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John Bohstedt, Major Professor

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TRIAL AND ERROR IN THE PURSUIT OF PUBLIC HEALTH: LEICESTER 1849-1891

A Dissertation

Presented for the

Doctor of Philosophy

Degree

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Scott Edward Roney

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Abstract

This study of Victorian Leicester has discovered three major findings about the study of public health. First, that public health history is complicated and inextricably connected to political history, social history, and cultural history. The borough passed from one equilibrium in 1849 to another equilibrium in 1891, but this passage did not occur by straight paths or by parallel paths.

Second, that public health is a societal construction and the construction follows a pattern. First, a problem is defined. Second, a response is advocated. Third, the response is implemented. Fourth, people must cooperate with the response. Above all, the construction is complicated because there are a great many publics involved. In Victorian Leicester public health responses had great variation because of the number and different interests of the publics and because health issues were addressed in piecemeal fashion. Moreover responses were not necessarily ameliorative for the original problem.

Third, more local studies should be done to flesh out the complicated history of public health in nineteenth century Britain. It was largely at the local level that the drama of public health played out. Such studies, and indeed this study, are relevant to current public health issues.

This study fills some of the holes in the field. It is a local study of Leicester, a Midlands town that in some ways pioneered in public health and paid a penalty for pioneering. This precocity and later recalcitrance are shown in chapter two on sewerage. Chapter three on water supply illustrates the limited value of a for-

profit public health measure. The typhoid fever analysis, chapter four, presents Leicester's response to a typical yet deadly endemic disease brought to notoriety by royal afflictions. Chapter five on scarlet fever demonstrates an aggressive public health response that was measurably successful. Chapter six on summer diarrhoea shows half-hearted and unsuccessful responses to a serious yet poorly understood problem. Finally, chapter seven on smallpox vaccination is instructive if ambivalent. The seemingly bizarre anti-vaccination sentiment in Leicester became confused with the famous "Leicester Method" of victim isolation that informed the World Health Organization's eventual eradication of the disease.

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1. Introduction

Who is the "public" in public health? Common sense discussions of public health do not reflect the complexity involved in answering this question because such discussions assume that "the public" means the population at large. This is far from the case, at least in Victorian Britain, which is when and where modern public health was being invented. There were numerous publics involved in the construction of public health both as decision makers and participants and each public, or those several publics, had different interests and different dynamics in shaping the construction of public health.

Despite those publics' different roles and weights, the process of the construction of public health followed a common pattern. First, a health issue must be defined as a problem. This historically has been less straightforward than might be imagined. Second, some public must advocate a particular response to the perceived problem. Third, some public must choose to implement the proposed response or an alternative response. Fourth, some public or publics must cooperate, or acquiesce, in carrying out the implemented response. Yet even when all four steps were taken, the implemented response might not ameliorate for the original problem. In nineteenth century Britain the fit between problem and solution was unpredictable. Moreover the various publics involved in this construction were not always involved at the same step in the sequence because public health problems were defined in piecemeal fashion rather than under some over-arching scheme.

At the first level, the definition of a health problem depended upon what segment of the overall population was suffering, how visible that suffering was, and how that suffering affected other segments of the population. The mere presence of disease or death did not necessarily demand response. In nineteenth century Britain class was relevant to this level of the construction. Working class diseases did not require responses in all cases, but to the extent that these diseases threatened the higher classes, town leaders acted expeditiously.

At the second step, proposed solutions to public health problems came from a variety of publics. These proposals often but not exclusively came from doctors. Sometimes the medical profession as a whole proposed actions they deemed ameliorative, sometimes individual doctors proposed solutions, and the medical press often weighed in on particular health problems. In the case of nineteenth century British municipalities, the individual town's Medical Officer of Health (MOH), could be the most influential purveyor of suggestions. These MOHs differed by background, personality, and level of medical knowledge. Thus there was variation among the responses they proposed. Moreover the different medical publics did not exhaust the possible publics who might propose solutions to public health problems. In nineteenth century Britain, lawyers such as Edwin Chadwick, civil engineers such as Thomas Wicksteed, politicians such as Joseph Whetstone and publishers, such as James Thompson, all posited solutions to perceived public health problems in Leicester. Not all of the proposed responses were compatible.

The third phase, the implementation of a public health measure was, in nineteenth century Britain, a political question (or problem). Some responses were addressed by parliament, but of the critical decisions lay with local authorities. Indeed most had to meet the approval of both national and local publics. To reach the level of implementation, a public health response had to be more than just perceived to be ameliorative; political bodies had to perceive cost-effectiveness from the response. That implied class once again. Should such political bodies accept the cost/benefit ratio, the nuances of implementation presented another hurdle.

At the fourth phase of implementation, some public health responses in nineteenth century Britain were compulsory, some suggested by local authorities, and some by outsiders. This meant that the various publics affected by the various responses could react in many different ways. This is not mere circular nonsense. It mattered a great deal whether the public health response was compulsory or advisory, who was being compelled or urged, and by whom. Compulsory public health responses were met with both acquiesence and resistance, depending on the threat to health and the burden placed upon a given public. Suggested responses, especially when they originated from outside a borough, were often met with defensiveness and inertia. Some responses were accepted by one segment of the population and rejected by another.

The construction of public health remains more complex than the factors just mentioned, but those four steps are crucial. The factors mentioned, indeed the publics, are at the heart of public health construction. But in addition there is the

question of results. Nineteenth century public health measures were sometimes ameliorative, sometimes irrelevant, and sometimes helpful in spite of a misapprehension of disease causation. So the construction of public health involved trial and error and learning for the several publics, which inescapably adds the historical dimension to the study of public health.

The decisive trials, errors, and learning took place at the local level, where measures were implemented and where people lived, got sick, and died. But that too was a matter of human choice and reflects historical decisions. The national and local concerns about health were interrelated and sometimes battles over turf complicated issues and delayed or modified responses. Because the early work on the history of public health focused on the national arena and national leaders, several recent scholars believe it necessary to complete the story with local studies. This local study of Victorian Leicester illuminates the local stage upon which the fitful drama of public health was played out. If a continuation of this metaphor can be forgiven, the actors need description.

We should not be surprised that the history of public health is in part explained by the state of medical knowledge in nineteenth century Britain. We might be surprised to learn that there were different levels of knowledge among medical practitioners and that "modern" discoveries were not immediately or universally disseminated among medical professionals. Therefore, MOHs for the borough of Leicester were not always among the leading lights of the profession. Yet the MOHs hired by the borough of Leicester were sometimes quite adept in applying new thinking. This variability among Leicester's MOHs reflects individual

expertise rather than a grand plan of the borough to construct public health. Moreover the Leicester town council's choice of MOHs does not reflect a particular construction of public health. Granted that John Buck and John Moore, as the borough's first two MOHs, were middle class residents of the borough, it gets more difficult to explain subsequent appointments to the MOH position. J. Wyatt Crane was middle class and rather ineffective, but William Johnston was closely associated with the working class and celebrated. Henry Tomkins, a typical middle class professional, was the most scientifically oriented of the borough's doctors, but is far from celebrated; he is largely ignored.

Besides the interests and personalities of the MOHs, the construction of public health in Victorian Leicester reflects levels of understanding or misunderstanding of disease causation. Theories of disease causation were competitive in the mid-nineteenth century. The most famous and influential health reformer of the time, Edwin Chadwick, believed firmly in the miasmatic theory of disease causation. This theory held that bad odors caused disease. This was a "localist" approach which tended to reject the notion of contagion. The localist position implied that disease was caused by immediate environmental conditions and discounted that disease could be spread from person to person. For Chadwick, the solution to health problems was to clean up the urban environment; efficient sewerage and clean water would eliminate the smells associated with stagnant sewage and foul water, thus eliminating disease.[1] A related theory of disease causation was pythogenic theory. Many doctors in mid to late nineteenth century Britain

accepted Chadwick's environmental premise but believed that disease was caused by decomposing organic materials if certain disease-causing agents were present in the decomposing material. The disease causing agents were supposed to waft into the air as decomposition took place. This is again a localist theory that leaves little room for the notion of contagion. Yet by acknowledging that these vague disease-causing agents must be present in the decomposing material, pythogenic theory contained the germ of germ theory. Germ theory itself was a product of the 1860s. But the introduction of germ theory did not directly lead to an epiphany among medical professionals or among the population at large. Indeed for many years to come some doctors would hold pythogenic notions for some diseases while simultaneously accepting germ causation for other diseases. So the construction of public health was piecemeal partly because there was not a generally accepted theory of disease causation that addressed all types of diseases.

