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Cover Page Footnote

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Descending upon Negaunee, Michigan, in the fall of 1889, typhoid fever was met with a perfect storm of factors that allowed it to proliferate. In Negaunee, then a bustling and industrious mining town, about one in every nineteen individuals fell ill with typhoid during an epidemic that lasted from August until November of 1889.[1] The exact death toll is unknown, but contemporary sources cite a fatality rate of nearly ten percent of the 350-400 estimated cases.[2] The clinical details are not preserved in the case of this epidemic, but typhoid fever has generally been characterized as a menacing multisystem disease, striking those afflicted with symptoms including high-grade fever, intestinal lesions, liver and kidney failure, and effects on the central nervous system occasionally leading to delirium, coma, and death.[3] A vast majority of those diagnosed with typhoid fever in Michigan in 1889 were under the age of twenty-five, and the average typhoid patient was just over twenty-three years old.[4] Obituaries in *The Weekly Mining Journal* discuss the typhoid-related deaths of otherwise strong and hardy young people with a kind of reserved disbelief. The incongruity of the sudden death of significant numbers of young adults is one point of many at which local reporting reflects a community struggling with both an eminent threat to public health and with the variety of responses to this threat. In the pages of *The Mining Journal*, the course of the disease is at once stated and understated, the root causes simultaneously manifestly clear and yet constantly evasive. The available routes of treatment and mitigation of transmission are contested— contributors regularly discuss the impact of chemotherapeutic treatments, the rigorous implementation of public health law, and the systems of assistance provided by the county and state to patients and their families. Outsiders exaggerate, resources stretch thin, and frustrations mount as the influx of cases does not cease. Then, in November, the disease suddenly dissipates.[5] This paper will emphasize the course of and responses to the typhoid epidemic in Negaunee, and the extent to which these responses to typhoid were effective (and *perceived* as effective) in mitigating the transmission of typhoid fever in the fall of 1889. The case study of typhoid fever in Negaunee is rife with points of contention, conflict, and complication within both the medical correspondence and newspaper reporting that provide valuable insight into the effects of epidemic disease on community structures and function.

Courses and Confusion

Conditions in Negaunee in 1889 were ideal for *Salmonella typhi* to thrive. The bacteria, transmitted via human fecal matter, apparently lived comfortably in "filth which has accumulated in backyards, alleys, etc." which punctuated the busy streets of Negaunee and surrounding mining locations.[6] This filth, along with improperly stored excrement from the city's multitude of outside toilets, contaminated the main sources of potable water for the people of Negaunee and nearby

locations. Sewage constantly leached through the sandy soil popularly thought to contain it effectively, seeping into the local water supply in large quantities.[7] Dr. C. S. Lombard, a local physician, marked the start of the outbreak in early August, with fifty cases occurring by September first.[8] By September tenth, eighty people had contracted the disease, almost all of whom were miners, or family members of miners.[9] Contaminated drinking water from Teal Lake, the No. 7 Mine, and various wells was suspected early on as the main source of the disease, and subjected to testing for impurities by the State Board of Health.[10] In a series of chemical tests designed to estimate the amount of organic matter present in the city's drinking water, samples were sent to the Michigan State Laboratory of Hygiene, where Vincent C. Vaughan, the state chemist, reported levels of free and albuminoid ammonia hundreds of times more concentrated than the recommended standard.[11] On October 12th, a statement published a month earlier encouraging people to boil their drinking water was revised; according to Vaughan, the water "should not be used."[12] However, formal lab results from Ann Arbor took weeks, and Vaughan's analysis was alarming without being terribly specific. The presence of ammonia, an organic nitrogenous compound, seemed to indicate an excessive amount of human waste or "the decomposition of animal matter," but the Secretary of the Board of Health clarified a week later that "none of the substances thus tested for are in themselves injurious to health."[13] "The waters were swarming with germs," but it remained unclear which sources of water were the most contaminated, and with what kinds of microorganisms.[14] In the absence of clear answers, locals theorized about the pathogen's habits. False rumors spread that the water at the nearby Jackson Location was the sole source of the disease, a misconception that warranted correcting in *The Mining Journal*.[15] Another tenuous hypothesis cited an incident a few years earlier during which the pipe that drew water from Teal Lake had broken: "the end of the suction pipe had dropped down in the mud," and rather than drawing from "water nearly a thousand feet out in the lake and twenty feet above the bottom," had instead pumped lakebed sludge to dozens of homes.[16] Perhaps, suggested the article's author, the epidemic could be halted by a straightforward repair job—beneath the hope for a simple solution was a profound anxiety, though, as the author concludes: "if the whole lake be condemned, Negaunee will be in a sore strait."[17] The number of people who relied on the lake for potable water remains unclear, but the article indicates that it was a significant portion of the population. No statement was made at any point that the people of Negaunee should obtain their water from another source— an omission that suggests that there simply was no viable alternative for a large portion of the people of Negaunee.

