Globalization and Health:

The Resurgence of Pertussis in the United States

RESEARCH PROPOSAL

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**Project Description**

Infectious disease threats know no borders, especially in a world where a potentially deadly infectious disease is only one day’s plane travel from anywhere in the world. Thus, it is not surprising that nations are increasingly recognizing the need for global health security, by strengthening local capacity to prevent, detect, and respond to public health threats that indeed could have global implications. Currently, world health officials are keeping an eye on dozens of potentially dangerous new pathogens, from H7N9 bird flu in China, to the MERS (Middle East respiratory virus) in the Middle East.

With this in mind, it is essential for the United States to recognize a more specific and stubborn foe. Despite pertussis (whooping cough) being a vaccine preventable disease, infection rates around the world are steadily on the rise. In fact, the World Health Organization (2008) stated that there were 18.4 million new cases of pertussis worldwide in 2004 (p. 28) and the Centers for Disease Control and Prevention (2013a) reported a 158% increase of pertussis cases in the United States in 2012 compared to 2011. Though pertussis is endemic throughout the United States, recently, multiple factors have led to a considerable increase in the incidence of pertussis; lower vaccination rates, waning immunity of the vaccinated population, and more circulation of the bacteria, worldwide, have all played a role.

At the foundation of my research I ask, *Why are pertussis infections on the rise in the United States, despite it being a vaccine preventable disease?* Combining both global health and health policy disciplines is critical to systematically examining the problem at hand. Studying the increased incidence of pertussis in the United States by way of global health will allow me to follow the global trends of the burden of disease. In addition, examining the concept of globalization will allow me to find possible cross-border factors related to the notable increase in
pertussis infections. Moreover, health policy studies are necessary to develop a theoretical framework with which to investigate the transmission of disease, from initial case to possible epidemic. The United States must recognize that a threat anywhere, is a threat everywhere.

**Literature Review**

Pertussis, or whooping cough, is a highly contagious, cyclically recurring disease caused by the bacterium *Bordetella pertussis*. Despite concerted and widespread immunization efforts, pertussis is once again contributing to morbidity and mortality in both developing and developed countries around the world. The theories behind this resurgence are vast and include “causes rooted in biology, including loss of infection and vaccine-derived immunity, vaccine efficacy, and pathogen evolution” (Rohani & Drake, 2011). In addition, other researchers have explored an alternative that there is no actual resurgence, per se, but increased awareness and more advanced testing methodologies that have resulted in a more accurate picture of *B. pertussis* infections (Cherry, 2003; Cherry, 2005). Furthermore, there is another possibility that has led to the increase in pertussis infections, namely, globalization. In today’s globalized world, the extent of integration in our world means that no country can be isolated from risks that emerge from elsewhere.

This paper will consist of four sections. First, I will set the stage by laying the groundwork of what *B. pertussis* is and explain its transmission. The second section of the paper will showcase the varied theories of why there has been an increase in pertussis infections over the past three decades. The third section will explore the concept of globalization including its defined processes, namely the expansion of economics, technology, and the movement of people. I will conclude my paper with an overview of the perceived relationship between globalization, specifically the movement of people, to the increase in pertussis incidence in the United States.
**Bordetella pertussis**

To better understand why *Bordetella* pertussis is such a significant issue, it is essential to comprehend the seriousness this bacterium elicits. According to the Centers for Disease Control and Prevention (CDC) (2013b), pertussis, or whooping cough, is a very contagious disease in which the *B. pertussis* bacteria attach to the cilia of the upper respiratory system. The bacteria release toxins, subsequently damaging the cilia and causing inflammation. Furthermore, pertussis can then lead to violent and rapid coughing until the air is completely expelled from the lungs and you are forced to inhale with a loud ‘whooping’ sound. The disease usually starts with cold-like symptoms, but over the course of one to two weeks pertussis can become a series of coughing fits that may continue for weeks (CDC, 2013b).

Pertussis is spread from person to person; usually by one person coughing or sneezing while in close contact with others, who then breathe in the pertussis bacteria. While everyone is susceptible to falling ill, infants are the most vulnerable population. Tan et al. (2005) argued that this is because they have not received any or only a few of the recommended vaccinations and have not reached full immunity against the disease (p. S83). Subsequently, pertussis is still widely considered an infant disease. Tan and colleagues (2005) maintain that because practitioners do not generally consider pertussis when diagnosing adolescents or adults, this leads to significant underreporting of the disease, particularly in this population (p. S84).

**Theories for Increased *B. pertussis* in US**

The United States is currently at the apex of what may turn out to be the largest outbreak of reported pertussis in 60 years (Rohani & Drake, 2011; Cherry, 2012). In fact, in 2012, 48,277 cases of pertussis were reported in the US, the most since 1955 (CDC, 2013c). And there are an
average of 16 million cases of pertussis and 195,000 deaths in children caused by pertussis worldwide each year (CDC, 2013c).

