TYPHOID FEVER IN
ATHENS COUNTY, OHIO
FROM 1867-1903:
MORTALITY, SOCIAL NETWORKS
AND CULTURAL STATUS

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INTRODUCTION

Infectious diseases have impacted human populations throughout their relatively short evolutionary history. Vectors of transmission can include humans themselves, animals, waterways, airways, and fomites. These vectors include common items that individuals interact with countless times throughout the course of a day. As human populations increase, the transmission of infectious disease also often increases. Populations live and interact in much closer proximity, ultimately increasing vectors and fomites as well as co-mingling infection between sub-groups and families of a community (Swedlund, 2010).

A specific infectious disease that has affected and continues to affect humans is typhoid fever, caused by the bacteria \textit{Salmonella typhi}. The disease is spread through human to human contact, specifically fecal-oral transmission. Today, although uncommon in most developed countries, typhoid fever is very common in the developing world due to poor sewage systems. Human waste infected with \textit{Salmonella typhi} can cause an outbreak of disease if integrated with the water system (CDC.gov). A few hundred years ago, typhoid fever had a presence in American society; thus, affecting not only the progress of westward expansion, but the cultural development of communities (Johnston, 1888).

Initial symptoms of typhoid fever typically occur within seven to ten days after contact (Gilchrist, 1998). Symptomatology of typhoid includes a fever of 103 to 104°F (39 to 40 °C), abdominal pain due to internal bleeding and swelling, weakness, headache, loss of appetite, gastrointestinal upset, and in some cases, a flat circular rosy
colored rash that occupies the infected individual’s trunk. Typhoid fever typically lasts three to four weeks, and may reappear up to two weeks after the fever has succumbed. During the last two weeks of infection, one may become delirious due to exhaustion and develop a “typhoid state” in which they lie completely still with labored breathing and half closed eyes. Without antibiotics, the majority of the infected will succumb to their illness due to exhaustion and dehydration. Today, those infected receive antibiotics and are intravenously rehydrated to reduce symptoms and increase survival (CDC.gov).

As the United States continued to expand westward, typhoid fever followed newly developed and growing communities, claiming the lives of hundreds of thousands of people. During the late 1700's, settlers began exploring mid-upper Ohio River Valley. Due to its proximity of waterways and paths to other established cities, Athens, Ohio, located in Southeast Ohio, was established in 1797 and was advertised as a modern "Promised Land" (Walker, 1869). Citizens from the east were promised lush farmlands, open space, and an abundance of resources. Athens was established in order to become a central area of activity, development, and growth within the newly acquired territory (Walker, 1869). However, like numerous American towns, as population size increased, typhoid fever entered the town’s water sources, infecting and killing members of the growing community. Although Athens County was growing at rapid rates during this time period, it was and still is considered highly rural in nature.
In contemporary culture, the knowledge and understanding of typhoid fever is directly related to the infamous popular culture figure, Mary Mallon, or as she is more commonly referred, Typhoid Mary. For most, typhoid fever is associated with large-scale epidemics due in part to the sensationalized reporting of Mallon’s story, making it difficult to separate factual events from dramatized retellings. Mallon was infected with typhoid fever in the early 1900’s and spread the infection working in several New York kitchens. Mallon’s case was unique because she was a healthy carrier, showing no signs of illness but still capable of spreading typhoid fever to others. At this time, doctors understood typhoid could be spread through contaminated food sources, but had little knowledge on the logistics of disease itself (Gibbins, 1998). The New York Department of Health was first alerted of the situation by Dr. Soper, an independent contractor assigned to finding the cause of a typhoid outbreak. Mallon severely refuted Dr. Soper’s claims, believing she was not ill as she never displayed any symptoms. According to a dramatized retelling by Dr. Soper, Mary even became violent while learning the news of her situation.

