the rate at which the disease spreads and limit the area over which the disease spreads. This relates to reducing R_0 .

Distribution depends on the epidemiology of the disease. Based on the CDC’s recommendations for the use of antiviral drugs for the 2009-2010 influenza season (CDC, 2010g) and the events that have transpired since 2009, I assume there would be mass distribution of vaccines but not of treatment. The CDC recommends treatment only for select people (CDC, 2010g).

Reducing infectivity necessitates cross-sectoral and cross-jurisdictional partnerships, the goals. I assume purchasing treatment and/or vaccines requires cross-sectoral partnership between the HHS and a treatment and/or vaccine producer, as is the case with purchasing a pandemic influenza vaccine (Gensheimer et al., 2002, p. S63).

Production is indirect and be located in cell Pub/Pri. However, the focus of this thesis is a creating surge capacity, so I turn the emphasis there.

Because the pandemic has a low R_0 , distributing vaccines in mass does not threaten to raise the number of contacts such that it negates efforts to lower the disease's infectivity. Cross-jurisdictional partnerships have been important to distribute vaccines and antiviral drugs. Concerning aH1N1, the CDC has sent vaccines to more than 50 project areas, which include states, the District of Colombia, and eight U.S. territories and freely associated states, and three metropolitan health departments (Zigmond, 2009, p. 1913). These lower levels of government distribute the vaccines from there. The federal government has also supplied states with antiviral medication (Schuchat, 2009) to supplement commercial supplies. All such relationships are located in cell Pub* and rely on indirect tools.

Cross-sectoral partnerships have also been important to distributing the vaccine. The aH1N1 vaccine has been distributed directly by public health agencies and indirectly by universities, pharmacies, and physician's offices (Maugh II, 2009). The HHS' aH1N1 guide for Community and Faith-Based Organizations says NGOs and faith-based organizations are potential venues of vaccine distribution, including out-reaching to vulnerable populations (HHS, 2009). Furthermore, states have distributed antiviral drugs to pharmacies, who in turn distribute them to patients, often free for those who cannot afford them (e.g. State of Tennessee, 2009; South Dakota Department of Health 2009). When states and local public health agencies distribute vaccines directly, the relationship is in Pub* and relies in indirect tools. When they rely on public third parties, such as

public universities distributing the vaccine, the relationship is in Pub* and relies on indirect tools. When they rely on private third parties, as is the case for much vaccine and antiviral distribution, the relationship lies in Pub/Pri and relies on indirect tools.

The aH1N1 vaccination effort has been successful. In its first detailed estimate of its inoculations, the CDC announced 61 million people, roughly 20 percent of the U.S. population, had been vaccinated (Winter, 2010). Although there were initial shortages, this was more a matter of supply, not distribution (Weise, 2009). One important reason has been the federal government has covered the cost of the vaccine itself, with state and local health departments covering much of the costs associated with distribution (Zigmond, 2009, p. 1913).

Another important reason is that governments realized their inability to conduct distribution by themselves. The CDC relied on lower levels of government, while those levels of government relied on a range of third party actors to complete distribution, including universities and businesses. The lower levels of government provided the right incentives for the third party actors to participate. These actors had the ability to provide something at no cost to them.

Purchasing and distributing vaccines and antiviral drugs involve several rocket science skills, the tasks. Distributing vaccines and treatment involves information to facilitate communication if business and hospitals are involved; the public health agency needs to devise a strategy that considers both of them, and needs to communicate the vaccine supply they can expect.

The CDC and state and local health departments have provided the right incentives for third party distributors, properly steering resources. As I mentioned, by covering the bulk of cost for the vaccines, third parties had the ability to offer something of high value at no cost to them during distribution of the aH1N1 vaccine.

Established relationships of trust were necessary to distribute the treatment when the aH1N1 pandemic began because supplies were needed immediately. However, they were not as important to distribute the vaccine. This is because the vaccine was not immediately available, and different partners had to form these relationships during the vaccine production process.

Which plates are relevant, and thus which aspects of the public interest need to be guarded, depend on who is distributing the treatment and/or vaccine. Privatization is relevant when business, private health care providers, NGOs, or faith-based organizations are involved. Because some state governments have been offering the vaccine for free, protecting the public has required government to create the right incentives for third parties to distribute the vaccine, without creating windfall profits for them. Federalism is relevant because one level of government has supplied the vaccine and treatment to another level. The CDC has handed the vaccines and antiviral drugs off to state and local authorities. Still, because all levels of government have the same interest, I doubt differing visions of the public interest have been relevant.

The public health system passed the test of a mild pandemic, overcoming supply constraints of vaccines, providing the incentives necessary, and relying on third parties to do a job of an under-staffed public health system. A networked approach points out the

opportunities that lie with NGOs and faith-based organizations. This improves on the security approach because utilizing their capacity keeps one from having to choose between micro costs and mortality. It also improves on the social inequalities perspective because a public health agency can utilize relationships it forms in the context of pandemic preparedness for other aspects of health. Furthermore, it provides a framework for the third party relationships any approach would have to depend on for distribution.

Now that I have addressed how public health agencies attempt to prevent someone from getting a disease to begin with, it is important to address how public health agencies treat those whose disease they did not prevent. Such activities have implications for the infected person and those surrounding him.

Connection Three: Treatment

On the epidemiology side, a public health agency is concerned with helping patients with the disease recover and reduce the duration of the disease, the potential outcomes. These patients are also hosts that public health agencies do not want to transmit the disease. Eliminating the disease with a curative treatment and easing suffering with palliative treatment are the goals. Curative treatment has a policy priority over palliative treatment. Furthermore, reducing the infectious period to limit one's time as a host is another goal, one related to R_0 . As far as the curative or palliative treatment can be produced, the tasks are producing and distributing the treatment. The indicator of treatment is the case-fatality ratio.

