Enigmatic Nature of Diphtheria in Anglo-American Contexts Following the Bacteriological Revolution, 1880s-1940s

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Abstract

Title: Enigmatic Nature of Diphtheria in Anglo-American Contexts Following the Bacteriological Revolution, 1880s-1940s

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This thesis examines the history of diphtheria in Ontario between 1880 and 1940. The purpose of this thesis is to look past the bacteriological excitement of the nineteenth century, and the discoveries that have often been reported by historians and popular media and explore why diphtheria remained an enigmatic disease despite the discovery of a single bacterial cause. Drawing on a variety of primary and secondary sources, this thesis also uncovers the social, personal and often fatal consequences that arose following the appearance of diphtheria within communities. The unresolved enigmatic nature of diphtheria allowed for the creation of a conceptual space in which both medical and non-medical members of Ontario's society often found themselves competing to promote their own conceptualizations of diphtheria. These conceptualizations, combined with the threat diphtheria posed to the health of a community, resulted in further confusion regarding the nature of the disease. Many historical concerns regarding diphtheria and its enigmatic nature have never been resolved.

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Introduction

In 1891, artist Luke Fildes produced a painting titled "The Doctor" which evoked the powerlessness and despair often experienced by physicians throughout the nineteenth century. In the painting, a doctor on a house call sits beside a very sick, unresponsive child lying on a makeshift bed of kitchen chairs. Worried parents wait and watch in the background. The physician, normally actively attempting to intervene, is aware of the poor prognosis and with few interventions that could change this fact, he is resigned to the position of observer, watching, as the parents do, for any sign of improvement.

The imagery and emotional state that Fildes' evokes in his work would not have been an uncommon occurrence for physicians in the nineteenth century.[1] In 1866, before the confirmation of bacteria as the cause of infectious diseases, the rural Ontario physician James Miles Langstaff was called to treat a child slowly suffocating from a disease known as the strangling angel.[2] The patient was in critical condition. Like Fildes' doctor, Langstaff had few medical options available, and decided to attempt a dangerous new operation known as a tracheostomy. By cutting a hole through the patient's neck and windpipe, so that a temporary breathing tube could be inserted, Langstaff hoped to bypass the child's blocked airway.[3] He lacked the experience and skill required to do the operation, however, and when he made the initial incision, according to his clinical notes, "*black* blood [spurted] from *arteries*".[4]

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[1] While this thesis sometimes references the emotional state of physicians and parents, it does not delve into the history of emotions. The history of emotions is a relatively new field which presents a new lens through which to analyse historical records. An in-depth analysis of the emotional history tied to the appearance of contagious diseases is outside the scope of this thesis. The following works, by academics provide a good overview of this new field and its interconnections with other areas of historical research; Rob Boddice, *The History of Emotions* (Manchester: Manchester University Press, 2018); Jan Plamper, *The History of Emotions : an Introduction* (Oxford: Oxford University Press, 2015).

[2] Jacalyn Duffin, *Langstaff a Nineteenth-Century Medical Life* (Toronto: University of Toronto Press, 1993), 165.

[3] A tracheostomy is another name for the operation known as a tracheotomy.

[4] Emphasis original. Duffin, *Langstaff a Nineteenth-Century Medical Life*, 166.

Disconcerted and probably fearful of doing more harm than good, he stopped the operation and the patient eventually died.[5] Even the creator of the tracheostomy, French surgeon Armand Trousseau who performed over 200 tracheostomies to save patients dying from the strangling angel, had many patients die from post-operative infections.[6] Langstaff's failure to perform the tracheostomy and save the awake, pediatric patient, greatly impacted him, and he remained hesitant to perform tracheostomies throughout his long career.[7] The strangling angel was widely recognized by physicians and parents throughout the nineteenth century, but not well understood. Some sufferers survived and others died, regardless of what decisions were taken and medical care administered. While local doctors like Langstaff confronted the strangling angel in emotionally heightened house calls in the late nineteenth century, physician-researchers in Europe were working in laboratories investigating the possibility that microorganisms were responsible for the disease also known as diphtheria.

By the 1890s, the new field of bacteriology confirmed the so-called germ-theory by presenting scientific proof that the cause of every disease was bacteria specific to each disease. Bacteriology revolutionized the field of medicine through the production and distribution of many life-saving antidotes and vaccines and the confirmation that the cause of many post-operative deaths was bacterial infection. Some cures, such as Louis Pasteur's rabies vaccine appeared almost miraculous and brought new hope that all diseases would soon be cured or prevented. Prior to Pasteur's discovery in 1885, rabies meant an automatic and agonizing death for anyone who contracted it. Even today it remains universally fatal without medical

[5] Duffin, *Langstaff a Nineteenth-Century Medical Life*, 166.
[6] Elizabeth Frost, "Tracing the Tracheostomy," *Annals of Otology, Rhinology & Laryngology* 85, no. 5 (September 1976): 618-621.
[7] Duffin, *Langstaff a Nineteenth-Century Medical Life*, 166.

intervention.[8] When Pasteur's antidote cured a nine-year-old boy who had been bitten by a rabid dog 60 hours earlier, it received sensational coverage by the international press.[9] Rabies itself and Pasteur's antidote were paradigmatic of bacteriological logic: there was a specific microbe that caused each disease and it acted universally in all bodies. For the general public, it was both miraculous and mysterious. Whereas germ theory only gradually complicated existing ideas about how to deal with contagious diseases, bacteriology rapidly transformed how physicians and medical scientists conceptualized diseases.

Within a decade of the incredible laboratory discoveries of scientists such as Pasteur, government public health agencies in North America were applying the logic of bacteriology to the prevention of disease in communities. Bacteriology also helped prove the existence of healthy carriers of infectious disease, people who were non-symptomatic but contagious. The logic of bacteriology subsequently permeated policies, laws, and regulations around public health, most famously in the early 1900s when Mary Mallon, an Irish-American cook and healthy carrier of typhoid, was involuntarily but legally quarantined by New York health authorities to prevent her from spreading the disease.[10] The idea of healthy carriers, however, challenged the assumption that bacteria acted universally on all bodies. Nevertheless, by the end of the nineteenth century, the idea that bacteriological knowledge and methods could cure and prevent infectious diseases was ubiquitous within North American medicine, government, and general society. As this historical analysis of diphtheria shows, however, bacteriology could not provide total clarification on the nature of every disease. Diphtheria remained a mystery, which

[8] George M. Baer, *The Natural History of Rabies* (Abingdon: Routledge, 2017), 12.
[9] Baer, *The Natural History of Rabies*, 13.
[10] Judith Walzer Leavitt, "'Typhoid Mary' Strikes Back Bacteriological Theory and Practice in Early Twentieth-Century Public Health," *Isis* 83, no. 4 (1992): 615-617.

had serious consequences for individuals, physicians, and societies when making decisions about cures, prevention, and outbreaks.

Throughout the nineteenth century, North America experienced an increase in number of immigrant communities settling in cities across the continent.[11] In addition to diverse religious and educational traditions, each brought various understandings of disease and medical treatment. The overwhelming number of British immigrants, however, ensured that despite the multicultural explosion, British ideals of colonial structures of classism, patriarchy, and racism governed everyday life.[12] The province of Ontario, which is the geographic focus of this research, also experienced a rapid implementation of industrialization and urbanisation, with Toronto, its largest city, growing to an astounding 20200 people per square mile between 1883 and 1890, with many people living in crowded unsanitary conditions that were highly conducive to the spread of infectious disease.[13]

As the need for a systemic health care program and sanitary knowledge grew, the Ontario government began to expand public health programs and increased the number of public schools. These progressive changes to Ontario society, however, were not evenly applied to all residents. Black families, for example, were often forced by local white officials to request the establishment of segregated schools, many of which were ill equipped, while Indigenous persons were routinely turned away from new provincial hospitals.[14] Like other regions in North

[11] See David Ward, *Cities and Immigrants; a Geography of Change in Nineteenth-Century America* (New York: Oxford University Press, 1971).
[12] For the main religions in Ontario see John Grant, *A Profusion of Spires: Religion in Nineteenth-Century Ontario* (Toronto: University of Toronto Press, 1998), 224.
[13] C.S. Clark, *Of Toronto the Good: a Social Study : The Queen City of Canada as It Is* (Montreal: The Toronto Publishing Company, 1898), 1; Richard Harris, *Unplanned Suburbs: Toronto's American Tragedy, 1900 to 1950* (Baltimore: Johns Hopkins University Press, 1996), 38-39.
[14] Constance Backhouse, *Colour-Coded a Legal History of Racism in Canada, 1900-1950* (Toronto: University of Toronto Press, 1999), 250; see Maureen K. Lux, *Separate Beds : a History of Indian Hospitals in Canada, 1920s-1980s* (Toronto: University of Toronto Press, 2016), 11; 14; 22.

America, Ontario also gradually expanded its publicly-funded scientific and medical institutions in this period, especially in collaboration with private companies and universities. Ontario's new provincial public health department circulated bacteriological concepts which became more widely accepted within the medical profession and by municipal governments and health authorities. Expectations were high that all diseases would soon be identified and controlled once their specific pathogens were identified by medical scientists in the laboratory.

Despite the identification of a single bacterial cause of diphtheria in 1883, however, the disease's character and behaviour remained enigmatic. Diphtheria's rates of mortality and recovery were unpredictable and not all patients developed the classic symptom of a membrane in the throat. Encouraged by the bacteriological logic that infectious diseases affect all bodies universally and predictably, Ontarians in the late nineteenth and early twentieth assumed that medical science would soon discover a reliable method for preventing deaths from diphtheria, which was disproportionately fatal in children because of their small airways. Nevertheless, bacteriology was unable to provide a laboratory-based explanation for why diphtheria looked and behaved differently from patient to patient and across multiple populations. Even after the discovery of a therapeutic "anti-toxin" in 1890 and a preventative vaccine, called "toxoid," in 1923, physicians and public health agencies could never offer a guarantee against outbreaks and deaths. I argue that this enigmatic quality, which diphtheria shares with diseases such as tuberculosis and Covid-19, created a conceptual space for competing, conflicting, and contradictory explanations and approaches to emerge, which resulted in uncertainty and confusion that had significant social consequences. Various non-medical individuals and groups—that is, those without scientific training or special medical knowledge—began to conceptualize diphtheria in ways that reflected common misunderstandings of the new

bacteriological logic. In addition, people's opinions and beliefs regarding the non-medical factors related to diphtheria, which appeared significant depending upon the perspective of who was observing the disease, were altered to suit shifting conceptualizations of diphtheria. These factors included financial and political considerations, religious beliefs, and older cultural associations about disease. Furthermore, how doctors, families, advertisers, or government agencies interpreted diphtheria influenced their decision-making around how to treat or prevent it. Through the lens of diphtheria, this historical analysis shows that when a disease behaves enigmatically clinically and epidemiologically, multiple social constructions and cultural meanings of the disease are generated that circulate simultaneously and create uncertainty, mistrust, fear and doubt. When dealing with the enigmatic diphtheria, there was also often a rearrangement or reassignment of traditional societal and medical roles; the appearance of new bonds of trust among businesses and members of the public; novel demonstrations of agency related to decision-making around diphtheria; and a new need for public health officials to adapt how they communicated with an increasingly weary and disconcerted non-medical public.

This thesis is divided into five distinct, interconnected chapters. The first deals with the new laboratory science and explores how Ontario became a leader in the successful control of diphtheria in the 1920s, yet still failed to fully consider and understand diphtheria's enigmatic nature. These oversights had several repercussions which are examined in subsequent chapters. Chapter 2 investigates how diphtheria's enigmatic clinical presentation, combined with the lack of definite scientific information and direction from public health authorities, left families and sick individuals pressed to develop their own answers in order to make treatment decisions. Communities often had to come together in ways that had not always been seen before. Most notably, religious leaders and organizations were called upon by both the public and local

governments to take an active role in the prevention and treatment of diphtheria. Chapter 3 employs medical advertisements to analyze how the failure of bacteriology allowed commercial businesses to promote alternative explanations and cures for diphtheria. Medical advertisements in media depended upon popular understandings of disease to increase product sales, and yet they could also influence how the populace newly interpreted illnesses by creating a new conceptual identity for the disease that the advertisement claimed to cure. Chapter 4 examines how the ideas, concerns, and work done by governments, medical authorities, and parents intersected in educational institutions. Schools became centres of change, wherein governments attempted to educate the next generation on the bacteriological methods of conceptualizing, treating and preventing diphtheria. Through conscious and unconscious interactions with one another, students could promote or limit the spread of diphtheria, forcing those in positions of authority to react and implement broad changes within society. The final chapter considers a disease that was known internationally as "black diphtheria" and shows how the non-medical public framed it as a new distinct disease. Physicians' and scientists' adherence to bacteriological logic, I suggest, acted as conceptual blinders when they encountered reports of black diphtheria. Despite the clear identification in the laboratory of the toxin-producing bacteria that caused diphtheria, and the subsequent development of an anti-toxin and vaccine, the concept of black diphtheria thrived in popular narratives. I am the first historian to examine how black diphtheria was constructed by the non-medical public in North America as distinct from pediatric diphtheria (i.e. the strangling angel), and how this new construct was largely dismissed by physicians who could not agree if it was diphtheria or not. This well publicized lack of consensus not only placed physicians at odds with patients, but left government health agencies stuck in between scientific experts and public expectations. It also perpetuated questions regarding the true nature of

diphtheria within civil discourse. This thesis contends that what connected all these social disruptions, new conversations and approaches, and conflicting concepts was diphtheria's enigmatic character.

The historical evidence on the effects of diphtheria in Ontario is sparse, as is the secondary literature on the disease in general. I started my research during the lockdown period of the 2020-2021 Covid-19 pandemic with a search for the keywords *diphtheria* (including alternate spellings), *black diphtheria* and *strangling angel* in online repositories of academic books and journals and in digital catalogues of archives and university libraries. No secondary sources focused exclusively on the history of diphtheria in Ontario or Canada, so I had to familiarize myself with the disease and its history through online primary source research. I performed keyword searches of digitized newspapers, popular magazines, medical journals and government reports using online databases such as ProQuest, newspapers.com, Canadiana (Canadian Research Knowledge Network) and PubMed for the period 1870-1940. Subsequently, I searched for mentions of diphtheria in the holdings of archives across Ontario. I discovered a few documents from Algoma University which revealed more about the increased dependency that families placed on non-medical religious authorities when dealing with diphtheria. Few archives had documents specifically relating to diphtheria. When I did find mentions of the disease, I endeavoured to contact the local archivist. This was not always successful due to the Covid-19 pandemic, although this is how I obtained two non-digitized documents held by the archives at St. Michael's Hospital (SMH) in Toronto which became crucial to my analysis of religious communities and diphtheria and the subsequent effects on the medical landscape in Toronto. In addition, the archivist for the Sisters of Providence in Kingston kindly mailed me a publication from their archives which also contributed to this analysis.

Eventually, I was able to access materials at Library and Archives Canada, the federal department responsible for holding archival and published federal government documents. Using a broad set of search parameters, I examined boxes of documents and publications that seemed to potentially contain relevant information. The majority of the materials, however, either related to questions of immigration and disease, which is outside the scope of this thesis, or they simply contained passing remarks about diphtheria. Part of the reason for this may be attributed to the fact that healthcare was not the responsibility of the federal government.

I was also able to access the records held by the Ontario Archives. The majority of these documents related to the closure of schools due to diphtheria outbreaks. Subsequently I accessed, in-person, the records held by the City of Toronto Archives, especially those related to the scientific work of physician John FitzGerald who held a pivotal role in promoting bacteriological solutions to controlling diphtheria in Ontario and Canada. Throughout my research of primary sources, I uncovered rich but disconnected historical evidence relating to diphtheria in Ontario that historians have yet to use.

I have analyzed these sources using social, cultural and intellectual history approaches, and the theories of social construction of disease put forward by Charles Rosenberg and Jacalyn Duffin. Rosenberg is a social historian of medicine who argues that diseases do not exist, they are created through processes of social construction.[15] He does not deny that there are living biological organisms that can produce a reaction within the human body, and this pathological process subsequently elicits a response from both the individual and their particular society. For

[15] Charles E. Rosenberg, "What Is Disease? In Memory of Owsei Temkin," *Bulletin of the History of Medicine* 77, no. 3 (2003): 491-505; Charles E. Rosenberg, "Disease in History: Frames and Framers," *The Milbank Quarterly* 67, no. 1 (1989): 1-15; Charles E. Rosenberg, "The Therapeutic Revolution: Medicine, Meaning, and Social Change in Nineteenth-Century America," *Perspectives in Biology and Medicine* 20, no. 4 (1977): 485-506.

Rosenberg, the concept and identity of a disease exists in our consciousness only once our society names and describes (or "frames") what that disease does to our bodies. All diseases are concepts that are dependent on the specific time and place that created them. I argue that bacteriologically oriented physicians and scientists could not pinpoint the nature of diphtheria, despite having isolated its bacterial cause, because the disease was not consistent in its clinical presentation or epidemiology. Because diphtheria was enigmatic, medical authorities were unable to accurately and consistently name and frame the disease among themselves when it affected individual patients or communities, and this often led to inaccurate diagnosis, confusion, doubt and conflict.

Rosenberg's theory, however, is unable to fully explain the continued misidentification of diphtheria and medical and social consequences of its enigmatic nature. Historian Jacalyn Duffin emphasizes that the conceptualization of a disease is not only dependant upon the social process of naming and framing it, but also upon who, specifically, within a society is observing the disease at any given moment.[16] Each individual proceeds to develop their own concept of a disease, based on their experiences and knowledge, which can result in a multitude of simultaneous names and descriptions for one disease. Drawing on Duffin's theory of shifting observers, my analysis shows how physicians, medical scientists, public health experts and members of the general public often developed their own recognition, understanding and interpretation of diphtheria which dictated their medical decision-making and social responses to this contagious disease. Because diphtheria is enigmatic both clinically and epidemiologically,

[16] Jacalyn Duffin, "A Hippocratic Triangle: History, Clinician-Historians, and Future Doctors," in *Locating Medical History: The Stories and their Meanings*, eds. Frank Huisman and John Harley Warner (Baltimore: Johns Hopkins University Press, 2004), 432-449; Jacalyn Duffin, *Lovers and Livers : Disease Concepts in History* (Toronto: University of Toronto Press, 2005).

the number of constructions increased as more observers plausibly named and framed it, including those without medical expertise or authority—especially because bacteriology could not provide a stable distinction either. For a disease to exist, therefore, there does not necessarily need to be a social consensus on the naming and framing, as Rosenberg suggests. Throughout this thesis, I also emphasize how children can be observers and actors during diphtheria outbreaks, changing and altering the definitions of disease and how the adults around them understand diphtheria. By combining the theories of Rosenberg and Duffin I have been able to identify and analyze many social consequences that occur when a disease is enigmatic.

Compared to diseases such as typhoid and diabetes, there are few books or articles devoted to the history of diphtheria within North America. Discussions are generally limited to book chapters or passing mentions in journal articles. In 2001, historian David Rosner noticed that "there has been virtually no serious or systematic attempt to define and develop the story [of diphtheria]."[17] The prominent exception is Evelynn Hammond's 1999 book *Childhood's Deadly Scourge: The Campaign to Control Diphtheria in New York City, 1880–1930*.[18] Hammonds examines the history of diphtheria in New York City in terms of the response of the local Board of Health to the arrival of diphtheria within the city, and the sometimes-antagonistic reactions from physicians and members of the public to the perceived interference of the Board of Health, a government entity, into their daily lives. Hammonds argues that laboratory discoveries and the various public health activities which emanated from said discoveries in tandem led to the eventual control of the spread of diphtheria in New York. My work has been greatly influenced

[17] David Rosner, "Childhood's Deadly Scourge: The Campaign to Control Diphtheria in New York City, 1880-1930 (review)," review of *Childhood's Deadly Scourge : the Campaign to Control Diphtheria in New York City, 1880-1930* by Evelynn Maxine Hammonds, *Journal of Health Politics, Policy and Law* 26, no. 6 (2001): 1410.
[18] Evelynn Maxine Hammonds, *Childhood's Deadly Scourge : the Campaign to Control Diphtheria in New York City, 1880-1930* (Baltimore: Johns Hopkins University Press, 1999).

by Hammonds. Her discussions of bodily independence, such as the public asserting their right to dictate how they respond to diphtheria, influenced how I understood the actions of families and medical practitioners in Ontario. I have incorporated her approach on intertwining stories of personal loss and scientific advancement in order to convey the emotionally and politically charged environment that appeared when diphtheria came into communities. Whereas Hammonds focuses on the urban setting of New York City, my work examines diphtheria in cities, townships and rural settings. In doing so, this research shows that Hammonds' study, which reveals that responses to the disease were often conflicting medical, social, and political reactions and is the only fully developed social history of diphtheria in an Anglo-American context, also applies to a Canadian context.

One recent addition to the sparse historiography of diphtheria is an article by Alan Rushton on the use of the anti-toxin in the Canadian prairies between 1894 and 1920. Rushton focuses on the history of the anti-toxin and explores the difficulties that Western provinces experienced in accessing the life-saving medicine. He concludes that geography was a main determinant of the outcome of diphtheria epidemics because of the great difficulty of accessing physicians and the antitoxin in a timely manner. While geographic proximity did play a role in the outcome of diphtheria cases in Ontario, it is not the main focus of this thesis. Rather, I examine the effects that bacteriological uncertainty had on how people in both urban and rural settings conceptualized diphtheria and subsequently responded to the disease.[19]

This research also depends upon Nancy Tomes' conclusions in *The Gospel of Germs: Men, Women, and the Microbe in American Life*. While Tomes does not focus on diphtheria, she

[19] Alan Rushton, "The Tyranny of Distance: The Treatment and Prevention of Diphtheria in Middle Canada, 1894-1920," *Journal of the History of Medicine and Allied Sciences* 77, no. 3 (2022): 267-290.

provides a critical interpretation of how popular culture and peoples' everyday lives were upended by the introduction of germ theory in the United States around turn of the twentieth century. Specifically, she examines how culturally diverse members of American society, from housewives to social activists, and rural and urban workers came to understand that germs, an invisible organism that few had seen or heard of, were responsible for diseases and deaths. Tomes also explains how germ theory gradually evolved and became more appealing to the public through public health campaigns and the use of germ theory in advertising. Once they accepted the idea of germs, the public's actions, along with those of the public health authorities, allowed bacteriology to take hold and shape concepts of diseases. Similar to Tomes, I interweave personal stories about the effect that the introduction and use of bacteriology had on individuals and families. Tomes hints at the role of the observer in altering the path of bacteriology, while I am more explicit and show how observers, the public, in this case who are receivers of expert public health knowledge and policies, are in fact also agents of constructing diphtheria, including how non-medical individuals dealt with the disease in their families and communities.[20]

Tomes' conclusions are confirmed by the economic analysis of Joel Mokyr and Rebecca Stein in their article "Science, Health, and Household Technology: The Effect of the Pasteur Revolution on Consumer Demand" which examines why mortality rates declined after the introduction of bacteriology. Using mathematical analyses, they show that there was a direct relationship between consumer behaviour, the new logic of bacteriology, technological progress and a reduction in mortality rates. Mokyr and Stein show how the bacteriological revolution, with its countless newsworthy discoveries, increased the rate at which householders began to

[20] Nancy Tomes, *The Gospel of Germs : Men, Women, and the Microbe in American Life* (Cambridge, Mass: Harvard University Press, 1998).

understand how diseases spread and how people with no medical expertise in all social classes incorporated germ theory into their daily lives. Like Tomes, Mokyr and Stein demonstrate the significance and power of non-medical individuals to construct concepts of diphtheria that made sense to them, and even to influence how those in medicine, advertising, and government conceptualized the disease.[21]

Anne Hardy also furthers the discussion around the importance of the individual in regards to disease management in an historical analysis of typhoid in the United States and England after the First World War. Hardy argues that because bacteriology was unable to provide a standardized approach for the general public and medical scientists to follow when dealing with typhoid, multiple understandings of the disease flourished in both countries. Consequently, the United States invoked a policy of prevention and England one of reaction, both supported by bacteriological principles, though neither was able to control the spread of the disease. Despite the identification of the bacteria that caused typhoid, there were multiple interpretations of its nature which supports my conclusions that the enigmatic character of diphtheria led to multiple, often conflicting social constructions of the disease and therefore caused diverse social and therapeutic consequences.[22]

Rima Apple, a professor of medical history and women's studies, expands upon the ideas of Tomes and Hammonds in her article titled "Constructing Mothers: Scientific Motherhood in the Nineteenth and Twentieth Centuries." Apple argues that, on the one hand, bacteriology allowed women to have a wider range of treatment choices available to them when their families

[21] Joel Mokyr and Rebecca Stein, "Science, Health, and Household Technology: The Effect of the Pasteur Revolution on Consumer Demand," in *The Economics of New Goods*, ed. Timothy Bresnahan and Robert Gordon (Chicago: University of Chicago Press, 1996), 143-206.
[22] Anne Hardy, "Scientific Strategy and Ad Hoc Response: The Problem of Typhoid in America and England, c. 1910-50," *Journal of the History of Medicine and Allied Sciences* 69, no. 1 (2014): 3-37.

became ill, and yet it also reduced women's independence as care providers because a faith in bacteriological principles meant that they had to rely much more on the authority of physicians when making medical decisions. According to Apple, the imposition of bacteriology on everyday life did not significantly alter how women responded to disease; rather it altered the medical power dynamic within families. Her underlining theme of the gendered impact that the arrival of bacteriology had on the public is not explicitly discussed in this thesis. This is due in part to the way in which responsibilities were divided among a household at the turn of the twentieth century. My analysis of medical advertisements, however, and the construction of so-called black diphtheria both revealed a distinct undercurrent of gendered rights and responsibilities.[23]

Chapter 1

Science Based Medical Interventions

Modern medical definitions of diphtheria differ slightly, but they agree that the disease is highly contagious and that it is caused by the bacterium *Corynebacterium diphtheriae.*[24] The bacterium is a Gram-positive bacillus which can either be toxigenic or non-toxigenic.[25] Depending on the morphology of the bacillus, it can be further divided into three biotypes: mitis, intermedius and gravis.[26] Each biotype can also either be toxigenic or non-toxigenic. The toxigenic strain excretes a toxin which can cause diphtheria.[27] In addition, there are two distinct clinical presentations of diphtheria: nasopharyngeal (infection in nose and throat) and cutaneous (infection on skin). *Corynebacterium diphtheriae* is generally spread through direct physical

[23] Rima Apple, "Constructing Mothers: Scientific Motherhood in the Nineteenth and Twentieth Centuries," *Social History of Medicine* 8, no. 2 (1995): 161-178.
[24] Tanya A. McFerran, "diphtheria," in *A Dictionary of Nursing*, ed. Jonathan Law (Oxford University Press, 2021).
[25] John R. Murphy, "Corynebacterium Diphtheriae," in *Medical Microbiology*, ed. Baron S. (Galveston: University of Texas, 1996), chap. 32.
[26] Murphy, "Corynebacterium Diphtheriae," chap. 32.
[27] Murphy, "Corynebacterium Diphtheriae," chap. 32.

contact with an infected individual, or through air droplets.[28] Once an individual becomes infected, it can take up to a week before any symptoms develop. Most symptoms tend to be general and not specific to diphtheria (fever, sore throat, swollen neck, shortness of breath, neuropathy), except for the gradual formation of a pseudo-membrane in the throat.[29] Untreated, the pseudo-membrane, which is often grey, can eventually completely cover the airway and cause suffocation. The diphtheria toxin can also enter the bloodstream, which can lead to heart failure.