We should not be surprised that social class was integral in the construction of public health. Some diseases were clearly delineated along class lines. For example, summer diarrhoea in Leicester killed working class infants almost exclusively. Other diseases, such as typhoid fever and scarlet fever, were perceived to originate with the working class but be capable of spreading to the higher classes. These were the diseases most likely to be defined as problems by middle class doctors, reformers, and politicians. So summer diarrhoea in Leicester could be addressed without a great sense of urgency, but typhoid fever and scarlet fever led to more frenetic activity by the borough's leaders and MOHs.

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[1] Sewerage refers to the pipes and other infrastructure that remove the waste; sewage is the

But class was not just an issue of the definition of problems, because class played important roles in the other steps of public health construction. Responses were advocated with clear, if sometimes implicit, recognition of class distinctions and responses were implemented against the backdrop of class. Moreover, class insinuated itself into the cooperation needed for a successful implementation. In this step, classes are often evident as different publics. For one example among many, the isolation of working class children with scarlet fever proved effective in reducing scarlet fever mortality in Leicester but as will be seen below, middle class parents refused to allow their stricken children to participate in the municipal program and scarlet fever mortality reached a plateau. Class was an ever-present factor in the construction of public health.

We should not be surprised that there was a powerful economic component in the construction of public health. This economic component had two sides: first, a cultural emphasis on the sanctity of profit; second, the actual pounds and shillings that would be spent upon a public health response. In the cultural system of Victorian Leicester, water was a commodity from which a private Company had a right to profit, rather than a public good provided by the municipality. The budgetary constraints were obvious in all public health issues in Leicester. This is because public health issues were the responsiblities of local authorities. The landmark Public Health Act of 1848 made health a governmental responsibility and a local responsibility. So the financial burden of public health responses was borne largely by Leicester's town council and therefore by the town's ratepayers.

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excreta and other waste that flows through the pipes.

That meant that politicians, voters, and taxpayers formed different publics in the construction of public health. Moreover this financial burden ensured that public health was constructed in the realm of politics as much as by experts in medicine, engineering, or other relevant fields.

Because public health was politically constructed, we should not be surprised that personalities played an important role. Myriad individuals contributed to the step by step construction of public health and those who refused to define an issue as a problem were as much a part of the process of construction as were the activists. But this is not a morality tale; well-intentioned reformers were sometimes wrong in the responses they advocated or implemented. For example Joseph Whetstone, the most heroic figure in Leicester's nineteenth century public health history, saddled the borough with an innovative, expensive, and ineffective sewer system in the 1850s. Thereafter it was more difficult to convince the political public to undertake another expensive "experiment" in municipal sewerage. Yet failure alone does not tarnish Whetstone's role as a leader in the field of public health in Leicester. While other political leaders in Leicester concerned themselves with more abstract issues, Whetstone consistently focused upon improving the overall health of the populace. On occasion this placed Whetstone in opposition to the difficult, if also well-intentioned, Chadwick, as well as his colleagues in local government. But Whetstone is but one example of the influence of personality on the construction of public health in Leicester.

Each MOH hired by the town council imprinted his own beliefs about disease causation and appropriate responses upon his employers. Given the piecemeal

approach to public health, this is less a chicken and egg conundrum than it might appear. While MOHs undoubtedly were hired by the town council because they held views that were compatible with the thinking of the politicians, the MOHs were charged with identifying and proposing remedies to problems unforeseen at the time they were hired. Sometimes these newly defined problems placed the MOHs at odds their employers because the MOHs advocated more aggressive responses than the politicians could accept. On at least one occasion, the town council recognized that the borough's MOH was "behind the curve" of contemporary medical thought.

Elected and appointed officials were not the only ones whose personalities affected the construction of public health in Leicester. Other influential personalities ranged from the single-minded anti-vaccinationist Amos Booth to the publisher of the Leicester Chronicle, James Thompson. Booth's quirky and indefagitable opposition to compulsory smallpox vaccination helped make Leicester Britain's capital of anti-vaccinationism by the mid 1870s. Thompson's unwavering support of Joseph Whetstone's vision of public health kept Whetstone's construction alive well after Whetstone died. Booth and Thompson represent extremes of personality in the construction of public health in Leicester, but there were many others who were influential and fell between these poles. Yet the mention of the Leicester Chronicle leads toward the role of the press and, indeed, the role of outsiders in the construction of public health in Leicester.

The medical press, represented in this dissertation by the Lancet, often challenged the borough of Leicester to define problems and implement responses.

Nowhere is this more evident than with the case of summer diarrhoea. The leaders of Leicester acknowledged that the Lancet was instrumental in defining summer diarrhoea as a problem in need of correction. Unfortunately, the Lancet could not recommend specific solutions to ameliorate the problem because the set of symptoms that were perceived as a disease could not be specifically prevented or cured. Nonetheless, the Lancet represented national medical opinion, summer diarrhoea fatality was higher than anywhere else in Britain, and Leicester was placed in a no-win situation of having to ameliorate the problem without being privy to any special or particular knowledge of its causation. But the medical press was not the only outside influence upon Leicester. Despite the local responsibility for public health, the central government was involved in the construction. Whetstone's efforts to sewer the borough met with opposition from the central government in the person of Chadwick, Whetstone's desire to provide a clean municipal water supply was precluded by parliament, and the central government largely decided upon vaccination issues. So the central government, the medical profession and its press, and the local press represented more publics involved in the construction of public health.

We should not be surprised that topography was a factor in the construction of public health, but this was subtle in the construction of public health in Victorian Leicester. The town of Leicester lies in a topographical basin; it is a low-lying town surrounded by higher ground. Natural drainage flowed from higher ground to lower ground. Moreover the lower ground was closest to the River Soar and could be inundated by periodic floods in the nineteenth century. In and of itself

the topography of Leicester presented serious challenges for borough sewerage. But, human beings complicated these challenges. To be sure, a civil engineer of the likes of Thomas Wicksteed could have dug his sewer lines deeper and at a sharper angle than he did, but that would have been expensive. Moreover much of the working class housing in Leicester was constructed relatively hastily, in the low ground, and without great concern to the firmament upon which it was constructed. One working class region of town, Middle St. Margaret's Parish, was built upon an old quarry. Garbage filled the old quarry: animal, vegetable, and miscellaneous. Then multi-family dwellings were built on top of what was termed "made ground." The quarry was bounded on all sides by clay. Middle St. Margaret's soon became the epicenter for summer diarrhoea mortality in Leicester and Leicester became the epicenter for summer diarrhoea mortality in Britain. So topography seems to be an objective factor in the construction of public health but on closer inspection human agency and human choices seem at least equally important.

Given the multiplicity of publics in public health and the four step construction of public health, we should not be surprised that public health is more history than science. Science was indeed part of the construction, but only a part, and not always the most influential part of the construction. So the history of public health is much richer than a history of progress. The story of public health is complex; it is not a history of right triumphing over wrong. The story of public health requires an open mind, the good guys sometimes got it wrong, the bad guys

were not necessarily evil in their intentions. Public health was constructed by human beings, not malevolent microbes.

Victorian Leicester is a unique and fertile ground to explore the Victorian construction of public health. The complexity of public health construction might be visible in other municipalities, but Leicester's odd position at the margins of public health reveal more potentialities than other towns. Nowhere else in Britain was there such a leader as Joseph Whetstone, nowhere else did such a noble leader fail. Yet Whetstone provides the parameters of this study; this study begins with his efforts to provide sewerage to the borough and ends with the court-ordered replacement of the sewer system he championed. So this story traces events from 1849 to 1891. The year 1849 was chosen to reflect Whetstone's response to the Public Health Act of 1848, but the year 1891 was chosen for several reasons. Whetstone had been dead for many years, but 1891 ushered in the Gordon sewerage scheme that replaced the original Wicksteed system. The year 1891 also marked a large borough annexation that brought new residents and new topographical challenges to Leicester. And MOH Henry Tomkins, the most scientific of the borough's nineteenth century MOHs, died from influenza in 1891. The years 1849 to 1891 do not reflect straightforward progress from one to the next, but they do represent certain parameters within the construction of public health and show that one equilibrium (1849) can pass to the next equilibrium (1891) by numerous and circuitous routes. The construction of public health in Leicester did not begin in 1849 and it did not end in 1891, but these are convenient and important dates for analysis.