On the RSM side, the potential outcomes are the high cost of failure and the quick, far spread of failure. Because reducing the duration of the disease also reduces the

period of infectivity, treatment is related to the quick, far spread of failure. This is related to reducing R_0 . Mortality for those one did not cure and those who contracted the disease because someone else's infectious period had not closed are the high costs of failure.

Reducing the duration of the disease and infectivity are dependent on cross-sectoral and cross-jurisdictional partnerships, the goals. I described the cross-sectoral and cross-jurisdictional dynamics of distributing treatment in Connection Two of this chapter. There is a need for treatment the public health agency could not distribute, the treatment requiring a medical professional and home remedies. The most public health agencies can do with respect to a medical professional is to strategize with hospitals to create enough capacity (or at least more capacity) in terms of infrastructure and human resources, a cross-sectoral partnership. In an example of how hospitals have such a need in a pandemic, an August 2009 study written to assist intensive care unit directors plan estimated aH1N1 would cause 2.7 million hospitalizations in the U.S. (Zilberberg, Sandrock, and Shorr, 2009). When it does not collaborate with hospitals directly, the CDC has produced a template that allows hospital administration and public health practitioners to estimate the surge in hospital demand during an influenza pandemic based on epidemiological parameters, FluSurge 2.0 (CDC, 2006). It is noteworthy most hospitals have not suffered a severe strain on their capacity during the aH1N1 pandemic and that a more severe pandemic would strain any health care system. Still, given that Brower and Chalk call for the need for hospitals to develop surge capacity (2003, p. xvii) and the low virulence of aH1N1, it is an open question whether the aH1N1 pandemic was a real test of hospital capacity. The relationship between the public health agency and the

hospital would lie in cell Pub* if the hospital is public and Pub/Pri if the hospital is private. Both relationships would rely on indirect tools.

Treatment also involves disseminating home remedies, a form of education. One method the CDC has utilized to reduce the number of contacts is encouraging people who think they have aH1N1 to stay home (CDC, 2010f). They have supplemented this with advice for caring for someone sick from the aH1N1 or seasonal flu (CDC, 2010a). Such efforts are important because the health care system may be overwhelmed in a pandemic and many Americans cannot afford access to it. Because I have not found evidence they distribute this message utilizing any particular means of coordination, I assume the CDC distributes the message directly. The activity lies in cell Pub* and relies on direct tools.

Public health agencies could enhance the legitimacy of this communication by relying on cross-sectoral partnerships with NGOs and faith-based organizations. Communicating with these organizations so they share the treatment message taps into the ties these organizations have with populations otherwise less trusting of government or ignorant of the languages the public health agency can communicate in would enhance the message's legitimacy and the public health agency's capacity to convey it. Because this type of messages is standard, there is no need for public health agencies to coordinate the message they will communicate. Although the aH1N1 guide for Community and Faith-Based Organizations sees a role for NGOs and faith-based organizations to educate others on home remedies for influenza, it does not consider the possibility of proactively contacting NGOs and faith-based organizations (HHS, 2009). Contacting NGOs is a

relationship lies in cell Pub/Pri and relies on indirect tools. Having described the goals involved, I will describe the tasks involved with these goals.

Treatment involves creating relationships of trust before they are needed and leading by making the public interest drive complex partnerships, the tasks. Because I have already reviewed the skills involved with the goal purchasing and distributing a treatment whose administration does not require a medical professional in Chapter Two, I will not address that aspect.

Pre-existing relationships of trust forms the basis of public health agencies collaborating with hospitals to enhance surge capacity. Pre-occupied with their respective duties during the pandemic, I doubt public health agencies and hospitals coordinate much during the pandemic to expand hospital capacity. Creating such relationships of trust is critical to enlist NGOs and faith organizations to distribute a message. Such organizations would not expect such a request without prior arrangements. Furthermore, such relationships help public health agencies know the capacities of various agencies to distribute the message and to whom they can reach.

Leadership by making the public interest drive partnerships is relevant to these relationships, which lie on the privatization and federalism plates. The privatization plate is relevant because public health agencies are coordinating with private hospitals, NGOs, and faith-based organizations. Federalism is relevant because public health agencies are coordinating with public hospitals. Still, between distributing a message and creating surge capacity, the protection of the public's interest lies in completing these goals, i.e. there is no reason to believe these partnerships threaten the public's interest.

I mentioned the advantages of the networked approach for connecting public health agencies with NGOs and faith-based organizations and the framework new governance provides for the dynamics of third party relationships. These advantages are also relevant for treatment. The activities public health agencies conduct for treatment are limited by their focus on population health. Reducing transmission of disease by lowering the number of contacts, however, is something on which society depend on them heavily.

Connection Four: Contact

On the epidemiological side, a high number of contacts is the potential outcome. Such an event would be worrisome because this is an aspect of R_0 . Reducing the contact is the goal. The tasks to complete vary by the nature of how the disease is transmitted and its severity. Typical efforts include disseminating education, restricting public encounters, quarantine and isolation, contact tracing, issuing travel warnings and enforcing travel restrictions, testing animal populations, culling relevant animal populations and perhaps their offspring, implementing water and food safety measures, and screening tissues and fluids. Public health agencies are the primary organization directing the vast majority of these activities, with water and food safety measures and screening tissues and fluids being obvious exceptions. A contact is an activity that can transmit disease, and the contact rate is the number of times at which these occur. Contact rate is the indicator for contact.

On the RSM side, the potential outcomes are the high cost of failure and the quick, far spread of failure. Excess mortality is the high cost of failure for not reducing

the number of contacts. The purpose of reducing contacts is to limit the rate and area over which the disease spreads.