The history of diphtheria is perhaps as enigmatic as the nature of the disease itself. There is little evidence pertaining to when the disease first appeared. Writers in the nineteenth century, however, have proposed that it has existed since at least 129-216 CE, when it was largely confined to the Mediterranean and called "Syrian ulcer" or "Egyptian ulcer".[30] By the seventeenth century, there is some evidence that an outbreak of the disease occurred in Naples during the winter of 1618-1619. An estimated 5000 people fell sick or died as a result.[31] With its propensity to kill children by suffocation, it soon earned the moniker "strangling angel". The disease was also known for its indiscriminate attacks on all members of the populace, with Princess Alice, the daughter of England's Queen Victoria, perhaps the most famous wealthy individual to reportedly die from it.[32] In 1826, the French physician Pierre-Fidèle Bretonneau, observed that large numbers of French citizens were sick or dying from a disease with a distinct

[28] Murphy, "Corynebacterium Diphtheriae," chap. 32.
[29] McFerran, "diphtheria."
[30] Russell Thacher Trall, *Diphtheria: its nature, history, causes, prevention, and treatment on hygienic principles* (New York: Miller, Wood, 1862), 76.
[31] Trall, *Diphtheria: its nature, history, causes, prevention, and treatment on hygienic principles*, 76.
[32] "Diphtheria" Museum of Health Care at Kingston, accessed January 10, 2019. http://www.museumofhealthcare.ca/explore/exhibits/vaccinations/diphtheria.html; A.G. Whitfield, "The Kiss of Death," *Annals of the Royal College of Surgeons of England* 61, no. 5 (1979): 392.

membrane.[33] He suggested that the disease be known as "diphtheria", which means leather or hide in Greek, in reference to the disease's characteristic pseudo-membrane.[34]

Modern understandings of diphtheria rely primarily upon the discoveries produced by bacteriology: the study of bacteria, how they interact with the human body and the development of treatments or preventative measures against disease-causing bacteria.[35] Bacteriology and its predecessor "germ theory" arrived in the nineteenth century surrounded by fierce debate over whether the concept of disease-causing "germs" had any validity. Prior to the acceptance of bacteriology, physicians relied on their ability to see, touch and physical examination of the patient in order to make a diagnosis.[36] Visible signs and symptoms were crucial to identifying, and naming diseases. Notions of external microorganisms invading the human body, leading to illness, appeared relatively early on in the nineteenth century. While studying diphtheria, for example, Bretonneau was one of the first scientists to argue that each disease was caused by a specific "morbid seed" in the same way plant species grow from specific seeds.[37] Hundreds of theories and studies, focusing on diseases, followed in laboratories around the world.[38] Notably, French physiologist Claude Bernard hypothesized in the 1860s that diseases could develop and change within a human body.[39] Debates continued, but new technological advancements such as the compound microscope allowed for the various theories of microscopic pathogens to be proven or disproven. The scientific experiments performed by Louis Pasteur helped to prove that

[33] Pierre Bretonneau, "Extrait du Traité de la Diphthérite, angine maligne, ou croup épidémique," *Archives générales de médecine* 1, no. 11(1826): 230.
[34] Bretonneau, "Extrait du traité de la diphthérite," 230.
[35] Michael Worboys, *Spreading Germs : Disease Theories and Medical Practice in Britain, 1865-1900* (Cambridge: Cambridge University Press, 2000), 4.
[36] Worboys, *Spreading Germs*, 22; Frank Martin Snowden, *Epidemics and Society : from the Black Death to the Present* (New Haven: Yale University Press, 2019), 205.
[37] Snowden, *Epidemics and Society*, 206.
[38] Worboys, *Spreading Germs*, 2.
[39] Snowden, *Epidemics and Society*, 206.

microorganisms were responsible for a variety of chemical and biological reactions, from fermentation in beer and wine to various diseases.[40] In particular, Pasteur posited and proved that omnipresent bacteria circulating in the air could enter a human body and cause disease.[41] Still, germ theory was not universally accepted. Experiments by the German physician Robert Koch confirmed microorganisms as the cause of anthrax, tuberculosis and cholera, and solidified the new science of bacteriology.[42] Koch developed four postulates, still used today, which became the basis of all future identifications of the bacterial causative agent of diseases.[43] According to historian Michael Worboys, by the 1880s the laboratory techniques and results of bacteriologists like Pasteur and Koch began to alter how disease was understood by people outside laboratories. Diseases were now defined by their "processes and causes."[44] In fact Worboys describes diphtheria as "the definitive bacterial disease […] whose pathophysiology was well understood and where the long-promised therapeutic benefits of laboratory medicine were first experienced."[45] Despite the quick discovery of a cure and vaccine, discussed below, however, this thesis will show that bacteriology did not give medicine total clarity on how it behaved in individual bodies or communities.

Bacteriology rapidly established the importance and acceptance of laboratory-based medicine to physicians and governments.[46] This was partly due to developments earlier in the century. Firstly, medicine's new basis of anatomical pathology where physicians used diagnostic

[40] Stanton B. Garner, "Artaud, Germ Theory, and the Theatre of Contagion," *Theatre Journal* 58, no. 1 (2006): 4.
[41] Thomas Schlich, and Bruno J. Strasser, "Making the Medical Mask: Surgery, Bacteriology, and the Control of Infection (1870s-1920s)," *Medical History* 66, no. 2 (2022): 118. The position of Pasteur as "father" of germ theory is controversial, but Pasteur's and Koch's experiments were major confirmations of the theory. For further information on this controversy see Kari Nixon, *Kept from All Contagion: Germ Theory, Disease, and the Dilemma of Human Contact in Late Nineteenth-Century Literature* (Albany: State University of New York Press, 2020).
[42] Gest, *Microbes: an Invisible Universe,* 125.
[43] Gest, *Microbes: an Invisible Universe*, 125.
[44] Worboys, *Spreading Germs*, 4.
[45] Worboys, *Spreading Germs*, 18.
[46] Snowden, *Epidemics and Society*, 229.

signs and diseased tissues to decide what was wrong rather than relying on the patient's own description of their symptoms.[47] Additionally, local governments were enacting new sanitation regulations, focused on the treatment and prevention of diseases in communities, including what behaviours could be elicited from the populace to attain successful implementation of the regulations.[48] Accepted ideas that focused on external disease rather than the patient's symptomatic body may have been easier for physicians and public health authorities to understand and implement the new logic of bacteriology.

While the late nineteenth century has been variously described as the "golden age" of bacteriology, in part due to the increase in the number of physicians relying on bacteriology and the numerous discoveries being made regarding disease, it was not as useful for diseases which were more enigmatic.[49] According to Elliott Bowen, in his study on the history of the laboratory limits of diagnosing latent-gonorrhea from the 1870s onwards, the disease was difficult to diagnose exclusively through laboratory means, resulting in a division among physicians. Some physicians saw the lack of laboratory evidence prior to 1879 as proof that the disease could not exist as proposed.[50] The discovery of the bacteriological cause of the disease would continue to confound scientists as the bacteria could not always be found under a microscope, with some physicians claiming that laboratories were of little use when attempting to discover if patients were suffering from latent-gonorrhea.[51] While eventually bacteriology and laboratory analysis would become the main tools in a physician's or scientist's arsenal in the fight against gonorrhea

[47] Worboys, *Spreading Germs*, 28-29.
[48] Worboys, *Spreading Germs*, 37.
[49] See Steve Blevins and Michael Bronze, "Robert Koch and the 'golden Age' of Bacteriology," *International Journal of Infectious Diseases* 14, no. 9 (2010): e744-e751.
[50] Elliott Bowen, "Limits of the Lab: Diagnosing 'Latent Gonorrhea,' 1872-1910," *Bulletin of the History of Medicine* 87, no. 1 (2013): 67; 69.
[51] Bowen, "Limits of the Lab," 75.

and other diseases, the golden age of bacteriology continued to rely on older understandings of disease and laboratory analysis. In essence, until the 1900s, bacteriology was not a revolution, but rather an evolution of the medical standard of practice.

Overall, however, bacteriology was mainly responsible for the explosion of new discoveries being made regarding contagious diseases in the 1870s to 1890s. Notions of healthy carriers, people who were infected with a disease but showed no symptoms, began to be proven and fully accepted by most members of the medical profession and even local health authorities throughout North America.[52] The field of bacteriology, however, ran into its own opposition from some members of the public who had a difficult time understanding how an invisible bacteria could cause such deleterious effects on the human body.[53] Concepts of bacteriology at the time had not yet been fully explained to and embraced by the non-medical public, a recurring theme throughout this thesis which as will be seen created uncertainty and fear regarding the new concepts of disease. The field of bacteriology and its adherents were eventually able to persuade health authorities to agree with their evidentiary based theories, and these officials in turn began to establish new healthcare laws and regulations. The science of bacteriology led to the rise of epidemiology, which is the study of how diseases behave in populations. Epidemiological findings can be used to develop new treatments methods of prevention.[54]

In 1883, Theodor Albrecht Edwin Klebs, a Swiss-German microbiologist, discovered the bacterium responsible for diphtheria.[55] He named it the Klebs- Löeffler bacillus, since his

[52] Leavitt, "'Typhoid Mary' Strikes Back," 613.
[53] See Leavitt, "'Typhoid Mary' Strikes Back".
[54] Alfredo Morabia, "Epidemiology and Bacteriology in 1900: Who Is the Handmaid of Whom?" *Journal of Epidemiology and Community Health* 52, no. 10 (1998): 618.
[55] Anne Hardy, *The Epidemic Streets Infectious Disease and the Rise of Preventive Medicine, 1856-1900* (Oxford: Clarendon, 1993): 84.

findings were supported by Friedrich Löeffler, a German bacteriologist who in 1884 used Koch's postulates to isolate the bacterium and prove that it was present in the mucous membranes of the throat of diphtheria patients.[56] It was eventually reclassified as *Corynebacterium diphtheriae* based on its club shape. Löeffler theorised that the bacillus excreted a toxin which traveled around a patient's body.[57] In 1888, Pierre Paul Émile Roux, and Alexandre Yersin, both French-speaking physicians and bacteriologists, determined that the bacillus did produce toxins that caused diphtheria.[58]

In 1890 Emil Von Behring and Shibasaburo Kitasato discovered a reasonably effective, though expensive, cure for diphtheria: the diphtheria antitoxin.[59] The antitoxin allowed the body to recognize and fight off a diphtheria infection in someone who already had symptoms, but it did not impart immunity against further infections. The original antitoxin, however, was slightly toxic, which could not only cause severe reactions, but also death.[60] In 1923, Gaston Ramon, working at the Pasteur Institute in Paris, discovered that by heating the mixture and adding formalin, commonly known as formaldehyde, the antitoxin was no longer toxic.[61] Ramon called his mixture anatoxin, or toxoid.[62]

As the twentieth century progressed, further discoveries were made in laboratories and under microscopes that uncovered the nature of diseases that had once been enigmatic. Diabetes mellitus, for example, was an ancient disease which killed sufferers before adulthood. Long after

[56] Robert Kyle, David Steensma, and Marc Shampo, "Friedrich August Johannes Löffler (Loeffler), German Bacteriologist," *Mayo Clinic Proceedings* 90, no. 12 (2015): 1.
[57] Kyle, "Friedrich August Johannes Löffler (Loeffler), German Bacteriologist," 1.
[58] Hardy, *The Epidemic Streets*, 84-85.
[59] Claude E. Dolman, "The Donald T. Fraser Memorial Lecture, 1973: Landmarks and Pioneers in the Control of Diphtheria," *Canadian Journal of Public Health* 64, no. 4 (1973): 323.
[60] "The Alleged Dangers Of Diphtheria Antitoxin," *British Medical Journal* 1, no. 1848 (1896): 1348.
[61] Gaston Ramon, "Applied Methods and Means of Investigation," *Canadian Journal of Public Health* 49, no. 2 (1958): 48.
[62] Ramon, "Applied Methods and Means of Investigation," 48.

European scientists detected microscopic lesions on the pancreas that they hypothesized were interfering with blood sugar regulation, the disease's nature remained enigmatic.[63] The most common treatment was an ultra low sugar diet nicknamed the starvation diet, which made diabetic children's lives miserable.[64] In 1921 and 1922, however, scientists working at the University of Toronto's Connaught Laboratories isolated pancreatic excretions responsible for regulating blood sugar and synthesized it into a treatment called insulin.[65] By taking insulin, the amount of sugar in a diabetic child's blood was controlled without adhering to a strict starvation diet. Underfed diabetic children who were close to death were the first to receive the treatment developed by laboratory medicine. Like Pasteur's rabies antidote, they were seemingly miraculously revived once injected with insulin and this discovery also received sensational international press coverage.[66]

This discovery also reinforced the popular perception of the Connaught Laboratories and city of Toronto as leaders in medical innovation. This reputation began before the discovery of insulin, when local physician John FitzGerald took a vested interest in the production of the diphtheria antitoxin. In 1899, FitzGerald, aged 16, became the youngest person accepted into the University of Toronto's medical school, where he came into contact with John Mackenzie, the first bacteriologist working on the Ontario Provincial Board of Health.[67] Initially, Mackenzie's laboratory imported the diphtheria antitoxin from Paris because no Canadian laboratory was able

[63] Michael Bliss, *The Discovery of Insulin* (Toronto: University of Toronto Press, 2007), 11; 27-28.
[64] Bliss, *The Discovery of Insulin*, 24; Allan Mazur, "Why were "starvation diets" promoted for diabetes in the pre-insulin period?." *Nutrition journal* 10, no. 23 (March 2011): 1.
[65] Bliss, *The Discovery of Insulin*, 119.
[66] Bliss, *The Discovery of Insulin*, 161.
[67] James FitzGerald, *What Disturbs Our Blood: A Son's Quest to Redeem the Past* (Toronto: Random House Canada, 2010), 160; P.A. Bator and A.J. Rhodes, *Within Reach of Everyone: A History of the University of the Toronto School of Hygiene and the Connaught Laboratories, Volume 1, 1927 to 1955* (Ottawa: Canadian Public Health Association, 1990), 1: 4.

to produce enough antitoxin.[68] In 1910 FitzGerald visited the Pasteur Institutes in both Paris and Brussels, and met Émile Roux.[69] By 1913, he had returned to Canada, and began to notice that families often could not afford the diphtheria antitoxin. One family's case in particular may have helped prompt FitzGerald to search for a way to produce antitoxin domestically. The parents had two children who had fallen ill with diphtheria, and although the antitoxin would have probably saved both their lives, the couple could only afford enough to save one child.[70] The other sibling died.[71] It was in this environment of despair that FitzGerald opened his first laboratory in 1914 to produce the antitoxin.[72]

Joining forces with Doctor J. W. S. McCullough, the Chief Medical Officer of Health of Ontario, FitzGerald sold his antitoxin to the Ontario Provincial Board of Health, at about one-fifth the commercial rate, allowing the government to purchase the lifesaving serum at thirty-five cents per thousand units.[73] The average cost of a complete dose of the diphtheria antitoxin was around $7.50.[74] He also convinced the Board of Governors of the University of Toronto to let him open a small laboratory which would produce the antitoxin at an affordable price in order to

[68] Bator, *Within Reach of Everyone*, 7; John W.S. McCullough, *1910-1920: A Review of 10 Years' Progress* (Toronto: Ontario Provincial Board of Health, 1920), 18.
[69] FitzGerald, *What Disturbs Our Blood*, 217.
[70] Bator, *Within Reach of Everyone*, xi; Gordon Bates, "Lowering the Cost of Life Saving : How the University of Toronto is performing active public service," *MacLean's*, August 1915.
[71] Bator, *Within Reach of Everyone*, xi; Bates, "Lowering the Cost of Life Saving : How the University of Toronto is performing active public service."
[72] Bator, *Within Reach of Everyone* 18.
[73] At thirty-five cents, we can calculate that the commercial rate for one thousand units would have run about one dollar and seventy-five cents. One dollar and seventy-five cents is about twenty five dollars today. Thirty-five cents is about five dollars today. Bator, *Within Reach of Everyone*, 18; J.W.S. McCullough, "An Appreciation," *Canadian Journal of Public Health* 31: 395; FitzGerald, *What Disturbs Our Blood*, 236; 238.
[74] Jane Lewis, "The Prevention of Diphtheria in Canada and Britain 1914-1945," *Journal of Social History* 20, no. 1 (1986): 164.

eventually make it free to Canadians.[75] FitzGerald's small laboratory at University of Toronto eventually became Connaught Laboratories.[76]

While the laboratory was focused on producing and distributing low-cost antitoxin to Canadians, it also attracted international interest. The American Rockefeller Foundation donated $600 000 to the new laboratory.[77] From 1921-1924, nevertheless, well after FitzGerald's supply of affordable antitoxin began in 1914, diphtheria was the main cause of death for children between age two to fourteen in Canada, and it accounted for one in every seven deaths from that age group.[78] When the diphtheria toxoid, a vaccine, was produced in France in 1923, FitzGerald and the Connaught Laboratories began almost immediately large scale production and trials of the new toxoid in schools across Ontario.[79] Their work resulted in close cooperation between local health authorities, the Minister of Education and parents. The trials accounted for a consistent reduction in the number of diphtheria cases and deaths throughout the province in subsequent years. Following the trials of the toxoid in Ontario schools, there was evidence of a 95 to 100 percent reduction in the number of diphtheria cases among groups who received three doses.[80] Other countries, such as England, were slower to accept the toxoid. With low rates of voluntary vaccination for diphtheria in the 1940s, a national campaign asked the British public: "If Canada can do it, why can't we?"[81] With FitzGerald's advocacy, Canada was one of the first

[75] Bator, *Within Reach of Everyone*, 18.
[76] Bator, *Within Reach of Everyone*, 4.
[77] FitzGerald, *What Disturbs Our Blood*, 239.
[78] J.G. Fitzgerald et al., "Experiences with Diphtheria Toxoid in Canada," *American Journal of Public Health and the Nation's Health* 22, no. 1 (1932): 26.
[79] Andreas Burkovski, "Diphtheria and Its Etiological Agents," in *Corynebacterium Diphtheriae and Related Toxigenic Species*, 1-14 (Dordrecht: Springer Netherlands, 2013), 3.
[80] FitzGerald, "Experiences with Diphtheria Toxoid in Canada," 28.
[81] "The Control of Diphtheria," *Canadian Journal of Public Health* 38, no. 3 (1947): 149; Lewis, "The Prevention of Diphtheria in Canada and Britain 1914–1945," 170.

countries to take on the technological, economic, and cultural challenges of treating and preventing diphtheria using the products of laboratory medicine.

With all the new life saving discoveries at the turn of the twentieth century, it would be easy to assume that laboratory medicine and the logic of bacteriology resolved all medical confusion about diphtheria, and that parents and physicians did not need to face the emotional terror of the strangling angel or decisions about emergency tracheostomies. This thesis will prove, however, this was not the case. Bacteriology not only failed to fully explain the enigmatic clinical and epidemiological behaviour of diphtheria, but it also placed conceptual blinders on physicians and scientists who rejected alternative explanations for illnesses. In addition, when bacteriology did confirm, through laboratory testing, that outbreaks that otherwise did not look like diphtheria to non-medical observers were caused by the bacillus, physicians often doubted or denied that it was diphtheria. Yet the public constructed and employed the new disease concept of "black diphtheria" which made sense culturally. Diphtheria's enigmatic behaviour in communities also required a well-established healthcare system to properly deal with outbreaks, but local health authorities were not yet fully developed in Ontario at the end of the nineteenth century, and as a result, families and governments turned to various entities—including religious organizations, newspaper advertisements, and even educational institutions—for help dealing with the unpredictable and dangerous disease.

Chapter 2

Religious Intervention

By the mid-nineteenth century, Christian religious organizations influenced practically every facet of Canadian settler society.[82] In the province of Ontario, most immigrant populations adhered to a branch of Christianity, with the most popular including Roman Catholic, Church of England, Baptist, Presbyterian, and Methodist.[83] Many of these religious organizations brought with them European concepts of religious hospices as places to provide medical and palliative care for the indigent sick and dying.[84] Through previously established bonds of trust and reinforcement of their charitable actions and provision of medical care, religious leaders were held in high regard by their congregants. This trust, which had developed between the church and its parishioners, meant that ideas and beliefs put forward by religious leaders were often enacted by the public. When a Roman Catholic priest, for example, told his congregation that it was necessary to pray every evening, it was the congregants who transformed his belief into a practical reality. The implicit trust in the clergy, was crucial in determining how the public understood and accepted bacteriological concepts and the intervention of physicians during outbreaks of enigmatic diseases, such as diphtheria.

The ease with which religious orders began to establish hospitals and provide medical care to settlers was due in part to the lack of oversight on the part of the provincial and local

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[82] For religious involvement in labour see Melissa Turkstra, "Constructing a Labour Gospel: Labour and Religion in Early 20th-Century Ontario," *Labour* 57 (2006): 93-130; Meenaz Kassam, "Religious Discourse in Nineteenth-century Ontario: Work, Workers and the Work Ethos," *Studies in Religion* 43, no.2 (2014), 243-266. For religious involvement at a community level see Marguerite Van Die, "'The Marks of a Genuine Revival': Religion, Social Change, Gender, and Community in Mid-Victorian Brantford, Ontario," *The Canadian Historical Review* 79, no. 3 (1998): 524-563.

[83] John Grant, *A Profusion of Spires: Religion in Nineteenth-Century Ontario* (Toronto: University of Toronto Press, 1998), 224.

[84] Elizabeth A. Iles, *Ask the Grey Sisters: Sault Ste. Marie and the General Hospital, 1898-1998* (Toronto: Dundurn Press, 1998), 25.

governments towards the medical community which lasted until the early 1900s. When French colonizers arrived in Canada in the seventeenth century, among the settlers who would go on to alter the land, were religious orders of nuns with long histories as hospitallers and nurses. These women brought with them the idea that providing refuge to the destitute, sick, and dying was a religious duty.[85] They would provide health services across the country at a time when families in Ontario were "obliged to meet many of its health needs on a self-help basis" as there was no healthcare provision from the provincial government and little government control over the quality of physicians practicing in the province. [86] Many of the women had no official medical training, which meant that families would have to rely on the medical services of individuals who understood diseases little better than they did, resulting in potentially unnecessary deaths.[87]

As the centuries progressed, the government of Upper Canada, later Ontario, began to take a greater interest in medical care, though they focused largely on the regulation of physicians and their practices rather than hospitals.[88] As a result of these professional regulations, combined with a rise in the healthcare needs of a growing population, there was a lack of qualified physicians. In 1827, the government attempted to soften the regulations with the establishment of a board of physicians who would examine and provide the licences for those wishing to practice in the province.[89] Even with these changes, however, private physicians, could do little to minister to the needs of a growing population, many of whom were unable to

[85] Iles, *Ask the Grey Sisters*, 25.
[86] Richard Splane, *Social Welfare in Ontario, 1791-1893; a Study of Public Welfare Administration* (Toronto: University of Toronto Press, 1965), 194.
[87] Splane, *Social Welfare in Ontario, 1791-1893*, 194.
[88] The Province of Canada, also known as the United Province of Canada, came into being when Upper and Lower Canada united in 1841. The name "Province of Canada" would continue to be used until 1867 when Canadian Confederation occurred and the previously named Upper and Lower Canada would become known as Ontario and Quebec.
[89] Splane, *Social Welfare in Ontario, 1791-1893*, 195.

pay for their services. Charitable and religious organizations continued to fulfill the population's medical needs partially through the establishment of their own privately run hospitals. It was only after Confederation, that the provincial government began to slowly increase its control over the hospitals that were receiving public grants.[90] This control came in the form of sending inspectors who would then make recommendations for the improvement of hospital practices, buildings and equipment.[91] With the new inspectors working during the bacteriological revolution, many of their suggestions revolved around the new concepts of disease. As hospitals began to implement the recommendations, they modernised, attracting more physicians, and helping with the establishment of professional nurses within the province.[92] Overall, however, the provincial government, did not institute any permanent oversight of the medical community or hospital management, allowing private institutions to continue providing medical care to the populace throughout the nineteenth century.