The borough of Leicester led other British municipalities in the pursuit of public health during the late 1840s. But by the 1870s, citizens paraded through the town to honor parents who refused to have their children vaccinated against smallpox. Throughout the Victorian era Leicester suffered Britain's highest rate of infant mortality and local leaders had to be goaded into taking any actions about this mortality. Yet the same authorities aggressively combated scarlet fever mortality with a degree of success heretofore unappreciated.

What can be gained from the study of public health in one nineteenth century municipality? Leicester's rich variety of responses make it an ideal "field laboratory. The borough had dynamic leadership on sanitary matters in the early years of the period 1849-1891, and paid a penalty for pioneering. Yet at the same time a cultural emphasis on the sanctity of profit led to legal restrictions that limited some municipal initiatives, while precocious efforts in civil engineering resulted in some expensive failures. Borough leaders responded to specific diseases on the basis of who was at risk and whose opinions were expressed most forcefully; working class infants who succumbed to summer diarrhoea never had their voices heard, but middle class parents of scarlet fever victims were not ignored. In short, nineteenth century Leicester was a municipality dealing with public health problems in piecemeal fashion as they came to be defined as problems. This sociology of medicine remains typical.

As Thomas Kuhn once argued, medical science develops in reaction to perceived problems rather than in the objective realm of pure science.[2] Though public health measures are generally more preventive than curative, they are also reactive. Since public health measures are responses to problems and public health problems can quickly become crises of mere survival, histories of public health go beyond informing those in the present about how we arrived at this point. Indeed histories of public health can instruct the present and the future, whether the lessons learned are about what to do or what not to do. The borough of Leicester shows a wide spectrum of conceivable public health responses during the second half of the nineteenth century and therefore represents the most valuable unit of local study possible.

Leicester, a pioneer in municipal sewerage, a town vilified for infant mortality, a leader in reducing scarlet fever mortality, and the seat of smallpox anti-vaccinationism, is the optimal municipality for a study of Victorian public health. No other sizable town in Britain exhibited such extremes. Even London, the focus of Hardy's study, can not show everything that Leicester has to offer historians. In 1983, Anthony S. Wohl challenged researchers to do local studies; in 1993, Anne Hardy challenged researchers to look at specific zymotic diseases; in 1998, Christopher Hamlin challenged researchers to think beyond the parameters of the Chadwickian construction of public health and consider social justice; in 1999, Peter Baldwin challenged researchers to explore the relationships between governments and geoepidemiology. This dissertation responds to most

of these challenges because Leicester is a fertile source for evidence on so many responses to public health problems.

About eighty-five miles north of London, Leicester is a town with ancient roots. It is a town where the ruins of Roman baths share stones with a still functioning church of Saxon and Norman construction. The River Soar generally meanders through the borough but was subject, in the nineteenth century, to periodic flooding that could inundate the lower portions of the town. At the beginning of the nineteenth century Leicester was home to some 17,000 people; by 1851 the population had risen to 60,642; in 1891 there were 174,624 inhabitants. A significant borough extension within 1891 explains only a fraction of the population growth; the rest came from in-migration and a high birth-rate.

Leicester was a center for hosiery manufacture throughout the period and a burgeoning shoemaking industry especially after 1850. Bill Lancaster enumerates the difficulties of assessing the importance of factories in Leicester but it would seem that some patterns can be discerned.[3] Workshops for hosiery manufacturing were replacing the putting-out system of home production from the 1840s but the shift was neither rapid nor universal. Moreover factories came on the scene only rather late in both industries during the 1870s and 1880s. According to Nancy Osterud the transition to factories was nearly complete by 1891.[4] Osterud reports

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[2] Thomas Kuhn, The Structure of Scientific Revolutions (Chicago: University of Chicago Press, 1962), 19.

[3] Bill Lancaster, Radicalism, Cooperation, and Socialism: Leicester Working-Class Politics 1860-1906 (Leicester: Leicester University Press, 1987).

[4] Nancy Grey Osterud, "Gender Divisions and the Organization of Work in the Leicester Hosiery Industry," in Unequal Opportunities: Women's Employment in England 1800-1918, ed. Angela V. John (Oxford: Basil Blackwell, 1986), 45-68. See also Sonya Rose, Limited Livelihoods: Gender and Class in Nineteenth-Century England (Berkeley: University of California Press, 1992), 4-7.

that women were always heavily employed in hosiery and this tendency only increased throughout the period, making hosiery into an industry with a predominantly female labor force. This trend was not duplicated in shoemaking but female labor still made up something like 33% of the total in this industry. Osterud argues that married women were part of the workforce while their children were quite young and only exited the labor market when their children were old enough to replace the mothers' incomes. Contemporaries and historian F.B. Smith contend that mothers' employment materially contributed toinfant mortality.[5] I do not echo this argument, but the issue resonates in the contemporary rhetoric of the problem.

Politically Leicester's local government lends itself to a periodization based on the 1835 Municipal Corporations Act. The corrupt, debt-ridden, Conservative-dominated local corporation, perpetuated by a system that allowed the leaders to hand pick fellow leaders, gave way to a ratepayer-elected "reformed corporation" on 1 January 1836. The new administration was overwhelmingly Liberal (52 to 4) and largely non-Anglican (40 to 16).[6] These two features continued to characterize the town council throughout the period under consideration but some changes did take place within the Liberal and dissenting leadership. According to Peter Jones' study the original leaders of the reformed corporation were large manufacturers but these men were gradually replaced by professionals and men of

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[5] Smith, The People's Health, 85-104.

[6] A. Temple Patterson, Radical Leicester: A History of Leicester 1780-1850 (Leicester: University College, 1954), 214-15. Denominationally, the dissenters were composed of 12 Unitarians, 12 Baptists, 10 Independents, 3 Quakers, 2 Methodists, and 1 Huntingtonian.

lesser means.[7] This finding is in keeping with E.P. Hennock's detailed analysis of Birmingham and Leeds in Fit and Proper Persons: Ideal and Reality in Nineteenth-Century Government.[8] These studies suggest that in the years after 1835 ratepayer parsimony increasingly dominated local elections. Not only did manufacturers remove themselves from the town council (in contrast to the magistracies that they continued to find desirable), but the composition of the professional members of the council shifted. In the early years of the reformed corporation those professionals were physicians but in later years accountants and other professionals replaced them. Despite such changes in personnel the local government was staunchly Liberal from 1849 to 1891 although electoral landslides to the extent realized in 1835 were a rarity.

The national government that produced the 1835 Municipal Corporations Act was expanding in terms of participation by an extended franchise and in terms of the central government's role in the lives of citizens and the administration of local governments. Catholic emancipation in 1829 and especially the Reform Act of 1832 ushered in the notion of the malleability of the constitution along with a relatively small number of new voters. The reformed parliament promulgated the Factory Acts of 1833, the New Poor Law of 1834, and of course the Municipal Corporations Act. Central government concerns about public health heightened with Edwin Chadwick's 1842 Report on the Sanitary Condition of the Labouring Population of Great Britain. Public awareness of deplorable urban living

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[7] Peter Jones, "The Recruitment of Office Holders in Leicester 1861-1931," Transactions of the Leicestershire Archaeological and Historical Society 57 (1981-1982): 64-77.

conditions grew from this well-publicized and well-distributed report; legislation soon followed.[9] Piecemeal laws such as the Nuisances Removal Acts of 1846 and the Towns Improvement Clauses Act of 1847 culminated in and were consolidated to some extent by the Public Health Act of 1848. This legislation created the central government's General Board of Health. Chadwick was appointed the sole stipendiary commissioner of that Board, from which position he attempted to guide local and national public health policies until his downfall in 1854.[10] Under the terms of the Public Health Act of 1848, local governments were permitted rather than compelled to create local boards of health. Both carrot and stick incentives were present in the bill. Local governments choosing to apply the Act became eligible to borrow against future rate revenue in order to finance such projects as municipal sewerage systems. Local governments that chose not to apply the Act could have its provisions forced upon them if their annual death rates exceeded the level of 23 per 1,000 living persons. While that compulsory aspect of the legislation was rarely if ever used, at least one historian suggests that some municipalities applied the Act to avoid the intervention of the central government in local affairs.[11] I can not say whether the reformed corporation of Leicester was motivated by such apprehension to apply the Act. I can say with certainty that some influential leaders of the corporation, led by

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[8] E.P. Hennock, Fit and Proper Persons: Ideal and Reality in Nineteenth-Century Government (London: Edward Arnold, 1973; reprint, Ann Arbor: UMI, 1991).
[9] M.W. Flinn, introduction to Report on the Sanitary Condition of the Labouring Population of Great Britain by Edwin Chadwick [1842] (Edinburgh: Edinburgh University Press, 1965), 1-73.
[10] The General Board continued until 1858 when its functions were taken over by the Privy Council. In 1871 the Local Government Board assumed these responsibilities.
[11] Malcolm Elliott, Victorian Leicester (London: Phillimore & Co., 1979), 58.