Reducing the number of contacts requires cross-jurisdictional and cross-sectoral partnerships, the goals. Concerning cross-jurisdictional partnerships, reducing contacts requires public health agencies to distribute education about sanitary practices. This includes the CDC's current advice for those who may have aH1N1 to stay home (CDC, 2010f). Public health agencies perform this goal for a variety of diseases. Especially as knowledge about the disease evolves, they would benefit from producing consistent messages, including gaining African-America's trust (Meredith, Eisenman, Rhodes, Ryan & Long, 2007). The HHS could coordinate a consistent message with state and large local public health agencies. The relationship would rely on indirect tools. If little coordination took place, a separate agency would create a message relatively independently of the others, save for possibly of some coordination between state and local agencies. They would rely principally on direct tools. Regardless of if they coordinated the message, the activity would be located in cell Pub*.

Concerning cross-sectoral partnerships, the state and local public health agencies could enhance the legitimacy of their message and their capacity to convey it by relying partnerships with NGOs and faith-based organization to distribute that message, much as they did for distributing the treatment message. Although the aH1N1 guide for Community and Faith-Based Organizations sees a role for NGOs and faith-based organizations to educate others on reducing contacts, it does not consider the specific

possibility of proactively contacting them (HHS, 2009). Such a relationship lies in cell Pub/Pri and relies on indirect tools.

Public health agencies may seek to reduce the number of contacts the sick had with others by enforcing quarantine or isolation of patients. Quarantine requires collaboration with hospitals to assure the capacity exists. This would rely on the surge capacity the public health agency created with the hospitals before the pandemic. For public hospitals, the relationship occurs in cell Pub*. For private hospitals, the relationship occurs in cell Pub/Pri. Both relationships rely on indirect tools.

Quarantining and isolating patients requires public health agencies to partner with agencies they normally have infrequent contact with, some at the same level of government and others not. Capacity to assure people obey quarantine and isolation orders would come from the police, firefighters, and the military (Cook & Cohen, 2008, p. 457). Such a relationship is in cell Pub* and relies on indirect tools. Based on the lack of news reports about quarantine, I assume such orders played a minor role in the U.S. aspect of the aH1N1 pandemic. If the state or local public health agencies wanted public schools to close, they would have to convince the state, school district, or individual schools (Kahn, 2007, p. 344). They would also have to ask private schools to close. The relationship between public schools and public health agencies lies cell Pub* and relies on indirect tools. The relationship between the private schools and the public health agencies lies in cell Pub/Pri and relies on indirect tools. The federal government only offers advice as to whether schools should close (Hsu, 2009). School closures were relevant to the aH1N1 pandemic in the U.S., but did not occur on a widespread scale.

If the disease is vector-born, the public health agency would have to expand its capacity spray, killing vectors and their offspring. This would probably build on the infrastructure for West-Nile virus. Many local, public entities rely on business to spray, such as the Sacramento-Yolo County District does (Barber, Schleier III, & Peterson, 2010, p. 482). When the Control district contracts business to spray, indirect tools characterize an activity that occurs in cell Pub/Pri. When the localities perform spraying themselves, the activity relies on Pub* and relies on direct tools.

Contact tracing may involve “public health nurses, disease investigators, and public health environmentalists” (Thomson, 2000, p. 72) who may or may not be in the same organization. Being an activity that public health agencies do not perform regularly, it requires increasing capacity. Still, in many epidemic or pandemic scenarios, contact tracing may require too many resources to be feasible (HHS, 2005, S8-4; Wu, Riley, Fraser, & Leung, 2006, p. 1532). For influenza, it may be telling that while contact tracing has occurred during the aH1N1 pandemic (Rosenthal, 2009), it was not an activity public health officials relied on heavily. Assuming these experts belong to distinct organizations, the indirect tools characterize contact tracing. Assuming everyone comes from public agencies, contact tracing is located in cell Pub*.

During the SARS pandemic, the CDC attempted to contact passengers who were on the same flights and ships as those later diagnosed with SARS. However, this attempt was hampered by airline’s concerns over “the CDC’s authority and the privacy of passenger information, as well as procedural issues” (GAO, 2004a, p. 3). If the airlines

would have cooperated, the CDC would have directed the activity and the airlines would have implemented it. It would have been located in cell Pub/Pri and rely on indirect tools.

Enforcing travel restrictions requires communicating with the Department of Homeland Security (DHS); DHS is in charge of restricting entry into the U.S. The HHS may ask them to do so in the event of a pandemic. Indirect tools characterize travel restrictions to the extent HHS directs the activity. However, DHS would be the principal agency directing and implementing the travel restrictions until HHS advised them such the activity was no long necessary. This did not occur during the aH1N1 pandemic.

The tasks involved include utilizing communication to discern how different agencies can coordinate action. This is relevant for distributing a message via NGOs and faith-based organizations and creating a consistent message among public health organizations. Communication is also relevant to coordinating agencies in accordance with a strategic direction tailored to the circumstances of the pandemic, coordinating with police, firefighters, and the military for quarantine, asking schools to close, contact tracing, and contacting passengers exposed to a disease. Pre-existing relationships of trust are important to distribute a message via NGOs and faith-based organizations, as I mentioned in Connection Three.

Which plates are relevant, and thus which aspects of the public interest need to be guarded, depend on these disease and the contacts that need to be prevented. Privatization is relevant if public health agencies ensure hospitals have the capacity to quarantine. It is also important for public health agencies asking private schools to shut down. In the case of a vector-borne disease epidemic, some states would hire planes to spray for the vector.

Because business and public health agencies are motivated by different factors, profits versus public health, public health agencies must protect the public's interest. If the CDC wanted to contact passengers who traveled with a human vector, they would have to work through the business that transported them. Non-profits may help spread a message in a community. Still, they pose no threat to the public interest in this role.