In North America, children currently receive 5 doses of a combined diphtheria-tetanus-acellular pertussis (DTaP) vaccine between the ages of two months and 6 years. Nicole Guiso (2013) claims the main reason for the marked increase in pertussis is that “individuals are vaccinated when they are young, but their immunity subsequently wanes…” The duration of protection post-vaccination is 3-5 years (He et al., 1994), and the waning of immunity leaves adolescents and adults vulnerable to infection, making them a source of infection for young infants, other adolescents and adults. Mooi, Van Der Maas, and De Melker (2013) add to this argument, even naming this reason as the “exclusive” cause for the resurgence of pertussis.

Although consensus exists that waning immunity plays an important part in the resurgence, few agree on the exact reason why this occurs. Experts argue the “[quality] of the vaccine” (Mooi et al., 2013), “lack of natural boosters” (Tan et al., 2005), and “adaptation of the pathogen” (Mooi et al., 2013) are all significant players. On the contrary, Camille Sabella (2005) and Tan et al. (2005) observe that there is a large percentage of mild disease that goes undiagnosed or unreported, which leads to a growing reservoir of B. pertussis. This growing reservoir can then lead to increased incidence in those individuals who are not immunized or under-immunized. What is more, Winter et al. (2012) analyzed the California pertussis epidemic of 2010 and add to the causes for the increased incidence in pertussis. They allude to large birth cohorts as well as increased awareness and detection of pertussis.

Globalization

Martens, Akin, Maud, and Mohsin (2010) define contemporary globalization as “the intensification of cross-national interactions that promote the establishment of cultural,
economic, ecological, political, technological, and social process on global, supra-national, national, regional, and local levels.” This definition, coupled with this addition from Yach and Bettcher (1998) that globalization is a process of increasing “…global integration that takes place as capital, traded goods, persons, concepts, images, ideas, and values diffuse across state boundaries,” truly expresses the complexity that encompasses globalization.

Still, some scholars feel that globalization is a purely economic concept. Schrecker, Labonte, and DeVogli (2008) further this conversation as they explore globalization as the “incorporations of national economies and societies into a world system, through movements of goods and services.” Though they do concede that contemporary globalization is multi-faceted and thus more complex than earlier periods of globalization, such as colonization, they remain steadfast that “this incorporation results [solely] in the exposure of economies…outside their borders.” In contrast, Labonte, Mohindra, and Schrecker (2011) discuss myriad of global flows directly related to globalization. Here they assert the movement of trade, finances, information, pathogens, and people all play a major role.

Together, the combinations of scholars just mentioned make incredibly valuable points. Some look at globalization launching due to economic incentives; while others look at it from technological innovation along with social and cultural perspectives; yet others look at globalization from a political viewpoint.

Because of technology and the advent of the Internet, the amalgamation of multiple nations has been drastically catapulted to the forefront of research within globalization. As Marsden (2004) asserts, “the ubiquity, rapid penetration and commonplace necessity of international data flows over digital communication networks [such as e-mail], combined with the economic and social effects of such flows, makes the Internet the paradigm of globalization.”
Though this is a grand statement, it makes the point that technology plays a vital role in globalization.

Likewise, the movement of people, a staple in defining globalization, is as important, if not more so, as each and every process previously mentioned. People move for a variety of reasons, the least of which includes economic and environmental necessity. For example, asylum seekers or refugees may be fleeing their previous residence out of fear of persecution, due to race, religion, nationality, membership in a particular social group, or due to a certain political opinion (Labonte et al., 2011). Whereas a person who is recruited, transported, or harbored by means of any sort of coercion for the purpose of exploitation, is considered a trafficked person (Labonte et al., 2011). In addition, there exist undocumented migrants, those without the legal means and paperwork, usually relocating for work. Unfortunately, this list is not limited with what is documented here. Individuals and families may take vacations in other countries, move there due to military service, or even attempt, even if temporarily, to look for cheaper health care services or pharmaceuticals that may not exist in their own country; this is known as medical tourism.

**Globalization and Health**

Globalization and health have a storied history. From the age of exploration in the 15\(^{th}\) century with the arrival of Columbus in the Americas in 1492, to the era of industrialization in the 18\(^{th}\) and 19\(^{th}\) centuries, communicable disease had ample opportunity to spread more widely and frequently (Lee, 1999). The renowned global health scholar, Kelley Lee (1999), continues her conversation by exploring the current stage of the relationship between globalization and health, most important of which is, “the geographical breadth it encompasses [and] the frequency and intensity of human interactions that are taking place.” Indeed, “globalization is evolving at
such speed and with such complexity that it challenges our ability to grasp its full extent” (Frenk, Gomez-Dantes, & Knaul, 2011). Along these same lines, Azevedo and Johnson (2011), add that “no matter how [globalization] is defined, it is here to stay, and is causing major changes on the globe.”