By the late 1870s, the few hospitals that were under provincial and local government oversight experienced difficulty in finding trained nurses. This may be attributed to the fact that the professionalization of nursing was still in its infancy. Historian Judith Young has argued that the number of trained nurses working in the city of Toronto, began to increase in the 1870s and 1880s, partially due to a growth in the number of individuals who sought professional training and due to Toronto's industrial growth during the nineteenth century.[93] Another factor which led to the incremental increase in available nurses was the relatively late establishment of the first recognizable nursing school in the province. Established in 1874 in St. Catharines, Ontario, the

[90] Splane, *Social Welfare in Ontario, 1791-1893*, 208.
[91] Splane, *Social Welfare in Ontario, 1791-1893*, 210.
[92] Splane, *Social Welfare in Ontario, 1791-1893*, 211.
[93] Judith Young, "'Monthly' Nurses, 'Sick' Nurses, and Midwives in 19th-Century Toronto, 1830-1891," *Canadian Bulletin of Medical History* 21, no. 2 (2004): 291.

nursing school provided a professional nursing course which took up to three years to complete.[94] With St. Catharines located over a hundred kilometers away from Toronto, where most of Ontario's early hospitals were built, many women who may have been interested in becoming professional nurses would have sought alternative employment due to the distance and time required. With the course requiring three years to complete, hospitals with an immediate need for nurses had to wait until 1877 to hire trained nurses. The limited number of nurses forced physicians, governments and members of the public to rely on individuals who had some experience treating diseases, namely religious nursing sisters.

The industrial revolution in the province also created a new social and cultural reality in which professional nurses were in high demand. Both new and traditional industries in the province began to incorporate new, often dangerous, technology in their daily operations. In the textile industry, for example, the introduction of power looms provided companies a way to increase their daily output, but it also had the potential to cause serious injuries. Many of these injuries required the expert care of a physician and hospital staff. The interaction between technology and health created "new health and medical needs" among the populace.[95]

The industrial revolution was also accompanied by an increase in immigration to Canada. The federal government often encouraged people from across Europe to travel to the country and settle on homesteads in the newly created provinces of Manitoba, Saskatchewan and Alberta.[96] Many immigrants, however, also moved to the cities in the hope of finding work, and were often

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[94] Mary Nutting, *A History of Nursing; the Evolution of Nursing Systems from the Earliest Times to the Foundation of the First English and American Training Schools for Nurses* Vol. 2, (New York: G. P. Putnam's Sons, 1907), 354-355.
[95] Young, "'Monthly' Nurses, 'Sick' Nurses, and Midwives," 291.
[96] See Douglas Francis, and Chris Kitzan, eds., *The Prairie West as Promised Land* (Calgary: University of Calgary Press, 2007).

left with no choice but to live in overcrowded dwellings. Living in close proximity to other members of the public, meant that contagious diseases, including diphtheria, could easily be spread. Immigration and technology created further demand on the few public hospitals and their staff, leading to a need for more nurses and healthcare institutions.

The provincial government, however, maintained an apathetic approach to healthcare throughout the nineteenth century, leading to a continual lack of public health resources. This allowed various organizations, including private and charitable medical institutions to continue providing healthcare in order to fulfill the public's increasing healthcare needs. One such charitable institution which not only provided accessible medical aid, but whose interaction with a diphtheria outbreak in 1891 in Toronto set them upon a path of providing comprehensive affordable hospital services across the city, was the Sisters of St. Joseph (SSJ). A Catholic religious order, the organisation was founded in the mid 1600s, in Le Puy-en-Velay, France, by a Jesuit priest named Jean-Pierre Médaille and six women.[97] From the outset, the order was focused on ministering to the sick, the poor and the aged.[98] By 1851, the congregation had come to Canada and established itself in Toronto, providing social services to those in need.[99]

It was not until 1891, however, that the sisters began to fulfill the role of healthcare provider on a large scale. During this year, the city of Toronto experienced a serious diphtheria epidemic that exerted pressure on the city's scant public health resources. The outbreak was so severe that scientists predicted November 1891 could see twice as many diphtheria cases as had

[97] Julia Moore, "The Sisters of St Joseph: Beginnings in London Diocese, 1868-1878," *CCHA Study Sessions* 45 (1978): 37; Elizabeth Smyth, "'Much Exertion of the Voice and Great Application of the Mind': Teacher Education Within the Congregation of the Sisters of St. Joseph of Toronto, Canada, 1851-1920," *Historical Studies in Education* 6, no. 3 (1994): 102.
[98] Moore, "The Sisters of St Joseph," 37.
[99] Moore, "The Sisters of St Joseph," 37.

been recorded in all Novembers since 1885.[100] Throughout the outbreak the sick flocked to the Isolation Hospital, also known as the Diphtheria Hospital, located on Broadview Avenue, near Toronto's Don River.[101] The two nurses who worked at the hospital were soon overwhelmed.[102] As a result of the lack of professional nurses available to help at the hospital, Norman Allen, the Medical Officer of Health for Toronto, turned to the Sisters of St. Joseph for help. He requested that the order supply nursing sisters to the Isolation Hospital who could fill the positions of nurse and matron.[103] Shortly after his request, on 26 November 1891, the SSJ congregation convened its senior administrative body, the General Council of the Sisters of St. Joseph, which approved Allen's request and called for volunteers from the order.[104] Both primary and secondary sources differ on how many SSJ nuns were assigned to the Isolation Hospital during the diphtheria outbreak.[105] Regardless of how many nursing sisters the SSJ reassigned to the city's Isolation Hospital, the religious order had made a decision to become involved in the treatment and management of diphtheria.

While the initial request was for the sisters to act as nurses, Toronto's Board of Health also requested that the SSJ nurses take charge of daily hospital operations.[106] These responsibilities allowed them to interact with diphtheria from both a position of care and

[100] "Who Defends this? : Diphtheria Epidemic in the City," *The Globe*, Oct 14, 1891, 5.
[101] This Isolation Hospital was the predecessor of the Isolation Hospital built in 1892, which eventually became known as Bridgepoint Health. Mary Alban Bouchard, "Pioneers Forever: The Sisters of St. Joseph of Toronto and Their Ventures in Social Welfare and Health Care," in *Catholics at the Gathering Place: Historical Essays on the Archdiocese of Toronto, 1841-1991*, eds. Mark George McGowan and Brian P. Clarke (Toronto: Dundurn Press, 1993), 114.
[102] The exact number of sisters called upon to work at the hospital varies depending on the source consulted. "Extracts from Minutes of Meetings Re St. Michael's Hospital." SMH, 1891-1914, 1.
[103] A hospital matron was responsible for overseeing the nurses and the domestic affairs that arose with the daily running of a hospital. "Extracts from Minutes of Meetings," 1.
[104] Irene McDonald, *For the Least of My Brethren: A Centenary History of St. Michael's Hospital* (Toronto: Dundurn Press, 1992), 18.
[105] McDonald, *For the Least of My Brethren*, 19; Bouchard, "Pioneers Forever," 114.
[106] "Extracts from Minutes of Meetings," 1.

administration. The sisters were able to observe the impact of diphtheria upon the human body and the difficulties in managing the disease at an institutional level. While there is little information available regarding how the sisters decided to run the hospital and the medical or therapeutic interventions they employed for diphtheria cases, the total number of patients under their care provides some insight into why Allen acknowledged the SSJ nurses as an invaluable resource to the community. During their year secondment to the hospital, the sisters treated 1917 of the 2691 diphtheria cases. [107] Their ability and willingness to treat over fifty percent of the total cases alongside the medical community through the use of the scientific conceptualized understanding of diphtheria reveals that their own knowledge and decision making was rooted in the logic of bacteriology. This clinical application of laboratory knowledge set them apart from other religious organizations who refused to accept new scientific discoveries due to their own understanding of disease.

The SSJ's decision to contribute to the medical management of the 1891 diphtheria outbreak set the religious order on a path of providing comprehensive hospital services to Ontarians. Prior to their involvement at the Isolation Hospital, the sisters had focused on providing the poor of Toronto with social services such as temporary housing, orphanages and schools.[108] Only a few months after they had answered Norman Allen's call, however, they opened their own hospital, which was known as St. Michael's in July 1892.[109] While this timeline might suggest that SSJ's decision to open their own hospital was directly influenced by their experiences obtained at the Isolation Hospital, author and member of the SSJ, Irene McDonald argues that their previous experiences had little to do with the sisters' willingness and

[107] McDonald, *For the Least of My Brethren*, 19.
[108] McDonald, *For the Least of My Brethren*, 16-17.
[109] McDonald, *For the Least of My Brethren*, 21.

ability to establish St. Michael's.[110] McDonald states that a proposal to build a hospital appeared thirteen months before Norman Allen approached the SSJ.[111] While the founding of St. Michael's Hospital was not a direct result of the sisters' work during the diphtheria outbreak, a careful study of the timeline suggests that it functioned as an unplanned trial, and that their success strengthened the congregation's confidence and resolve to open a general hospital. This becomes a stronger possibility when one considers the timing of the opening of St. Michael's Hospital. By the time St. Michael's opened its doors in July 1892, the congregation had been discussing founding their own hospital for at least a year. It was only after the sisters became involved with the Isolation Hospital, however, that any important developments regarding their own hospital were agreed upon. The location of the hospital, for example, was only decided upon on 1 May 1892.[112] While again this could be seen as a coincidence, the reassurances they received and the immediate need for hospitals in the city may have prompted the sisters to accelerate the opening of St. Michael's.

Although the sisters had a basic knowledge of medical care prior to working at the Isolation Hospital, the experiences they gained provided them not only the necessary knowledge to run their own hospital, but also the emotional reassurance that they were competent enough to be responsible in the long term for such an endeavour. Many of these reassurances came from Norman Allen, who when he had heard that the sisters were to be removed from the Isolation Hospital, requested that the decision be reconsidered.[113] Allen's appreciation of the sisters' work lasted into the twentieth century. In a speech given in 1903 to the graduation ceremony for the

[110] For a source which suggest that there was some direct influence see Malcolm Cameron, "St. Michael's Hospital," SMH.
[111] McDonald, *For the Least of My Brethren*, 21.
[112] McDonald, *For the Least of My Brethren*, 21.
[113] "Extracts from Minutes of Meetings," 2.

St. Michael's Hospital School of Nursing, Allen stated that the sisters "were the *only* volunteers who went to the relief of the afflicted."[114] Allen's continued admiration may be due to the fact that "in special times of need […] it was difficult to find sufficient nurses".[115] While the sisters quickly accepted bacteriological concepts and were praised for their work, the protracted establishment of public medical institutions led to a continued dependency by Ontario's medical and government entities and citizens on the works of charitable institutions.

The sisters' time at the Isolation Hospital was an additional opportunity for them to evaluate the ever-growing need for free or subsidized hospitals for Toronto's poor. It may have also made them realize that immediate action was needed to alleviate the city's health care crisis. Their experiences with diphtheria did not merely influence their resolve to open their own hospital, but may also be linked to the sisters' willingness to continue working in the healthcare sector and inevitably to the creation of the SSJ's other hospitals including St. Joseph Health Center in 1921, and Providence Healthcare in 1962.[116] Through founding multiple hospitals in the early part of the twentieth century, the SSJ unwittingly became healthcare policy makers and urban planners in Canada's largest city. The provincial government's apathy towards public healthcare meant that urban planners were often not concerned with questions about how many hospitals the growing population would need and where best to place them. Religious organizations such as SSJ met some of these increasing needs, especially in neighbourhoods

[114] McDonald, *For the Least of My Brethren*, 19.
[115] Young, "'Monthly' Nurses, 'Sick' Nurses, and Midwives," 286.
[116] Providence Healthcare was originally named House of Providence and while it was founded in 1857 and provided help for those in need in Toronto, once it was moved to Scarborough in 1962 the institution began to focus on providing medical care. See Michael Swan, "Merger creates largest Catholic healthcare network," *The Catholic Register*, last modified January 14, 2018. https://www.catholicregister.org/item/26658-merger-creates-largest-catholic-healthcare-network ; Danielle Milley, "Providence Healthcare history rooted in Scarborough's past," *Scarborough Mirror*, last modified January 28, 2012, https://www.toronto.com/news/providence-healthcare-history-rooted-in-scarboroughs-past/article_90791bd7-aea8-572c-a5ec-4fc255c20544.html

where the demands for charitable healthcare were greatest. The Sisters of St. Joseph chose the locations of their hospitals with care. St. Michael's was located in downtown Toronto, while St. Joseph was placed in the west end of the city. Providence Healthcare had originally been located near the current Don Valley Parkway, but was eventually relocated to Scarborough, in the east end of the city. With at least half of the cardinal points of the city having a hospital run by the Sisters of St. Joseph, the sisters were able to fulfill the healthcare needs of a greater percentage of the population, exposing individuals of all social status to bacteriological concepts.

While the Sisters of St. Joseph's relationship with diphtheria was limited mainly to hospital settings, other Christian organizations which established themselves in more rural communities, developed a more intimate relationship with the disease. This relationship began to affect established societal roles. This can be seen in the experiences of another Catholic sisterhood, the Sisters of Providence of St. Vincent de Paul (SPSVP) located in Kingston. This religious order traces their origins back to France in the 1600s when Saint Vincent de Paul established the Company of Daughters of Charity (CDC).[117] This group, composed of women, focused on ministering to the healthcare needs of their communities.[118] Eventually the CDC began to expand their organization internationally and by 1841 established an Association of the Ladies of Charity in Montreal which performed many of the same duties as the CDC.[119] By the 1860s, the organization had come to the attention of Edward Horan, the Bishop of Kingston. In the late nineteenth century, Kingston found itself in a similar position to Toronto: it had a growing population but it received inadequate support from the provincial government to

[117] Mary Electa, *The Sisters of Providence of St. Vincent de Paul* (Montreal: Palm, 1961), XV.
[118] Electa, *The Sisters of Providence of St. Vincent de Paul*, XV. St. Vincent de Paul had not originally intended the Company of Daughters of Charity to become a religious order as at the time religious orders were to be cloistered, essentially preventing the women from going out into their communities and providing the care that was at the heart of Paul's original mission, see Electa, *The Sisters of Providence of St. Vincent de Paul*, 6.
[119] Electa, *The Sisters of Providence of St. Vincent de Paul*, 11; 13.

minister to the poor. In January 1861 Bishop Horan traveled to Montreal to inquire whether some of the sisters would be willing to help found an organization to help those in need in his community, namely: the poor, aged and orphaned.[120] A groups of sisters agreed and founded the Sisters of Providence of St. Vincent de Paul (SPSVP).

In 1876, an outbreak of diphtheria in the small rural community of Hungerford prompted the SPSVP to expand their mission of caring for the destitute to include specialized nursing for cases of contagious disease such as diphtheria. This outbreak shared many commonalities with the later outbreak in Toronto. For example, the local minister at the time, Reverend Patrick Murphy, knew that there were not enough professional healthcare workers to care for the sick, and turned to the sisters for help.[121] In response, the sisters sent two of their own to Hungerford.[122] While the sisters tended to the sick as best they could, they were unable to save eight children who died due to what has been described as "a virulent form of diphtheria".[123] The exact nature of this virulent form has never been uncovered, either by the public or bacteriology.

The finer details of the sisters' involvement with the outbreak are unknown. From the brief description of their work, however, it is clear that they usurped the role of parental figure in addition to healthcare provider. With no access to a local hospital where they could treat the sick, the sisters often had to treat diseases within the homes of the ill. If a parent fell ill, the religious sisters, who worked in pairs, would ensure one sister focused on ministering to the health of the sick, whilst the other would ensure the continual wellbeing of the rest of the household.[124] With

[120] Electa, *The Sisters of Providence of St. Vincent de Paul*, 35.
[121] "Tweed," Sisters of Providence of St. Vincent de Paul, accessed May 1, 2021, https://www.providence.ca/our-story/history/missions/ontario/tweed/.
[122] Sisters of Providence of St. Vincent de Paul, "Tweed."
[123] Electa, *The Sisters of Providence of St. Vincent de Paul*, 65.
[124] Electa, *The Sisters of Providence of St. Vincent de Paul*, 63.

children and adults affected by the diphtheria outbreak, the family unit could easily become destabilized. Having additional people willing to come into the household and provide even a brief sense of stability could help people heal both physically and emotionally from the traumatic disturbances of the disease. As with the SSJ, the sisters who worked in Hungerford quickly gained the admiration of the individual who had originally asked for their help. In a letter to the Warden of Hastings, Reverend Murphy stated that the two sisters who were helping the community were "doing noble service."[125] For the sisters at the very least, interactions with diphtheria helped to solidify their role of healthcare provider in communities of various sizes across Ontario. While we cannot imply that a causative innate inter-dependency between local governments and religious organizations exists during diphtheria outbreaks, it is clear that the arrival of the disease within communities placed new pressures and created new societal needs, which forced various organizations to cooperate with each other.

The sisters were not the only religious individuals who became involved in the provision of healthcare during the outbreak in Hungerford. Reverend Murphy also took a vested interest in ensuring his community was well looked after and given the highest standard of care possible. While he did not get involved in providing medical care as the sisters did, he applied notions of contagion to his work as a reverend, which helped alter the course of the outbreak. In doing so, Murphy fulfilled the roles of both religious leader and medical officer of health. Part of a reverend's occupation involved ministering to the emotional and spiritual needs of the public, predominantly during three major life events: birth, marriage and death. With diphtheria ravaging the community, however, these major life events had to be altered to suit the realities of dealing with an enigmatic contagious disease. Murphy decided to suspend the tradition of

[125] Sisters of Providence of St. Vincent de Paul, "Tweed."

holding a wake, which often took place at the home of the deceased, for those who died from diphtheria.[126] In a letter to the Warden of Hastings, Murphy explained that "As the patients died [he] had them buried on their own farms, or with few exceptions where they were near the cemeteries."[127] By limiting travel of both the deceased and their friends who may live in other cities which did not have a diphtheria outbreak, Murphy understood that the disease was contagious and unpredictable, quarantining those who posed a health risk to others. Evidence for his role as medical officer of health comes from his letter, wherein he wrote that through his actions he wanted "to confine the disease as much as possible."[128] It is unclear whether Murphy became aware of the emerging bacteriological and epidemiological concepts surrounding diphtheria through his own experiences or popular media. Having community members understand the basic behaviour of an infectious disease allowed families and individuals to implement methods of identification, treatment, and isolation, prior to the arrival of a physician who may still be a couple days away. Diphtheria again forced individuals to blur the lines between traditional social roles in order to control the disease. Significantly, these atypical interactions between religious and lay individuals, centred around controlling diphtheria as it was understood by the medical community, occurred due to the enigmatic nature of diphtheria. As there existed no decisive cure—science-based medicine and nursing could not make strong claims that its control ought to fall exclusively under their domain, and this created social space for others to make decisions.

Protestant leaders also had their relationships with their congregations upended by the arrival of diphtheria within their communities. The experience of one Anglican Reverend,

[126] Susan Smart, *A Better Place : Death and Burial in Nineteenth-Century Ontario* (Toronto: Ontario Genealogical Society, 2011), 47-48.
[127] Sisters of Providence of St. Vincent de Paul, "Tweed."
[128] Sisters of Providence of St. Vincent de Paul, "Tweed."

Gowan Gilmor, exemplified the interdependent relationship between science and religion which emerged during diphtheria outbreaks. In the 1880s, Gilmor was appointed as a missionary to Nippissing and the surrounding area in order to care for the spiritual welfare of the men working on the Canadian Pacific Railway.[129] Work on the railways was inherently dangerous. Yet physicians were few, and hospitals were often located hundreds of kilometres away in the nearest city. While Gilmor often acted strictly in his capacity as Reverend, an encounter with a diphtheria outbreak among a family he knew well, led him to temporarily adopt the role of medical caregiver.

The diphtheria outbreak and its subsequent effect upon both Gilmor and the family were recorded in an article published in the *Algoma Missionary News* journal for November 1888. In the article, Gilmor wrote about how he met a section-foreman who was overseeing part of the Canadian Pacific Railway line, and his family.[130] The unnamed man had four daughters and a young son.[131] Over the years, he grew close with the family. When the family's second daughter, at an unspecified date, died of typhoid, the father asked Gilmor to decide where she should be buried.[132] It is not clear why the father relinquished this decision to Gilmor, but it seems unlikely that it was for health reasons. While typhoid is a disease which can cause fever, abdominal pain, bleeding and death within the span of three weeks, it is only contagious through the ingestion of food or drinks that have been touched by an individual who is ill or if the individual has not

[129] "The History of St, Mary's Anglican Church in Powassan and District," Algoma University Archives, Container 007, Accession Diocesan Heritage Centre History Collection, Shelf location 2013-078-007, 2, 1980, 2013-078_007_017_0.pdf
[130] Gowan Gilmor, "A Touching Story," *Algoma Missionary News* X, no.8 (November 1888): 53. Algoma University Archives, Container 001, Accession Synod of the Diocese of Algoma, Shelf location 2009-081-001, http://archives.algomau.ca/main/sites/default/files/2009-081_001_002_1888Nov.pdf
[131] Gilmor, "A Touching Story," 53.
[132] Gilmor, "A Touching Story," 53.

washed their hands after using the bathroom.[133] As a result, unlike the diphtheria outbreak in Hungerford, once the second daughter died there would have been little threat to any individuals attending her funeral. Bacteriology allowed physicians to remove the fear that had been associated with typhoid, with many cases of typhoid identified as wasting diseases in which the sick would simply become unconscious and pass away.[134]

In 1888, the family's eldest daughter, aged 18, fell ill with diphtheria. Gilmor rushed to her bedside where he noticed that there were instruments to perform a tracheotomy laid out.[135] Gilmor, though he was a reverend, recognized and correctly identified the tools necessary to perform a tracheotomy. This indicates that he may have had more training or experience in the medical field then a typical reverend, which as will be discussed below, placed him in a position to dispute a physician's diagnosis. While he made no mention of a physician being in the home, if tools for a tracheotomy were near by, a physician must have been at the house to evaluate the daughter's condition. If the physician had left, leaving his tools near the daughter suggest that he believed he still had time to intervene on her behalf and planned on returning to her bedside before her condition worsened. It is possible, however, that leaving the tools was merely a symbolic gesture on the part of the physician who wanted to provide a sense of hope to the family. We only know for certain that Gilmor decided it was important to include this detail in his account.

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[133] Thomas Butler, Asma Islam, Iqbal Kabir, and Paul K. Jones, "Patterns of Morbidity and Mortality in Typhoid Fever Dependent on Age and Gender: Review of 552 Hospitalized Patients with Diarrhea," *Reviews of Infectious Diseases* 13, no. 1 (1991): 85; "Questions and Answers," Center for Disease Control, Georgia, Accessed November 16, 2020, https://www.cdc.gov/typhoid-fever/sources.html

[134] Butler, "Patterns of Morbidity and Mortality in Typhoid Fever Dependent on Age and Gender," 85.

[135] Gilmor, "A Touching Story," 54.

Whatever the reason, reflecting later about sitting at the young woman's bedside, Gilmor noted that, although he had ministered many of his parishioners who were gravely sick or dying, her illness was one of the worst he had ever encountered. He thought the recent descriptions that he had read of the slow death of Frederick III, German Emperor and King of Prussia, from cancer that had perforated the monarch's oesophagus, paled in comparison to the suffering caused by diphtheria that he observed at the deathbed of the teenaged woman he had known since she was a little girl.[136] It was "suffering in one of its most awful forms—suffocation," he wrote, "a lingering death of agony, most appalling."[137] He did not use this visceral vocabulary when writing about the second daughter's death from typhoid. In addition, Gilmor witnessed one of the most difficult facets of diphtheria with which to contend. Contrary to typhoid cases in which the patients often fall unconscious, diphtheria patients remained cognizant throughout their illness, meaning they could not only feel the effects of the membrane on their breathing, but they could also communicate their pain and fears to those sitting by their bedside. These fears, once relayed, could heighten the emotions of the observers, leading to vivid descriptive language often being used when the public discussed diphtheria cases.

While Gilmor sat in the physician's place at the bedside, he was not the only observer. In a manner reminiscent of *The Doctor* by Luke Fildes, the daughter's parents were present in the periphery of the room, though they were close enough to be "helpless witnesses of her awful sufferings".[138] Forced to watch as others took over the care of their loved one, it could be argued that the parents no longer had any agency over their daughter's health, though they could still help to direct their daughter's emotional state. As academics have begun to examine the history

[136] John Röhl, *Young Wilhelm : The Kaiser's Early Life, 1859-1888*, trans. Jeremy Gaines and Rebecca Wallach (Cambridge: Cambridge University Press, 1998), 824; Gilmor, "A Touching Story," 54.
[137] Gilmor, "A Touching Story," 54.
[138] Gilmor, "A Touching Story," 54.

of populations through a societal lens, discussions surrounding emotions and their role in history have invariably appeared. Scholars have noticed that "the fabric of family life is woven together by the complex interplay of the emotions of its members."[139] This interplay of emotions can clearly be seen through parental emotions influencing their children's development and children's emotional state influencing the emotions and decisions of their parents.[140] When we examine this relationship between emotions and behaviour, within the context of Gilmor's experience, it is clear that this relationship is all the more crucial to those suffering from diphtheria. If the daughter's parents were in a highly emotionally volatile state, it is probable that their anxiety and fears would have been noticed by the daughter and reflected in her behaviour with Gilmor. In order for the parents to control their emotions and attempt to take comfort that her death may have had some greater purpose, they turned to religion. According to Gilmor, the parents responded positively to the daughter's dying wish that her funeral be delayed until her fiancé could attend.[141] Through reassurances such as this one, the parents were able to appease some of their daughter's fears and concerns. In a similar vein to Gilmor, we can see that the parents believed and trusted in physicians and modern medicine until they could no longer provide the care or comfort their daughter required.