Alderman Joseph Whetstone, supported passage of the Act by parliament but hoped that the Act's final language would not give such coercive powers to the central government.[12]

Leicester's town council commissioned a survey of the town in 1847 to prepare for municipal sewerage. The council was among the first English towns to apply the Act of 1848. The council appointed the country's first MOH under the auspices of the Act, Dr. John Buck, although Liverpool's MOH provision was the legal template for such a position. The council, under Whetstone's leadership but without unanimity, blazed the trail for Chadwickian sanitation yet came into conflict with Chadwick himself on sewerage and piped water supply. After Whetstone passed from the scene, the central government continued to pass public health legislation. Two important pieces of legislation, the Public Health Act of 1872 and the Infectious Disease Notification Act of 1889, had no impact on Leicester whatsoever because the town had already set similar or higher standards for itself through private bill legislation

Much of the evidence for this dissertation comes from sources produced within Leicester. The reports of the borough's Medical Officers of Health (MOHs) have been exploited extensively. Each MOH, surgeon or physician, was hired by the town council and charged with collecting health data and improving health conditions in the town. The abilities of the MOHs varied considerably and their responsibilities increased throughout the period under study. The Leicester Chronicle (after 1864 the Leicester Chronicle and Mercury), provides both

information and commentary. This newspaper consistently represented the town's majority Liberal position.[13] Town council minutes are employed, but they seem "sanitized" in order to minimize the differences of opinion among the councilors. The council's minutes often do not record debate. Minutes from the board of directors of the Leicester Waterworks Company have proven useful, but are inconveniently missing for the period 1872-1878 when the Company passed from private to municipal ownership. Numerous published pamphlets survive on topics from sewerage proposals to summer diarrhoea to smallpox vaccination. Local authors, from the Unitarian missionary Joseph Dare to the cantankerous anti-vaccinationist J.T. Biggs, weighed in on public health issues and this study reflects their opinions where appropriate. These sources, and others not specifically mentioned, can be found at the Leicestershire Record Office (LRO) in Wigston Magna.

Sources produced outside of Leicester have also been useful for this study. Some documents from central government officials provide counterpoints to locally generated documents. These include selected Parliamentary Papers and pamphlets. The journal Lancet, was not an official publication of the British medical community, but has proven particularly useful to represent the medical community's positions on issues affecting Leicester and upon local responses.[14]

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[12] Leicestershire Record Office (LRO) CM 1/5, Common Hall Books, Minutes of Town Council, 22 March 1848, 90-92.

[13] Leicester's Liberals were not always unitary, even during the period when the leaders were all Unitarians. James Thompson's Chronicle tended to favor Whig Liberals over Radical Liberals.

[14] Precedents for using the Lancet for this purpose can be found in K. Codell Carter, "Nineteenth-Century Treatments for Rabies as Reported in the Lancet." Medical History 26 (1982): 67-78 and Ronald D. Cassell, "Lessons in Medical Politics: Thomas Wakeley and the Irish Medical Charities, 1827-1839," Medical History 34 (1990): 412-423.

Since its origins in the 1950s, the history of British public health has broadened in scope and matured in analysis. Three important books published within the last ten years represent the diversity and maturity of the field.[15] Much work remains to be done to address the complex of medical, political, social, economic, and environmental histories that make up the history of public health. In particular the field needs more research at the municipal level because these were the arenas where problems were identified and potential solutions were implemented. Yet on a wider scale, public health problems long solved in Britain continue to challenge other parts of the world and some problems that seemed to have been solved worldwide might soon resurface. For example, though no human being on earth has contracted smallpox for almost three decades the virus is alive and well and could be disseminated in terrorist attacks or unconventional warfare. So the study of public health history is more than an academic exercise. Since public health problems can quickly become crises of mere survival, histories of public health go beyond informing those in the present about how we arrived at this point. Indeed histories of public health can instruct the present and the future, whether the lessons learned are about what to do or what not to do. The borough of Leicester shows a wide spectrum of conceivable public health responses during the second half of the nineteenth century and therefore represents the most valuable unit of local study possible.

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[15] Anne Hardy, The Epidemic Streets: Infectious Disease and the Rise of Preventive Medicine (Oxford: Oxford University Press, 1993); Christopher Hamlin, Public Health and Social Justice in the Age of Chadwick: Britain, 1800-1854 (Cambridge: Cambridge University Press, 1998); Peter Baldwin, Contagion and the State in Europe, 1830-1930 (Cambridge: Cambridge University Press, 1999).

The historiography of British public health has evolved over the last five decades. Perhaps the best example of this evolution is the treatment of Edwin Chadwick. Chadwick remains a key figure in Victorian public health; in all but the narrowest of studies his role can not be avoided. R.A. Lewis nearly beatified Chadwick and the public health movement[16] while S.E. Finer explored the motivations, actions, and foibles of the erstwhile Poor Law Commission secretary.[17] Lewis' and Finer's emphasis on central government reformers helped to spark a debate about the importance of Benthamism in British social reform. Though most historians acknowledge that Chadwick created the public dialogue about health in Britain, historiographical commentary in the 1960s and early 1970s devolved into a debate between Oliver MacDonagh and Henry Parris about the pervasiveness of Bentham's Utilitarianism in social reform.[18] By 1988, this tangential argument was resolved by Anthony Brundage's England's "Prussian Minister:" Edwin Chadwick and the Politics of Government Growth, 1832-1854.[19] Brundage convincingly argued that Benthamites were few but disproportionately influential. Brundage's work remains essential for its exposition of how Chadwick's dogged style led to several central government reforms.

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[16] R.A. Lewis, Edwin Chadwick and the Public Health Movement, 1832-1854 (London: Longmans, Green, 1952).
[17] S.E. Finer, The Life and Times of Sir Edwin Chadwick (London: Methuen & Co., 1952).
[18] See Peter Stansky, ed., The Victorian Revolution: Government and Society in Victoria's Britain (New York: New Viewpoints, 1973).
[19] Anthony Brundage, England's "Prussian Minister:" Edwin Chadwick and the Politics of Government Growth, 1832-1854 (University Park, Pa.: Penn State University Press, 1988).

Yet not until Christopher Hamlin's work in 1998 were Chadwick's views on public health properly contextualized.[20] Hamlin demonstrates that Chadwick was not unique. In itself this was historiographically important but Hamlin went farther. Hamlin took the time to explain Chadwick's opinions on disease causation. Previous scholars acknowledged Chadwick's obsession with proper sewerage and clean water supply to the extent that it has become cliché to associate Chadwick with egg-shaped glazed earthenware pipes. But Hamlin shows that Chadwick's Benthamist views were not destined to prevail because they were based on ultimate "Truth." Chadwick believed that miasma caused disease; "bad air" led directly to disease. Since "bad air" permeated the cities of Victorian Britain it was no wonder that urban dwellers were ill. Following Chadwick's logic, sick working class people made unproductive employees, therefore cities should be made more healthful. Sewerage, garbage disposal, and clean water should yield a more productive workforce. But Hamlin cautions that truth won out only in the sense that we still subscribe to the "sanitary idea" advanced by Chadwick and his associates. Indeed Hamlin argues that the very term "public health" was claimed and defined along Chadwickian lines. Hamlin reminds us that politics determined the course of public health, not Truth.

For all its merits, Hamlin's work leaves room for more explanation of disease causation theories. He correctly labels Chadwick's view as miasmatic, but Chadwick was a lawyer not a doctor and Hamlin's study ends in 1854. For the period of the current study, many medical professionals subscribed to the

pythogenic theory of disease causation. As mentioned above miasmatic and pythogenic theories have similarities yet have an important difference. Specific causative agents remained obscure well beyond Pasteur's work in 1864. Moreover, germ theory was not once and universally accepted in 1864. Indeed this study will provide examples of the gradual acceptance of germ theory and microbiology among health professionals. But it was miasmatic theory that first informed Chadwick and pythogenic theory that led to many sanitary reforms.