Also present in "The Water Question," the article published on the twelfth of October, is a different kind of anxiety. Following the report of the state chemist on the abysmal state of the water of Negaunee, one writer for *The Mining Journal* appeared fed up with the report's contents and methodology. The author writes: "Negaunee people who have been using Teal Lake water have all this time been unconsciously offering themselves as martyrs to science!"[18] This bizarre statement, while far from an accurate assessment of events, is nonetheless an interesting glimpse into the attitudes of "Negaunee people" about the response to the epidemic

by the state health authorities. A disconnect arises between the interests of the local populace and the nebulous outside force of institutional science, at once seeming intrusive and frustratingly ineffective. Whether due to journalistic flair or genuine outrage, the author's declaration of the martyrdom of the people of Negaunee is evocative, and readers struggle to remain neutral when faced with it— once again reinforcing a community of "Negaunee people" as they face both a public health crisis and a multitude of local and state-wide responses to it. On October seventeenth, the local Dr. Lombard wrote to the secretary of the State Board of Health about public sentiment regarding the epidemic:

> "…Of course the published analyses of our city water have set the inhabitants all agog and many are rash to say that they don't credit them as true... We are, i.e. the city people, (not the writer) in a state of agitation for between bad water, typhoid fever, death and the almost daily mournfulness of the dirge that is pathetically piped upon our streets there is enough to quail the strongest hearts."[19]

Dr. Lombard's sobering description of a population in disbelief seems to echo the earlier opinions voiced in the *Mining Journal*— though Lombard was himself a local, he felt the alienation of aligning himself with the state-wide health institutions. Lombard states: "The State Board of Health must need have some enemies as does every good thing that attempts to root up existing evils and prejudices Attempting to investigate the cause of this epidemic has made me not a few enemies…"[20] The former mayor of Negaunee, Alexander Maitland, also speaks rather backhandedly of Dr. Lombard specifically, stating that "He should not raise the cry of epidemic when he has a few cases of the so called preventable diseases that are affecting his pocket a little."[21]

Law, Chemotherapeutics, and Effective Communication

By mid-October, the gravity of the epidemic was becoming clearer. While criticism remained that outside newspapers were exaggerating the situation on the ground in Negaunee, legislation had been put in place to attempt to control the spread of the fever. On the first of October, it became a misdemeanor to not report a suspected typhoid case to a "health officer"— those who failed to report would face a hundred-dollar fine or ninety days in the county jail.[22] The steep fine could mean the loss of two months' wages for an iron range miner— the loss of three month's work, if one could not produce the sum, was even more devastating.[23] The author of an article in *The Mining Journal*, published on October fifth, emphasizes the urgency and necessity of these new laws. An emphatic clarification immediately follows the description of the law: "the actual penalties which are incurred by the violation of these laws are the death penalties to many of our people… The saving of a large proportion of these lives is the real reason for the effort for the restriction of typhoid fever…"[24] There is no record of the sentiment of the public in response to the implementation of this legislation. However, it is not unreasonable to read the article as anticipating resistance; the author carefully indicates that the law is not unprecedented, and similar ones are already in effect for other infectious diseases—

"it seems important that the people generally shall understand that this new law applies to scarlet fever, diphtheria, small pox and all such dangerous diseases as well as to typhoid fever."[25] There is a focus on group cohesion, most striking in the invocation of the image of a "death penalty to many of our people," but also present in statements of how "the safety of the people may now be greatly promoted" by following public health law.[26] Where other earlier articles seem to downplay the threat, the October fifth publication speaks carefully and deliberately to the efforts that must be taken in order to mitigate the spread of typhoid fever, and to curtail the ever-increasing death toll as a community.

A reprinted article from the *Detroit Evening News* found its way to Negaunee on the nineteenth of October, providing more insight into the spread of the disease. While earlier sources exclusively pinpoint drinking water as the point of transmission, Henry B. Baker, the Secretary of the State Board of Health, informed the public that the typhoid bacillus was in fact a "microscopic plant which is found in the intestines of one sick with typhoid fever."[27] This was potentially important for the general population. The prevailing ideas about water contamination did not account for cases that arose from contact with human waste outside of the water supply— prepared foods, contact surfaces, and sanitation issues allowed for the transmission of typhoid fever without direct interaction with contaminated water.[28] Baker stresses, also, that there existed no conclusive chemical test for the bacillus, nor was there anything that any ordinary physician or "druggist" could do in terms of identifying the pathogen itself— this was work that could only be performed by an "expert bacteriologist," and "as yet they are few in Michigan."[29] Even with the help of Vincent Vaughan, one of the few bacteriologists in the state, the *Salmonella typhi* bacillus proved elusive in the case of Negaunee for the duration of the epidemic— still, Baker's insights were valuable. While the information in his statement was likely known to medical professionals prior to publication, distribution of reputable information and clarification of the methods of identification and diagnosis (which proceeded in Negaunee, as in most places, on the presentation of symptoms) was helpful in addressing the concerns expressed in earlier publications, and in correcting the stream of misinformation that followed typhoid wherever it went.