“She seized a carving fork and advanced in my direction. I passed rapidly down the long narrow hall, through the tall iron gate, out through the area, and so to the sidewalk. I felt rather lucky to escape.” (Soper, 1939)

Due to her previous interaction with Dr. Soper, Mallon was forcibly removed from her home. Dr. Soper relayed his concerns to the Department of Health stating “It was impossible to deal with her in a reasonable and peaceful way…” (Soper, 1939). Mallon was forced into quarantine by authorities for two years beginning in 1908. In 1910, the city health commissioner released Mallon with the promise that she would
self-report to the health department and no longer work as a cook. Due to her lack of other employment options and the belief that she was not sick, Mallon continued working as a cook. Five years later, another outbreak of typhoid fever was traced back to Mallon, as she was cooking in a hospital kitchen under an alias. Once again, Mallon was put in quarantine, until her death in 1932 as the result of pneumonia. In the end, Mallon was accused of infecting thousands of New Yorkers when in reality she infected fifty at most, resulting in the deaths of only one or two individuals (Gibbins, 1998). The misunderstandings and pure ignorance regarding the transmission of typhoid fever was ultimately showcased in Mallon’s situation. Doctors at the time did not fully grasp the concepts of typhoid transmission, as displayed in their inaccurate reports and scapegoating of Mallon.

LITERATURE REVIEW

Mallon’s case, although not fully understood by doctors at the time, demonstrated the progression of science and medicine in America with respect to typhoid fever. Fifty years prior, many people assumed typhoid fever affected only the weak, such as women and children, and was spread through bad air or contaminated cow’s milk (Thusfield, 1890). Transmission by a contaminated food source and raw sewage was not at all understood in this time. Following the construction of sanitation facilities, people noticed the rates of typhoid fever decreased, thus leading to the assumption that it could be spread through human waste and infected waterways (Johnston, 1888). This discovery further advanced the prevention and treatment of exposed people.
A report in the British Medical Journal (Thusfield, 1890) dated August 30, 1890 illustrates the point that doctors did not know what caused typhoid fever, and there was no treatment available. Dr. W.N. Thusfield tried to explain the transmission of typhoid in a legal and medical setting. He argued typhoid could be transmitted from old germs inside a house. Thushfield did not look at environmental or cultural reasoning behind the infection, but rather the structure of the house itself. He explained his theory by blaming a local child’s sickness on contaminated wallpaper in the boy’s home, which was not replaced after a family fell ill to typhoid three years prior. Thusfield went on to explain an event where a field was fertilized with animal excrement and garbage, residents reported falling ill with headaches and diarrhea immediately after the mixture was spread. However, one man contracted typhoid after visiting a house weeks after the initial event. Thusfield argued that the initial disease contracted immediately evolved into typhoid fever infecting a man weeks later. Finally, Thusfield discussed the possibility of water sources transmitting typhoid, but admitted he did not have indisputable evidence to support that hypothesis (Thusfield, 1890).

Other more recent studies researched the disease in the context of historical military camps, especially during the American Civil War (Gilchrist, 1998) and the American Spanish War (Smallman-Raynor and Cliff, 2001). In 2001, geographers from the University of Nottingham and Cambridge examined causation of typhoid during the Spanish American War, with a focus on unsanitary conditions and overcrowding of camps (Smallman-Raynor and Cliff, 2001). National military camps
established as main headquarters during the war, were examined with larger regiment migration to and from major national camps mapped and identified in relation to outbreaks. Outbreaks of typhoid fever occurred as national military camps grew. Due to overcrowding, unhygienic living conditions developed, such as soldiers relieving themselves on the ground within confines of the camp. These actions transmitted typhoid, as more soldiers contracted the infection, more parts of the camp became infected leading to higher rates of infection and ultimately epidemics (Smallman-Raynor and Cliff, 2001).

Although the study conducted by Smallman-Raynor and Cliff examined subgroups, or regiments, and their relation to outbreaks, it did not focus on the individual soldier. The regiments were treated as communities, with national camps acting as a gathering point for the regiments coming from a diverse background with different experiences. If one regiment contained a soldier infected with typhoid, he could have transmitted the disease to other regiments while at a national camp. (Smallman-Raynor, Cliff, 2001)

To compliment Raynor and Cliff’s research, Gilchrist (1998) published a similar study which focused on the American Civil War. According to Gilchrist’s data, 62 out of every 1,000 Union soldiers during the American Civil War died from infection, compared to 13.3 out of 100 wounded men. This amounted to 63% of all Union deaths compared to only 12% due to battle wounds. Typhoid fever was accounted for the greatest amount of deaths on both sides of the war, with other diarrheal and intestinal infections also accounting for a high number of deaths. In
comparison, the Spanish War demonstrated a similar trend with 25.6 out of 1,000 men dying from infection, and 6.1 out of 100 wounded men dying from complications of gunshot (Smallman-Raynor and Cliff, 2001).