Hamlin argues that the Chadwickian construction of public health involved epidemic communicable diseases, sewers, and water supply. In 1993, historian Anne Hardy wrote that historians have not paid enough attention to the specific diseases involved. Victorian public health officials referred to diseases that were perceived to be contagious as "zymotic."[21] Hardy's book, The Epidemic Streets, addresses eight of these diseases in some depth.[22] This dissertation overlaps her work on several of these diseases, though in a different locale and with some differences in findings. But Hardy also engages another historiographical debate in her work. In 1976, Thomas McKeown advanced the thesis that now bears his name.[23] McKeown posited that improving mortality rates in Britain, especially after 1870, resulted much more from improved nutrition than from preventive public health measures. Hardy argues that some public health measures were

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[20] Christopher Hamlin, Public Health and Social Justice.

[21] The term "zymotic" was coined by the Registrar-General, Dr. William Farr, and for the purposes of this dissertation will be used in its Victorian sense as "contagious" or "communicable." John M. Eyler, Victorian Social Medicine: The Ideas and Methods of William Farr (Baltimore: Johns Hopkins University Press, 1979), 24.

[22] To some extent these diseases had been previously addressed in F.B. Smith, The People's Health 1830-1910 (London: Croom Helm, 1979), but Smith's national approach is necessarily more scattered and anecdotal than Hardy's study of London.

ineffectual but on the whole, public health innovations and interventions had a positive effect upon mortality rates. This study agrees with her general thesis and ironically strengthens it because her finding that scarlet fever mortality did not improve from preventive measures is here contradicted.

Hardy's belief that public health responses proved effective places her in the same historiographical camp as Anthony S. Wohl. But to Hardy's way of thinking, Wohl's Endangered Lives focuses too narrowly on the sanitation side of public health history.[24] Yet this book remains the finest primer in the field. Indeed Christopher Hamlin argues that if the history of British public health consisted of exposing horrific conditions and describing sanitary improvements, such a history has already been written.[25] Published several years after F.B. Smith introduced the social historian's statistical tools and bottom-up perspective to public health history, Wohl crafted these new elements into a masterfully written and researched book. Wohl exploited the records produced by Victorian Medical Officers of Health (MOHs) more fully than had writers who came before him and these records provide particularly rich source material. Moreover, Wohl issued a call to researchers to investigate how local authorities dealt with public health problems because he recognized that this was the critical level of

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[23] Thomas McKeown, The Modern Rise of Population (London: Edward Arnold, 1976).
[24] Anthony S. Wohl, Endangered Lives: Public Health in Victorian Britain (Cambridge, Mass.: Harvard University Press, 1983).
[25] Hamlin, Public Health and Social Justice, 8-9.

implementation. In part, this dissertation responds to Wohl's call as did Hamlin in 1988.[26]

Yet Wohl's work remains subject to criticism on two levels. First, it exposes conditions that modern readers consider so abhorrent that it might seem that the conditions alone led to the search for solutions. Thus "right-thinking" reformers become heroes as they battle the apathetic or parsimonious villains holding power over local governments. But the heroes were not always right, nor the villains always wrong. Moreover conditions, however deplorable, did not directly lead to responses. Human agency, politics, and the opinions of numerous publics defined conditions as problems and limited conceivable responses.

Second, Endangered Lives takes a "triumphalist" approach to public health. Wohl's admonition that readers should credit the reformers for their achievements rather than criticize them for their failures is similar to Anne Hardy's acceptance of the beneficial results produced by nineteenth century innovations. But Hamlin suggests that the triumphalist view allows Victorian public health reformers to write their own history. That is, Chadwick and his associates framed the discourse of public health so effectively that contemporaries and historians alike have allowed the framework to stand. While Hamlin's criticism of the triumphalist view is valid and provocative, it does not diminish the value of Wohl's contribution to the field. Wohl addresses the public health reformers on their own terms. He measures success based upon what the reformers set out to do using contemporary standards and knowledge.

Hamlin's Public Health and Social Justice reinforces the political constraints of public health policy in Britain. So does Peter Baldwin's Contagion and the State in Europe 1830-1930 in a comparative way. In this recent work, Baldwin assesses public health policies from a top-down perspective. Baldwin's book problematizes previously accepted connections between political systems and public health initiatives. Baldwin challenges the logical formulation, once posited by historian Erwin Ackernecht, that countries with authoritarian governments were interventionist and countries with liberal governments were not.[27] Simply put, Ackernecht's position meant that authoritarian governments should have accepted the notion of "contagion" and responded with quarantines; liberal governments should have rejected "contagion" and safeguarded the freedom of movement for individuals. Baldwin shows that logic need not prevail in the history of public health. Indeed Baldwin persuasively argues that liberal Britain accepted "contagion" and intervention under certain circumstances. So British political authorities accepted restrictions upon the freedoms of individuals when these individuals were perceived to be significant threats to the health of others.[28] Baldwin's ultimate argument then, is that public health initiatives did not proceed from the type of government a state had. Rather, public health initiatives and types of government both arose from geoepidemiological experience.[29]

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[26] Christopher Hamlin, "Muddling in Bumbledom: On the Enormity of Large Sanitary Improvements in Four British Towns, 1855-1885," Victorian Studies 32 (1988): 55-83.
[27] Erwin Ackernecht, "Anticontagionism Between 1821 and 1867," Bulletin of the History of Medicine 22 (1948).
[28] See for example, R.J. Morris, Cholera 1832: The Social Response to an Epidemic (New York: Holmes and Meier, 1976).
[29] Baldwin, Contagion and the State, 555.

While geoepidemiology is a cumbersome term, the concept behind it is straightforward. Disease has always been a bane of human existence and contagious epidemic disease creates the greatest amount of consternation. Geographical and topographical circumstances enhance or inhibit the spread of communicable diseases. Human societies respond to the connection between geography and disease culturally. The culture that arises from the fear of disease is then reflected politically. Governments have long been expected to protect subjects or citizens. So different political systems are, at least in part, responses to where different societies find themselves in the geoepidemiological landscape because societies exhibit varying levels of vulnerability to "imported" diseases.[30]

Baldwin's work, in one way, brings British public health historiography back to Benthamism. After all the "felicity calculus" of the greatest good for the greatest number should determine that the public's right to health outweighs an infected individual's right to freedom of movement. Baldwin does not accept the Benthamist position uncritically. But the top-down approach has limitations. Baldwin recognizes that all individuals had the same rights in theory, but in practice middle class individuals had more options than working class individuals. Baldwin mentions this distinction, but it is not the focus of his project. In Leicester, working class victims and working class diseases faced different consequences and responses than did their middle class counterparts. Class issues insinuate themselves into this story because they are present in the evidence.

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[30] Though Baldwin makes no reference to it, the controversial William H. McNeill, Plagues and Peoples (Garden City, N.Y.: Anchor, 1976), also shows the effects of disease on a global scale.

This study fills some of the holes in the field. It is a local study of Leicester, a Midlands town that in some ways pioneered in public health and paid a penalty for pioneering. This precocity and later recalcitrance are shown in chapter two on sewerage. Chapter three on water supply illustrates the limited value of for-profit public health measures. The typhoid fever analysis, chapter four, presents Leicester's response to a typical yet deadly endemic disease brought to notoriety by royal afflictions. Chapter five on scarlet fever demonstrates an aggressive public health response that was measurably successful. Chapter six on summer diarrhoea shows half-hearted and unsuccessful responses to a serious yet poorly understood problem. Finally, chapter seven on smallpox vaccination is instructive if ambivalent. The seemingly bizarre anti-vaccination sentiment in Leicester became confused with the famous "Leicester Method" of victim isolation that informed the World Health Organization's eventual eradication of the disease.

Readers of this dissertation might question my selection of the issues to be discussed. For example, readers might well ask why cholera, the scourge of the nineteenth century does not merit a chapter. The answer is fairly simple; cholera was not a health problem in Leicester between 1849 and 1891. I recognize the significance of the British epidemic of the early 1830s and I acknowledge the importance of a renewed visitation leading to the Public Health Act of 1848. Indeed Dr. John Snow's groundbreaking epidemiological investigations of water-borne cholera took place in 1849 and 1854, which are clearly within the chronological parameters of this study but cholera was not defined as a problem in Leicester between 1849 and 1891. Anne Hardy argues that as the last British

cholera outbreak in 1866 was confined to London, the country had an effective sanitary cordon. In Peter Baldwin's terminology, the central government's "neo-quarantinist" policy was successful. So this study marginalizes the disease most apt to cause panic in nineteenth century Britain. Moreover, this study does not address typhus, another deadly disease that had very little impact on Leicester. Rather than explaining why other diseases such as diptheria, whooping cough, and measles are omitted, it would be more fruitful to discuss why the included chapters have been chosen.