Federalism would be relevant if the HHS, state public health agencies, and some local public health agencies coordinated a message about the disease. It would also be relevant if state and local public health agencies utilized military forces. The later relationship could involve differing visions of what the public interest is.

While collaboration across the seismic divides is important, the same level of government would perform many of the tasks relative to reducing contacts. This includes state and local collaboration with police, firefighters, and public schools and federal collaboration between the DHS and HHS.

The networked approach is especially useful for those collaborations involving rapid scaling up and scaling down. A purpose of the RSM is to create flexible capacity, one tailored to the relevant tasks (Kettl, 2009, p. 220). What public health agencies should do to prevent contacts often relies on factors that flux. This includes knowledge about a disease, which affects education. It also includes how many people in a community or school have a disease, which affects the appropriateness of closing schools. Relevant to the West-Nile Virus, surveillance and monitoring determine the appropriateness of spraying for mosquitoes (West Nile Facts). While rapidly scaling up

or scaling down capacity are actions consistent with the security and social inequality approaches, neither focuses specifically on it.

Having demonstrated the connection between epidemiological principles and RSM principles, the task of connecting these findings to the model's explicit criteria remains.

The Rocket Science Model and Pandemics

For a problem to be relevant to the RSM, it must require collaboration across the seismic divides and require adaptive solutions. I will utilize this section to evidence a pandemic disease's relevance to the RSM.

The Three Plates: Pandemics

I demonstrated in Connections One through Four for Pandemics that an effective epidemiological response to communicable disease pandemics requires collaboration across the seismic divides.

On the privatization plate, surveillance necessitates private health care providers supplying information on disease incidence. Public health agencies may desire to quarantine patients at hospitals. Some of these hospitals are private. In the case of mosquito-borne diseases, many localities depend upon private contractors spraying. Distributing treatment and/or vaccines involve private hospitals and businesses. Convincing hospitals and possibly other health care providers to create surge capacity assists patient recovery, limits the duration of the disease, and, in the case of hospitals, is a place to quarantine patients. Engaging non-profit organizations and faith-based

organizations to distribute an accurate message enhances compliance with public health messages.

On the federalism plate, surveillance relies on an intricate relationship between different levels of government. Public health care providers supply surveillance information. Distribution of treatment and/or vaccines relies on the federal government to deliver their supply to state agencies. Public hospitals may assist in final delivery of the treatment and/or vaccines. Coordination of messages from the local public health agencies to the HHS enhances the effectiveness of the message. The public health agency may administer some treatment that cannot be distributed.

On the globalization plate, the U.S. has obligations to comply with the IHR, and benefits from other countries complying. Furthermore, federal agencies conduct surveillance in other regions of the world.

Many of the tasks I mentioned here are the fruit of collaboration that occurs at the same level of government, especially the activities related to reducing the contact rate. These activities are dependent upon local-level collaboration. While I feel obligated to explain all the significant intricacies of the relationship between the RSM and epidemiology, the process of doing so has hidden the importance of local response. Having demonstrated that pandemic span the three plates in addition to requiring collaboration among organizations at the same level of government, I will now turn to the model's other criterion.

Adaptive Solutions: Pandemics

I have not yet demonstrated that meeting the epidemiological principles requires adaptable solutions. Utilizing the information in Connections One through Four for Pandemics and from other literature, I will attempt to do this.

HHS Influenza Plan specifically addresses plans to intensify surveillance in an influenza pandemic. Still, its themes can be applied to intensifying surveillance during pandemics in general. These include increasing planning for the event that health care providers cannot provide outpatient surveillance (HHS, 2005, p. S1-7); state and local public health agencies providing state and local policy-makers, as well as the CDC, with mortality surveillance data (HHS, 2005, p. S1-8); and states reporting the estimated spread of influenza year-round instead of only October through May (HHS, 2005, S 1-8). How surveillance is adapted to a disease depends on how the disease is transmitted.

In an example of adaptive surveillance, the CDC began tracking all cases of laboratory-confirmed deaths of aH1N1 and pneumonia during the 2009 pandemic. This ended on August 30, 2010, when jurisdictions are asked to report all laboratory or syndromic-based counts of hospitals and mortality for all types of influenza and pneumonia (CDC, 2009a).

Distributing a one-dose curative drug and/or vaccine that does not have to be administered by a medical professional is routine if there is civil order. The public health agency administers the curative drugs and/or vaccines, possibly collaborating with other levels of government and/or business. Patients enter, sign a form, get the vaccine or drug, and leave. The public has maintained such order during the aH1N1 vaccinations. These

arrangements are complicated slightly if public health agencies utilize businesses and other governmental agencies to distribute the curative drugs and/or vaccine. For business, relationships involve offering the right incentives, such as providing the vaccine or drug at no cost. This occurred during aH1N1 vaccinations.

Treating patients in a manner that requires medical professionals requires adaptations in a pandemic situation. The medical system would be strained if every sick patient came in with the current health care workforce. Therefore, asking patients to self-triage and expanding infrastructure and human resources through creativity may be necessary, as I mentioned. For example, the CDC has asked those who think they have aH1N1 to stay home (CDC, 2010f).

Effective efforts to reduce to the number of contacts are routines adapted to a given epidemiological, cultural, and resource situation. Such routines are often novel. In 2002-2003, there was an epidemic of Exotic New Castle Disease (END) in chickens that spanned four states. The California Department of Food and Agriculture (CDFA) and the USDA were the lead agencies in a network that at point involved six incident command posts and 1,686 people (Moynihan, 2005, p. 15- 16). The epidemic occurred largely in backyard populations, where the types of birds differed from owner to owner. Unlike commercial situations, owners sometimes had a strong emotional attachment to their chickens. As a result, it was difficult for network members to establish standard operating procedures. This challenge continued until “epidemiologists determined that END was prevalent” in a neighborhood (Moynihan, 2005, p. 21). At this point, the task force implemented a more routine solution. The neighborhood chickens were treated as a flock

and destroyed (Moynihan, 2005, p. 21). While this example deals with reducing contact rates among animals, the same is true for humans. Reducing human contact with Ebola, for example, has required public health practitioners to create new routines for handling the dead.