As Gilmor continued to sit at her bedside, he further adopted the role the physician. Part of physician's responsibility was to inform the patient, or their relatives, of their condition so that they could be aware of what was occurring with their bodies and make an informed decision regarding their healthcare needs. Although the surgical tools were evidence of a physician being in the family's house, Gilmor eventually realized that the young woman had not been told of the

[139] Richard Fabes, Carlos Valiente and Stacie A. Leonard, "Introduction," in *Emotions and the Family*, ed. Richard Fabes, (New York: Routledge, 2003), 4.
[140] Fabes, "Introduction," 8.
[141] Gilmor, "A Touching Story," 54.

severity of her condition. According to Gilmor, he made the decision to inform her that a tracheotomy "was impracticable" and to explain to her "the whole truth".[142] In addition to solidifying his adopted role as prognosticator, Gilmor's decision to tell the daughter "the truth"—in other words, that she was dying—further reveals the complicated nature of religion and medicine which diphtheria cases forced people to confront. As mentioned, it is possible that the physician left his tools near the daughter as he believed that she was not at death's door, and he still had time to intervene. If we accept this hypothesis, then Gilmor's personal assessment of her condition was in direct opposition to that of a medical practitioner. As with many diphtheria cases, each observer tended to have their own opinion on the severity of the disease and the type of healthcare the infected should receive. This is once again reminiscent of Rosenburg and Duffin's argument that diseases are framed by individuals and the frames reflect their own experiences and understandings of a certain disease.

While physicians and religious leaders often remained and worked within their sphere of influence, diphtheria cases, such as the one presented, forced the two to work in tandem. At first glance, the two differing opinions regarding the daughter's fate, would suggest that Gilmor and the physician vehemently disagreed with one another regarding the treatment the daughter should receive. There seemed to be a level of awareness, however, from both the physician and Gilmor regarding their own capabilities, which influenced the responsibilities each undertook. Though Gilmor may have disagreed with the physician over the daughter's prognosis, he did not offer to cure her through religion as he had decided there was nothing anyone could do to save her. Similarly, there is no indication the physician attempted to intervene once her condition deteriorated and Gilmor sat down next to her. For the daughter's parents the difficulties in

[142] Gilmor, "A Touching Story," 54.

deciding who to trust with their daughter's healthcare were minimized through Gilmor's cooperation with the physician.

Once Gilmor made his prognosis he transitioned away from his adopted role as medical provider and back towards his role as a minister of religious teaching and comfort. Having informed the daughter that she would not survive, Gilmor noted that she began to pray. Contrary to what may be assumed, the daughter did not pray for a miracle, instead she prayed that death would quickly take her to her saviour.[143] As with most diphtheria cases, the daughter's pleas for a quick death went unheeded. Her suffering was prolonged to the point where she asked Gilmor "why [God] delayed so long."[144] While the daughter's faith in God never wavered, it is clear that diphtheria could influence the prayers and priorities of sufferers. During periods of sickness, people often prayed for health, but the physical and emotional toll that diphtheria had on the ill forced them to revaluate their decisions regarding the direction in which they wanted their lives to take.

In the following months, the daughter's parents were forced to rely once again on both medicine and religion when diphtheria reappeared among the family's other children. After their daughter's death, their son and twin daughters also succumbed to the disease.[145] While Gilmor made no mention of whether the physician was called again to the household, he did mention that the parents continued to rely on their faith to help them cope. Diphtheria was an unpredictable disease and often, as was the case here, medicine could not provide the hope or results wished. Parents may thus have felt the need to place their trust and hopes in as many institutions as possible to save their children's lives, especially when they were powerless to stop

[143] Gilmor, "A Touching Story," 54.
[144] Gilmor, "A Touching Story," 54.
[145] Gilmor, "A Touching Story," 54.

their cognizant child's suffering. It is this public need which helped to push both religious and medical organisations to work together either in a hospital setting, as seen with the Sisters of St. Joseph or to share the responsibilities of a physician as with Gilmor. Diphtheria is a disease whose framing, and responses by institutions were directed by the public and their individual understandings of the disease.

Throughout the last half of the nineteenth century, while Catholics and Protestants gradually accepted and incorporated bacteriological explanations of disease into their missions, other religions were not as open to these new concepts, particularly members of the Church of Christ Scientist. Popularly known as Christian Science, the church's founder, Mary Baker Eddy, had experienced a life changing event in February 1866. On the first of the month, Eddy had fallen on ice and suffered injuries so severe people were unsure she would be able to survive.[146] According to Eddy, it was only after she picked up her bible that she was healed.[147] Afterwards, she concluded that all physical effects upon the body, be they due to injury or diseases were products of the mind.[148] This belief in the power of the mind proved to be the foundation for what Eddy described as "the Science of divine metaphysical healing".[149] Science and the advancements in modern medicine, including bacteriology, were of little concern to Eddy and were not sought out as a source of healthcare for Christian Scientists. In 1879 proponents of Eddy's ideology gathered and voted to establish a church based on her teachings.[150]

[146] Alison Piepmeier, "'Woman Goes Forth to Battle with Goliath': Mary Baker Eddy, Medical Science, and Sentimental Invalidism," *Women's Studies* 30, no. 3 (2001): 303.
[147] Gilian Gill, *Mary Baker Eddy*, (Reading, Mass: Perseus Books, 1998), 162.
[148] Gill, *Mary Baker Eddy*, 162.
[149] Gill, *Mary Baker Eddy*, 162.
[150] Gill, *Mary Baker Eddy*, XXXI.

As Christian Science grew in popularity, it formed a robust community of faithful within Canada. Notably, women were largely the main adherents to Christian Science.[151] Part of the reason for this gender imbalance may be due to the women's traditional role of both healthcare provider and spiritual leader of the home being upended by the male dominated medical field.[152] In order to convince women that male physicians knew more about their bodies and its needs, physicians had to convince women of their importance, which meant discrediting their medical knowledge and practices.[153] Eddy partially relied on this attempt to nullify the need for women's healthcare in order to solidify her argument "that doctors could cause illness because of their focus on and intensive belief in the reality of sickness."[154] By relying on a singular explanation for diseases and cures, the medical community may have pushed some women away from the new bacteriological concepts of disease embraced by most late nineteenth century doctors, and towards alternative healthcare including Christian Science.

Christian Science's rejection of bacteriological explanations and medical treatments of diphtheria placed its followers in conflict with Ontario's legal and healthcare systems. According to historian Patrician Jasen, Eddy's rhetoric brought Christian Science into conflict with public health reformers, physicians and various members of the public, which included government officials because Eddy vigorously campaigned against everything they were trying to institute.[155] In addition, the conflict was born out of the emerging belief in the nineteenth century that

[151] Brandy Scalise, "Mary Baker Eddy, Sentimental Christianity, and Women's Rhetorical Authority in the Christian Science Church," *Journal for the History of Rhetoric* 24, no. 3 (2021): 291.
[152] Further discussions on Christian women and the public and private spaces available to them in the nineteenth century can be found in the following articles Scalise, "Mary Baker Eddy, Sentimental Christianity," 290-314; Patricia Jasen, "Mind, Medicine, and the Christian Science Controversy in Canada, 1888-1910," *Journal of Canadian Studies* 32, no. 4 (1997): 5-22.
[153] Piepmeier, "Woman goes forth to battle with goliath," 309; Apple, "Constructing Mothers: Scientific Motherhood in the Nineteenth and Twentieth Centuries," 162.
[154] Piepmeier, "Woman goes forth to battle with goliath," 309.
[155] Jasen, "Mind, Medicine, and the Christian Science Controversy," 14.

children were unique individuals who required different levels of care and attention in order for them to be able to grow into productive members of North American society.[156] According to historian Lynne Curry, this change in how children were viewed occurred in tandem with an emerging child welfare movement and a tendency for the American justice system to interpret the role and responsibilities of adults towards children in medicalized terms.[157] When children began to die from potentially preventable diphtheria cases due to their parents' preference for alternative treatments such as Christian Science, the simmering conflict between Christian Scientists and governmental and medical institutions was propelled into the public eye. Some parents' medical decision-making on behalf of their children was criminalized and they faced legal trials.

One early account of such a trial comes from an article published by *The Globe* on 31 October 1895. According to the report, a child named Percy Robert Beck, of Toronto, had died after falling ill with diphtheria. Unlike the family Reverend Gilmor had attended, Percy's parents did not call for a physician. Instead, they requested the help of Mary Ellen Beer, a follower of Christian Science.[158] It is unclear to what extent the parents were believers in or devotees of Christian Science. It is possible, however, that Percy's parents had become disillusioned with laboratory trained physicians since the uncertainty that surrounded diphtheria's nature meant that physicians were often powerless to prevent children from succumbing to diphtheria. With parents relegated to the position of passive observers if they called for a traditional doctor,

[156] Lynne Curry, "A Sick Child Deserves Its Rights': Law, Religion, And Children's Medical Care In The United States, 1870-1910," *Journal of the History of Childhood and Youth* 10, no. 3 (2017): 314.
[157] Curry, "A Sick Child Deserves Its Rights'," 314.
[158] "Christian Science," *The Globe*, October 31, 1895, 8.

Percy's parents may have been attracted to alternative healthcare options which promised to heal what the medical profession could not, all while adhering to traditional family roles.

Percy's illness and subsequent death attracted the attention of both civil and health authorities who held an inquest into his passing. Beer was called upon to take the stand, and revealed that Christian Scientists had little experience with diphtheria. When asked whether she had ever seen a case of diphtheria, or if she would ever recognize a case of diphtheria, Beer admitted that "I never saw a case" and that she would not recognize the disease.[159] Perhaps, however, due to the prevalence of the disease and the multitude of reports in newspapers regarding how diphtheria spread, Beer also stated that for Christian Scientists, diphtheria was not infectious and did not therefore spread from person to person.[160] While Beer's statements are contradictory, they reveal how for enigmatic diseases, one did not need to be able to recognize the disease in order to conceptualize it. While physicians often focused on conceptualizing diphtheria through a bacteriological lens; families through their experiences; and Christian Scientists from what they had heard; the enigmatic nature of the disease meant that no single method of conceptualizing diphtheria was ever completely correct. By focusing exclusively on one conceptualization, individuals could ignore others, leading to the distrust seen between physicians and Christian Scientists.

No matter the conceptualization, as previously mentioned, the importance of monitoring diphtheria patients closely, especially their airways, was crucial. Beer, however, treated Percy, through prayer, from a distance when he first contracted the disease and did not see him until he became seriously ill.[161] With this delay in a physical observation of Percy, Beer had not been

[159] "Christian Science," 8.
[160] "Christian Science," 8.
[161] "Christian Science," 8.

expecting him to die even ten minutes prior to his death.[162] Percy's death was not the first or last time that Christian Scientists fell afoul of the courts regarding a child's death from diphtheria. In May 1904, in St. Thomas, Ontario, there was an inquest to decide whether a criminal trial should be launched regarding the death of eleven-year-old Audrey Merrill Kennedy. Audrey died from diphtheria, and during the inquest, it was revealed that her mother was a Christian Scientist.[163] When she became sick, it was thus predictable for her parents to first contact a member of Christian Science, Helen Chittick.[164] Just as Beer had done, Chittick's intervention was to pray for the sick child because, as reported by the newspaper, she testified "she knew of no disease that could not be cured by Christian Science methods" with "the proper faith."[165] Reportedly, Chittick had not employed any interventions beyond prayer.

Audrey's case illuminates how diphtheria complicated decision making, even for fervent adherents to an otherwise dogmatic religious ideology such as Christian Science. Media reports on the inquest reveal that Audrey had died on 22 April and, although Chittick had been at her sickbed the previous day, her parents had also called a physician to the home when their child lost consciousness that same day.[166] Their decision to contact a member of the medical profession may seem unusual considering Eddy's teachings on healthcare. As seen before, however, when faced with the realities of an enigmatic disease such as diphtheria, parents often set aside their once steadfast beliefs in the hope that a different opinion on an illness may result in a preferable outcome for their child. While a disease is, as Rosenberg argues, always framed in ways specific to its time and place, Percy and Audrey's cases show the significance of

[162] "Christian Science," 8.
[163] "Christian Science," *The Globe*, May 18, 1904, 1.
[164] "Christian Science," 1.
[165] "Christian Science," 1.
[166] "Christian Science," 1.

Duffin's observation that disease construction depends also on who, specifically, is doing the framing or observing, which means that multiple, simultaneous concepts of disease can exist in a single context. Audrey's case goes even further and shows how one observer, in this case, her parents, could exchange one conceptualization of disease (divine) for another (medical) when the first fails to produce results or hope.

Members of the medical profession were quick to announce that Audrey's 1904 death from diphtheria was the result of Chittick's medical malpractice, which ignored the well-known reality that diphtheria patients regularly died while under the care of trained, male physicians. During the inquest into Percy's 1895 death under Beer's care, bacteriologist J.O Orr claimed that if the child had been examined and received "proper medical treatment", he would have survived.[167] For Dr. Orr, the proper medical treatment would have involved calling a trained medical physician to treat Percy. A similar conclusion was reached in Audrey's case with members of the inquest deciding that she would have survived diphtheria had "a physician been called in time and the proper dose of antitoxin administered."[168] The anti-toxin, however, was not always immediately available in Ontario before 1914. In Percy's case, Toronto's *Globe* newspaper proclaimed that Christian Science was a "menace to the community" because "its demonstrators profess no knowledge whatever of diseases [and] in fact ignore the existence of disease."[169] With knowledge about diphtheria slowly increasing in the nineteenth century, it is clear that a shift in understanding of rights and responsibilities also occurred, and that childhood deaths from diseases were no longer seen as an inevitability.

[167] It is unclear if Orr had viewed the body or had been privy to the severity of the child's illness and how he could know with certainty that Percy would have survived if he had been given medical care. "Christian Science," 8.
[168] "Christian Science," 1.
[169] "Christian Science," 8.

Percy and Audrey's deaths led to visceral reactions from the legal system, physicians and even journalists, but other members of the public were not as certain about the culpability of their parents or of Christian Science. According to Lynne Curry, grand juries in the United States often acquitted parents who had been charged with medical neglect, because people were worried about the intrusion of governments into their personal lives.[170] With individuals valuing their medical independence, the government and physicians telling them how they should interpret diphtheria and react to its appearance within their communities, became a source of contention. There was a prevailing belief that parents had the right to decide how they wished to treat their children and that they could not be punished simply because they held views which differed from others.[171] Cases such as Percy's and Audrey's may have led people to become wary of the new medical science, which, convinced it fully understood the nature of diphtheria, demanded that the non-medical public reject alternative treatments. Subsequently, this may have unwittingly promoted the concepts of independent medical and parental decision making expressed by Christian Scientists. The court cases, while illuminating the beliefs of major institutions, reveal that the fight against diphtheria was also positioned within larger discussions surrounding the rights of the individual versus the rights of the government, and the emerging discussions regarding the responsibilities of adults towards children.

With religious organizations often acting as a microcosm of society, analysis of the actions of their followers during diphtheria outbreaks, allows academics to further their own understanding of people's behaviour in times of crisis. This section has shown how malleable social constructs can become when observers confront a disease whose nature changes

[170] Curry, "A Sick Child Deserves Its Rights'," 321-322.
[171] Curry, "A Sick Child Deserves Its Rights'," 322.

depending upon each observer's previous experiences and beliefs. With so many differing opinions on the cause and treatment required for diphtheria, decisions made by the populace on all aspects of the disease became varied, inevitably leading to ideological splits, contradictory decision making and preventable loss of life. The interaction between medicine and religion, which originated in part due to the arrival of diphtheria in local communities, created a new relationship between the two and allowed religious leaders who believed in science to take on new roles within their community.

Chapter 3

Advertisements

While medical and religious personnel often interacted regularly with one another to control the spread of diphtheria within their communities in the last half of the nineteenth century, their successes could vary widely due to the disease's enigmatic nature. When neither could promise or deliver the physical or emotional relief required by patients and their families, non-medical members of the general public often searched for their own understanding of diphtheria and potential cures. This search for a remedy brought parents into contact with alternative forms of medicine, many of which were not approved by physicians. Sometimes cures were made at home, but they could also be purchased through mail order companies which advertised their products in daily newspapers and magazines. In addition, with these cures often being sold for less than what a physician charged, they were an attractive option for those with few economic means at their disposal. Diphtheria's enigmatic nature and the failures of local governments, physicians, and bacteriology to control the spread of the disease and provide definitive answers and cures to the public, encouraged businesses to produce and promote, and

the public to try, a multitude of potential treatments and cures, many based on different conceptualizations of the disease.

Aided by the rapid industrialisation and urbanisation of the eighteenth to twentieth centuries, medical advertisements and their cures flourished in Anglo-American countries. According to historian Hannah Barker, medical advertisements often followed a particular pattern. They would begin by providing a general overview of the product they were selling, which often included an explanation of the diseases they purported to cure. Afterwards, the advertisements would attempt to gain the public's trust through the inclusion of testimonials. Attempting to persuade a stranger to place their trust and hope in a product they have never seen nor heard about can be a difficult undertaking. In order to gain the public's trust, medical advertisements relied on what Barker has termed "thick trust" in which people formed bonds with members of their communities, including family and neighbours.[172] Relying on these bonds, many testimonials mentioned that the advertised remedy had been recommended by a neighbour.[173] By specifically mentioning neighbours, advertisements would have sought to appease the worries of potential buyers, assuming the latter had previously formed strong mutually reciprocal relationships with their own neighbours.

Testimonials also helped to persuade readers that a community had formed around a product, increasing the likelihood that they would buy the product on offer. Barker concurs with historian Lori Anne Loeb who shows that the use of testimonials in advertising made readers feel part of a "community of consumers" that helped to create a collective experience that provoked

[172] Hannah Barker, "Medical Advertising and Trust in Late Georgian England," *Urban History* 36, no. 3 (2009): 397.
[173] Barker, "Medical Advertising and Trust in Late Georgian England," 397.

confidence in the product advertised.[174] According to Loeb, advertisements were often written in a way to appeal to women, who were seen by Anglo-American society to be responsible for the daily running of the household, which included purchasing any products, such as medicines, deemed necessary for the family.[175] Historian Nancy Tomes, also states that women, especially during the bacteriological revolution and appearance of germ theory, were largely responsible for not only keeping the household clean, but also ensuring the health and well being of those within their familial unit.[176] With many testimonial writers purporting to be women, companies may thus have relied upon the societal gender norms to strengthen the trust the public placed in the company. Through the use of describing shared experiences with diseases, testimonial writers could begin to form an emotional connection to their readers. This connection was sometimes combined with an offer in certain advertising campaigns to contact the testimonial writers themselves. Their names and addresses were published, which could help assuage fears that the company was lying about their product's capabilities. This ability to quickly form a trusting relationship between business and readers, differentiated advertisements from physicians and laboratory scientists whose focus on promoting one conceptualization of diphtheria often made it difficult to persuade the public to trust.

An advertisement published in *The Globe* on 13 December 1892, for example, shows the function of thick trust as an advertising tactic to gain the confidence of the buying public. The product, while not named, was described as "A Positive Cure For Diphtheria and Croup".[177] The cure could be bought for one dollar, perhaps in order to make it more appealing to the budget

[174] Barker, "Medical Advertising and Trust in Late Georgian England," 396.
[175] Lori Anne Loeb, *Consuming Angels : Advertising and Victorian Women* (New York: Oxford University Press, 1994), 8-9.
[176] Tomes, *The Gospel of Germs*, 10.
[177] "Display Ad 15," *The Globe*, December 13, 1892, 8.

conscious public.[178] This low price, however, was not enough to form any meaningful bond of trust with the public. Instead, the advertisement capitalized on the established bonds between community and a religious leader. The advertisement stated that any money or requests for further information, including testimonials, could be sent to Reverend H. Dierlamm of St. Jacob's, Ontario.[179] H. Dierlamm does not appear to have been a creation by the company in order to rely on the thick trust already established between reverends and the public. There was indeed a Reverend H. Dierlamm who by 1900, worked in the Port Elgin area about two hours away from St. Jacob's.[180] Having a reverend support the product meant that people who knew Dierlamm could talk to him directly about the cure, and perhaps inform their friends about how to contact him too. With diphtheria being a difficult disease to predict and cure, this explicit reliance on bonds of thick trust could allow businesses to rapidly gain the trust of communities and establish themselves as profitable suppliers of diphtheria cures.

Placing an advertisement for a product in a newspaper was an effective way to bring a product to the attention of people across a wide geographic area. With many other companies, however, also using the same medium to advertise their medical products, readers could easily become overwhelmed by the number of products available. In order to separate themselves from the competition and increase their visibility among the public, the unnamed company selling "A Positive Cure For Diphtheria and Croup", stated in their advertisement that their cure was also for "sale at corner of Spadina and King west" in Toronto.[181] By selling their product in local stores, including in pharmacies where the public may have already developed a trusting

[178] "Display Ad 15," 8.
[179] "Display Ad 15," 8.
[180] "John Weichel Research Files Index," 104, Bruce County Archives, 20121026_john_weichel_research_files_index_a2006179.pdf
[181] "Display Ad 15," 8.

relationship with the pharmacist, companies could capitalize on pre-existing bonds of trust to help sell their product.[182] In addition, the physical building of the store could help to provide an air of legitimacy to the product. With the concept of drug stores already well ingrained in the minds of the public as trustworthy institutions, health cures in the stores could be seen by the public as legitimate over-the-counter-medicines. According to physician Edward McCoul's study of the significance of over-the-counter medicines to the general public in this period, these types of remedies could empower "consumers to act as their own advocate".[183] When they engaged the services of a physician, a patient or family generally had little say in the type of medicine used. Being able to handle the products in a store, however, a patient or family member could be provided a feeling of choice for those with few alternative means of healthcare. A consumer could examine and compare various types of remedies available and decide which product's therapeutic claims best aligned with their own understanding of diphtheria.

The ability to choose their own remedy also relied on consumers being aware of the disease's symptoms and understanding the meaning of the words used on the packaging.[184] With limited time to act once the symptoms of diphtheria appeared, ease of access made over-the-counter diphtheria medicines appealing to the public.[185] While people living in major cities, such as Toronto, benefitted from the availability of physicians, pharmacists and multiple charitable hospitals, access to lifesaving healthcare was more difficult to come by in rural Ontario. The nearest physicians and hospitals could be hundreds of kilometers away from a patient. Nearby local stores, however, provided patients the ability to buy a potential cure and begin treating

[182] Barker, "Medical Advertising and Trust in Late Georgian England," 396-397.
[183] Edward D. McCoul, "Direct-To-Consumer Advertising of Over-the-Counter Sinonasal Remedies: A History of Mixed Messages," *The Laryngoscope* 130, no. 9 (2020): 2116.
[184] McCoul, "Direct-To-Consumer Advertising of Over-the-Counter Sinonasal Remedies," 2118.
[185] McCoul, "Direct-To-Consumer Advertising of Over-the-Counter Sinonasal Remedies," 2117.

diphtheria before the physician arrived, potentially altering the course of their illness. While physicians relied on their social standing to encourage their conceptualization of diphtheria and its cures, businesses approached enigmatic diseases through the exploitation of a community's bonds of trust that were overlooked by the field of medicine's focus on bacteriology.

With the gradual acceptance of bacteriological concepts by the public in the late nineteenth century, many businesses began to incorporate these concepts in their medical advertisements. Historian Rima Apple, states that the acceptance of bacteriology not only provided a wider range of potential treatments that people could choose from, but it also gained prestige within societies, with women expected to incorporate bacteriological notions, and being disparaged if they did not.[186] To reinforce the validity of their claims among women who felt pressured to adopt bacteriological guidelines, medical advertisements often referred to bacteriological concepts in their advertisements.

Despite persistent inconsistencies in its clinical presentation and mortality rates, it was a reliable and well-known fact that diphtheria cases spiked during colder months. This awareness of diphtheria's behaviour was widely understood by medical, government authorities, and also the general public and advertisers. The Munyon's Homeopathic Remedy Company, for example, in a medical advertisement for Munyon's Cold Cure, which was published in *The Evening Star* on 16 January 1897, claimed the product could prevent diphtheria based on the accepted association between winter, the common cold, and coughing. The advertisement stated plainly: "Colds lead to coughs," and "coughs to pneumonia, diphtheria and consumption."[187] Although today it is known that the bacteria responsible for the common cold does not cause diphtheria,

[186] Apple, "Constructing Mothers: Scientific Motherhood in the Nineteenth and Twentieth Centuries," 176-177.
[187] "Grip Colds," *Evening Star*, January 16, 1897, 3.

over a century ago, only a small fraction of non-medical North Americans knew that the diphtheria bacillus was responsible for causing the disease. With symptoms that were difficult to identify and isolate from other diseases, a cough from an individual who was sick with diphtheria may not have been seen as a cause for concern by those who were not aware of bacteriological concepts. As diphtheria progressed and the characteristic membrane formed, observers might also have reasonably inferred that the cough had either caused or progressed into diphtheria. Rather than having to create cures and preventative medicines for each disease, companies such as Munyon's Homeopathic Remedy Company could rely on the confusion surrounding the cause of diphtheria and create one product which promised to target the popularly accepted origins of multiple diseases. As individuals tend to gravitate towards both companies and other members of the public who have similar beliefs, by mirroring the general understanding of diphtheria, companies could increase the trust the public placed in their products.

The predictable seasonal fluctuations of diphtheria could also be helpful to companies since it allowed them to tailor their advertisements to whichever diseases were prevalent during a certain time of year. For Munyon's Homeopathic Remedy Company, their decision to publish their advertisement in January, meant that they could target consumers at a time when parents may have been more vigilant when their children fell ill; fearful that a benign cough could turn out to be a symptom of a deadly disease. The enigmatic nature of diphtheria combined with its predictable behaviour could thus be used to the benefit of companies who sought to increase sales of their product while continuing to gain the public's trust.