Both studies relating to typhoid fever during early American wars examined infection rates within smaller companies and regiments within the military. However, individuals were not specifically examined; therefore, no biographical or in-depth cultural explanation could be observed. The majority of data was collected from Union camps, as this data was much easier to collect due to preservation of documents after the war. Therefore, another half of the country and population was not examined. Thus, cultural explanations that were unique to the Confederate have been lost. As a result, no comparative studies could be conducted examining the similarities and differences between Union and Confederate camps. Both journals (Gilchrist, 1998) (Smallman-Raynor and Cliff, 2001) focused more on medical process and migration patterns as opposed to the individuals comprising the groups being studied.

Recent research from rural Kenyan villages have explored the cultural reasoning behind the transmission of typhoid fever (Kinuthia, et al. 2012). The Njoro district of Kenya is a rural setting with farming and small scale trade comprising the majority of the economy. All affiliations with the research were Kenyan universities, with researchers residing in Kenya. The data were gathered from interviews, observation, and questionnaires; household interviews were selected on a random basis. Two regional hospitals were also randomly selected to provide data concerning typhoid fever rates from 2004-2009. Analysis was conducted finding an age range
peak of infection occurring in the population in individuals 30-40 years of age. 61% of typhoid patients were female. Data methods provided information pertaining to the environment and hygienic conditions of homesteads and latrines. The majority of water was collected from rainfall; however the majority of the population that chose to boil water (37.5%) before consumption was of higher class when compared to those who do not (61%). In addition, researchers concluded 95% of the population was at risk of contracting typhoid fever due to improper hand-washing techniques.

Although Kinuthia, Gicheru, Ngure, and Kabiru (2012) identified practices that could lead to higher risk of contracting typhoid fever, they did not attempt to explain the behaviors identified or provide guidance to solving problematic practices. Behaviors such as improper hand washing techniques can be the result of rationing water, or lack of access to soap; these situations could be mended if given an explanation and opportunity. In addition, problematic sentences such as the following place the accountability on residents who do not have access to pit latrines.

“Lack of pit latrines may have led to careless defecating in the bushes near the homesteads leading to contamination of domestic dams and crops with feacal materials during the rainy seasons.” (Kinuthia, Gicheru, Ngure, and Kabiru, 2012)

The researchers identified behaviors that transmit typhoid fever within the population. However, they failed to take into account cultural reasoning behind these behaviors. Proper hand washing techniques can be difficult to follow if warm running water and soap are not available. Defecating too closely to camp may not be an example of careless behavior, but rather a response to a lack of other options. Without proper latrines, relieving oneself becomes a challenging task with unintended
consequences. Although this research successfully identified causes that increase rates of typhoid fever, the researchers did not culturally situate these behaviors.

**MATERIALS AND METHODS**

For the purposes of this project, the annual mortality rates of typhoid fever in Athens County, Ohio from 1867 to 1903 was determined using mortality records obtained from ancestry.com. Online records were microfilm scans taken in 1963 of the original mortality books housed at the Athens County Probate Court. After the mortality records were gathered, a database was constructed containing all individuals succumbing to typhoid fever during the study period. Each death record contained the individual’s name, place of death, residence, age, sex, occupation, as well as the day, month and year of death recorded. The final database contained four-hundred individuals. The data were organized and analyzed using Microsoft Excel.

Broad age groups based from life stage were used, dividing the population between the very young (<5), prime (18-40) or old (>65). A second age grouping was developed in order to observe trends between specific subsets of the population. The age groups for in-depth observation were: 1-3 years, 4-6, 7-9, 10-12, 13-15, 16-18, 19-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95-99, and 100+ years (see figure 1). Each community was also analyzed to determine year to year infection rates. As well as examining the place of residence and age, the sex and occupation was analyzed in order to determine which occupations and sex were most affected by typhoid fever.
Once the data were analyzed, biographical vignettes were composed using online genealogical sources containing census records, marriage and birth certificates. Each of the four individuals chosen has a story that adds cultural significance to the larger dataset. Individuals were selected based on availability of information as well as the common themes of their biography that shared similarities with many members of the dataset. Census, birth, and marriage records were gathered from ancestry.com and familysearch.com. At this time period, census records had not been standardized so each census year asked different questions and was formatted differently. Information regarding cemeteries and tombstones was gathered from findagrave.com.