In the event public health agencies decided to close schools, they would have to do so considering the care of the children. School closures should only be coupled with a larger shutdown of public gatherings because otherwise many parents would have to work. They may drop their children off at an informal daycare with a group of other children, defeating the purpose of the closure and at a severe monetary cost to many parents. Many governmental operations and businesses critical to modern survival cannot be done via telecommuting. While I do not have a solution to this dilemma, it will require one adapted to the situation. Having laid the foundation for the RSM, I now propose how it facilitates creative solutions in the event of a more severe pandemic.

Chapter Four: Pandemic Influenza and the RSM

Introduction

Drastic scenarios highlight the RSM's ability to create flexible capacity. In the case of a worst-case scenario pandemic, public health agencies would have to find creative solutions to meet the all of first three policy objectives, minimizing mortality, proportional macro costs, and proportional micro costs. In this chapter, I attempt to demonstrate how the RSM can assist public health practitioners meet these goals in such a situation.

A worst-case scenario pandemic would be unlike any influenza pandemic since the 1918-1919 influenza pandemic. It would qualify in category five of the HHS' pandemic severity index, one with a case-fatality ratio of 2.0 or above (HHS, 2007). It would also have a high R_0 in terms of pandemic transmissibility, between 1.9 and 2.4 (Yang et al. 2009a, p. 730).

The H1N1 pandemic of 1918-1919 meets both qualifications for the worst-case scenario (see HHS, 2007 for case-fatality ratio and Mills, Robins, & Lipsitch, 2004, p. 904-905 for the R_0) and its parameters are considered the worst-case scenario for pandemic planning (Mills, Robins, & Lipsitch, 2004, p. 904-905). Still, government's reliance on third parties has changed drastically since that time (see Kettl, 1993, p. 4) and no one knew what disease was causing mortality at the time of the pandemic. Furthermore, the public health context I presented in Chapter Two was drastically different then. Thus, I will not draw on how public health practitioners addressed that pandemic.

I began the thesis by identifying the four factors making pandemic influenza amenable to new governance. I have already connected epidemiological and RSM principles and featured evidence from an influenza pandemic. I will now connect the epidemiological concepts to three factors making pandemic influenza amenable to the RSM: its novelty, amenability to fast, sustained human-to-human transmission, and its ability to cause a high level of mortality. I will not address symptom-based public health measures specifically because such measures are relevant to multiple epidemiological principles: surveillance, treatment, and the number of contacts. I will finish the chapter by relating findings from the first section and to the criterion for the RSM.

I will assume there are significant stockpiles of antiviral drugs in the pandemic, although not enough to treat everyone who is sick at the same time. I base this assumption on the fact that the national stockpile needed replenishing within weeks of the aH1N1 pandemic beginning (Lowe, 2009). At the same time, the CDC claims the Strategic National Stockpile is sufficient to supply treatment “in several large cities at the same time” (CDC, 2009f). Furthermore, I will assume the influenza virus is sensitive to these antiviral drugs.

Moreover, I will assume neighboring jurisdictions have the same antiviral drug and vaccination policies. Furthermore, I will assume public health agencies strive for compliance by giving people credible support (free antiviral drugs for the sickest and, when it is developed, free vaccinations for everyone). At the same time, public health agencies have the credible threat of detaining those who do not obey isolation, quarantine, and receiving support within their jurisdiction.

The Four Connections and Worst-Case Scenario Pandemic Influenza

Surveillance

Factors Making Pandemic Influenza Amenable to the RSM

The disease's novel nature makes the disease difficult to detect because it is not routine medical behavior to look for a novel disease. Health care practitioners generally relate the complications they see to existing knowledge. In a sense, the world depends on health care practitioners like Dr. Carlo Urbani who have the skill to identify when they are witnessing a novel disease and report it, in his case SARS. Still, surveillance of novel forms of influenza is not so dependent on health care practitioners such as Dr. Urbani because novel influenza is a new type of an old disease. Furthermore, between the CDC and WHO, surveillance for novel forms of influenza in the U.S. is strong, compromising the need to contemplate alternative scenarios.

Concerning the nature of influenza's transmission, learning the disease's infectious parameters such as the R_0 , infectious period, and pre-symptomatic transmission are among the primary aims of surveillance. Knowing these parameters is critical so policy-makers can make decisions concerning how to prioritize different options (see Fraser et al., 2009 for an example with aH1N1). Initial signals that aH1N1 was not going to be a worst-case scenario pandemic was essential in moderating responses toward the disease. In a worst-case scenario, such initial signals would be essential in intensifying responses and initiating networks. Gaining such knowledge involves a wide range of actors who adapt how they address surveillance to the pandemic situation.

Proposed Solutions

The WHO and CDC have surveillance systems that actively monitor for novel strains of pandemic influenza. Each of these systems depends heavily on voluntary relationships with third parties. The WHO Influenza Surveillance Network is a worldwide network of Collaborating Laboratories, National Influenza Centres, and Collaborating Centres who report their influenza findings to the WHO, especially findings concerning a virus with pandemic potential (WHO, 2010c). The network includes approximately 80 WHO Collaborating Laboratories in U.S. These include all state public health laboratories, some county public health laboratories, and some large tertiary care or academic medical centers. They report the number respiratory specimens they tested and the number that tested positive for influenza types A and B each week to the CDC for further characterization (CDC, 2010d, p.1). The National Influenza Centres are the main components of the Network, sampling patients with influenza-like-illness and submitting the results to the WHO Collaborating Centres (WHO, 2010c). In the U.S. there are four National Centres. They are located at a California state public health department, a New York state public health department, the University of Michigan, and the CDC (WHO, 2010a). The Collaborating Centres perform antigenic and genetic analysis (WHO, 2010c). In the U.S. there are three Collaborating Centres, located at the CDC, St. Jude's Hospital, a non-profit, and the FDA (WHO, 2010b).