Hardy argued that sewerage and water supply were inappropriate for her study of zymotic (contagious) diseases. I appreciate her position that not enough work has been done on specific diseases and I believe this dissertation will help in that regard. Yet sewerage and water supply were at the heart of the Chadwickian construction of public health. Christopher Hamlin describes the primacy of the Chadwickian construction in Public Health and Social Justice, but in another work he provides a model to explain the implementation of municipal sewerage schemes.[31] Such models need to be tested. This study shows that Hamlin's model of municipal sewerage holds for Leicester, but in a very unusual way. Hamlin argued that litigation to clean up rivers forced towns to provide sewerage, yet Leicester's town council faced no such legal challenge when they introduced the borough's first sewer system. This innovative system proved a failure however, and ultimately litigation forced the council to provide another system.

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[31] Hamlin, "Muddling in Bumbledom."

The history of the town's piped water supply pits public health in competition with the drive for profit. Though it seems counterintuitive today, the expectation that piped water would necessarily be used to flush sewerage does not reflect mid-nineteenth century thinking. Water supply and sewerage could be completely independent. Moreover Chadwick himself assumed that water supply and sewerage would be managed for profit. Leicester's town council guaranteed profits to a private company. Then it took nearly three decades for the town's leaders to wrest away control of the piped water supply from the private company.

Hardy's call to focus on specific zymotic diseases is reflected in this dissertation's chapters on typhoid fever, scarlet fever and summer diarrhoea. Of these three, summer diarrhoea came to be the problem that national publics closely associated with Leicester. As mentioned above, typhoid fever was endemic throughout Britain. A classic example of a filth disease, typhoid fever became notorious because it struck members of the royal family, but it brought no particular opprobrium to the town of Leicester. The borough's health officials responded to the disease according to the Chadwickian, sanitationist approach. They tried to improve the urban environment by closing polluted wells and upgrading effluent plumbing.

Scarlet fever was another deadly disease that did not place Leicester in the national spotlight. In combating it, local officials were not satisfied with an environmental approach aimed at filth and sanitation. They used legislative measures and an isolation hospital to limit the spread of scarlet fever. Contrary to Hardy's findings, evidence from Leicester indicates that this interventionist

approach, which Baldwin would term "neo-quarantinist," succeeded in reducing mortality from this disease. Yet the measurable value of this interventionist approach waned when confronted with middle class resistance to victim isolation.

Summer diarrhoea was a little understood malady that brought Leicester to the forefront of national attention. Infant mortality from summer diarrhoea was consistently very high in the borough, indeed higher than in any other British town. Because no one knew the cause of this "disease," the national medical community heaped blame upon the town, but had little to offer in the way of a remedy. Leicester's officials moved haltingly to investigate this working class "disease," but continuous pressure from outside Leicester led local officials to address the problem with rhetoric, shoe-leather epidemiology, and eventually microscopic research. Hardy found summer diarrhoea too complex to address in her book and I do not pretend to provide a definitive etiological explanation in this dissertation, but a study of public health in Victorian Leicester that did not address summer diarrhoea would be a cowardly enterprise. Twenty-first century medical practices can lessen the ravages of this "disease," but such symptoms remain and occasionally lead to fatalities.

Likewise a study of public health in Victorian Leicester would be remiss if it did not address the smallpox anti-vaccination movement. Chapter seven concerns the resistance to compulsory vaccination much more than the disease itself. Leicester became the anti-vaccination capital of Britain and people associated with Leicester led the movement that ultimately achieved the parliamentary repeal of compulsory vaccination laws. Anti-vaccinationist rhetoric claimed that the

movement was about individual freedom and that the Leicester Method of victim isolation was about sanitation. Baldwin accepts the first part of this claim, but cites the Leicester Method as an example of neo-quarantinism.[32] For many years historians have accepted the anti-vaccinationists' claim that popular resistance to smallpox vaccination in Leicester mushroomed when the Leicester Method was introduced.[33] This dissertation shows that widespread resistance to compulsory vaccination had less to do with the alternative Leicester Method of victim isolation than it had to do with reduced penalties for parents who refused to have their children vaccinated. This finding adjusts the historiography of anti-vaccinationism. Middle class leaders of the movement have, to some degree, been allowed to write their own history much as Hamlin contends that Chadwick and his associates did. Anti-vaccination leaders espoused abstractions about the power of the central government. But working class people in Leicester recognized the limitations of vaccination through personal experience and only turned against vaccination in great numbers when the penalties for refusal were greatly reduced.

A study of nineteenth century Leicester accomplishes more than most local studies could. All Victorian towns faced public health problems but Leicester handled these problems uniquely, with the exception of typhoid fever. Rather than being a mere oddity in the history of public health, Leicester illustrates alternative responses. To be sure, some responses were more effective than

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[32] Baldwin, Contagion and the State, 290.
[33] See, for example, Stuart M. F. Fraser, "Leicester and Smallpox: The Leicester Method," Medical History 24 (1980).

others, but that is precisely why this study has merit. Too often advances in public health are assumed as by-products of "progress." We should recognize that such advances were the results of processes that included trial and error, and sometimes it was error that persisted. Responses had to be perceived as ameliorative and economical by many different people who influenced implementation.

This dissertation concerns a town at the forefront of Victorian public health. In some ways the town's leaders put the borough in the forefront, in other ways, with other issues it was outsiders who put Leicester to the front and, to be sure, there were public health issues that left Leicester in the middle of the pack. I believe that it is important to address all three scenarios and I believe that no other nineteenth century British town can exemplify such diversity as does Leicester. This dissertation shows that medical knowledge was changing in the second half of the nineteenth century, it shows that medical knowledge needed to be politically, economically, and socially accepted in order to be implemented, and it shows that such acceptance depended upon popular beliefs and acquiescence. The construction of public health was accomplished in a four step process: definition, advocacy, implementation, and cooperation. Many publics were involved in the construction. This dissertation reveals the complexity within the construction. It shows the importance of local studies because they were the main arenas within which nineteenth century British public health was constructed. It dispels notions that public health was something other than a human construction and clearly shows that health issues were addressed individually rather than

according to grand schemes. Moreover, it traces a fascinating and complex set of stories in a town with fascinating and complex people.

2. "The experiment at Leicester failed:"[1] municipal sewerage

Rapid urbanization in the era of the industrial revolution was an unprecedented phenomenon in Britain. Problems associated with such concentrations of population were largely unprecedented as well. These problems were in a great number of different areas but health problems were among the most significant. By the 1830s, if not before, it was clear that towns were far more lethal than rural areas. This situation was underscored by Edwin Chadwick's Report of 1842. As a Benthamite, Chadwick was concerned by the effects of poor urban health on productivity and the parochial poor rates. In terms of Chadwick's pythogenic theory of disease, bad smells, or miasms, were actual agents of disease. Thus the elimination of bad smells would materially lessen disease and thereby increase productivity and reduce the burden on the rates. The construction of sewerage systems to dispose of waste would clearly make towns less noisome.

Yet when Chadwick wrote his Report what would come to be called "sanitary science" was in its infancy. Sewerage systems that existed in towns were designed more as storm drains than as modern sewers. Moreover, in Britain, these sewers were under the auspices of individual parishes rather than town governments. Some engineers and reformers were quite interested in making sewerage a comprehensive municipal service. Their theories of sewerage were largely untested however because of expense and parochial control. In fact the first comprehensive sewerage system in Europe, that of Hamburg in 1853, was

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[1] Richard Smith, PP 1864, vol. Xiv, Select Committee on Metropolis and Town Sewers, Minutes of Evidence, 64.

only made feasible because a fire had destroyed much of the town. British engineers had no towns to be rebuilt to use as experiments. In these conditions no proven method of sewage removal and disposal, could have arisen. Some towns would have to serve as guinea pigs before an accepted remedy developed.

The reformed corporation of Leicester, more specifically its Highway and Sewerage Committee, was very quick to respond to the Public Health Act of 1848. The town council was among the first British towns to apply the Act to its jurisdiction, transforming itself into a Local Board of Health. Moreover the town was the first in England to appoint a Medical Officer of Health (MOH) under the terms of the Act, in the person of the surgeon, John Buck.[2] Additionally the Committee set itself upon the task of petitioning the General Board of Health for a sanitary inspection of the town.[3] This initiative was launched by the Unitarian Liberal leaders of the town council, Joseph Whetstone and John Biggs.