Due to the nature of historic documents, problems arose which had the potential to affect sample size and accuracy. In some cases, individuals were reported more than once. Additionally, sometimes names differing from an individual's legal name were reported, depending on the name the person reporting used. For example, one individual was reported first by her full name, Katherine. Later, she was reported again with her nickname, Katie. If the above mentioned occurred and it was suspected an individual had been reported twice, birth date, death date and residence were examined. If enough information coincided, the record with the least amount of information was deleted in order to keep the database as accurate as possible.

A similar problem with the methods used was in relation to the occupation given for a deceased person. Once again, due to the fact that no standards in vital records reporting existed at this time, occupations were recorded as whatever the person reporting the death stated. These practices could potentially lead to an
inaccurate depiction of the population in the analysis. For example, a woman who stayed at home and did not have an official job was reported as many different things. In order to achieve an as accurate as possible analysis; housekeepers, housewives, no occupation, and blank columns associated with a female over the age of seventeen were all grouped together as a single occupation. Another problematic occupation was that of children. The majority of children reported had a blank column for occupation; however, some were also listed as students and others as no occupation/none. Those reported as students could have higher socioeconomic status as those with no occupation, as their families could afford to send them to school instead of the workforce and were located in an area with a school present. However, juveniles listed as students were grouped with juveniles with no occupation, as many reporters listed the juvenile’s occupation as none instead as student.

Lastly, as with all historical documents, human error such as inaccurate or missing (unreported) information were encountered. Depending on the issue, the researcher acted to provide the most accurate depiction of the population at the time. As previously mentioned, duplicated individuals were deleted. In addition, individuals with their age in months exceeding twelve months were corrected to depict an accurate year and month age. Although the mortality records contained a column for “race”, or ethnicity, several pages in the second edition were corrupted while a record taker counted the rows; ultimately making the ethnicity columns unusable, as both “White” and “Black” were checked, these individuals were listed as unknown ethnicity. Mortality records did not always include an individual’s sex, so the name was used in
order to determine sex. If an individual’s sex could not be determined by name, in instances where initials or ambiguous names were used, the person was recorded as an unknown sex.

Lastly, the cause of death had the potential to be very subjective and reflect symptomatology rather than actual illness (Thusfield, 1890). Doctors and family members could list whatever they chose, which could include a wide variety of causes. Some causes were likely not accurate as illnesses often share similar symptoms making it difficult to accurately diagnose. Specifically, the researcher questions the accuracy of children’s diagnoses where dysentery is listed as the cause of death. It is unclear what was used during the late 1800s to distinguish dysentery from typhoid, as dysentery very closely shares the same symptoms of typhoid and is even transmitted in similar ways. Although it is speculated that children listed as dying from dysentery actually died from typhoid fever, these children were not included in the dataset but rather noted, as it could not be proven that they actually died from typhoid fever.

**HYPOTHESIS**

As previously mentioned, the story of Mary Mallon heavily influences the attitudes and assumptions concerning typhoid fever even today. The initial hypotheses for this research were directly related to preconceived ideas developed from the infamy of Mallon. It was originally hypothesized that typhoid would make its way into a population, infecting a “patient zero.” From there, it would infect large portions of the population systematically killing the majority of the community within a small
amount of time (Soper, 1907). This thought process is the direct result of the sensationalized re-telling of Mallon infecting and killing hundreds of people.

While specifically examining Athens County, Ohio, the following hypothesis were formed:

- The very young (<5) and the very old (<65) would succumb to the disease at higher rates than those in the prime of health (18-50).
  Initially, this was believed due to these individuals being at higher risks of contracting typhoid due to weakened immune systems as the result of age.

- Individuals interacting in close proximity would have higher rates of mortality.

  Specifically, it was hypothesized that those who worked as coal miners or children who attended school would transmit the infection to others at a high rate due to the close confines of these activities. Both activities comprised the majority of the individual's day and kept a small, closed off number of people in constant contact with each other on a daily basis. Thus, it was inferred that if one individual contracted typhoid fever, it would be spread to many others within the close-quartered environment creating an epidemic.