The WHO credited Mexico and the U.S. for promptly reporting aH1N1 (WHO, 2009). While I have not found evidence specific to this point, I imagine the IHR played a role in this, given how Katz praised the system's execution (2009). I also imagine Mexico

and U.S.' participation in the Influenza Surveillance Network played a role, given they both have National Influenza Centres (WHO, 2010a).

Concerning the CDC's influenza surveillance, state public health agencies report human infection of novel influenza A to the CDC as a nationally notifiable condition (CDC, 2010d). In addition, the National Respiratory and Enteric Surveillance System gathers "virus antigen detections, isolations, and electron microscopy results" from "collaborating university and community hospital laboratories, selected state and county public health laboratories, and commercial laboratories" (CDC, 2010e, p. 1). It also includes mortality surveillance from the vital statistics offices of 122 cities (CDC, 2010e, p.2). State and Territorial Epidemiologists Reports convey the spread of influenza in their jurisdictions to the CDC (CDC, 2010e, p. 3). The Outpatient Influenza-like illness Surveillance Network includes outpatient centers in 50 states who report on the total number of patients seen for and the number of patients with an influenza-like illness by age (CDC, 2010e, p. 2-3). Finally, the Emerging Infectious Disease Program includes hospitals who report their estimates of laboratory-confirmed influenza for children (CDC, 2010e, p. 2-3).

State public health agencies report nationally notifiable conditions as part of the U.S. surveillance networked I discussed in Chapter Two. I mentioned how the CDC tracked all mortality due to influenza and pneumonia between April 2009 and August 30, 2009 (CDC, 2009a). The HHS Pandemic Influenza Plan makes general plans for scaling up surveillance, leaving the CDC to issue recommendations when the pandemic begins (HHS, 2005, p. S1-5). With the knowledge from surveillance, public health practitioners

implement three other types of activities. I will begin with pandemic influenza's infectivity.

Infectivity

Factors Making Pandemic Influenza Amenable to the RSM

In the introduction to the thesis, I said because pandemic influenza comes is a novel form of influenza, the population lacks immunity. Compared to seasonal influenza, this raises the probability of infection per contact, part of R_0 . Still, there are no actions anyone can take to address pre-pandemic immunity. The nature of how the disease spreads, which involves fast, human-to-human transmission, means efforts to lower infectivity should not create too many new contacts. This is especially relevant for a worst-case scenario. Because of such a disease's virulence, reducing contacts is especially important to reduce mortality. The range of actors employed to administer the aH1N1 vaccine has demonstrated one organization acting alone is not sufficient for the task of mass-vaccination. In a worst-case scenario pandemic, the need to lower the number of contacts and maintain security means one organization would not be sufficient to distribute antiviral drugs either.

Proposed Solutions

Many of the solutions I proposed involve distributing products highly valued in the context of a worst-case scenario pandemic. Therefore, it is important jurisdictions have conformed policies. This is not a difficult issue when local public health departments all exist under the control of a state public health agency; the state agency can create and enforce one policy. When local health departments are independent,

however, multiple agencies in an area must coordinate policy to ensure an infectious person does not travel to a more lenient district or unfairly taxes the resources of other localities.

In the beginning stages of the pandemic, the only steps public health agencies will be able to take to mitigate infectivity surround distributing the antiviral drugs according to the guidelines the CDC establishes. I assume the antiviral drugs would be free to those who cannot afford them and would only be available to people meeting the CDC guidelines. In Chapter Three, I said the states give pharmacies antiviral drugs, who in turn give them to patients. While this is still an option, a worst-case scenario pandemic creates a situation in which distributing the antiviral drugs through pharmacies may create a great of risk of increasing the number of contacts. This is because the patient/human vector may create contacts while picking up the antiviral drugs. Increasing the number of contacts enhances transmission.

The simplest alternative to increasing capacity is assuring health care practitioners, emergency rooms and clinics, have a supply of antiviral drugs they can give to patients directly. Still, this strategy would have to overcome the logistical challenge of providing all emergency rooms and clinics with the right amount of antiviral drugs. Patients with cars and cell phones would wait in the parking lot and come into the medical facility when someone called them. In situations or for patients for which this not feasible, there would be no alternative to the waiting room. Police may have to guard medical facilities so no one robs the drugs.

An alternative strategy, delivering antiviral drugs to everyone or just those who are home bound, would involve the Post Office. To prevent theft, postal workers would have to deliver the antiviral drugs by having someone sign for it. This may expose the postal worker to the disease. This solution still leaves the open question of how patients would have their drugs prescribed. Furthermore, police may have to accompany postal workers to assure safety.

Once the vaccine is ready, the issue of distributing at the local level it becomes relevant. I assume its distribution from the CDC to states and localities would not change from what I described in Chapter Three, and that the vaccine would be free.

In the worst-case scenario, public health agencies would not want to distribute the vaccine in a manner that creates more contacts. Therefore, the options are administering the vaccines at people's doorstep or in prescribed mass mobilization settings. I doubt public health agencies would want to involve business because this would create the potential for contacts they have no control over.