Following a description of Munyan's Homeopathic Remedy, the company included a testimonial from a Mrs. Ellen Rutledge of Toronto: "My son was taken with an attack of sore throat, which was greatly inflamed, and we feared it would develop into diphtheria. We used

Munyon's Sore Throat Cure with splendid results. One vial removed the trouble, and we feel that we can recommend Munyon's Remedies."[188] It is unknown if Mrs. Rutledge was a genuine customer, or if her testimonial was fiction written by the company itself. Either way, the use of this testimonial both strengthened the bonds of trust that the company had begun to form with readers, and perhaps inadvertently, helped to prove the scientific certainty that severe throat maladies were often caused by bacteria such as *Corynebacterium diphtheria*. With the product marketed at 25 cents per vial, or about five dollars in 2023, the testimonial helped to make the product even more appealing to those searching for a cheap and effective way to prevent diphtheria.[189] Notably, the testimonial is quite vague. Mrs. Rutledge does not name the disease that affected her child, nor does she state whether a physician had been consulted. It is possible that the company preferred a vague testimonial because fewer details created conceptual space for more readers to see themselves in the same position as Mrs. Rutledge, thus increasing the chance that they would follow her actions and buy the product.

In addition to selling their product at a low price, the company found a unique way to separate itself from the competition. The company opened an office at 11 and 13 Albert Street in Toronto, which the advertisement stated would provide free medical consultations to the public between 8 a.m. to 8 p.m.[190] Alternatively, the ad also stated, if the sick could not be brought to the office, customers could send in a request for medical advice and receive a response in the mail free of charge.[191] Given diphtheria's enigmatic nature, it was difficult for parents to correctly diagnose their child, select and obtain a cure and place their trust in alternative medicines which may not have been approved by physicians. Some parents may have felt that

[188] "Grip Colds," 3.
[189] "Grip Colds," 3.
[190] "Grip Colds," 3.
[191] "Grip Colds," 3.

the opportunity to go to an office and consult an individual who claimed to be a physician was a safer and economically viable option. By opening an office, Munyon's Homeopathic Remedy Company not only ensured that their advertisement catered to the growing number of public entities who believed in bacteriology, they also reinforced the notion that medical claims surrounding diphtheria were trustworthy and defensible. If the product worked as promised, it could only serve to further support the need for the company and medical knowledge; thus, creating a positive feedback loop which over time increased society's reliance on medicine based on the logic of bacteriology.

With diphtheria outbreaks continuing to cause concern among members of the public, newspapers themselves began to weigh in on the effectiveness of certain cures. In an article published, and seemingly written, in 1893 by *The Globe*, an unnamed author presented a recipe for a diphtheria cure. Similar to the ad for Munyon's Homeopathic Remedy, the article relied on widespread announcements about scientific advancements in order to capitalize on the public's potential trust in laboratory medicine. Notably, the author mentioned that the cure was "successfully employed in France for the cure of true diphtheria."[192] With the diphtheria anti-toxin and the original laboratory miracle cure, Pasteur's antidote for rabies, discovered in France, the strategy to connect the advertised cure to France would have helped to legitimize the cure in the minds of the readers. Through the inclusion of references to France, *The Globe* author demonstrated a general bacteriological understanding of diphtheria, and expected the same from their potential readers.

[192] "Notes and Comments," *The Globe,* December 13, 1893, 4.

The diphtheria cure described in *The Globe* in 1893 was relatively simple. It consisted of "applying with a camel's hair brush or throat swab a small quantity of coal oil to the white spots on the throat."[193] The coal oil was supposed to help reduce the membrane, which was believed to consist of a "rapidly-growing plant" and which often began as white or gray spots in the throat.[194] Reinforcing the idea that this cure required no intervention from a trained physician is the line which mentioned that the cure "may be of service where professional help cannot be at once obtained."[195] The importance of using a cure in a timely matter with regards to diphtheria is once again brought to the forefront of the reader's mind. Home made cures could allow parents to react in an efficient manner to the most obvious symptoms of diphtheria, especially the dreaded grey membrane in the throat. Parents no longer had to wait for a physician or leave the bedside of their sick child, ensuring they could provide near constant emotional support and observe the progression of the disease. As with the other advertisements and cures, *The Globe* article did not limit parental decisions, rather their cure could be used in addition to calling a physician. In this way, parents could be sure that at every step of the disease, they were providing some medical intervention and if they did not trust bacteriology completely, they could still act upon their own conceptualization of diphtheria while still including bacteriological concepts in their child's treatment plan.

Discussions surrounding other cures typically avoided mentioning any potential side effects, since it could frighten people away from the product. The article, however, stated that great care needed to be taken with the cure as if there was too much oil on the brush, it could "strangle" the patient whose throat and larynx were affected by diphtheria. [196] The article

[193] "Notes and Comments," 4.
[194] "Notes and Comments," 4.
[195] "Notes and Comments," 4.
[196] "Notes and Comments," 4.

mentioned that if families so wished they could make the cure at home, but the authors provided the potential side effects to absolve themselves of any potential litigation which may have arisen due to individuals miscalculating the dose of the various ingredients.

While the author at *The Globe* may have believed that they needed to inform the public of this cure in order to help those who did not have the time or ability to contact a physician, certain economic factors may have prompted the newspaper to publish the article. If the cure worked as promised, then members of the public may have viewed *The Globe* as not only a trustworthy source for daily news, but also for healthcare. As a result, people who may have never have been inclined to buy *The Globe* previously, may now be tempted to buy the newspaper regularly, in order to stay informed regarding new cures and medical discoveries which could help their family.

Medical advertisements are unique sources of historical information because they make visible the gaps and connections between popular and scientific conceptions of diphtheria, in particular regarding its potential causes and remedies. Additionally, in the late nineteenth century, they were able to easily adapt to the new transitional reality in which bacteriology was beginning to increase in popularity, while long-established concepts of disease were still circulating among the public and physicians. The ability of advertisers to adapt continuously to the most pressing concerns of the buying public meant that they also reflect the popular narratives, beliefs and gendered roles circulating amongst the non-medical public with regards to diphtheria. One of medical advertising's most important social roles was, according to historian Hieke Huistra, the ability of advertising, through its large readership to "change values and

ideas" as seen in the positive feedback loop they developed with medicine.[197] With medical advertisements often reinforcing pre-existing conceptualizations of disease, however, they were unable to expound the enigmatic nature of diphtheria.

Chapter 4

Intersection of Schools and Education

While the relationships that adults have forged with diseases and their reactions to the appearance of illnesses within their communities, has been the focus of multiple academic works, and to an extent this thesis, the enigmatic nature of diphtheria opened a new conceptual space that could foster new forms of agency among children. Children and scholarly institutions found themselves at the nexus of decision making undertaken by Ontario society in response to diphtheria's appearance. Health agencies and provincial government officials, found that their attempts to reach out and educate adults did not always result in positive changes. As discussed, adults often still held onto previous understandings of disease and were reluctant to fully embrace bacteriological explanations and procedures. In the late nineteenth century, health and government officials refocused their public health messaging to target those most vulnerable to diphtheria: children. Children presented an appealing observer base, who, as they spent up to eight hours a day in school, could be taught bacteriological concepts of diphtheria in detail. As such the provincial government and health officials began to focus their attention towards improving both the architecture of school buildings and lessons taught regarding healthcare. With the institution of education acting as a microcosm of society, schools also presented a fascinating opportunity for physicians and scientists to observe the results of large-scale

[197] Hieke M. Huistra, "Experts by Experience: Lay Users as Authorities in Slimming Remedy Advertisements, 1918-1939," *Bijdragen En Mededelingen Betreffende de Geschiedenis Der Nederlanden* 132, no. 1 (2017): 130.

immunization programs. School were not only the receivers of changes that occurred within society, but when children began to exert their own agency, they also became the enactors of change.

The influence that the provincial government hoped to enact on children's knowledge about contagious diseases relied on first having control over the field of education. Until the passing of the Common School Act of 1846, however, the governments of Upper Canada, and subsequently Canada West, undertook little responsibility for the management of public or private education. Prior to the Act, it was individual districts who controlled the building of schools and the curriculum to be taught.[198] This system favoured a community's elites who could afford to send their children to school and help pay for any repairs or upgrades needed to improve the school's sanitation.[199] As academic Anthony Di Mascio notes, however, other members of the public were also clamoring to send their children to school, though their communities could not afford to build or operate a school without government aid.[200]

With an ever-growing population requesting that their children receive some form of formal education throughout the nineteenth century, the colonial government was left with little option but to acquiesce to the public. The passage of the Common School Act of 1846 instituted wide ranging educational reforms, based on the recommendations made by Egerton Ryerson, the then chief superintendent of education for Canada West. Decision making regarding scholarly institutions began to be centralized with the introduction of the Act, with one governing power, in this case the government of Canada West, now making the decisions regarding how to operate

[198] Anthony Di Mascio, "Educational Discourse and the Making of Educational Legislation in Early Upper Canada," *History of Education Quarterly* 50, no. 1 (2010): 50.
[199] Di Mascio, "Educational Discourse and the Making of Educational Legislation," 45-46.
[200] Di Mascio, "Educational Discourse and the Making of Educational Legislation," 50-51.

schools and educate children. Additional reforms included the establishment of Normal Schools, the appointment of school inspectors, standardised textbooks which encouraged a uniform education for students throughout the province, and perhaps most importantly the recommendation that future schools be built according to a pre-approved architectural plan.[201] These recommendations would later be combined with bacteriological concepts, leading to a reduction in the number of cases of contagious diseases and an improvement in the overall health of the students.

The next major change in the education system occurred in 1867. During that year the British North America Act (BNA Act) shifted responsibility for governing education unto the newly formed provincial legislatures.[202] This change of power meant that laws governing the education system in Ontario could be uniformly applied to all schools. In addition, it allowed for each province to institute education requirements which best reflected the needs of the province. For example, if the government of Ontario noticed that the province had higher rates of diphtheria compared to others, it could adjust how schools were built and their curricula in order to ensure that students were taught the dangers of the disease and how to prevent its spread in an environment which reflected these new lessons.

Following the BNA Act, the provincial government of Ontario continued to be concerned with the spread of diseases in schools. These concerns, however, were not reflected in changes to the education system. In 1871, for example, while drafts of the bill which would become the Ontario School Act, clarified the difficulties that schools were facing in regards to

[201] "An Act for the better establishment and maintenance of Common Schools in Upper Canada," Government of Ontario, Accessed September 25, 2022, http://www.archives.gov.on.ca/en/explore/online/education/common-school-act-01.aspx
[202] "British North America Act, 1867-Enactment no.1," Government of Canada, Accessed August 28, 2022, https://www.justice.gc.ca/eng/rp-pr/csj-sjc/constitution/lawreg-loireg/p1t13.html

healthcare, the act itself focused on ensuring that education in common schools was free, and it instituted mandatory attendance for children between the ages of seven and thirteen.[203]

Notably, although the provincial government brought forth many amendments to the laws governing education, the application of the laws was unequal. In 1849, the School Act of United Canada allowed for racially segregated schools to be established.[204] While Black families were supposed to be given the opportunity to send their children to common, or public schools as they became known, they were often forced by local government members to send their children to segregated schools.[205] These segregated schools did not enjoy the same improvements that the provincial government was instituting in common schools. Segregated schools were sometimes open for only three months a year, attendance was rarely enforced, and libraries which would have been filled with standardised textbooks were often non existent.[206] With Black children being exposed to the same deleterious environments which had concerned government leaders and communities, but without having the opportunity to obtain the same knowledge of hygiene and diphtheria as children attending common schools, these students might have been at a higher risk for diphtheria.

The introduction and acceptance of bacteriological concepts in the late nineteenth century, brought questions related to the health and safety of schools to the forefront of discussions held by provincial education ministers. The knowledge that diphtheria could be spread by being in close contact with an individual who was sick, combined with the new annual

[203] George J. Hodgins, *Documentary History of Education in Upper Canada : from the Passing of the Constitutional Act of 1791 to the Close of the Reverend Doctor Ryerson's Administration of the Education Department in 1876* Vol. XXII, (Toronto: Department of Education, 1908), 213.
[204] Backhouse, *Colour-Coded a Legal History of Racism in Canada, 1900-1950*, 250.
[205] Backhouse, *Colour-Coded a Legal History of Racism in Canada, 1900-1950*, 250.
[206] Backhouse, *Colour-Coded a Legal History of Racism in Canada, 1900-1950*, 250.

reports which were being published by the Toronto Board of Health beginning in the late nineteenth century, demonstrated that the crowded and unsanitary conditions of public schools were promoting the spread of the disease. George Hodgins, the Ontario deputy minister of education in 1886, published a book which provided a general set of sanitation guidelines that he hoped would influence how schools were being built. Hodgins focused on the problem of air quality in schools. He noted that while the Provincial Board of Health had unanimously passed a resolution stating that each student should have at least 500 cubic feet of air, only eight percent of public schools had attained this minimum.[207] Additionally, Hodgins was aware that an increase in airspace would not be sufficient to reduce the spread of contagious diseases, and referenced a report of the Committee on School Hygiene which was published by the Provincial Board of Health in 1883 which suggested that there should be six air changes per hour in a classroom.[208] Many suggestions were put forth regarding the best way to provide ventilation in schools; however, the easiest method which involved simply opening windows and doors was seldom used by teachers and school administrators who often kept the windows closed.[209] While increased ventilation could not prevent children from interacting with others who were ill, it could at least reduce the likelihood of a child coming into contact with an airborne droplet. By the mid-1880s members of the field of education accepted and incorporated bacteriological concepts surrounding diphtheria into their professional lives, rapidly changing all aspects of the field of education and suggesting that the close relationship between the provincial authorities and physicians, which Dr. FitzGerald benefited from in the 1920s, was not uncommon.

[207] George J. Hodgins, *Hints and Suggestions on School Architecture and Hygiene with Plans and Illustrations* (Toronto: Department of Education, 1886), 12.
[208] Hodgins, *Hints and Suggestions on School Architecture*, 65.
[209] Hodgins, *Hints and Suggestions on School* Architecture, 60; 67.

Although local boards of education worked closely with the Ontario Board of Health in order to improve the physical state of schools, the inability of bacteriology to elucidate the enigmatic nature of diphtheria led to confusion for education workers regarding how to approach the disease. For example, Hodgins discussed diphtheria only twice. Both instances are in relation to the need for clean water. According to Hodgins, in a conversation he had with the first secretary of the Ontario Board of Health, Peter Henderson Bryce, in order for a source of water to be described as "pure" it needed to have no history of causing water born illnesses such as typhoid, and no history of causing any diphtheria infections.[210] During Bryce's tenure at the Ontario Board of Health, the Board sought to improve the dissemination of hygiene information, investigate and control the outbreaks of diseases, improve the purity of food and water and ensure that public institutions reflected the new understandings of disease and health.[211] Additionally in 1904, Bryce was selected to be the Chief Medical Officer of the Department of the Interior, a post from which he was eventually fired because he continually insisted on alerting his superiors to the preventable tuberculosis epidemics occurring in residential schools for Indigenous children.[212] Perhaps due to the recent discovery that typhoid could be spread through contaminated water, people assumed that other diseases with bacterial causes were also spread in the same manner. It is also possible that education and health officials believed that water played an important role in the spread of diphtheria due to the almost simultaneous implementation of increased ventilation and water purity in schools in the 1880s.

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[210] J. G. FitzGerald, "Doctor Peter H. Bryce," *Canadian Public Health Journal* 23, no. 2, (February 1932): 88; Hodgins, *Hints and Suggestions on School Architecture*, 24.
[211] Provincial Department of Health, "The Development of Public Health in Ontario," *Canadian Public Health Journal* 26, no. 3 (1935): 112.
[212] FitzGerald, "Doctor Peter H. Bryce," 90; See P.H. Bryce, *The Story of a National Crime* (James Hope and Sons, Ottawa, 1922).

While the architecture of schools was being overhauled to provide a more hygienic environment for students and teachers, the Board of Health and Minister of Education noticed that an improvement in the environment did not result in students altering their behaviour to reduce the spread of diphtheria. In the late nineteenth century, the Minister of Education and the Ontario Board of Health worked together to produce a new curriculum which included classes on sanitation and disease which were based on the new bacteriological concepts. The Minister of Education began to publish hygiene books which covered a multitude of subjects, including diphtheria. In one of these books, written by Archibald Patterson Knight, a professor of physiology at Queen's University, and authorized by the Minister of Education for Ontario, students in forms IV and V were introduced to "the laws of health."[213] Reflecting the bacteriological understanding of diphtheria, Knight wrote that the time from exposure to first sign of illness was between one to eight days, with the winter months seeing the greatest increase in the number of diphtheria cases due in part to people staying inside and creating environments in which germs and bacteria could easily be shared.[214] Knight also informed the reader about how to react to a diphtheria exposure, warning that the infected family member and their caregiver needed to remain isolated until the disease passed.[215] Afterwards, the room in which the child had been isolated needed to be thoroughly disinfected, including the walls, curtains and even floors.[216] According to Knight, it was by meticulously following these steps that families and communities could hope to confine diphtheria to one individual or household.

[213] Forms IV and V were the equivalent to today's grades 7 and 8. It is of note that the books were not freely available and cost around 20 cents. A.P. Knight, *The Ontario Public School Hygiene* (Toronto: The Copp, Clark Company, Limited, 1910), V, 6.
[214] Knight, *The Ontario Public School Hygiene*, 39; 40.
[215] Knight, *The Ontario Public School Hygiene*, 45.
[216] Knight, *The Ontario Public School Hygiene*, 45.

Knight also wrote that houses where diphtheria had been found needed to have a health placard posted on their door. These placards were produced by medical health authorities and advertised to the neighbourhood which disease was circulating within a household.[217] They were controversial and not always welcomed by families because they announced to neighbours, friends and even strangers that the household was dangerous to others. Knight was aware of the resistance to placards, but emphasised that while the children may think that the law which requires the posting of a placard "is a cruel one" it was necessary to prevent diseases from spreading.[218] With illnesses often being seen as a private family matter, the introduction of placards was widely perceived as an invasion of privacy by government authorities. With bacteriology still unable to provide consistent, definitive answers to diphtheria's enigmatic nature, and portions of the population refusing to accept bacteriological concepts, having a placard on one's door allowed for each passer-by to conceptualize the disease and the family's actions which led to the placard being placed, in their own way.

While Knight based the majority of his book on the bacteriological knowledge that was emerging at the turn of the century, some of his suggestions continued to reflect the theories supported by the general populace. In a similar vein to the medical advertisements published in newspapers, Knight stated that colds could lead to diphtheria. According to him, if someone had a cold for a prolonged period of time, then the lining of their nose and throat would become irritated and swollen, leading to the perfect breeding ground for the diphtheria bacillus.[219] With the field of bacteriology still relatively new, it is perhaps not a surprise that Knight may have believed in at least one of the many theories circulating at the time regarding diphtheria's

[217] Knight, *The Ontario Public School Hygiene*, 46.
[218] Knight, *The Ontario Public School Hygiene*, 46.
[219] Knight, *The Ontario Public School Hygiene*, 72.

behaviour. It is also possible that Knight wanted to include a theory which was already popular among families in order build bonds of trust with communities who were hesitant of the government and health official's rejection of traditional medicine in favor of the new bacteriological based explanations.

In addition, Knight mentioned that milk can also be a vector for diphtheria, and that it is important for everyone to obtain pasteurized milk.[220] The relationship between milk and diphtheria will be discussed further in the next section of this thesis. The extent to which Knight emphasised the dangers of unpasteurized milk, combined with information uncovered in the subsequent section, indicates that diphtheria infections from milk were much more common than healthcare guidelines suggested because they focused almost exclusively on the ability of diphtheria to be transferred through respiratory droplets.[221]

It became clear to health and education officials that while children were learning bacteriological concepts in schools, they also presented an opportunity to educate adults. With adults often holding onto their previous conceptions of disease, government authorities found that they were not as willing to listen to their suggestions, making the acceptance of bacteriology in Ontario a slow process. In order to reach out to parents, education officials altered their messaging to children. For example, rather than simply discussing how bacteriology could improve their lives, Knight recommended that children inform their family and friends about these new laws of health. In doing so, Knight and the Minister of Education and Health hoped

[220] Knight, *The Ontario Public School Hygiene*, 162.
[221] For information on the ways diphtheria can spread see "Causes and How It Spreads," Center for Disease Control, Georgia, last modified September 9, 2022, https://www.cdc.gov/diphtheria/about/causes-transmission.html#:~:text=Diphtheria%20bacteria%20spread%20from%20person,People%20in%20the%20same%20household

that parents would be more willing to listen to their children and apply bacteriological concepts to their daily lives.

The reluctance of adults to listen to authorities, yet accept and even change their behaviour for their children, is well documented. According to psychologist George Holden and political science professor Robert Urbatsch, the ideas and behaviours learned during childhood often become ingrained in adults, sometimes resulting in a rejection of new ideas.[222] This can have a direct impact upon the hygiene of society as a whole. For example, if children are not taught that handwashing can prevent diseases, then as adults they may be reluctant to follow any government guidelines which promote handwashing, as they do not understand the reasoning behind the new suggestions.

Further supporting the notion that there is a bi-directional influence exerted by parents on their children, and vice-versa, is an article published in the *Journal of Adult Development*, in 2016. According to the article, decisions made by parents regarding matters such as health, hygiene, and personal beliefs, are influenced by what their children require and desire.[223] With overall relationships between children and adults remaining largely unchanged throughout the centuries, the article suggests that this bi-directional influence would have also been at play when governments and parents were attempting to control the spread of diphtheria.

This analysis of the role of children and schools is an element lacking in the works of Mokyr and Stein, who argue that it was the discoveries made regarding bacteriology which

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[222] George W. Holden, *Parenting a Dynamic Perspective* (Los Angeles: SAGE, 2010); Robert Urbatsch, *Families' Values : How Parents, Siblings, and Children Affect Political Attitudes* (New York: Oxford University Press, 2014).
[223] Leon Kuczynski, Robyn Pitman, Loan Ta-Young, and Lori Harach, "Children's Influence on Their Parent's Adult Development: Mothers' and Fathers' Receptivity to Children's Requests for Change," *Journal of Adult Development* 23, no. 4 (2016): 196; 200. See also Anne Williams and Jane Noyes, "The Information Matters Project: Health, Medicines and Self-Care Choices Made by Children, Young People and Their Families: Information to Support Decision-Making. Study Protocol," *Journal of Advanced Nursing* 65, no. 9 (2009): 1807-1816.

increased the rate at which people understood diseases and applied bacteriological concepts in their lives.[224] This analysis is also missing in the works of Nancy Tomes, who argues that changing scientific concepts of disease influenced non-scholarly education programs, leading to new behaviours.[225] To understand how bacteriological concepts of diphtheria became fully accepted by the public, however, further discussions are necessary on the role children played in influencing the rise of bacteriology in North America.

Schools eventually attracted the attention of physicians and scientists, who understood that because the environment in public schools was often conducive to the spread of diphtheria, they presented a unique opportunity for researchers to study the disease in non-laboratory-controlled conditions. In 1925, for example, FitzGerald and the Connaught Laboratories were able to rely on students and schools to prove the efficacy of the diphtheria toxoid. While physicians were aware of the preventative capacity of the toxoid, it had only been tested on small cohorts and largely under strictly controlled conditions. FitzGerald's initial tests were also limited, with a small number of employees at the Connaught Laboratory receiving one dose.[226] The results of the initial tests were promising and prompted the initiation of larger trials among those living in institutions and schools.[227] In the Essex Border Municipalities in the fall of 1925, the Connaught Laboratories began one of the largest toxoid trials. The local board of health for the area began to provide two doses of toxoid to around 7000 school aged children, with another 2000 children immunized by private physicians.[228] The information gleaned from this mass

[224] Mokyr, "Science, Health, and Household Technology: The Effect of the Pasteur Revolution on Consumer Demand," 145.
[225] Nancy Tomes, "The Private Side of Public Health: Sanitary Science, Domestic Hygiene, and the Germ Theory, 1870-1900," *Bulletin of the History of Medicine* 64, no. 4 (1990): 514.
[226] J. G. FitzGerald, "Diphtheria Toxoid as an Immunizing Agent," *The Public Health Journal* 18, no. 5 (May 1927), 207.
[227] FitzGerald, "Diphtheria Toxoid as an Immunizing Agent," 207.
[228] FitzGerald, "Diphtheria Toxoid as an Immunizing Agent," 208.

immunization emphasised that the toxoid rarely caused any severe reactions and that 70 percent of those with two doses of the toxoid were able to obtain full immunity against diphtheria within three months.[229] Notably, FitzGerald was not yet certain regarding the need for a further third dose.[230] This early investigation into the effectiveness of the toxoid reinforced the need for a large scale distribution of the drug and allowed researchers to formulate more specific avenues of investigation. The trial also came to the attention of the Ontario Board of Health, who was so impressed with the results, that they issued a Memorandum about the use of toxoid, and offered to provide it and test materials for free to all of the provinces of Canada. This decision to offer free vaccinations was not universally supported. Many physicians were being paid by their patients for their services, including vaccinations, and saw the introduction of free vaccinations as the removal of an important source of income. In discussions held by the Toronto Board of Health, in the 1920s and 1930s, some private physicians requested that the government only offer free diphtheria vaccines to children whose families were unable to afford the cost of a private physician.[231]

In 1936, FitzGerald reported that further toxoid trials conducted among school children revealed not only that three doses of the toxoid was the optimal number of vaccines to ensure long lasting protection against diphtheria, but that there had also been a marked decrease in the total number of diphtheria infections throughout the city of Toronto since the trials began.[232] Throughout these trials, the toxoid was administered by nurses and doctors working for local

[229] FitzGerald, "Diphtheria Toxoid as an Immunizing Agent," 208.
[230] FitzGerald, "Diphtheria Toxoid as an Immunizing Agent," 208.
[231] March 7, 1927, "Report of the Special Committee RE Toxoid Inoculation," City of Toronto Archives, Series 2244, File 1; "Minutes and related records. - 1927-1931," City of Toronto Archives, 634698-10.
[232] J. G. FitzGerald, "Diphtheria Prevention, Methods and Results," *Canadian Public Health Journal* 27, no. 2 (1936): 53-60; "Minutes and related records. - 1931-1963," City of Toronto Archives, Series 2244, File 2, 634698-11.

boards of health.[233] Additionally, children were not provided the toxoid without the express permission of their parents. In order for any child to receive the toxoid at school, administrators sent home a consent form which parents needed to sign.[234] While the exact numbers of families agreeing to have their children vaccinated is unknown, it is clear that there was a large number of parents who agreed with the Ontario Board of Health's plan to provide largescale vaccination.