- The summer months (June-August) would contain higher mortality rates.

  As temperatures rose, it was suspected that individuals in the community would interact more often than during cold months. Children would be more likely to play in streams and rivers that could be infected with typhoid, leading to infection.
Additionally, communities would gather for events as the weather would permit outdoor activities, also rising the transmission rates of typhoid.

RESULTS

After analyzing the data, it was discovered that males had higher rates of mortality (n=207) when compared to females (n=173), with individuals of unknown sex contributing to the rest of the sample size (n=15). The age group with the highest amount of mortality was 19-24 years of age (n=59), the second most common age group contained individuals between 25 and 29 years of age (n=40), the third most common age group was of 16-18 year old individuals (n=36). In all, the top three age groups account for 135 deaths, or 33.75% of the sample size (see figures one and two).

The highest mortality rates related to occupation were of housekeepers and housewives. In all, 111 homemakers died as the result of typhoid fever, or 27.75% of the sample size. Children (<16 years of age) accounted for 96 deaths of 24%, however this number could be higher as a result of inaccurate cause of death reporting and convoluted dysentery reports. The next common occupation in terms of mortality was farmers which also included with farm boys and farm laborers. Members of this occupation comprised 19% of the population, or 76 individuals. Miners comprised the fourth most common group containing 32 members, or 8%. The remaining 21.25% are of various occupations with the largest group only containing a dozen individuals (see figure three).
Localized epidemics were studied to show rates of mortality within individual communities. A localized epidemic was characterized as three or more deaths in a particular city or township within a month. Attempts were made to observe possible transmission through community or familial ties using biographical data such as census and marriage records. Throughout the time period, four localized epidemics occurred (see figure four).

The first took place September, 1888 where three people residing in York Township succumbed to typhoid fever. Although none of the individuals appeared to be related in familial ties, two of the women were of similar age (21 and 26 years old) and were both housekeepers. J. Sheldon Scott, a merchant, also died in September 1888 in York Township, but did not appear to have any similarities with the women.

The next localized epidemic took place on October 1893 in Shade, a small town located in southern Lodi Township, Athens County. This localized epidemic involved two related individuals, a husband and a wife, and one non-related individual. Ezra and Sarah Carney, the husband and wife, lived on a farm and died on the same day, October 23. The unrelated individual died six days before the Carneys and was a housekeeper.

In November 1895, a localized epidemic affected Nelsonville, located in York Township, the northwest most part of Athens County. A domestic worker, Aura Munks, died November 7. Twenty-two days later, a six and a half year old boy died. The next day, November 30, his four year old sister died. It is unclear if the domestic worker worked in the children’s household, as the 1890 census has been destroyed.
Aura Munks family cannot be located in the census record after her death, while the children's family migrated out of the area.

The last localized epidemic took place in December 1897 and claimed the lives of two biologically related individuals living in Glouster, located in Trimble Township. Susanna Smith was the first individual to pass away on December 1st. Eight days later, on December 9th, her husband, a miner, passed away. Twenty days later, another miner, Samuel Hopes, died on December 29th. It is uncertain where Susanna contracted the typhoid, but it can be inferred that she spread it to her husband, who potentially infected Samuel, a man who shared the same occupation as Mr. Smith. However, it is unclear if Samuel and Mr. Smith worked in the same mine.

Lastly, rates of mortality were examined based on calendar seasons. Although not exact due to estimated dates of death, individuals were placed in specific seasons based on the month they died. Therefore, the seasons were only separated by month, instead of the actual equinoxes and solstices. Winter comprised the months of December, January, and February which contained 73 deaths or 18.25% of the sample size. Spring included March, April, and May with 60 deaths or 15%. Summer contained 85 deaths or 21.25% of the sample size dying during the months of June, July, and August. Lastly, fall included September, October and November which contained the highest rates of mortality with 179 deaths or 44.75% of the sample size. The remaining 00.75% included individuals without a death date due to incomplete reporting (see figure five).
Biographical vignettes were composed to retell a more individual side of typhoid fever mortality. As previously mentioned, previous research involving this infectious disease did not look at individuals or their personal life histories that could relate to their contraction and mortality from typhoid. The next three vignettes represent individual stories that share many characteristics of other mortalities in the data set. This biographical vignette was enriched through census, marriage, and birth records.