Surprisingly, given their superficial similarities of religion, economic position, and political party, the call for a sanitary inspection was one of the few times that these two leaders would agree on a course of action. Whetstone and Biggs were both members of the Unitarian Great Meeting. Whetstone was one of the founders of the Meeting's Domestic Mission and Biggs was a substantial contributor to the cause. Both men were significant manufacturers, Whetstone in worsted and Biggs in hosiery. Both were Liberals. Both men advocated causes

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[2] Leicester appointed two MOHs, Buck being one of them, following the 1846 Nuisances Removal Act but three months after these appointments Liverpool obtained a local act which "caught the imagination of the nation." Anthony S. Wohl, Endangered Lives: Public Health in Victorian Britain (Cambridge, Mass.: Harvard University Press, 1983), 180. The Liverpool model was the basis for the MOH in the 1848 act and Leicester was then the first town to conform to this model.

for which England's leadership was not ready. Whetstone petitioned Parliament for a national poor rate[4] and Biggs agitated for something close to universal male suffrage.[5] Both men recognized that Leicester had managed to clear off the inherited debt from the pre-1835 corporation before 1849, but they had distinctly different opinions on how the newly unencumbered revenue should be spent. Biggs was an "improver" or Radical Liberal while Whetstone was an "economist" or Whiggish Liberal. Biggs was a popular champion because of his nearly Chartist ideals and his unilateral abolition of frame rents for his workers. Indeed the following generation commemorated him as such with an impressive statute, at an important crossroads in Leicester's City Centre. But when the future MP, Biggs, considered physical "improvements" for the town his thought turned to projects like a new building for the town council.[6]

Paradoxically, sewerage became recognized as a problem to be addressed when Whetstone, the "economist," insisted that a sewerage scheme must come before any cosmetic improvements in Leicester. It has been posited that local politicians who embraced the "sanitary idea" did so to diffuse concern over egalitarian political issues.[7] Whetstone did not fit into this category. Whatever his thoughts might have been about enlarging the electorate, and these are unknown to me, he was such a singly stalwart supporter of sanitation and

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[3] LRO CM 1/5, Town Council Minutes [hereafter Minutes], 29 November 1848, 182-83.
[4] Ibid. 1 March 1848, 77.
[5] Bill Lancaster, Radicalism, Cooperation and Socialism: Leicester Working-Class Politics 1860-1906 (Leicester: Leicester University Press, 1987), 76.
[6] The Guildhall which served as the town council meeting place and as a library among other functions had been in existence since at least the fourteenth century.

sewerage reform that there can be little doubt about his sincerity. Indeed, I would argue that Whetstone was too zealous for his time; because of his personal ability and tenacity Leicester would be saddled with a sewerage system that was both inefficient and ultimately dangerous. It seems that Whetstone was moved by Chadwick's 1842 Report and concerned about Leicester's overall death rate of 30 per 1,000 which was third highest in the nation. He would also have had contact with Chadwick in the mid-1840s when the reformer took personal interest in the drainage and watering of Leicester.[8] Whetstone wedded his personal concerns about public health with the borough's newfound solvency and the opportunity provided by the Public Health Act of 1848 to demand the primacy of sewerage reform from his position as chairman of the Finance Committee of the town council. Yet this is far from a condemnation of the man; if the Leicester sewerage system eventually proved to be disastrous it was because later leaders, with "weaker shoulders"[9] than Joseph Whetstone, failed to react with the decisiveness and forcefulness that he would have shown.

The sanitary inspection that Whetstone and Biggs requested, by William Ranger of the national General Board of Health in 1849, was quite positively received in Leicester.[10] This report pointed to deficiencies especially in regard to the drainage of the town, but it did not prescribe any "particulars" to ameliorate

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[7] R. A. McKinley and C.T. Smith, "Social and Administrative History," in The Victoria History of the Counties of England, A History of the County of Leicestershire, vol. 4, Leicester, ed. R. A. McKinley (London: Oxford University Press, 1958), 214. [hereafter VCH 4]

[8] Anthony Brundage, England's "Prussian Minister:" Edwin Chadwick and the Politics of Government Growth (University Park, Pa.: Penn State University Press, 1988), 104-06.

[9] Councillor William Winterton addressing the town council as reported in the LC, 4 April 1874. Despite Winterton's appeal the council shelved consideration of sewerage reform at that time.

the situation.[11] Therefore Whetstone, the newly appointed chairman of the Highway and Sewerage Committee, and Samuel Stone, the town clerk, took it upon themselves to commission an engineer to design a system for Leicester's sewage.[12] As comprehensive sewerage systems were neither legal nor plausible before the late 1840s (as they were parish not corporation systems), Leicester became something of a test case.[13]

The decision-making process within the Highway and Sewerage Committee is rather opaque, but the committee quickly affirmed Whetstone's choice of the gentleman to evaluate the town and propose a scheme. Samuel Stone referred to Thomas Wicksteed as "an eminent engineer"[14] and there is every reason to believe that Wicksteed had earned such a reputation. Chief engineer of the East London Water Works, Wicksteed pioneered the use of steam engines to lift sewage, consulted on projects as distant as Boston and Berlin, and received an engineering Gold Medal for his efforts.[15] In addition Wicksteed was the holder of five separate sewage treatment patents out of only twelve such patents awarded in Britain by 1850. The local press also believed that Wicksteed possessed "the most eminent engineering advice to be had."[16] Table 2.1 helps to illustrate the paucity of choices available to the town in 1849, and again points to the

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[10] Accounts of the Ranger Report can be found in McKinley, VCH 4, 264 or Malcolm Elliott, Victorian Leicester (London: Phillmore & Co., 1979), 56-57.
[11] LRO CM 1/5, Minutes, 27 July 1849, 289.
[12] Samuel Stone was commemorated equally with Whetstone in the "shoulders" speech by Winterton.
[13] McKinley, VCH 4, 256.
[14] LRO CM 1/5, Minutes, 5 September 1849, 313.
[15] The Engineer 32 (1 December 1871): 383; Proceedings of the Institution of Mechanical Engineers (1872): 23.
[16] LC, 4 September 1852.

reasonableness of the Committee's offer to Wicksteed. Few engineers of the time could boast of Wicksteed's experience in matters of sewerage.

On 17 September 1849, Wicksteed accepted the offer to survey Leicester and design a sewerage plan. He informed the town council that he could not spare the time to personally superintend the construction of the system. The council, acting as the Local Board of Health, hired him at five guineas per day on 19 September.[17] The drainage conditions which confronted Wicksteed were dismal. What rudimentary sewers existed in the town had been installed by individual parishes or private developers with little coordination. These sewers were flushed only by rainwater, had only a slight

Table 2.1. Sewage treatment patents awarded in Britain 1800-1875[18]

Years	Patents
1800-1809	1
1810-1819	0
1820-1829	0
1830-1839	1
1840-1849	10
1850-1859	59
1860-1869	75
1870-1875	156

[17] LRO CM 1/5, Minutes, 19 September 1849, 333-34.

[18] PP 1857 vol. xx, Report on the Means of Deodorizing and Utilizing the Sewage of Towns by Henry Austin, C.E., 93-96. PP 1876 vol. xxxviii, Report of a Committee appointed by the President of the Local Government Board to Inquire into the Several Modes of Treating Town Sewage, Appendix vi, 105-15.

gravitational flow, and were square and angular; they tended merely to accumulate filth. What effluent managed to escape the various systems was simply discharged untreated into the River Soar.[19] Approximately 3,000 uncovered cesspools littered the urban landscape, occupying fully 1 ¼ acre of the town.[20]

The cesspools were concentrated in the poorer neighborhoods where overcrowding was heaviest. The deleterious effects to health from stagnant, raw sewage will be treated elsewhere in this dissertation, but it is relevant here to mention the coincidence of such sewage with housing patterns. In 1850 the Highway and Sewerage Committee attempted to respond to complaints by middle class landlords and working class tenants about the high cost of having cesspools cleaned by initiating a municipal program to empty their contents at five shillings per week.[21] The committee soon halved the rate because the tenants, who were held responsible for the fee, did not subscribe to the service in numbers acceptable to the landlords.