On the whole, the association between the global movement of people and the spread of infectious diseases is possibly the best-known health effect of globalization (Frenk et al., 2011; Huynen et al., 2005; Martens et al., 2010). In fact, “globally, there were 232 million international migrants in 2013,” and between 1990 and 2013, 53 million people migrated to North America (“United Nations Population Division, Department of Economic and Social Affairs,” 2013). In addition, the outbreak of Severe Acute Respiratory Syndrome (SARS) demonstrated the potential of infectious diseases spreading rapidly throughout the world, increasing the chances for a global pandemic. Due to the complex nature of both globalization and health, the perceived relationship between the two is invariably multifaceted and complicated. To summarize, this paper will focus solely on a single process of globalization and a specific infectious disease in the United States, global mobility of people and pertussis, respectively.

**Methods of Analysis and Evidence**

The rise in incidence of pertussis cases in the United States is substantial. Along these lines, globalization processes are continuing at tremendous rates throughout the world. A systematic examination of globalization, specifically the movement of people across borders, along with the global burden of pertussis, is required to fully understand the mutual impact they have on the United States. This research paper will consist of four sections of evidence and analysis that help explain my hypothesis that the increased rates of cross-border migration due to
globalization has an impact on the recent increase in pertussis cases in the United States. First, I will describe the global burden that pertussis yields across the world. I will utilize statistics from the World Health Organization (WHO) along with the CDC and others to illustrate how pertussis, a vaccine-preventable disease, is re-emerging. I will look at the countries with the highest rates of pertussis as well as those with the lowest rates and compare them. This will help the reader understand the global environments in which pertussis thrives.

Second, I will explore the re-emergence of pertussis in the United States. I will start by studying the time in recent history where the incidence of pertussis cases was lowest in the US and describe the public health strategies used at that time. Next, I will develop a time-line to compare the incidence of pertussis and the public health strategies that coincide with the rates over the years. Lastly, I will utilize case studies and other empirical evidence of recent epidemics to try and determine causality. Together, all of these points will allow me to show the reader any possible correlation between the rise in pertussis incidence in the US and the public health strategies used to mitigate that rise.

Third, I will further discuss the varied processes of globalization. More specifically, I will use existing statistical data to explore the eruption of migrant populations around the world. I will further define the different populations regarded as migrants, including asylum seekers or refugees, trafficked persons, undocumented migrants, military service-members, international vacationers, and medical tourists; I will also include the threats each of these populations generate.

Finally, I will present two existing theoretical frameworks that study the relationship between globalization and health (Woodward et al., 2001; Huynen et al., 2005). As Woodward et al. (2001) explain, “…there is no consensus either on the pathways and mechanisms through
which globalization affects the health of populations or on the appropriate policy responses.”

The effects Woodward et al. (2001) identify as most critical for health are mainly economically based. Contradicting this view, however, Huynen et al. (2005) approach their framework with a more holistic approach, starting with multiple, large, contextual health determinants and tapering into more proximal health determinants. I intend to use these existing frameworks to formulate my own theoretical framework that can be used to explore the specific relationship I am researching, the relationship between global mobility and the rise in incidence of pertussis in the United States.

Largely, I will rely on scholarly sources to support my research. There may be a need to use print media as well as interviews of scholars and other individuals knowledgeable in the transmission of disease and globalization. I do not plan on interviewing individual patients of pertussis or families that have dealt with migrating, thus I do not foresee the need for an Institutional Review Board (IRB).

**Conclusion**

This research proposal has presented the following question: *Why are pertussis infections on the rise in the United States, despite it being a vaccine preventable disease?* I have explored this question from multiple perspectives, most notably, global health, through the investigation of the global burden of disease and the processes of globalization. In addition, I have taken a health policy outlook while exploring existing theoretical frameworks that relate globalization and health. The answer to my research question is complex and will develop through continued secondary exploration of globalization as well as the utilization of my proposed theoretical framework tying global migration to the rise in incidence of pertussis in the US. I can only speculate on possible outcomes; I may see that there is a definite correlation between global
migration and pertussis resurgence; I may see a moderate correlation between them, or no
correlation at all. I may also find that the ideas of previous scholars, lower vaccination rates,
waning immunity of the vaccinated population, and more circulation of the bacteria, worldwide,
have all played the largest role.
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Timeline for Petzinger Research Project: Globalization & Pertussis in the US

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