It was not only parents and physicians, however, who dictated whether a child should receive the diphtheria toxoid. While the decisions made by children were largely influenced by those around them, a child's agency sometimes put them at odds with their caregivers and the plans of health authorities. In a letter dated 15 February 1940, and sent to a future Toronto Medical Officer of Health, Dr. Pequegnat, it was reported that a child attending the Duke of York School had received a diphtheria vaccine without having a signed consent form.[235] The child, aged six, had responded positively to the name of another student being called to receive their vaccination, after having taken the other student's vaccination card.[236] The child's mother had not agreed to the vaccination because she had been told tales of the potentially severe reactions to the toxoid and had been afraid of what would happen to her child.[237] It is doubtful that the child understood the consequences, both positive and negative, of receiving a vaccine. In fact, they may have taken the vaccination card in order to simply get away from class for awhile or to not be apart from their friends who may have been getting their diphtheria vaccine. While it is impossible to know exactly why the child acted in the way they did, their conscious decision

[233] "Diphtheria Toxoid Programme: Origin and Growth. 1929-1940," City of Toronto Archives, Series 412, File 114.
[234] "Diphtheria Toxoid Programme: Origin and Growth. 1929-1940," City of Toronto Archives, Series 412, File 114.
[235] "Diphtheria Toxoid Programme: Origin and Growth. 1929-1940," City of Toronto Archives.
[236] "Diphtheria Toxoid Programme: Origin and Growth. 1929-1940," City of Toronto Archives.
[237] "Diphtheria Toxoid Programme: Origin and Growth. 1929-1940," City of Toronto Archives.

affected them, their mother, who eventually came to accept the vaccination and seemed to be open to their child receiving another, and the Toronto Board of Health, who were now in the unenviable position of explaining to the mother why her wishes were ignored.[238] No matter how well planned and executed the roll out of the administration of the diphtheria toxoid was, the one variable that neither educational, health institutions nor adults could control was the agency of children.

These trials saw the intersection of physicians, the Connaught Laboratories, and the Ontario Board of Health all of whom worked closely to uncover the most efficient method of controlling diphtheria. The use of public schools provided unique access for researchers to children who were most at risk of falling ill with the disease. With students located in one building for up to eight hours a day, multiple variables that might affect the effectiveness of the toxoid, such as environmental conditions, could be controlled. In addition, the restrictive movements of children in schools allowed those conducting the trials to closely examine the effect of the vaccine, which allowed them to begin filling the conceptual gaps regarding diphtheria and the toxoid. With large numbers of students attending public schools, scientists had access to a larger sample size upon which to base their arguments and results, allowing FitzGerald and his co-workers to present certainty in their conclusions. Certainty meant that people could trust the bacteriological conceptualization of diphtheria, reducing the non-medical public's need to create their own conceptualizations. Until the 1920s, diphtheria rates across the city of Toronto remained relatively high. Once free toxoid vaccinations for children were introduced in 1926, there is an almost immediate reduction every year in the total number of

[238] "Diphtheria Toxoid Programme: Origin and Growth. 1929-1940," City of Toronto Archives.

diphtheria cases in the city.[239] This trend would continue well into the 1940s and 1950s when only a few cases of diphtheria were reported each year.[240] It is perhaps surprising that so many parents were willing to have the government intervene in the health and decision-making process regarding their children, however, when one considers that these parents in the 1930s were children themselves at the turn of the century and were taught the basics of bacteriology by books such as Knight's, it is unsurprising that a generation of individuals who were aware of the importance of bacteriology and the toxoid were more willing to allow their children to be vaccinated.

Chapter 5

Black Diphtheria

The late nineteenth and early twentieth centuries were marked by periods of intense advancement within the field of medicine. Ideas and theories which had until then remained theoretical, such as the "germ theory" were confirmed and led to the establishment of the scientific discipline of bacteriology, which revolutionized medical understanding of disease. Contagious diseases and their bacteria became viewable under the microscope and, as Nancy Tomes shows, the non-medical public gradually learned that "germs" were responsible for many common diseases. These developments helped to pave the way for the discovery and use of the diphtheria antitoxin, and eventually of the TDaP vaccine which is in use today. While the bacteriological revolution altered the ways in which diphtheria was understood by physicians, scientists and the general public, the reality of dealing with an enigmatic disease quickly dashed any hopes of a simple resolution to its spread. Most physicians embraced the simple and

[239] Series 2223, File 1 "Monthly reports of communicable diseases. - 1910-1922," City of Toronto Archives, Series 2223, File 1, 639057-1; "Diphtheria Toxoid Programme: Origin and Growth. 1929-1940," City of Toronto Archives.
[240] "Diphtheria Toxoid Programme: Origin and Growth. 1929-1940," City of Toronto Archives.

predictable explanation for all forms of diphtheria provided by the discovery of the *Corynebacterium diphtheriae* bacterium through the new field of bacteriological studies, and they were confident in the effectiveness of the new anti-toxin. Medical narratives of the disease subsequently took on a more complacent tone than those expressed by the previous generation of doctors who had been forced to watch helplessly as many pediatric patients slowly suffocated.

This analysis of public narratives, however, shows that simultaneous with the popularization of bacteriological logic everyday people increasingly worried about an apparently new, distinct disease called "black diphtheria." In these popular accounts, black diphtheria was more severe and fatal, and it primarily affected adults. Medical and public narratives in this period appear incompatible. Indeed, black diphtheria divided both the public and physicians, many of whom seemingly disagreed on whether it existed at all. What was described as black diphtheria in newspaper reports and private correspondence shared only some symptoms with diphtheria, and the bacterium *Corynebacterium diphtheriae* was only sometimes detected in specimen swabs collected from those cases reported as black diphtheria. Bacteriological techniques were unable to provide a clear determination. Increasingly invested in bacteriological logic, scientists and physicians often assumed it was simply a form of diphtheria that was "black" in the public imagination only. In practice, however, there was no medical consensus on why the enigmatic diphtheria looked and behaved differently across multiple individuals within one outbreak, even if all cases were presumed to share a common bacterial cause. I suggest that this lack of medical consensus created conceptual space for competing and sometimes harmful public narratives to circulate within North American society, which filled gaps in popular new ideas about "germs" with longstanding cultural associations between "black" diseases and deadly, frightening epidemics. As Rosenberg theorized, diphtheria was being reframed

conceptually in ways that were specific to this period, scientifically and socially. As I show below, and as Duffin emphasizes, diphtheria could also be constructed simultaneously as two distinct diseases depending on who was doing the observing and framing.[241] The following historical analysis also shows that gradually physicians did acknowledge black diphtheria as a distinct sub-type of diphtheria, but only once bacteriological results encouraged this path of consideration.

In 1883, *The Weekly Mail* newspaper included a passing mention of black diphtheria outbreak in Ontario in a section called "A Record of the Week's Events in Canada." There was no description of the symptoms of those affected.[242] The earliest detailed discussion of a black diphtheria outbreak that I identified comes from a newspaper article published by *The Globe* in November 1892. According to the report there had been an outbreak of black diphtheria at a worksite near Ottawa.[243] Four men died during the outbreak in the span of one week.[244] Some of the workers decided to quit their jobs and return home rather than risk catching the disease. They conceptualized this disease as very serious with potential harmful effects that were not just physical, but emotional and economic too.[245] The short article hints at a lack of clarity between black versus common diphtheria, describing the outbreak as the former, whereas the workers are listed as having reported the deaths as due to simply "diphtheria."[246] At the same time, it describes some crucial differences between this black diphtheria outbreak and a common diphtheria outbreak. First, for example, the article makes no mention of any children having been

[241] Rosenberg, "Disease in History: Frames and Framers," 2.
[242] "A Record of the Week's Events in Canada-Ontario," *The Weekly Mail*, August 9, 1883, 2.
[243] "Black Diphtheria on the Upper Ottawa," *The Globe*, November 23, 1892, 1.
[244] "Black Diphtheria," 1.
[245] "Black Diphtheria," 1.
[246] "Black Diphtheria," 1.

affected by the outbreak. Indeed, all who died and who fell ill were adults.[247] Common diphtheria did affect adults, which was well known among the public and physicians, but it was also common knowledge that it was not normally as deadly for adults because of their airways. The second difference is the visceral reaction from the other workers to the risks they perceived from black diphtheria. During common diphtheria outbreaks, affected businesses and schools would regularly close, but there was generally no need for vacate the affected area.

While this article on its own is not sufficient to make any definitive remarks regarding conceptual differences between black diphtheria and diphtheria, when contextualized alongside other public narratives, it becomes clearer that there was a popular perception that black diphtheria had a propensity to affect adults over children with deadly results. In almost every outbreak described as black diphtheria that I detected, it elicited visceral reactions from the public, which makes it reasonable to speculate that these cases appeared visibly different to observers than typical cases of common pediatric diphtheria.

An article published in 1899 by the *Evening Star* (precursor of the *Toronto Star*) provides not only important descriptions of black diphtheria, but is evidence that the term was in use internationally. The subject of the article was Prince Hillkoff, a Russian aristocrat who had been exiled from Russia, and who was attempting to lead a persecuted religious community called the Doukhobors to safety in Canada.[248] According to Hillkoff, he lived through outbreaks of many diseases including "diphtheria, black cholera and black diphtheria epidemics".[249] The way Hillkoff's circumstances were described also illuminates another notable aspect of black

[247] "Black Diphtheria," 1.
[248] The Doukhobors were a dissenting and pacifist Christian sect who were fleeing the persecution of Russia's czarist government. J. Russell Elkinton, "Quakers and the Doukhobors," *Friends Journal : Quaker Thought and Life Today*, (November 1995): 16.
[249] "The Day in Paragraph," *The Evening Star*, January 31, 1899, 3.

diphtheria: it was not the only one to be given the descriptive word "black". The use of the word "black" in relation to disease, which is examined in detail below, suggests that there was a commonality between diphtheria cases described as "black" and other so-called black diseases.

In 1907, *The Globe* reported on a common diphtheria outbreak that had occurred in the fall months in Ridgeville, Manitoba. During the outbreak, at least fourteen people had become ill and four had died as a direct result of the disease.[250] Even the health officer for the area, a Dr. O'Brien, became ill with diphtheria.[251] Although this outbreak was reportedly due to the diphtheria bacillus, detected by laboratory tests, the journalist specified that four of the cases observed were due to black diphtheria.[252] Notably, this article refers to a defining feature of black diphtheria, its severity, describing it as "one of the worst forms" of diphtheria.[253] There was no information as to how or why black diphtheria was worse. The fact that they felt the need to separately identify the black diphtheria cases indicates that there were visual clues that could be read by non-medical experts to distinguish between the two forms. These remarks also provide an alternative theory on black diphtheria: that it was a variant of diphtheria. This theory helps to explain why many physicians in this period assumed that when patients and newspapers reported black diphtheria, it was simply some form of common diphtheria. It also elucidates why reactions from the public and health authorities changed very little when compared to their decision-making during common diphtheria outbreaks. With a mix of common and black diphtheria cases reported by the newspaper, during this 1907 outbreak authorities administered the antitoxin where possible and quarantined and placarded houses with sick occupants.[254]

[250] "Diphtheria Epidemic," *The Globe*, November 2, 1907, 2.
[251] "Diphtheria Epidemic," 2.
[252] "Diphtheria Epidemic," 2.
[253] "Diphtheria Epidemic," 2.
[254] "Diphtheria Epidemic," 2.

Mentions of black diphtheria also appear in private correspondence. In a letter written by famed Canadian actor Mary Pickford (nee Gladys Smith) in 1918, and sent to her childhood physician, George Smith, Pickford thanked him for having saved her life as a child. "I still remember my 'Little doctor' and the oranges you brought me," Pickford wrote, "when you made your nightly visits while I had the Black Diphtheria."[255] Unfortunately, Pickford did not include any further details regarding the nature of her illness, but her letter does make clear that her family framed the disease and her illness in very serious terms. For example, she told Dr. Smith that "Mother tells everyone that I owe my life to your skill and unfailing attention."[256] It also confirms that physicians in the late nineteenth and early twentieth century treated patients who conceptualized their illnesses as black diphtheria.[257] Examining how medical doctors perceived this elusive concept is even more challenging.

Descriptions of major outbreaks of black diphtheria in newspapers and individual cases in private letters created a small but fascinating archive of this disease concept. By contrast, physicians and medical scientists writing in English and French left practically no written records regarding its existence. Subsequently, the historian must face these documentary silences. With limited bacteriological knowledge, members of the public relied on friends, families, media reports, and advertising to provide them with a basis upon which they could formulate their own definitions of black diphtheria. A close comparative study of public and medical narratives around black diphtheria cases and outbreaks led me to identify commonalities and divergences that allows me to read and interpret professional medicine's silences on the popular concept of black diphtheria.

[255] 5 September, 1918, "Mary Pickford to George Smith," City of Toronto Archives, SC 276, File 1, Item 1.
[256] "Mary Pickford to George Smith," City of Toronto Archives.
[257] "Mary Pickford to George Smith," City of Toronto Archives.

Recently, historians have analyzed the meaning and function of documentary silences, especially in the archives. While silence itself is noted as being the absence of sound, silence in the archives occurs when there are either intentional or unintentional gaps within records, both written and spoken, which if ignored or explored can alter our perceptions of events. As academic archivists Michael Moss and David Thomas theorize, for example, silences in documents can create confusion for researchers because they can either illuminate a previously unknown area of research, or lead to confirmation bias in which a researcher presumes uncritically that an existing silence or absence confirms their hypothesis.[258] Lilia Topouzova, an assistant professor in History at the University of Toronto, encountered similar silences when investigating the history of the gulags in Communist Bulgaria. While physical records of what occurred in the gulags were purged from the archives, leading to difficulties for historians to piece together a thorough and accurate narrative, Topouzova states that from few records, patterns can still emerge and form the basis of a historian's work.[259] Even when there are no records, the silences can force researchers to explore other avenues of research which can provide new areas of inquiry.[260]

The case of black diphtheria, not previously been analysed by historians, exemplifies why it is important to "leave the gaps open and let the silences speak," according to Topouzova. The lack of medical writing on black diphtheria circumvents the problem of researcher bias because I have found a small number that do mention the concept, which indicates that it was known within the medical community, but for an as yet undetermined reason physicians chose not to

[258] Michael Moss and David Thomas, *Archival Silences : Missing, Lost and, Uncreated Archives* (Abingdon: Routledge, 2021), 11.
[259] Lilia Topouzova, "On Silence and History," *The American Historical Review* 126, no. 2 (2021): 690.
[260] Topouzova, "On Silence and History," 692.

study the disease. Only by reading scientific medicine's silences on the subject can we interpret why black diphtheria loomed so large at a moment when bacteriology was supposed to provide certainty and safety.

Occasionally, members of the medical profession did discuss black diphtheria. Towards the end of the Montreal Medico-Chirugical Society meeting of 1916, for example, a brief discussion ensued between Dr. G. Hall and Dr. H.B. Cushing. Cushing worked at the Alexandra Hospital in Montreal which dealt primarily with infectious diseases.[261] Earlier in the meeting, Cushing had presented his recently published paper on diphtheria treatments. His experiences with the disease thus made him an expert for his contemporaries. After listening to Cushing's presentation, Dr. Hall evidently saw an opportunity to get some clarity on black diphtheria: "There seems to have been a severe epidemic in a certain district of the city some years ago and the people still talk of it as the "black" diphtheria. I would like to know if this was the haemorrhagic form."[262] From Hall's query, the outbreak left a lasting impression upon the population of Montreal, an effect which only severe diphtheria outbreaks produced. Severity and black diphtheria again appear to cluster together. In addition, Hall's question is further evidence that doctors continually encountered the concept of black diphtheria among the patients and populations they served, even if they did not recognize it as a distinct disease in medical journals and textbooks. Moreover, Cushing did not ask Hall for a description or clarification, nor does Hall feel the need to provide one. If these physicians had never heard of, or experienced cases of black diphtheria, then this silence in their exchange would not exist. The question also indicates that while physicians may have heard about black diphtheria from patients, there were no

[261] H.B. Cushing, and E.V. Murphy, "Treatment of Diphtheria at the Alexandra Hospital, Montreal," *Canadian Medical Association journal* 6, no. 9 (1916): 817.
[262] "Medical Societies," *Canadian Medical Association Journal* 6, no. 9 (1916): 861.

published resources readily available which provided a description of its etiology, clinical presentation, and relevant diagnostic tests. If Hall had known exactly what black diphtheria was, or was able to look it up in a textbook or medical journal, he would have had no need to ask Cushing about the nature of the disease at the society's meeting.

Cushing's reply exemplifies how the medical community interpreted the term black diphtheria: it was "a popular term of course".[263] This response is in line with the very few other written references in medical publications which all tend to dismiss the concept and mention it only in passing. Cushing further stated that cases of so-called black diphtheria were "undoubtedly" haemorrhagic cases of diphtheria, as Hall had suggested.[264] While Cushing presented his answers with authority and certainty, he seems to doubt his own statements. His first sentence is structured in such a way that it leads the reader to understand that although most cases described as black diphtheria by patients or newspapers were likely to be haemorrhagic, some cases labelled as black diphtheria did not fit into this second category.

This exchange between Cushing and Hall in 1916 reveals that there was existing medical knowledge about a severe haemorrhagic form of diphtheria, but it was minimal.[265] For instance in 1895, two English physicians published their notes of 58 cases of haemorrhagic diphtheria in the *British Medical Journal*, noting "This variety of the disease is but scantily described in the literature of diphtheria, though most writers on the subject have recognised its extreme

[263] "Medical Societies," 862. Dr. FitzGerald also briefly mentioned black diphtheria, see J.G. FitzGerald, "The Future of Public Health," *The Public Health Journal* 19, no. 4 (April 1928): 154.
[264] "Medical Societies," 862.
[265] The haemorrhagic form continued to be identified internationally throughout the twentieth century. In 1984, for example, a report was made regarding two cases of haemorrhagic diphtheria, one of which died. See P. Saguanchua, P. Patamasucon, and S. Yuthasompob, "Hemorrhagic diphtheria," *Southeast Asian Journal of Tropical Medicine and Public Health* 15, no. 2 (June 1984): 261.

malignancy."[266] All of the cases were "easily recognized clinically as diphtheria" by the membrane that formed on the tonsils, uvula or soft pallet in combination with hemorrhagic spots on the skin that looked like "ordinary traumatic bruises".[267] All the cases were "invariably fatal" within 24 to 48 hours of the appearance of hemorrhages.[268]

Fourteen years later, in 1930, Beverly Hannah described the haemorrhagic form in more detail. Hannah was a clinical associate at Connaught Laboratories in Toronto and her characterization drew on a variety of medical textbooks.[269] Haemorrhagic diphtheria manifested itself randomly, Hannah explained, and appeared from the third to seventh day of the original infection from the diphtheria bacillus.[270] Bleeding could occur from the nose, throat, gums, and around the membrane.[271] The spontaneous bleeding in cases of hemorrhagic diphtheria was visually arresting and probably terrifying to non-medical observers (discussed in more detail below). Her description of the disease, however, does not match characteristics in public narratives of black diphtheria. None of the newspapers alluded to spontaneous bleeding when reporting on black diphtheria outbreaks. According to Cushing "the diphtheritic membrane is often black without it being a critical case or the prognosis bad."[272] Insinuating that the hemorrhagic form of the disease may not be black diphtheria. We can also infer from his statement that since the membrane was often black it could be strongly associated with the public's concept of black diphtheria.

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[266] Harold Austen and Harry Cogill, "Notes on Fifty-Eight Cases of Hemorrhagic Diphtheria," *British Medical Journal* 1, no. 1787 (March 30, 1895): 694.
[267] Austen, "Notes on Fifty-Eight Cases of Hemorrhagic Diphtheria," 694.
[268]Austen, "Notes on Fifty-Eight Cases of Hemorrhagic Diphtheria," 695.
[269] Hannah Beverley, "Hemorrhagic Diphtheria," *Canadian Public Health Journal* 21, no. 1 (1930): 9.
[270] Beverley, "Hemorrhagic Diphtheria," 11-12.
[271] Beverley, "Hemorrhagic Diphtheria," 12.
[272] "Medical Societies," 862.

The association between a darkened membrane and popular narratives of black diphtheria is supported by a case that occurred in the United States. In 1922, two scientists who worked for the Texas state government investigated an outbreak of diphtheria that was widely reported publicly as black diphtheria. The investigators observed that the membrane in these cases "appeared in several parts of the throat simultaneously [and] involved an unusual area [and] quickly developed a dirty, black appearance."[273] The tonsils were also "covered with a thin, milky-looking membrane that shaded gradually into tissue that appeared normal without any sharp line of demarcation."[274] Presumably, non-medical onlookers such as family members who cared for the sick also observed the dark colour of the membranes. Nevertheless, the scientists provided no alternative explanation for this atypical, dark appearance of the membrane and tonsils. Their report makes clear that they firmly believed that they were simply dealing with an ordinary outbreak of diphtheria. [275]

Frederick Gavin, a medical student whose 1928 medical doctorate thesis contains a brief mention of black diphtheria, wrote that black diphtheria occurred in severe cases during which there can be a "wide extension of the diphtheritic membrane.[276] The association of the colour, size, or thickness of the characteristic membrane with black diphtheria allow us to make a supposition regarding why the public may have given the disease this name. If the membrane prevented individuals afflicted with diphtheria from breathing properly, the cells in the membrane may not have been able to obtain the oxygen necessary to continue living, and may

[273] Malcolm Graham, and E. H. Golaz, "Milk-Borne Diphtheria," *Journal of the American Medical Association* 79, no. 16 (1922): 1300.
[274] Graham, "Milk-Borne Diphtheria," 1300.
[275] Graham, "Milk-Borne Diphtheria," 1300.
[276] Frederick William Gavin, "The control of diphtheria with special reference to the Schick test" (M.D thesis., University of Edinburgh, 1928), 2. A medical doctorate thesis is a requirement for the completion of a medical degree.

have eventually died, resulting in necrosis of the membrane. Necrosis often results in the skin turning black due to the accumulation of dead cells. This distinct black colour could have been why some cases were described "black diphtheria". There are problems with this hypothesis too, however, since necrosis is often accompanied by a foetid smell, and as the cases discussed below will clarify, there were no reports of a bad smell in popular accounts of black diphtheria cases. Moreover, I could find no published medical that included necrosis accompanying diphtheria. In addition, necrosis does not explain why newspaper reports of black diphtheria described a disease that did not behave as regular diphtheria cases did.

Many physicians evidently avoided using the term black diphtheria altogether, and instead discussed unique cases of diphtheria. Some of these atypical cases could provide an explanation for why the public embraced the concept of an especially fatal, adult form of black diphtheria. One unique case of diphtheria was reported in the September 1861 edition of the *British American Journal*. In an article extoling the benefits of using quinine to treat pneumonia, the authors mentioned that a 35-year-old patient, who had been ill for a week showed many common symptoms of diphtheria including a fever and a throat which had "the peculiar appearance of diphtheria," that is, the characteristic membrane beginning to form.[277] This patient, however, had one additional symptom that was not typically seen in diphtheria cases: a tongue that was "as black as charcoal."[278] A black tongue would have been a visually visceral image for both medical and non-medical observers. Nevertheless, physicians in this period were more likely to confirm or rule out diphtheria based on whether the bacterium was detected.

[277] "Bloodletting in Pneumonia," *The British American Journal* 2, no. 9 (September 1861): 415.
[278] "Bloodletting in Pneumonia," 415.

Within the public imagination, however, a black tongue in a case of diphtheria would have been worth examining in more detail.

This visceral image raises the possibility that there was a linguistic reason for the popularity and longevity of the concept of black diphtheria within public conversations. As previously mentioned, the word diphtheria was not used in reference to the disease prior to the 1820s. Instead, in accordance with the theories of both Rosenberg and Duffin, various physicians and scientists around the world framed and named the disease in ways that clarified their observations and circumstances.[279] One early name for diphtheria was "black tongue." [280] Nevertheless, this name did not seem to refer any visual clinical sign of diphtheria. Rather, early nineteenth-century black tongue cases and early twentieth-century cases of black diphtheria appear to share only one important similarity: speed. In a report of one patient's death in the nineteenth century, which had been attributed to black tongue, a man of only twenty years old died within thirty-six hours of seeing a physician for a sore throat and fever.[281] Over time, as knowledge of diseases and diphtheria increased, these alternative names for diphtheria slowly began to disappear from the English language. Instead of vanishing, however, the name black tongue may have undergone an evolution over the course of the nineteenth century. By this time, the word *tongue* was no longer useful in identifying diphtheria cases, as the word diphtheria itself was not only able to denote the disease but also the major symptom of the membrane, exhibited by those who were ill. On the other hand, the definition of the word *black* which

[279] "Etymologia: Diphtheria," *Emerging Infectious Diseases* 19, no. 11 (2013): 1838.
[280] Gregg, Rollin R, *Diphtheria: its Cause, Nature, and Treatment* (Buffalo: Matthews Bros. & Bryant, 1880), 2. It is important to note that as black tongue can be referenced as a disease or a symptom, it can be difficult even today to properly identify which disease was being referred to in older texts. For an alternative understanding of black tongue, in which it is believed to be a disease of cattle that has spread to humans please see R. H. Goldsmith, "Some Account of Diphtheria as it occurred at Oakland College (Miss.), and Vicinity," *The American Journal of the Medical Sciences*, no.82 (1861): 392-395.
[281] Gregg, *Diphtheria: its Cause, Nature, and Treatment*, 43.

became associated with ill-boding sentiments, especially during the eighteenth and nineteenth century, represented for the public the fears and concerns they had regarding more severe cases of diphtheria.[282] As a result, with the public's continual need to rapidly identify which type of diphtheria was in their community—which in turn would dictate their responses to the outbreak—the words *black* and *diphtheria* may have been combined in order to allow the non-medical public the agency to differentiate between diphtheria cases without having to wait for a physician or scientist to confirm the disease's identity using a laboratory test.