Later in October, a strange development occurred in the course of the epidemic and its mitigation. D. L. Flanders, a man from Sturgis, Michigan, arrived unexpectedly in Negaunee with a tonic that he claimed would "knock out every case of typhoid in the city."[30] Flanders was fresh from Florida, where he had been using the same formula in the ostensibly successful treatment of yellow fever, a mosquito-borne viral infection.[31] While his proprietary cure-all "doubtless savors of quackery," Flanders did not seem intent on peddling snake oil to the ailing population of Negaunee.[32] Not only did Flanders provide consultation and medication at no cost, he quickly garnered the support of local physicians and the Sisters of St. Joseph, who distributed his "Diffusible Tonic."[33] Support poured in from local newspapers, who encouraged all those afflicted with typhoid to give the tonic a chance; Flanders would rely on "future sales to

recompense him."[34] Remarkably, Flanders' Diffusible Tonic appeared to quickly lessen the severity of typhoid symptoms, a statement reiterated by local medical professionals— *The Mining Journal* clarifies that Flanders had in no way solicited praise in the newspaper, but instead that the published accolades for his efforts were the reflection of a grateful community.[35] In correspondence with the State Board of Health, Flanders' insistence on chemotherapeutic treatment illustrates a divide between a philosophy focused on the treatment of individual cases and one focused on the general prevention of infection. A report from October notes that in regard to the Negaunee outbreak, "The Secretary said that… this Board dealt with the prevention and not with the cure of disease and that Mr. Flanders had responded that the cure of a first case was an important item in the prevention and spread of the disease."[36] It is unclear if patients knew what they were ingesting when they took the recommended dose of Diffusible Tonic, as the blend of ingredients was not published in advertisements nor endorsed otherwise. The State Board of Health, however, ordered a comprehensive chemical breakdown of the tonic, and found it to be composed primarily of dissolved "sulphate of the cinchona alkaloids," with a smaller proportion of "extract of hydrastis."[37] The former chemical is also known as quinine— a compound used for centuries in the treatment of malaria and other tropical diseases.[38] Recent studies focused on the unintended side effects of antimalarial treatment have successfully demonstrated that "quinine sulfate interferes with the invasion and internalization of *Salmonella typhi*…"[39] *Hydrastis canadensis*, commonly known as goldenseal, is a plant containing a number of alkaloid compounds— one study found that "aerial portions of this plant, which can be harvested sustainably, are a good source of antibacterial compounds."[40] Other than the anecdotal testimonies of a handful of locals, quantitative data on the efficacy of Flanders' remedy is hard to come by. While the epidemiological significance of the tonic is unclear, it is possible that the Diffusible Tonic provided at least a marginal benefit to those taking it.

Early November marked the unofficial end to the epidemic, as the remaining patients recovered their strength and returned to their usual lives. A week after five hundred dollars were distributed to each family of those affected by typhoid, an article from November sixteenth notes that the city had just passed through the typhoid epidemic; while "not so bad as the outside papers reported it, it was bad enough."[41] There are a number of potential factors in the dissipation of typhoid fever in early November, including the cyclical seasonal pattern of the disease. It is unlikely that any conclusive policy decision, healthcare institution (the Negaunee "pest house" had, after all, just been renovated), or chemotherapeutic aid was the sole determining factor in the disappearance of typhoid.[42] For one thing, not much had been accomplished to address the primary source of the issue: the contaminated drinking water.

C.S. Lombard and Typhoid Two Years On

Two years after the epidemic ended, astonishingly little had been done to address the state of potable water in Negaunee. This was despite calls for the improvement of the water supply following the epidemic, when it was decided that "some steps will be taken by the city

authorities to give the people of Negaunee a better water supply before spring [of 1890].”[43] In 1891, the water was still replete with albuminoid ammonia: “it is still a corrupt water.”[44] Further, those who had downplayed the severity of the epidemic were criticized by a frustrated Lombard: “If sent to a chemist whose ability and integrity is recognized as inferior to none upon two hemispheres of the earth and a report is returned such as has been read here tonight you growl, shrug your shoulders and like St. Peter begin to curse and damn and say ‘Teal Lake water is all right and we know it!!!!’”[45] The general sense is one of disillusionment and disgust with the negligence that had been allowed to continue in regards to the management of waste, the construction of any kind of sewer system, and the failure to properly incentivize the position of “health officer” in Negaunee.[46] The state of the debate in 1891 displays a lack of concern for mitigating the seasonal incidence of typhoid fever and for preventing future large-scale epidemics. Both powerful and disaffected individuals like former mayor Maitland and the population of the city of Negaunee resisted the sweeping structural change necessary to do anything to make the area less conducive to the spread of infectious disease. Change would be expensive and driven largely by bodies like the State Board of Health, an authority from distant downstate with no grasp on the peculiarities of Negaunee life, ways, and cultures. The public seems intensely sensitive to the assertions and simplifications of outside actors; state health authorities and the local physicians they have employed generally misjudge severity, misunderstand ways of life, and pass unfair judgements upon a complex community, alternately patronizing and derisive.