If a layman could administer the vaccine and it does not involve a needle, delivering it to peoples' doorstep becomes plausible. Public health agencies could send out temporary employees much as the U.S. Census does. They would benefit from hiring a multi-cultural, multi-lingual staff to reach people more effectively. Sending out temporary employees with vaccine needles and without immediate supervision, however, may turn into a criminal and public health problem. The networked aspect of this solution would come in selecting, training, and supervising hundreds of employees, as even state

public health departments are not prepared to mount such a widespread response without outside support. Furthermore, a police officer may have to accompany the employees.

Administering the vaccine in a mass mobilization setting could involve any number of partners able and willing to administer the vaccine. Still, I doubt it would occur in a business because of their inability or unwillingness to screen people for the influenza upon entering. Screening people for the disease upon entry would be necessary because otherwise the vaccination could turn into a center for transmission. A public message not to come if one has or has had the virus would also help lower the number of contacts (such individuals would have immunity to the strain in question anyway). Large, public facilities near public transportation routes are best for a large number of people. A multi-cultural, multi-lingual staff would increase the comfort of marginalized populations, as would administering the vaccine in NGOs or faith-based organizations. The vaccine could also be distributed at a hospital or clinic. Security would be necessary. Having addressed infectivity, addressing treatment reveals more about the network approach's contribution to messaging.

Treatment

Factors Making Pandemic Influenza Amenable to the RSM

In the previous section, I described the dynamics of distributing antiviral drugs. The disease parameters and proposed solutions I offer there are applicable to treating the disease. Still, I see no need to repeat them. Treating the disease is related to curing the patient and, to the extent they are also a human vector, lowering the duration of infectivity. Lowering the duration of infectivity is related to R_0 .

The novelty of a worst-case scenario influenza pandemic, the nature by which it spreads, and the case-fatality ratio would create a heavy demand on the health care system, including testing hospitals' surge capacity. Even if the health care system's capacity is expanded, home remedies may be essential to keeping the case-fatality ratio down because everyone who should see a doctor and receive antiviral drugs may not be able to.

Proposed Solutions

In Chapter Three, I explain the public health agency's role to expand hospital capacity. After explaining why such a strategy will fail to reach everyone, I point out how public health organizations supplement the advice for the sick to stay home (CDC, 2010f) with home treatment advice (CDC, 2010a). I propose public health agencies form contacts with NGOs and faith-based organizations before a pandemic. Once the pandemic occurs, public health agencies can draw on these relationships to convey their treatment message to those communities more effectively. I think such advice is especially relevant in the context of a worst-case scenario. Having addressed three of the connections, public health agencies would still have the responsibility of lowering the number of contacts.

Contacts

Factors Making Pandemic Influenza Amenable to the RSM

When a novel influenza strain first appears, no one to very few people may know about the disease. Once they know about it, many have to undergo the process of adjusting to new sanitary practices, which may take time. The length of this process is

compromised the sanitary measures the public utilizes to combat influenza are already routine for a significant portion of the population.

The activities surrounding attempts to reduce the number of contacts primarily relate to influenza's spread through casual contact, relatively long infectious period, and the ability to function with a degree of normalcy with the disease. The number of contacts is a major factor in why an influenza strain with such virulence may cause significant excess mortality.

Proposed Solutions

In Chapter Three, I explained the advantages of federal, state, and select local public health agencies coordinating a consistent message and the advantages of disseminating the message through NGOs and faith-based organizations. Quarantine and isolation requires collaboration with police, firefighters, and the military (Cook & Cohen, 2008, p. 457). There is not a consensus on whether quarantine would play a major role in an influenza pandemic. The HHS Influenza Plan mentions the word 'quarantine' 405 times (HHS, 2005), while Webby and Webster question its utility (2003, p. 1522).

Concerning school closures, Kahn says because decisions to close schools are likely to be uncoordinated, it is not likely to be effective. She would like to see a national policy or specific guidelines for school closure (2007, p. 344). Short of this, state or local public health agencies could team and lobby the relevant school governing bodies and private schools for a pandemic contingency plan. Having reviewed how the different connections relate to alternatives networks offer, it is important to assure that such proposals conform to the RSM's criteria.

The Rocket Science Model and Pandemics

The Three Plates: A Worst-Case Scenario Influenza Pandemic

On the privatization plate, WHO influenza surveillance depends on one private and non-profit hospital, and, among those who are private, tertiary care and medical centers. CDC surveillance depends on the health care providers who report novel influenza A to their state health departments, commercial laboratories, outpatient centers, and, among those who are private, universities and hospitals. Reducing the infectivity and helping treatment with antiviral drugs depends on pharmacies, clinics, and hospitals, if they are distributing agents of the vaccine. Reducing the infectivity through vaccines depends on hiring outside support to mobilize temporary workers if the public health agency depends on doorstep vaccines. Vaccine mobilization at NGOs, faith-based organizations, private universities, and private health care providers depends on the collaboration of these agencies. These organizations are also potential partners for distributing a message that would enhance home treatment or reduce the number of contacts. Working with private hospitals to expand capacity also lies here, as would lobbying private schools for a pandemic contingency plan.

On the federalism plate, some county public health laboratories, some state public health departments, the University of Michigan, the CDC, and the FDA, and, among those who are public, tertiary care and academic medical centers participate in the WHO's Influenza Surveillance Network. State public health agencies, some state and local public health laboratories, vital statistics offices, and, among those who are public, university and commercial laboratories participate in the CDC's influenza surveillance

network. Distrusting antiviral drugs through the Postal Service or doorstep vaccination lies here. Finally, security by the military occurs at this level. On the globalization plate, the WHO Influenza Surveillance Network coordinates influenza information from throughout the globe.

Some of the tasks I mentioned involve collaboration among agencies at the same level of government. When local public health agencies are not all under a state public health agency, antiviral drug and vaccine distribution depends on them coordinating policies. Security provided by police and firefighters also occurs at this level. Having demonstrated how the solutions I propose meet one of the RSM's criteria, I will now address the other.