As with most theories presented regarding the nature of black diphtheria, the notion of black tongue being a precursor to black diphtheria does not satisfy all aspects of the disease. Mainly, this theory fails to account for the fact that, while the term *black diphtheria* was used internationally, *black tongue* seems to have been regionalized to North America. This theory, however, cannot be immediately discounted as there have been other instances in which diseases were given the moniker "black" in order to portray the dangers and unknowns of certain diseases. One of the most well-known examples of this can be found in the linguistic history of the bubonic plague, which affected a multitude of countries, including most of Europe during the fourteenth century. Historians such as Nükhet Varlik, and Ole Jørgen Benedictow, argue that the "black plague" or "black death" did not get these infamous monikers until centuries later. Although there are mentions of a *black* disease in archival records from the fourteenth to seventeenth centuries, it was not until the nineteenth century that the original name of "great death" was regularly replaced with "black death" in historical accounts.[283] Varlik explains "that

[282] Joyce A. Joyce, "Semantic Development of the Word Black: A History from Indo-European to the Present," *Journal of Black Studies* 11, no. 3 (1981): 310.
[283] Ole Jørgen Benedictow, *The Complete History of the Black Death* (Suffolk: Boydell Press, 2021), 4; Nükhet Varlik, "Why Is Black Death Black? European Gothic Imaginaries of 'Oriental' Plague," in *Plague Image and Imagination from Medieval to Modern Times*, ed. Christos Lynteris (Cham: Palgrave Macmillan, 2021), 14.

the blackness of the Black Death is not so much of a colour marker as an emotional one."[284] This emotion, he argues, is tied to Gothic epidemiology, which Varlik explains focuses on death, disease and destruction.[285] The imagery that this Gothic epidemiology raises makes it clear that nineteenth-century Europeans wanted to reframe historical diseases with new names that invoked their emotional value, specifically of fear. By evoking fear, a term such as "black death" provided the general population with a way to separate outbreaks of very fatal diseases from less dangerous, survivable ones. When examined through the lens of the Black Death, and in light of Varlik and Benedictow's linguistic theory of black diseases, it is suddenly clear that the early twentieth-century concept of black diphtheria may not be related to any visual presentation of the disease. Rather, the public narratives of black diphtheria that circulated may be connected to how local populations felt about more severe diphtheria outbreaks, and especially as a way to identify those that were more severe, and fatal, and make decisions accordingly without the assistance of expert physicians and laboratory tests.

As Tomes emphasizes, the public's initial faith in the germ theory of disease was gradual and unstable, and bacteriological logic did not necessarily help the public cope with heightened levels of fear when diphtheria fatalities occurred within their families and communities. The enigmatic nature of diphtheria was reinforced by the bacteriological confusion around the disease, which continued to obstruct any definitive answer from scientific medicine about the existence or significance of black diphtheria.

One clear example of the confusion regarding the exact nature of black diphtheria can be seen in news articles published by the *Toronto Star* and *The Globe* that reported on an

[284] Varlık, "Why Is Black Death Black?," 25.
[285] Varlık, "Why Is Black Death Black?," 19.

outbreak of a mysterious disease which began on April 10 1929 in Ekfrid Township, Ontario. Unlike other reports on black diphtheria cases in which limited numbers of people were affected, the *Toronto Star* reported that a staggering 600 people may have "been in direct contact with [the] rare and malignant germ disease that has already caused four deaths and the illness of perhaps a dozen more."[286] The newspaper's headline warned readers that "Doctors Are Baffled by Unknown Disease." The deaths, which occurred shortly after the outbreak began, included a Ms. Dougald Sinclair, aged 53, and her daughter Barbara Sinclair, aged 18.[287] While attending Barbara's funeral, a 21-year-old man by the name of Daniel Brown was taken ill with the disease and died the next day.[288] Unfortunately, his nine-year-old brother William also contracted the disease and died just six hours after showing symptoms.[289] With three adults and one child dead within a very short period of time, any observer could see that the disease was highly contagious and fatal. These peculiarities of the outbreak differentiate it from a normal diphtheria outbreak, which tends to follow a seven-day time period between the onset of symptoms and death. William Brown's death only six hours after becoming ill was highly unusual, and both non-medical and medical observers knew it. He was not the only person who died very soon after contracting what was quickly labeled black diphtheria.

The Ekfrid outbreak worried both the district medical officer of health and the township medical officer, who both began to rigidly implement healthcare regulations in order to prevent the disease from spreading. According to the *Toronto Star*, these government agents enforced "an almost military discipline on the infected community."[290] Five different schools in the region

[286] "Doctors Are Baffled by Unknown Disease While 4 Persons Die," *Toronto Daily Star*, April 18, 1929, 25.
[287] "Doctors Are Baffled by Unknown Disease," 25; "Mysterious Deaths of Four Near London to be Investigated," *The Globe*, April 18, 1929, 1.
[288] "Mysterious Deaths of Four Near London to be Investigated," 1.
[289] "Mysterious Deaths of Four Near London to be Investigated," 1.
[290] "Doctors Are Baffled by Unknown Disease," 25.

were closed; churches were prevented from conducting public services; and public meetings were banned until they could gain control over the disease.[291] This government response to a "mystery disease" for which they had no name yet is one which is not always seen with diphtheria outbreaks.[292] For example, schools were not normally closed unless an infected child had attended class. The bans and restrictive measures instituted in Ekfrid were unique in their severity if the agencies thought that they were dealing with common diphtheria. The Provincial Department of Health also prepared for the worst by getting ready to send both the antitoxin and medical personnel in the form of doctors and nurses to the area.[293] This outbreak thus brought together all levels of government to prevent its transmission, something that was not typical in response to a localised diphtheria outbreak. The decisions and actions of the health departments indicate that they, at the very least, were quite concerned (perhaps fearful) that they were dealing with a very severe and fatal disease for which they would be unprepared to cope. As a result, they responded aggressively.

Another decision undertaken by the health departments caused concern among the public in Ekfrid Township. After an emergency meeting of the township's board of health to discuss the disease, government authorities decided that "immediate inoculation of all those who have come in contact with cases, or suspected cases, is recommended and may be made compulsory."[294] Those cases identified through contact tracing would be inoculated with "anti-diphtheric toxins."[295] Newspapers described the government's decision to make inoculation for diphtheria potentially obligatory as "ominous."[296] Decisions undertaken by the government were thus not

[291] "Doctors Are Baffled by Unknown Disease," 25.
[292] For similar responses to the appearance of black diphtheria in communities see "Black Diphtheria Outbreak Closes Up School and Fair," *The Globe*, September 24, 1925, 3.
[293] "Doctors Are Baffled by Unknown Disease," 25.
[294] "Doctors Are Baffled by Unknown Disease," 25.
[295] "Doctors Are Baffled by Unknown Disease," 25.
[296] "Doctors Are Baffled by Unknown Disease," 25.

always in accordance with what the public thought should be done. Yet, even here when dealing with a disease that the public nor the healthcare departments knew exactly what it was, the typical roles and responsibilities that were expected of each group continued. We do not see the same inverting of responsibilities that other diphtheria outbreaks caused with society. The government's role as healthcare provider and investigator of potentially deadly diseases continued unabated, as did the public's role as local caregivers and implementers of governmental policies.

It is difficult to pinpoint the exact nature of the outbreak in the small township of Ekfird which frightened and confused so many. While it is clear from the reaction of the health agencies to propose mandatory inoculation with diphtheria antitoxin that they suspected it was an outbreak of diphtheria, not everyone in the medical community agreed. Doctors and nurses observed a wide variety of clinical presentations and symptoms exhibited by the approximately 600 individuals who got sick. According to the *Star*, the disease included "the presence of the black spots on the skin."[297] *The Globe*, however, made no mention of black spots and instead stated: "In all cases a septic throat condition has been the outstanding symptom."[298] The variation in potential symptoms created a problem for both physicians and the public. Without being able to identify one symptom which linked all the cases, the public would have had a difficult time properly identifying what disease was circulating within their communities. This would result in delays in accessing proper treatment, since parents and family members who were the first observers may not have realized the severity of the disease and postponed calling the doctor. Delayed medical care could have led to higher mortality rates.

[297] "Doctors Are Baffled by Unknown Disease," 25.
[298] "Mysterious Deaths of Four Near London to be Investigated," 1.

For physicians, the ramifications of having widely different symptoms for the same disease, were similarly perilous. Without a way to identify and diagnose the various diseases that were affecting their communities, doctors were unable to respond quickly in the face of an outbreak. This in turn would not only delay the application of proper treatment, but it would also cause them to not seek help from the health departments immediately, leading once again to a longer transmission time. Since during the Ekfird outbreak, it became clear that physicians could not rely on visible and characteristic symptoms to provide them with a definitive diagnosis, they turned to bacteriological analysis for answers. Cultures of blood and sputum were taken from sick persons in the hopes of gaining a positive identity for the disease.[299] None of the newspapers reported the results of these analyses.

Without any immediate scientific confirmation regarding the cause of the disease, physicians began speculating about its origins. According to the *Toronto's Daily Star* reporter, some doctors believed that the outbreak could have been caused by one of "three virulent diseases, black diphtheria, black smallpox [or] meningitis."[300] Other physicians, according to *The Globe*, thought that it was due to ""a virulent type of typhoid fever".[301] Though these diseases have very different symptoms, the notion for some physicians that it was a black smallpox epidemic may have originated due to areas around the township which were dealing with a confirmed smallpox outbreak.[302]

Eventually the evidence pointed so strongly in favour of the diphtheria bacillus being the cause of the outbreak that Dr. Forbes Godfrey, the Ontario Minister of Health stated: "I

[299] "Doctors Are Baffled by Unknown Disease," 25.
[300] "Doctors Are Baffled by Unknown Disease," 25.
[301] "Mysterious Deaths of Four Near London to be Investigated," 1.
[302] "Mysterious Deaths of Four Near London to be Investigated," 1-2.

understand now that diphtheria is accountable."[303] Perhaps due to the understanding that diphtheria was well understood by the medical community, Godfrey believed that an individual had been careless in their understanding of the disease, which had delayed the arrival of the antitoxin, and resulted in further deaths.[304] While Godfrey may have wanted to release such a definitive statement in the hopes of alleviating the concerns of the public, and restore faith within public health authorities, he ignored that his own Deputy Minister of Health, Dr. W.J. Bell, who is reported to have said that the disease in Ekfrid Township may have been either black diphtheria, black small pox, or meningitis.[305] The confusion surrounding the outbreak is due to the enigmatic nature of diphtheria. In order to be effective at combating this disease, society needs to agree upon the basic tenets of what constitutes a disease. The cultural and bacteriological construction of diphtheria, and the resulting diversity of opinions can cause behaviours to alter from person to person, meaning that a community may never unanimously agree on the type of behaviour or reaction required to correctly identify diphtheria and prevent its spread. Specifically in this case, the unwillingness of physicians to understand the social construction of black diphtheria provided by the public, led to, as Dr. Godfrey implied, higher death rates, as uncertainty over the nature of the disease translated into uncertainty over the cure. Getting the cultural construction of a disease wrong can be fatal.

While an origin for Ekfrid Township's 1929 outbreak was provided by laboratory science, another case of supposed black diphtheria was connected to a different disease. On 19 June 1929 in Stratford Ontario, it was reported that a woman, Mrs. Gordon McCarthy died due to black diphtheria.[306] Unlike the other occurrences of the disease, it was believed that Mrs.

[303] "Mysterious Deaths of Four Near London to be Investigated," 2.
[304] "Mysterious Deaths of Four Near London to be Investigated," 2.
[305] "Doctors Are Baffled by Unknown Disease," 25.
[306] "Black Diphtheria Fatal to Woman," *The Globe*, June 19, 1929, 1.

McCarthy had originally been suffering from quinsy which had developed into a form of black diphtheria.[307] What is curious is that quinsy and diphtheria are very different diseases. Quinsy is defined as being a collection of pus that forms near the tonsils that can lead to the appearance of a bulge on one side of the palate.[308] How black diphtheria could have developed from quinsy was and is unknown. Newspaper reports such as these continued to raise the question of whether black diphtheria was a subtype of diphtheria, or if it was a distinct disease with its own variation in terms of severity and interaction with other diseases.

Two aspects of black diphtheria reported within almost all public narratives was its speed and lethality. As seen earlier in Ekfrid Township outbreak, many of those who became infected were sick for an extraordinarily short amount of time before they died. This feature of the disease was often mentioned in other cases called black diphtheria. For example, Walter Thompson was a five-year-old boy who lived in Campbellford, Ontario. In 1922, he was sick with black diphtheria.[309] He first became ill around 10 p.m. one Saturday and died between the hours of 9 and 10 a.m. the next day.[310] The speed of the disease translated into a rapid reaction from his parents and the public. While most burials were conducted a few days after the death of a loved one, Thompson's burial occurred at 4pm on the day of his death.[311] By contrast, the gradual onset of typical pediatric cases of common diphtheria left caregivers enough time to try domestic remedies and, if those did not work, call for the local doctor. Public narratives of black diphtheria, emphasize how there was no time to make treatment decisions, which in turn prevented individuals from experiencing the positive or negative effects of their decisions.

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[307] "Black Diphtheria Fatal to Woman," 1.
[308] I. Mohamad and Aa Yaroko, "Peritonsillar swelling is not always quinsy," *Malaysian family physician : the official journal of the Academy of Family Physicians of Malaysia* 8, no.2, (2013): 53.
[309] "Blame Black Diphtheria For Death of Little Boy," *The Globe*, December 28, 1922, 2.
[310] "Blame Black Diphtheria For Death of Little Boy," 2.
[311] "Blame Black Diphtheria For Death of Little Boy", 2.

Though decision making is at the heart of both the public and scientific interaction with diseases, the perceived threat of black diphtheria complicated those choices.

On 11 December 1931, *The Globe* newspaper reported another case of black diphtheria that not only illustrates the rapidity associated with it, but also provides further information regarding its popular conceptualization. From August to December 1931, the community of St. Thomas in Ontario recorded eight deaths from diphtheria or septic sore throat.[312] The latest victim was a twelve-year-old boy who had only been ill for twenty-four hours.[313] His death showed swiftness and lethality, prompting physicians to reportedly state that they believed the disease "is much like the black diphtheria."[314] As with the outbreak in Ekfrid Township, specimen swabs were taken from the sick boy's throat in order to hopefully gain a positive identification of diphtheria. When examined, the cultures revealed that the disease was "a combination of streptococcus and diphtheria."[315] Notably, this was not the first time a link between black diphtheria and the interaction between diphtheria and streptococcus was observed by medical science using laboratory testing. During the outbreak in Ekfrid Township, it was also reported that black diphtheria was "a form of blood-poisoning, attended by erysipelas."[316] Erysipelas has been described as "an acute bacterial infection of the dermis and hypodermis that is associated with clinical inflammation."[317] The disease "is generally caused by group A streptococci."[318] This revelation regarding potential interactions of the diphtheria bacillus and

[312] "Ill Only One Day, Boy Eighth To Die Of Throat Malady," *The Globe*, December 11, 1931, 3.
[313] "Ill Only One Day," 3.
[314] "Ill Only One Day," 3.
[315] "Ill Only One Day," 3.
[316] "Mysterious Deaths of Four Near London to be Investigated," 1.
[317] Jean-Marie Bonnetblanc and Christophe Bédane, "Erysipelas: Recognition and Management," *American Journal of Clinical Dermatology* 4, no. 3 (2003): 157.
[318] Bonnetblanc, "Erysipelas: Recognition and Management," 157.

streptococci would prove crucial to clarifying from a bacteriological perspective a disease that the public had observed, framed, and named as black diphtheria much earlier.[319]

When we compare some of the characteristics of gravis diphtheria, a diphtheria biotype, it is soon seen to be one of the most probable explanations for the popular conception of black diphtheria. The symptoms of this biotype included some not always seen in less severe cases, such as vomiting, high fever, swollen tonsils, cyanosis, and cardiac failure.[320] In addition, the gravis form could have a little to non-existent pseudo membrane.[321] As previously mentioned, this presentation of symptoms that was atypical of common diphtheria would have made it difficult for both physicians and family members to quickly identify the illness as diphtheria, especially if they had only dealt with the milder form.

One symptom associated with gravis diphtheria provides yet another explanation for how black diphtheria got its name: cyanosis. Cyanosis occurs when a decrease in oxygen in the bloodstream causes the skin to take on a blue-purplish hue. This strange appearance of the skin would be visible to caregivers and the public who may have interpreted the blue-purple hue as black areas on the skin. This is by no means definitive; however, it may very well explain how people of various backgrounds and in different countries all gravitated towards calling this presentation of diphtheria "black". Many of those who fell ill with the gravis biotype were older children and adults, compared to the younger patients which were observed in more mild

[319] A more recent scientific article investigated the potential connection between diphtheria and streptococci. While the authors did not discuss a direct relationship between the two diseases, they found that a diphtheria toxoid could impart some immunity against group A streptococcus, indicating that the two diseases may interact with each other to a certain degree; Michael R Batzloff et al., "Protection Against Group A Streptococcus by Immunization with J8-Diphtheria Toxoid: Contribution of J8- and Diphtheria Toxoid-Specific Antibodies to Protection," *The Journal of Infectious Diseases* 187, no. 10 (2003): 1598-1608.
[320] Martin Frobisher, "The Etiology of Malignant Diphtheria," *American Journal of Public Health and the Nation's Health* 33, no. 10 (1943): 1244.
[321] Frobisher, "The Etiology of Malignant Diphtheria," 1244.

cases.[322] In addition, as seen in the examples of black diphtheria outbreaks and cases that I have examined, deaths due to the gravis biotype typically occur within 24 to 72 hours after symptoms.[323]

Gravis diphtheria does deviate from most descriptions of black diphtheria in one important aspect. Though most physicians thought they could cure cases of so-called black diphtheria through the administration of the diphtheria antitoxin, use of the antitoxin during a gravis biotype case was often ineffective.[324] This more aggressive nature of the gravis biotype would also explain the zealous response from the public to black diphtheria cases. For example, when the twelve-year-old boy died in St. Thomas in 1931, not only was his classroom closed for fumigation, but all the school books that he had used were destroyed.[325] The Board of Health also passed a "resolution warning against social gatherings" and emphasized to the public the importance of taking all possible preventative methods, including preventative immunization.[326] My suggestion that malignant or gravis diphtheria was conceptualized in public narratives as black diphtheria is given further legitimacy in a 1923 publication produced by the Education Department of Los Angeles, California. The book includes a section on "malignant diphtheria (black diphtheria)" and this paired terminology confirms the connection in publicly available information. The definition provided explains that the onset of the disease is swift and the effects severe.[327] In addition, death may occur within a day or two after infection.[328] This definition, while mirroring the behaviour of suspected black diphtheria cases, does not explain why the

[322] Frobisher, "The Etiology of Malignant Diphtheria," 1244.
[323] Frobisher, "The Etiology of Malignant Diphtheria," 1244.
[324] Frobisher, "The Etiology of Malignant Diphtheria," 1244.
[325] "Ill Only One Day," 3.
[326] "Ill Only One Day," 3.
[327] Ira W. Drew, ed., *The Osteopathic Treatment of Children's Diseases* (California: The A. T. Still Research Institute, 1923), 676.
[328] Drew, *The Osteopathic Treatment*, 676.

public used the name, nor why the symptoms of the disease seemed to vary so widely. In fact, the definition provides us with new symptoms not previously mentioned, namely, the face becomes pale and swollen, along with a weak pulse, hemorrhaging, nosebleeds, and occasionally blood appearing in stools and vomit.[329] Overall, however, when comparing these historical descriptions of gravis and black diphtheria, there is a similarity which could explain why the public who relied on observation and physicians who increasingly depended on laboratory analysis were at odds regarding whether black diphtheria existed.

The previously mentioned diphtheria outbreak in Austin, Texas in 1922, provides yet another alternative justification for the concept of black diphtheria as distinct from common diphtheria identified by the presence of the *Corynebacterium diphtheriae* bacterium. The outbreak was investigated by George Malcolm Graham and E. H. Golaz. Graham was a researcher who served as director of laboratories for the Texas Health Department and as clinical director for the Rockefeller Foundation's research commission on hookworms.[330] Golaz was a state chemist for the Food and Dairy Department in Austin, and had a vested interest in promoting the quality and purity of food that was being distributed to Texas consumers.[331] In 1914, for example, Golaz spoke to the Texas Federation of Women's Clubs regarding the enforcement of the state's pure food law.[332] His interest in uncontaminated foods was pertinent to his investigation of the outbreak because milk-borne diphtheria was assumed to be the cause.

[329] Drew, *The Osteopathic Treatment*, 676.
[330] Patricia L. Jakobi, "Graham, George Malcolm (1886-1937)," last modified January 1, 1995, https://www.tshaonline.org/handbook/entries/graham-george-malcolm
[331] J.S. Abbott, *Directory of Federal and State Dairy, Food, Drug, and Feeding Stuffs Officials* (Washington: Government Print Office, 1916), 10.
[332] Judith N. McArthur, *Creating the New Woman the Rise of Southern Women's Progressive Culture in Texas, 1893-1918* (Chicago: University of Illinois Press, 1998), 52.

In January and February of 1922, the city of Austin, Texas only experienced 10 diphtheria cases. In March, however, the numbers began to increase dramatically, with eleven new cases by March 20 and another twenty-three cases by March 30.[333] Many of the individuals who had taken ill were students attending the University of Texas who lived together in the same boarding house.[334] This increase was cause for concern because not only was the outbreak more virulent than normal diphtheria, but it had also been described as being "too explosive to be due to ordinary carriers."[335] As in other public reports of black diphtheria, the physical features of the membrane and tonsils of those adults who became sick differed from what was normally observed in pediatric diphtheria. Graham and Golaz seem to have been certain from the beginning that they were dealing with a diphtheria outbreak, and not black diphtheria.[336]

With concern mounting, the University of Texas requested help from the state health department in order to conduct a full investigation into the outbreak. Part of the reason why the two researchers may have been so confident is that incidences of milk-borne diphtheria were relatively common. Notably, there was no direct evidence to lead medical officials at the university to assume that the milk supply from the boarding house had been infected with the diphtheria bacillus.[337] Publicizing the connection between diphtheria and milk, however, supported the push of scientists and government officials to get members of the public to accept the pasteurization of milk.[338] As will be seen, however, their focus on milk as the cause led

[333] Graham, "Milk-Borne Diphtheria," 1300.
[334] Graham, "Milk-Borne Diphtheria," 1300.
[335] Graham, "Milk-Borne Diphtheria," 1300.
[336] Graham, "Milk-Borne Diphtheria," 1300.
[337] Graham, "Milk-Borne Diphtheria," 1300.
[338] For similar cases of milk-borne diphtheria see Joseph Priestly, "Outbreak of Milk-Borne Diphtheria," *Practitioner* 258, no. 1776 (2014): 38. For more information on milk and food borne diseases, and how in the 1870s, the discovery that they were a public threat, encouraged physicians and scientists to rely on observation and case-tracing, influencing the trajectory of epidemiology see Jacob Steere Williams, "The Perfect Food and the Filth Disease: Milk-Borne Typhoid and Epidemiological Practice in Late Victorian Britain," *Journal of the History of Medicine and Allied Sciences* 65, no. 4 (2010): 514-545.

Golaz and Graham to ignore assessments and concerns among non-medical observers of the outbreak, and it resulted in further confusion regarding the concept of black diphtheria.

Soon Golaz and Graham narrowed their investigation to one dairy, which in their report they named simply as Dairy B which sold their milk unpasteurized.[339] At Dairy B they collected information from the family and workers, noting that the grandchild of the owner "had been ill with throat trouble for some time" and had received "several injections of some kind of medicine."[340] They examined the child and discovered that there was "an extensive, dark, necrotic membrane, occupying both tonsillar fossae and extending posteriorly on the pharyngeal wall."[341] While this description conformed to descriptions of diphtheria and black diphtheria, the investigators made a point of stating that they did not acknowledge that the illness was diphtheria until they received laboratory confirmation.[342]

Once it was clear that the grandchild was infected with diphtheria, Golaz and Graham quickly realized that the child could not have been the source of the outbreak as according to the investigators "the child had not been near the dairy since falling ill and had not handled any tools which were used around the dairy."[343] Most importantly, the child had only become seriously ill on 29 March 29, long after others in the area had already been infected with diphtheria.[344] An investigation of the milker, identified as Mr. S. who had not gotten sick, revealed that he was an asymptomatic carrier of diphtheria after his laboratory results came back positive for the bacterium. He was also discounted by the authors as being the source of infection.