The first vignette is of Samuel Hopes, a miner who resided in Glouster, a small mining community in Trimble Township, the northern most township of Athens County. On November 12, 1890, Samuel married Amelia Vercoe in Athens, Ohio. Four years later, on July 25, 1894, in Trimble Township they had their first child, a girl named Esther. Almost two years later, on May 13, 1896, in Glouster, they had their second child, another girl named Freda. A year and a half later, Samuel died as the result of typhoid fever, leaving behind a young wife and two children both under the age of four.

After Samuel’s death, Amelia, Esther, and Freda could not be found in the census data for Athens County, or any surrounding areas. Due to the economic struggle of raising two children without a husband, it is entirely possible Amelia remarried before the 1900 census was taken in the summer, or moved closer to her family for support. The destruction of 1890 census due to a fire also impeded the retelling of the Hopes family story as it could have provided names of nearby families and relatives that could have cared for Amelia and her young girls.
The next vignette took place in Connett, a small town south of Nelsonville in York Township. Here, the tombstone of Ida V. Elder can be found in the Connett Cemetery. Ida was born in Ohio on January 21, 1867. She later married A.J. Elder at an unknown date, however they did not have children, this could have been a result of her early death. On September 17, 1888, Ida succumbed to her infection of typhoid fever.

Ida’s story is unique as neither she nor her husband can be located in the census records. Primarily due to Ida taking her husband’s name, she cannot be located in the 1870 or 1880 census. A.J. Elder does not appear in the census record for one of two reasons. First, A.J. could have moved out of the area after his wife’s death, or he cannot be located in the census record due to incomplete information on his marriage record. We do not know his full name, age, or occupation. A.J. Elder does not appear to be in the Connett Cemetery, the same cemetery as his late wife, Ida.

Lastly, Ida’s tombstone is of large structure and of high quality. Instead of being a flat stone so commonly seen in Southeastern Ohio coal town cemeteries, Ida’s stone stands tall as an obelisk comprised of marble, with high amounts of detail and carving. Stones of this expensive nature are uncommon, and Ida’s is even more impressive when realized that she was a young 21 year old woman with no children when she died. Ida’s stone probably cost a large amount of money, most likely paid for by her husband or family.

The last vignette took place in Nelsonville, a larger town in the northern part of York township. The Maxwell family was headed by Marcellus Maxwell and his wife,
Florence Maxell. In 1895, they had two children, Robert Irwin born in 1889 and Alpha B. born in 1891. On November 29, 1895, Robert died of typhoid fever at six and a half years old. The next day, his sister, Alpha, died at four years old. Both children are buried in Greenlawn Cemetery in Nelsonville.

Neither Marcellus nor Florence can be located in the 1900 census, but in 1910 they were reportedly living in Columbus, Ohio. Marcellus worked as a carpenter, and they had three children in the 1900 census. Addie was the eldest at 15 years old (b.1895), Mary is 9 (b.1901) and Walter the youngest at three years old (b.1907). Interestingly, Addie was born the same year Alpha and Robert died, although it is uncertain if she was a newborn at the time of her siblings death or born immediately after.

DISCUSSION

This research examined the mortality rates specifically related to typhoid fever in Athens County, Ohio from 1867 to 1903. Cultural as well as personal events were examined using census, marriage, and birth records. This enriched the research by providing an in-depth examination of typhoid fever effects within the county. Males and females had somewhat different rates of mortality, however occupations were primarily gendered affecting the overall analysis of the community. Typically, males worked as miners or farmers, while females were listed as housekeepers or housewives. This affected the overall analysis of the community because almost all women were confined to one occupation while men had many. Housekeepers were the most affected occupation, with children and farmers ranking second and third.
Housekeepers and farmers likely had higher rates of mortality due to the nature of their work. In both cases, individuals were tasked with chores involving fecal matter and possibly infected waterways. During the late 1800s and early 1900s households did not contain indoor plumbing, so housewives were often tasked with cleaning out chamber pots each day, where the contents were disposed of outside in the soil or nearby stream. Likewise, farmers interacted with potentially infected vectors such as waterways. This may have increased the rate of contraction and transmission within these occupations. Children also had high rates of mortality which could be due to completion of household chores involving vectors of typhoid.