New Perspectives, New Directions

The appeal to “our people” made in a *Mining Journal* article dated October 5th, 1889, is an interesting one. Any attempt to discuss community life and structure during this epidemic must first take into account the dimensions of stratification that separated different populations in the same space at the same time. Negaunee was home to a diversity of ethnic groups, each with their own language, customs, religious affiliations, and political tendencies. There is a sense of glaring omission when examining the experiences of these people through the viewpoint of an English-language newspaper, English-language reports, and English-language correspondence. The linguistic barrier provides difficulty in scholarship, while also indicating potential unreliability during the outbreak itself. Of all of the typhoid deaths memorialized in *The Mining Journal*, only two, Knute Knuteson and Alfred Hansen, have names that are not English or Irish in origin.[47] The apparently comprehensive list of typhoid cases was compiled by Anglophone physicians; one out of every five patients was Finnish, and not a single one was named.[48] This is also the case for other immigrant groups. Joining the ranks of unidentified Finns were a smaller number of Swedish, German, Italian, French, and Cornish individuals.[49] Challenges in communication likely impacted case reporting from these communities and affected how new and changing public health laws and notices were disseminated.

There is no evidence that the great volume of correspondence from the State Board of Health designed to help individuals minimize their risk of contracting typhoid (the salient parts of which were transposed into publications like *The Mining Journal* for ease of access) was ever translated into any other language– here the immigrant perspective is both crucial and absent.

The data compiled by physicians is nonetheless very helpful for tracing the developing centers of the epidemic, as the Finnish cases especially tend to appear in clusters centered in crowded boarding houses and family homes, which shared a source of water infested with *Salmonella typhi*.[5051] The distinct structures of community among the Finnish and other immigrant groups may have impacted transmission, but, as noted above, this element is not preserved. The related socioeconomic stratifications of society in Negaunee may also be looked to for more divisions among the sick and well, and access to non-contaminated water, food, and living spaces. Another weak point in the state of research is the lack of clinical information and epidemiological data pertaining to the outbreak, the absence of which makes it difficult to compare this epidemic to others like it, and to accurately assess the course of the epidemic in Negaunee.

Clinical data is preserved primarily in a series of written memos to Joseph Primeau, the city recorder, from the small handful of medical doctors who treated every single typhoid patient. This must be necessarily understood as an approach in the absence of institutionalized hospital- based care. The reopening of the county "pest house" at the very end of the epidemic, with its constant staff of nurses and physicians on rotation, was the closest thing to hospital healthcare that existed for the treatment of typhoid fever in 1889 Negaunee. Implemented to assist those who could not receive care in their homes, the pest house was, at the end of November, filled entirely by Finnish men.[51] Little is known about the experience of these men, as is generally the case throughout this epidemic; very little remains to tell the story from the point of view of the patient. While plenty can be said about disagreements among the general public and medical community, the consultation of first-hand experiences of those ill with typhoid would provide a critical third angle on the debates. Unfortunately, none could be referenced in the writing of this paper; this shortcoming represents a critical point where more research is necessary to gain a more comprehensive understanding of the events of the epidemic.

Typhoid fever was devastating to the city of Negaunee. Though it afflicted a small portion of the population, it brought with it unrest, suspicion, and hostility. Assessing the course of the disease alongside attempts at its mitigation, both epidemiologically and therapeutically, illustrates the challenges faced by a diverse town to accommodate the information and orders of what was viewed as an occupying power– the State Board of Health. Responses to attempts to ease the damage of typhoid and reactions to the inaction of those with the capacity to enact change reflect a population struggling with the consequences of pervasive epidemic typhoid *and* with the social and structural tensions of working with and at times seemingly in opposition to perceived outsiders. While outsiders may have unfairly amplified the threat of typhoid, the rampant dissent and disagreement of Negaunee certainly points to a city embroiled in crisis. The case of typhoid fever in Negaunee was a preventable one, as the contemporary literature

stressed, yet even two years after dozens of young people died due to the disease, the causative agent had not been properly addressed. A careful examination of the course of the epidemic, the diversity of responses to it, and the perspectives on both of these things from Negaunee locals with different roles provides a nuanced view of the management of infectious disease in a prominent Upper Peninsula town in the late nineteenth century.

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