Adaptive Solutions

Creating ad-hoc distribution networks is something public health authorities did quite well during the aH1N1 vaccinations. In the case of a worst-case scenario pandemic, the task would be trickier, involving security and contact concerns. I hope the solutions I propose to respect the need for capacity along with the disease parameters worst case scenario pandemic influenza entails.

Issues of quarantine and school closures highlight the need for public health practitioners to collaborate with agencies with whom they normally do not have much communication. Because these agencies are dealing with agendas distinct from public health, such relationships especially benefit from preformed relationships of trust.

That said, in addition to the fragmented nature of the public health system, those implementing these suggestions would have to wrestle with the fragmented nature of the

medical care and school system. This is in addition to the variety of organizations that are an aspect of civil society. Such a situation creates the need for the public health agency to adapt their solutions not only to the governance and public health realities, but their own capacities as well.

The suggestions surrounding NGOs and faith-based organizations center on gaining the trust of the communities these organizations serve. While I believe it is a useful strategy, its effectiveness will only reach its potential in the context of a public health system that attends to their needs even when there is not a public health emergency. In short, the networked approach is not meant as a substitute for issues of fair governance. Because I write about adaptive solutions to surveillance in Chapter Three, I do not see a need to write about it again.

Chapter Five: Conclusion

The SARS Epidemic in Canada

In the context of reflecting on its response to the SARS epidemic in Canada, the National Advisory Committee on SARS and Public Health for Canada reports surveillance and the response to outbreaks relies on voluntary partnerships, and emphasizes the importance of voluntary collaboration between the federal, provincial, and territorial governments. The National Advisory Council evidences this statement by citing Canada's Auditor General (Health Canada, 2003, p. 97). The Auditor General says a lack of specific legislation, policies, and agreements hampers collaboration between different levels of government to conduct surveillance (Auditor General, 1999, 14-11 through 14-12) and to respond to a food-borne illness outbreak (Auditor General, 1999, 14-13 through 14-14).

In an emergency, front-line public health practitioners have the responsibility of assessing whether it has sufficient capacity to handle the problem. If the public health agency does not, it must engage other agencies in seamless collaboration (Health Canada, 2003, p. 98). Such a response requires coordination at the local, provincial, and territorial levels (Health Canada, 2003, p. 98). One department has the lead role and other departments provide support. Federal, provincial, and territorial collaboration is also necessary. Still, "the federal, provincial, and territorial frameworks have not been analyzed for comparability and interoperability" (Health Canada, 2003, p. 99). The response also requires "common operating procedures, compatible training and

equipment, and most importantly, prior agreements for mutual assistance in emergencies requiring a sudden surge capacity” (Health Canada, 2003, p. 98).

The Security Approach, the Social Inequalities Approach, and the RSM

The RSM is adaptable to the security and social inequality approaches, helping each mitigate some of the weaknesses I highlighted in Chapter One. The RSM can help the security approach from having to make tough choices between micro-costs and excess mortality by creating the surge capacity I have discussed. The RSM cannot correct the approach’s over-emphasis of communicable disease and the general accusation the approach does not assist public health, however. The RSM can help the social inequalities approach by mitigating some of the costs associated with the programming to narrow the gap between the privileged and the marginalized. This is by creating capacity that can be scaled up or down as the problem demands. This helps avoid the efficiency/equity choice I explained, at least to a certain degree. Still, the RSM cannot correct the approach’s lack of preparedness specific to a communicable disease outbreak.

This Thesis’ Work and Final Thoughts

I have proposed the networked approach, embodied by the RSM, provides a useful alternative and potential complement to the security and social inequality approaches. First, I introduced the policy priorities relative to a communicable disease pandemic, the debate concerning different approaches to a pandemic, new governance, the RSM, pandemic influenza, and the public health context in which the public health system addresses pandemics. Second, I connected epidemiological and RSM principles for pandemics in general. Third, I related a worst-case scenario influenza pandemic’s

parameters to epidemiological concepts and proposed how a networked approach would assist thesis tasks.

If public health agencies adopt the RSM for pandemics, they will face the challenge of having to manage two systems: one for the non-routine problems I have focused on and another for the routine problems that public health agencies confront on a daily basis (Kettl, 2009, p. 220). Each not only involves a separate method of addressing problems; each involves a separate model of accountability (Kettl, 2009, p. 227).

Perhaps the greatest weakness of the RSM is the lack of intellectual capital those who utilize it have to draw from. Research on tools continues to be scant. Furthermore, rocket scientists must often work with little political support and intellectual foundation (Kettl, 2009, p. 200).

These problems of knowledge about tools and accountability mechanisms can be resolved if academics and rocket scientists study the RSM. They must also champion the model's strengths; they must do so with proper intellectual scrutiny and transparency about what is still unknown and the model's weaknesses. For example, the model's heavy reliance on the right individuals in key positions (Kettl, 2009, p. 220) is a vulnerability inherent to it. Because public actors often rely on strategies involving indirect tools with little evidence on how they function (Milward & Provan, 2003, p. 2; Kettl, 2002, p. 481) and such strategies are pervasive (Salamon, 2002, p. 8; Kettl, 1993, p. 4) such research has the potential to benefit public administration.

Eyes wide open to its challenges and vulnerability, we can embrace and create a governance system that maturely grapples with the realities inherent with utilizing

voluntary collaboration. We can confront problems that spread pain far and fast throughout the social system with the leadership, and eventually, the intellectual base, necessary to fix them. Like John Snow, the epidemiologists that followed him, and the rocket scientists that work in virtual isolation (Kettl, 2009, p. 200), we can diagnose the community's problem, reference and build upon our understanding, and tailor our solutions to the diagnosis.

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