To add, the sample population of this study encompassed primarily rural communities, an area under-represented in current research. Although the sample size is not as large as studies involving urban areas, the deaths that occurred likely still had a significant impact on the communities. As previously mentioned, individuals 16-29 years old accounted 135 deaths or more than 30% of mortality. This is highly significant as a large amount of individuals were dying at a time where they were in prime reproductive and working state. Also, in a community where migration and industry was dominant, losing young able-bodied workers due to infectious disease was detrimental to families who relied on those members to support the household.

Lastly, localized epidemics were examined to explain transmission on a cultural level and observe areas where typhoid fever was prevalent. High rates of mortality were found in Nelsonville as well as Glouster. These areas could have higher rates of mortality due to their geographic location as well as industry impacting the
local population. Both towns contained active railways and large streams that cut through or encircled residential living areas.

The above-mentioned findings support prior research in terms of migration and bursts of population leading to conditions suitable for higher rates of transmission. However, this research looked at the results on a more personal and individualized level differently than previous studies. In this research, culture, as well as familial and community ties were examined in order to observe common activities that transmitted typhoid fever. The methodology of researching specific individuals showed the impact their death had on not only their families but the community as a whole. These methodologies have not yet been used while studying typhoid fever, so this methodological study ventured into new territory observing both the infection, and the people it affected.

This newly applied methodology has the potential to change the way in which infectious disease is viewed. Recent development and methods in the field view both medical and cultural significance of infectious disease. By viewing the individuals in a population as an important and necessary agent to fighting transmission disease, infection and transmission can be more easily fought with culturally appropriate methods. This could lead to greater communication and understanding between medical officials and the individuals being affected by infectious disease. Open communication and understanding of both parties can lead to more collaborative efforts in treating and reducing morbidity and mortality as it relates to infectious
disease. This would be highly beneficial as humanitarian efforts often fall short as they do not account for cultural barriers concerning the attitudes of disease and treatment.

Further research could include other rural areas in differing regions of the country. Findings from other regions could be compared to the findings of this research to determine if the results vary by region or are common across rural areas. Due to the large amount of migration and industry developed in Athens County during the researched time period, it would be interesting to see if other populations in areas not affected by the coal industry responded to typhoid fever in the same way.

Studying other infectious diseases using the same methods, study area, and time period could be useful in better understanding mortality in Athens County. Different illnesses and diseases could have greater or lesser impacts on the region depending on attitudes and prior knowledge of specific infectious diseases. It would be beneficial to study this, as it could reveal differing cultural conceptions of various forms of illness that affected this population simultaneously.

Modern populations could also be researched using similar methodology as this study. Observing and recognizing local culture could ultimately increase the responsiveness a community has in relation to reducing the transmission and mortality of infectious agents. Especially prevalent in humanitarian aid, the treatment proposed by the assisting community does not always coincide with the beliefs of the affected population. This potentially causes confusion, distrust, and lower rates of success than initially anticipated. Studying the infectious disease, not only as a medical entity but an event that affects human populations can reduce conflict revolving around the
treatment of infected. Researching the community and the individual members affected by the illness can show trends and behaviors not initially showed by simply researching the medical factors of infectious disease.

To conclude, the newly applied methodology used in this research to analyze typhoid fever has the potential to impact a wide variety of research areas. Anthropologists and medical researchers alike should implement methods examining community interaction more consistently to understand both the scientific and social aspects of infectious disease. Historical and modern populations can be studied using similar methods in order to not only understand the medical properties of infectious disease, but also the cultural ramifications infection and mortality can cause on a population.

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figure one

figure two
DEATH BY OCCUPATION

- Housekeeper: 28%
- Farmer: 19%
- Child: 27%
- Miner: 8%
- Other: 12%
- None: 6%

*figure three*

figure four
DEATHS BY SEASON

- Spring: 15%
- Summer: 22%
- Winter: 18%
- Fall: 45%

Figure five
REFERENCES


1875 Atlas, Mahn Center for Archives and Special Collections, Ohio University Libraries