[339] Graham, "Milk-Borne Diphtheria," 1300.
[340] Graham, "Milk-Borne Diphtheria," 1300.
[341] Graham, "Milk-Borne Diphtheria," 1300.
[342] Graham, "Milk-Borne Diphtheria," 1300.
[343] Graham, "Milk-Borne Diphtheria," 1300.
[344] Graham, "Milk-Borne Diphtheria," 1300.

Golaz and Graham turned their attentions to a cow that resided at Dairy B named Humpy. Humpy only had three teats, which had sores on them that were "covered with thick, black scabs".[345] When the scabs were removed they "left a ragged, ulcerated surface that exuded a mucopurulent fluid."[346] The state of the teats differed from the other cows on the farm, who had mostly cuts and abrasions on their udders.[347] Sores on a cow's teat may be due to a multitude of causes, but Mr. S., who milked Humpy and all the other cows on a daily basis, reported that he was taken aback by the sores on Humpy because they "did not heal like the sores on other cows."[348] His surprise at the sores indicates that they were not due to any disease that a dairy farmer would normally come across, such as bovine mastitis.[349]

As with the investigation into the child's illness, in order to positively identify the disease causing the strange symptoms in Humpy, Golaz and Graham turned to laboratory analysis. Cultures made from the specimens collected from the sores on Humpy's teats tested positive for the diphtheria bacillus also detected in the cultures analyzed from the grandchild and Mr. S.[350] In addition, diphtheria bacilli were discovered in samples taken from Humpy's milk.[351] With this positive confirmation of the disease which afflicted Humpy, more of diphtheria's enigmatic nature is slowly revealed. Diphtheria's zoonotic ability made it difficult for investigators to trace the origin of one outbreak and contain it in order to prevent another.[352] As seen in this Austin outbreak, both the health department and the public needed to be watching for both classical and

[345] Graham, "Milk-Borne Diphtheria," 1300.
[346] Graham, "Milk-Borne Diphtheria," 1300.
[347] Graham, "Milk-Borne Diphtheria," 1300.
[348] Graham, "Milk-Borne Diphtheria," 1300.
[349] For information on bovine mastitis see Wei Nee Cheng, and Sung Gu Han, "Bovine mastitis: risk factors, therapeutic strategies, and alternative treatments - A review," *Asian-Australasian Journal of Animal Sciences* 33, no. 11 (2020): 1699-1713.
[350] Graham, "Milk-Borne Diphtheria," 1300.
[351] Graham, "Milk-Borne Diphtheria," 1301.
[352] For further information on the zoonotic ability of diphtheria see Andreas Hoefer et al., "Zoonotic Transmission of Diphtheria from Domestic Animal Reservoir, Spain," *Emerging Infectious Diseases* 28, no. 6 (2022): 1257-1260.

unusual symptoms of diphtheria in humans, and potential diphtheria symptoms in animals, which as seen in Humpy's case varied quite a bit from the symptoms expressed in humans.

Uncovering a potential source for the outbreak did not improve the air of confusion surrounding the situation, as questions still remained regarding when and how the cow became sick. Mr. S. told the researchers that he noticed the sores on the cow on 1 February.[353] Later, however, he changed his mind and stated that the cow had had the strange "sores on her teats when he first came to work for the dairy, January 10, and that before January 1 this herd had been milked by Mr. M., his wife and child".[354] Even if we accept the implied notion from Mr. S that he was not the person who gave Humpy diphtheria, and instead it was Mr. M, neither of his statements provide a timeline that match the epidemiology of common diphtheria or black diphtheria. As mentioned, diphtheria follows on average a seven-day period from time of infection to resolution, and as seen in supposed black diphtheria cases, it acts even faster. For the majority of cases to have occurred towards the end of March, those who became ill must have been infected within the previous week or two. Golaz and Graham were also at a loss to explain the lack of a coherent timeline, and as often occurred with perplexing questions about diphtheria outbreaks that made little epidemiological sense, they did not attempt to provide an explanation for this discrepancy.

Golaz and Graham then turned their attentions to Mr. M. and his new place of work, a dairy, identified as Dairy Z.[355] During the early part of their investigations, they had not suspected that the outbreak could have originated from this dairy. As soon as Mr. S., however, declared that Humpy had been milked earlier in the year by Mr. M., "two new cases of diphtheria

[353] Graham, "Milk-Borne Diphtheria," 1300.
[354] Graham, "Milk-Borne Diphtheria," 1301.
[355] Graham, "Milk-Borne Diphtheria," 1301.

were reported among the customers of Dairy Z".[356] Graham and Golaz began investigating Dairy Z and its workers. The cows at this dairy all tested negative for diphtheria, as did all the employees except for the milker Mr. M.[357] The investigation casts doubt on the point of origin for the two cases reported to have come from Dairy Z. Yet the authors made no mention in their published report of having identified the method of transmission.

Another question that went unanswered relates to a physical change noted by Golaz and Graham between those who had fallen ill initially and those who got sick later during the outbreak. In the later cases, they observed, "the membranes appeared more like the usual type" and were much milder.[358] While they described and investigated the cases as a single outbreak, this difference in the presentation and behavior of the disease suggests that the earlier cases may have been gravis diphtheria or diphtheria-streptococcus. The early cases were described as being more virulent and causing abnormal membrane formation. In other words, the terrifying disease that the public had framed and named as black diphtheria. As time went on, however, the first wave of black diphtheria cases abated, which may have created an opening for the milder common diphtheria to infect the rest of the population. As seen through the previously mentioned examples of black diphtheria cases, this is not the first time black and common diphtheria appeared at the same time in a community. While at times confusing, this Austin outbreak reinforced the idea that black diphtheria, no matter its etiology or laboratory explanation, represented an especially virulent and fatal form of diphtheria which could coexist with common diphtheria.

[356] The timing of the appearance of the two cases is odd considering there had been no indication that Dairy Z was a potential source of diphtheria. Graham, "Milk-Borne Diphtheria," 1301.
[357] Graham, "Milk-Borne Diphtheria," 1301.
[358] Graham, "Milk-Borne Diphtheria," 1301.

From the black diphtheria cases mentioned throughout this section, it is clear that the enigmatic nature of diphtheria allowed for various conceptualizations of the disease to appear in both public and medical imagination. The conceptualizations and experiences of each individual reinforced their beliefs that they were correct in identifying black diphtheria as either a new disease or simply another type of diphtheria. This led to the reframing of diphtheria according to new conceptual bacteriological understandings, as Rosenberg suggest and as Duffin presents, simultaneously by each observer. [359] While in popular accounts, black diphtheria was viewed as more severe and fatal, and primarily affecting adults, the medical community emphasized and popularized their bacteriological findings often at the expense of physical observation. This led to disagreements and uncertainty within the medical community, who the public relied on to direct their own reactions and opinions of contagious diseases. The introduction and use of the diphtheria toxoid led to a decrease not only in diphtheria cases, but also in black diphtheria, leading to questions relating to diphtheria's enigmatic nature remaining unanswered.

Conclusion

The arrival of bacteriology in the late nineteenth century has often been described as a "revolution" in medicine. Diseases now had identifiable causes and a slew of discoveries regarding the nature of disease promised to allow North American society to control and eradicate illnesses that had terrified communities for generations. Many were quick to adopt and incorporate bacteriological concepts in their daily lives. This is seen most readily with Ontario government and health officials, who ensured bacteriological concepts formed part of government policies and laws. Bacteriology also allowed for communities to undertake

[359] Rosenberg, "Disease in History: Frames and Framers," 2.

preventative rather than reactionary approaches to disease, leading to a noticeable reduction in the number of contagious disease cases.

The nature of diseases such as rabies and even diabetes were no longer enigmatic due to bacteriological discoveries. Had the rural Ontario physician James Miles Langstaff practiced medicine later in the century, guided by the principles of bacteriology, his decision-making for a pediatric diphtheria case may have even followed a different path. His first treatment of choice would likely have been the affordable anti-toxin developed by John FitzGerald. Had that failed and an emergency tracheotomy was necessary to unblock the airway, post-operative infection would have been understood and controlled.

Despite the hope that the nature of all disease would soon be resolved, the discoveries made by the field of bacteriology, placed conceptual blinders on physicians and medical scientists who became dependant upon a laboratory analysis to confirm a diagnosis of diphtheria. Patients were seen as receptacles of disease-carrying bacteria that needed to be controlled according to the logic of bacteriology, rather than as individuals whose agency could help reveal their illness. This focus on bacteriology meant that physicians remained unable to explain why diphtheria symptoms and mortality rates were unpredictable. Despite their best efforts, the nature of the disease remained enigmatic, creating a conceptual space for multiple simultaneous social constructions. With each individual holding onto the belief that they had correctly conceptualized the disease, and no single voice emanating as the authority on diphtheria, people began to distrust health officials who seemed, in the case of black diphtheria, to ignore the fears and concerns of the public. This variety of contradictory conceptualizations, some based on bacteriological theories, had social consequences that temporarily disappeared only once the disease was controlled through the introduction of the toxoid.

In the first chapter, I discussed how bacteriology led to new discoveries regarding diphtheria which allowed people to identify and name the disease. Discoveries regarding the antitoxin and toxoid soon followed. While most physicians were focused on the medical requirements of their communities, others such as FitzGerald understood that the only way in which a community could control diphtheria was through the free distribution of preventative medicines, such as the toxoid. FitzGerald's work fundamentally altered Ontario's relationship with diphtheria.

The second chapter explored how health officials, and families reacted to the appearance of diphtheria within their communities when bacteriology and physicians could offer little help. With physicians often relegated to the position of bed-side observer, many parents turned to their faith and religious leaders. In Ontario, various religious organizations began to take on the role of physician, including Catholics, Protestants and Christian Scientists. Each religious order conceptualized the enigmatic nature of diphtheria differently, allowing parents to choose which organization was best aligned with their own understanding of contagious diseases. Catholics and Protestants, often sisters, found themselves forming close bonds with physicians and public health officials, and supporting them when they were unable to properly respond to a patient suffering from diphtheria. Christian Scientists, had viewed the disease in terms other than bacteriological, which often placed them at odds with the medical and local government institutions.

The third showed that the open conceptual space allowed businesses, through trustworthy medical advertisements, to provide new alternative diphtheria cures. These cures, at a reduced rate, allowed parents to fulfill the role of observer, physician and pharmacist. By relying on traditional gendered roles, medical advertisements reflected the concerns of the public in regards

to the notion of the independent family unit and government and physician interference. They also reflected the health beliefs of the populace and could influence those same beliefs through promoting certain cures, whether backed by bacteriology or not.

The fourth chapter investigated the dichotomy of schools. While provincial and local governments altered their messaging regarding diphtheria, and students began learning about the bacteriological concepts of the disease, the latter were at risk of contracting a disease in an environment that remained precarious for their health. Educational institutions brought all individuals involved with the control of diphtheria; parents, governments, education and health members, and children, together in an environment where each had their own agency. Within this environment, new discoveries were made regarding diphtheria, which led to its successful control in Ontario. Additionally, a close examination of schools allows us to see the agency of children, an often forgotten and difficult to analyse historical actor.

The hope that bacteriology had instilled in many was quickly dashed in Chapter 5, when the public began talking about a disease they had named "black diphtheria". While the non-medical public conceptualized the symptoms and behaviours of black diphtheria as belonging to a new disease, public health authorities and physicians tended to reject this notion. Discussions surrounding black diphtheria were one of the first instances in which the concepts of bacteriology and laboratory analysis were truly tested within the public sphere. Diphtheria's enigmatic nature meant that whatever method of testing for black diphtheria was available, it only served to reinforce the conceptualization that each observer had already formed. Laboratory analysis, for example, only reinforced the physicians' opinion that black diphtheria was simply a popular name given to more virulent diphtheria cases. The inability of bacteriology to

conclusively provide answers to the enigmatic nature of diphtheria, allowed questions surrounding black diphtheria to remain unanswered.

Overall, over the course of the twentieth century Ontarians were able to reduce the mortality rate of diphtheria and control its spread. Preliminary research beyond the scope of this thesis, however, has revealed that diphtheria's enigmatic nature needs to be revisited in light of the discovery that, historically, Indigenous and Black people in Canada and the United States forged their own unique relationships with the disease. These unique relationships reveal that Indigenous communities in Canada continued to suffer from outbreaks of the non-toxic strain of the disease decades after the introduction of the antitoxin and vaccine, and that Black communities in the United States, never experienced the same large-scale outbreaks as had been seen in predominantly white localities.

In Canada, there is no evidence that Indigenous communities suffered from diphtheria prior to the arrival of European settlers.[360] It is only in the nineteenth century, with the establishment of residential schools for Indigenous children that cases of diphtheria began to be reported. Importantly, these institutions were built with little to no consideration for sanitation and with limited access to medical care, based on the racist notion that Indigenous bodies were inherently dangerous carriers of disease that threatened white bodies.[361] Perhaps due to diphtheria's enigmatic nature, the federal government had no consistent policy regarding how it should approach diphtheria outbreaks among Indigenous children, leading to diphtheria cases

[360] Liza Piper, "Diphtheria Antitoxin and Tales of Mercy in Northern Health Care," *Canadian Bulletin of Medical History* 38, no. 2 (2021): 290; James V. Fenelon, "The Haunting Question of Genocide in the Americas," *Great Plains Quarterly* 35, no. 2, (2015): 208.
[361] Megan Sproule-Jones, "Crusading for the Forgotten: Dr. Peter Bryce, Public Health, and Prairie Native Residential Schools," *Canadian Bulletin of Medical History* 13, no. 2 (1996): 215-216; Maureen K. Lux, "Care for the 'Racially Careless': Indian Hospitals in the Canadian West, 1920-1950s," *The Canadian Historical Review* 91, no. 3 (2010): 414-416; Mary Ellen Kelm, "Diagnosing the Discursive Indian: Medicine, Gender, and the 'Dying Race," *Ethnohistory* 52, no.2 (Spring 2005): 396.

appearing among Indigenous children long after the diphtheria antitoxin had been in use.[362] Once technological improvements to identify toxic and non-toxic diphtheria appeared, it became clear that Indigenous children, in Northern Canada, were more at risk of suffering from the non-toxigenic forms of the disease, including non-toxic respiratory and cutaneous diphtheria.[363] It is currently unclear whether there is an environmental or physical factor influencing how diphtheria interacts with Indigenous communities. In order to fully understand diphtheria's enigmatic nature, however, researchers will need to explore this question further, because if there is an undiscovered extraneous factor, it could affect how medicine and science understand diphtheria and how governments and communities prevent future outbreaks.

Throughout the nineteenth and twentieth centuries, Black communities in the United States often found themselves subjected to social, economic and housing disadvantages, including being regularly denied access to clean water, functioning public sewers and forced to live in cramped conditions.[364] Within such environments, diphtheria should have spread rapidly, and had a high mortality rate, especially since Black patients were often unable to afford the cost of the diphtheria antitoxin, leading them to rely on a private physician to supply them with the life saving dug.[365] As early as 1910, however, Black physicians observed that Black communities were not affected by diphtheria at the same rate as was being reported by

[362] It is of note that unlike the rest of the population, Indigenous lives and healthcare were dictated by federal government policy, which removed the ability of Indigenous parents to make decisions regarding their children's lives and health. *Canada's Residential Schools: The History, Part 1 Origins to 1939 : The Final Report of the Truth and Reconciliation Commission of Canada* Volume 1, (Published for The Truth and Reconciliation Commission of Canada by McGill-Queen's University Press, 2015), 443; Claude E. Dolman, "The Donald T. Fraser Memorial Lecture, Landmarks and Pioneers in the Control of Diphtheria," *Canadian Journal of Public Health* 64, no. 4 (1973): 317.
[363] J. M. S. Dixon, "Diphtheria in North America," *The Journal of Hygiene* 93, no. 3 (1984): 419; 424.
[364] Tomes, *The Gospel of Germs*, 227; 233.
[365] "The Price of Diphtheria Antitoxin," *JAMA XLII, no. 4 (1904)*: 249.

physicians who cared for white patients.[366] Physician Charles Victor Roman, the first editor of the *Journal of the National Medical Association* (the National Medical Association was founded by Black physicians who were barred from joining the American Medical Association), and founder and head of the Department of Ophthalmology and Otolaryngology at Meharry Medical College, noted that for diphtheria, the Black community "had less than his share". [367] The *Journal of the National Medical Association* was also conspicuous by its lack of articles discussing diphtheria. During its first forty years of publication, beginning in 1909, the journal covered various healthcare topics which greatly affected Black families, and yet published only one article devoted to the disease.[368] As with Indigenous communities, there is little to no explanation for why Black people seem to have a more robust immunity against diphtheria. One article from 1934 which attempted to explore this question found that the environment did not seem to be a deciding factor, and the author concluded that more research needed to be done in order to understand why Black adults and children, contributed to a small fraction of the reported diphtheria cases during an epidemic, though they constituted one third of the population of the county.[369]

These aforementioned relationships further reveal that diphtheria is a complicated disease whose enigmatic nature has never matched the socially constructed definition provided by medical authorities and the public. In order to make a decision at either a personal or institutional

[366] C.W. Birnie, "The Influence of Environment and Race on Diseases," *Journal of the National Medical Association* 2, no. 4 (1910): 249.
[367] Sheena M. Morrison and Elizabeth Fee, "Charles V. Roman: Physician, Writer, Educator, Historian (1864-1934)," *American Journal of Public Health* 100, no. S1 (2010): S69; C.V. Roman, "A Preventable Death-Rate," *Journal of the National Medical Association* 7, no. 2 (1915): 91.
[368] "Four Hundred Deaths from Diphtheria," *Journal of the National Medical Association* 10, no. 4 (1918): 182-183.
[369] J.B. Black, "A Comparative Study of Susceptibility to Diphtheria in the White and Negro Races," *American Journal of Epidemiology* 19, no. 3 (1934): 734-748. It is of note that Black also discovered that the ages at which Black and white children suffer from diphtheria varies greatly, providing another avenue of research that other academics can pursue.

level regarding how best to react to the appearance of the disease within a community, people need to know how dangerous the disease is for them personally. Assumptions that diphtheria affects everyone equally, no matter their social standing, need to be revisited in light of the new revelations that the enigmatic nature of diphtheria has never been resolved.

Diphtheria is not a disease of the past. Today most North Americans live in an environment where their children and those around them are vaccinated against the disease, in part due to the work of FitzGerald and the Connaught Laboratory. Parents and public health agencies no longer feel the need to discuss at length the dangers of diphtheria and scientific and medical communities do not perform large-scale experiments relating to the disease. By all appearances, it would seem the disease has been successfully "conquered". This illusion of security and poor understanding of a contagious disease puts us at risk for another diphtheria outbreak. On 4 January 2021, an article published in the *Canadian Medical Journal* reported that an unvaccinated 69-year-old traveler from India to Canada had, prior to boarding the plane, experienced a sore throat, hoarse voice and dry cough.[370] These symptoms were relatively innocuous until 48 hours later, when after arriving in Ontario the traveler began to experience shortness of breath, a fever and diaphoresis.[371] The symptoms worsened and the traveler was admitted to an emergency department, where physicians noticed that the patient had a "slightly swollen neck, no palpable lymph nodes and no stridor."[372] Though these symptoms could have been applied to any number of diseases, the patient mentioned that they felt "something sticking in their throat."[373] This may have been the beginning of the membrane forming, and such a

[370] Scott Cholewa, Fareen Karachiwalla, Sarah E. Wilson, Jeya Nadarajah and Julianne V. Kus, "Fatal respiratory diphtheria in a visitor to Canada," *Canadian Medical Association Journal* 193, no. 1 (2021): E19.
[371] Cholewa, "Fatal respiratory diphtheria in a visitor to Canada," E19. Diaphoresis is sweating generally due to another condition.
[372] Cholewa, "Fatal respiratory diphtheria in a visitor to Canada," E19.
[373] Cholewa, "Fatal respiratory diphtheria in a visitor to Canada," E19.

statement would likely have been a cause for concern for the average North American physician in the late nineteenth and early twentieth centuries. Because nothing was found upon physical examination of the throat, the traveler's complaint seems to have been disregarded by the attending physicians. Eventually the doctors performed radiographs on the patient, which led them to a diagnosis of influenza with concomitant bacterial pneumonia.[374] After a period of 48 hours, however, the traveler died. It was only after laboratory analysis that the cause of death was confirmed as diphtheria.[375] The false sense of security which mass vaccinations provide society and the reliance of physicians on post-mortem laboratory tests to identify diphtheria, suggest that if an outbreak of diphtheria were to occur, our initial social reactions might be too slow to prevent the spread of the disease.

Although international travel could be a cause of future diphtheria outbreaks in North America, most of the cases that have occurred within the past decade in Canada have had unknown, though suspected environmental causes. In January 2020, an adult and child, both unrelated, one of whom lived on Onion Lake Reserve between Alberta and Saskatchewan, and the other in a nearby community, both fell ill with diphtheria around the same time.[376] No information was provided on the symptoms of the child, but the adult was reported to have suffered "skin abrasions".[377] As has now been established by convention with diphtheria, confusion surrounded every aspect of these cases. The provincial government of Saskatchewan and the Regional Health Officer with Indigenous Services, which is part of the federal

[374] Cholewa, "Fatal respiratory diphtheria in a visitor to Canada," E19.
[375] Cholewa, "Fatal respiratory diphtheria in a visitor to Canada," E19.
[376] Kyle Benning, "2 cases of diphtheria reported on Saskatchewan First Nation," *Global News*, last modified January 21, 2020, https://globalnews.ca/news/6439298/indigenous-services-sask-first-nation-rare-disease/ ; Morgan Modjeski, "Some Onion Lake residents say info about diphtheria not coming fast enough after 2 cases confirmed," *Canadian Broadcasting Corporation*, last modified, January 23, 2020, https://www.cbc.ca/news/canada/saskatoon/diphtheria-onion-lake-1.5436957
[377] Benning, "2 cases of diphtheria reported on Saskatchewan First Nation," *Global News*.

government, presented competing opinions on whether these cases posed any health risk to the rest of the population.[378] The confusing messaging resulted in events seen over a hundred years ago: parents became afraid, some withheld their children from school and members of Onion Lake turned to each other for answers.[379]

In addition to the cases that occurred around Onion Lake, two recent incidences of diphtheria in Edmonton pitted the medical and government authorities against the parents of the area. In 2017 and then subsequently in 2019, a child was diagnosed with cutaneous diphtheria.[380] The child, who was ten years old at the time of the first infection, was up to date on all his immunizations.[381] According to the mother of the infected child, she had asked health officials where her son was exposed to the diphtheria bacillus. Both times however they were unable to provide her with an answer.[382] Alberta Health Services (AHS), as with the federal services who responded to the diphtheria cases in 2020, have access to modern laboratories and research centers. Their inability to find the source of the boy's cases suggest that for all the technology, physicians and scientists still do not fully understand diphtheria's enigmatic behaviour. Solidifying this claim is a comment from a mother whose child attended the same class as the boy who had been infected. She told reporters: "The poor little guy that is sick – is this going to continuously happen? That would be my next question and [AHS] had no answer for that,

[378] Modjeski, "Some Onion Lake residents say info about diphtheria not coming fast enough after 2 cases confirmed," *Canadian Broadcasting Corporation*.
[379] Modjeski, "Some Onion Lake residents say info about diphtheria not coming fast enough after 2 cases confirmed," *Canadian Broadcasting Corporation.*
[380] Caley Gibson, "Case of diphtheria confirmed at Edmonton elementary school," *Global News*, last modified November 3, 2022, https://globalnews.ca/news/3848065/case-of-diphtheria-confirmed-at-edmonton-elementary-school/ ; Karen Bartko, "Edmonton school informs parents after student contracts diphtheria for 2nd time," *Global News*, last modified June 11, 2019, https://globalnews.ca/news/5374082/evansdale-school-diphtheria-infection/
[381] Gibson, "Case of diphtheria confirmed at Edmonton elementary school," *Global News*.
[382] Gibson, "Case of diphtheria confirmed at Edmonton elementary school," *Global News*; Bartko, "Edmonton school informs parents after student contracts diphtheria for 2nd time," *Global News*.

because they couldn't answer it for me."[383] Bacteriology's failure to clarify over a century ago the absolute nature of diphtheria continues to have modern consequences.

While today the vaccinations and laboratory-based analysis may be sufficient to contain small diphtheria outbreaks—as long as everyone follows through with the actions and decisions suggested by the government and medical professionals—a growing number of people have become dissatisfied with modern medicine's approach. While some turn, as many did a century ago, to alternative or "natural" forms of medicine, others have taken a hardened stance against preventative measures such as vaccines (so-called "anti-vaxxers"). These concerns and fears, which turn the public away from modern medicine if unaddressed—such as in the case of the young child who contracted diphtheria twice—have the potential to dictate the severity of the next diphtheria outbreak. If medical experts are unable to reassure the non-medical public of their understanding and control over diphtheria, the overall protection that herd immunity provides to both the vaccinated and currently unvaccinated against a variety of diseases may decrease to where it is insufficient to prevent outbreaks of diphtheria. In some areas in the United States, herd immunity levels have already fallen to the point at which measles is once again becoming a common illness among children.[384] If this should occur with diphtheria, periods of parents and physicians waiting by the bedside of sick children would ensue at rates, which generations of people have not experienced. Our protection against the disease is tenuous at best and relies on communities coming together to protect one another through making the decision to trust and follow medical advice. If the fields of medicine and science can solidify the bonds of trust and improve the relationship they have cultivated throughout the centuries with the public,

[383] Bartko, "Edmonton school informs parents after student contracts diphtheria for 2nd time," *Global News*.
[384] Gretchen LaSalle, *Let's Talk Vaccines : a Clinicians Guide to Addressing Vaccine Hesitancy and Saving Lives* (Philadelphia: Lippincott Williams & Wilkins/Wolters Kluwer, 2020), 105.

then they may be able to prevent outbreaks of diphtheria and other deadly childhood diseases from reappearing within the Anglo-American sphere.

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