It was clear to many members of the community regardless of economic status, that the status quo for drainage and waste removal was unsatisfactory. Wicksteed's comprehensive sewerage scheme was submitted to the Local Board in March of 1850. Writing on behalf of the Highway and Sewerage Committee, Samuel Stone called the plan "a very long, able, and interesting document [it]

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[19] Jack Simmons, Leicester: Past and Present, vol. 2, Modern City 1860-1974 (London: Eyre Methuen, 1974), 13.
[20] Wohl, Endangered Lives, 95.

contains much information and suggestions of a very valuable character which will require the calm and deliberate consideration of the Council."[22] Stone's words were taken to heart; five hundred copies of the report were printed and distributed for "calm and deliberate consideration." Additionally, the Leicester Chronicle ran a full description spread across two issues of what would come to be described as the "Preliminary Report."[23]

The essence of the Wicksteed system was to drain the town's sewage in brick lines, which were more porous but less expensive than glazed earthenware pipes, by gravitation to the "works" which were to be located on the banks of the Soar, north of the town and downstream from Leicester (see figure 1.1). There the sewage would be pumped into long reservoirs where it would be treated with a lime slurry to precipitate the solid matter. The liquid portion would move slowly through two reservoirs totaling 190 feet at which point it would be deemed "sweet" and be discharged into the river. The precipitated solid matter would be raised by an Archimedes screw to a "Jacob's ladder" series of large buckets that would raise the material to a height of twenty feet. Then it would be deposited into a large pipe with perforated trays; gravitational force would press out any remaining liquid. The trays would then be removed, the residue cut into brick size, and dried to be sold as manure.[24]

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[21] LRO CM 1/5, Minutes, 20 December 1849, 395-96.
[22] Ibid., 20 March 1850, 451.
[23] LC, 23 March 1850, 30 March 1850.
[24] The most concise description of the Wicksteed system can be found in PP 1857, vol. xx, Royal Commission on the Deodorization and Utilization of the Sewage in Towns, 22-24 [hereafter PP 1857, vol. xx RCDUST].

Several key assumptions which would have both short and long-run effects informed the Wicksteed plan. The first of these assumptions was that the collection of sewage, or human excreta, could be a profit-making venture. While "sewage for profit" sounds quite odd to twenty-first century ears, it was a pervasive goal for Victorian reformers.[25] They were deeply convinced that farmers would buy town sewage for fertilizer. Edwin Chadwick himself founded a private company to distribute human waste to agricultural consumers.[26] It was obvious to the Chronicle that "Mr. Wicksteed places great reliance upon the returns to be derived from the sale of manure."[27] In fact, Wicksteed anticipated that the manure bricks would fetch £2 per ton, a price on a par with high quality South American guano. However, Leicester did not enter into the venture to make profit for itself. The corporation intended to bear the expense of installing the lines and erecting the "works" as a civic function. Wicksteed's Patent Solid Sewage Manure Company would receive the town's sewage in exchange for the operation of the "works." Thus any profit that would accrue from the sewage would belong to the Company. This does not mean that the corporation rejected "sewage for profit" as too risky a venture; in the lease that was granted to the Company, the Company was permitted to back out of the contract at any time.[28]

Another faulty assumption underlying the Wicksteed system was an underestimate of Leicester's future growth. Wicksteed estimated that his system

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[25] See for example S.E. Finer, The Life and Times of Sir Edwin Chadwick (London: Methuen & Co., 1952), 300.
[26] Brundage, England's "Prussian Minister." 101-07.
[27] LC, 16 March 1850.

would be sufficient for thirty years, but it is unclear how he arrived at that figure. If Wicksteed relied on what I would call "best estimates" a population growth of 19% per decade might have been projected.[29] The actual population growth rate over the thirty-year period (1851-1881) was 34% per decade.[30] Again the Highway and Sewerage Committee accepted Wicksteed's figures, and therefore the town council, or Local Board of Health, did as well. Thus the corporation expected a thirty-year respite from sewage problems if the system was implemented.

A third assumption, that rainwater would be sufficient to flush the proposed system, will be dealt with in specific detail later. Here it must be argued that there was no serious alternative. Flushing the sewers with municipal water may seem eminently practical in the twenty-first century but it was hardly practicable in 1850s Leicester. Municipal corporations were legally prohibited from establishing their own waterworks systems if private companies stood willing to provide services. Such a company had existed in Leicester since 1846.[31] Although the corporation held a minority position in that company (originally 21%) it was unable to set policy for the company.[32] One policy of the company was that customers could not subscribe to the service merely to flush water

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[28] LRO L.614, John Moore, Annual Report of the Medical Officer of Health for 1855 [hereafter MOH 1855], 7.
[29] These figures can be constructed from the data presented in Barry Haynes, Working-Class Life in Victorian Leicester: The Joseph Dare Reports (Leicester: Leicestershire Libraries and Information Service, 1991), 10, 96, based on growth 1831-41 and 1841-51.
[30] Ibid., 96. This average distracts from the increasing population growth. If Wicksteed anticipated 57% over 30 years this was in fact realized in 20 years.
[31] Simmons, Leicester: Past and Present, 11.

closets. So even where dwellings communicated with the sewerage system via water closets no benefits could be derived if the occupants used another water source for other household uses. This situation made it hardly imaginable that anything other than rain could have flushed Wicksteed's system; the seemingly complementary services of water and sewerage were not in communication conceptually even when such communication was physically possible.

A fourth assumption of the Wicksteed scheme, based on limited evidence, was that a lime slurry could effectively purify the sewage. From Table 2.1 it is clear that there were not a great many sewage treatment systems to choose from. The lime slurry method of purification had not been attempted on as large a scale as a town the size of Leicester but several experiments had produced results which permitted optimism. Two chemistry professors from Guy's Hospital, Alfred S. Taylor and Arthur Aikin, tested the lime slurry method under laboratory conditions and found the resulting water to be quite pure.[33] A field test undertaken in Leicester satisfied the Local Board of Health and positively delighted the Leicester Chronicle.[34] That these tests formed the basis of the town's acceptance of the treatment method tells us two important things. First the lime slurry method of sewage treatment had achieved nothing approaching the

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[32] Robert Read, Jr., Modern Leicester: Jottings of Personal Experience and Research, with an Original History of Corporation Undertakings, and of each Regular, Militia, Yeomanry, & Rifle regiment localized at The New Military Centre (Leicester: Winks & Son, 1881), 28-29.

[33] LRO Pamphlets vol. 49, Report of the Highway & Sewerage Committee of the Local Board of Health for the Borough of Leicester, Respecting the Proposed Scheme for the Sewerage of Leicester, and the Report of the General Board of Health Thereon, with 1.A Report from Mr. Lee, One of the Superintending Inspectors of the General Board of Health; 2. A letter from the General Board to the Local Board; and 3. The Reply of Mr. Wicksteed to the Report of Mr. Lee [1852], 41-51. [hereafter LRO Pamphlets vol. 49, Report...Respecting...Scheme]. The two chemists declined to evaluate the quality of the manure for fertilizer.

status of an ameliorative technical consensus. It was still an experimental method that required demonstration of its likely success. Second the leaders of Leicester were rational, responsible consumers of Wicksteed's approach. They personally attended the on-site experiment and evaluated the merits of the method.

Under the terms of the 1848 Public Health Act it was not sufficient for the Local Board and/or the corporation to accept a sewerage scheme. Parliament would then need to pass a local bill and the General Board of Health must approve the borrowing of the necessary funds. While Parliament proved not to be a major obstacle to the plan, the General Board assumed a confrontational position.

It has been argued that the General Board's antagonism to the Wicksteed scheme was the result of personal animosities. Historian S.E. Finer concluded that Edwin Chadwick of the General Board resented the arrogance of engineers in general, and of Wicksteed and Robert Stephenson in particular.[35] That contention is shared by all of the contemporary sources from Leicester. But in the long run, the Local Board and the General Board both presented valid points and mistaken conclusions.

The General Board of Health did not respond to the Wicksteed proposal in a timely manner. The Local Board submitted Wicksteed's "Preliminary Report" to the General Board at the same time that it initiated the legislative process for the local act of Parliament. At this time the General Board had no comment. Several

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[34] LC, 2 October 1842.

months later the Local Board forwarded Wicksteed's "Written Report" to the General Board. The "Written Report" revised and refined the "Preliminary Report." The "Preliminary Report" was drawn while Wicksteed was a five guinea per day consultant, but the "Written Report" was drawn when Wicksteed had signed on to oversee construction and operate the works.

The General Board "sat" on Leicester's plan until the day before the local bill went before Parliament. According to Leicester's town clerk, Samuel Stone, Chadwick and his board were accused of being dilatory, underhanded, and unreasonable.[36] Indeed the timing of Chadwick's objection to the plan is questionable. The substance of the objection was that the plan did not specifically diagram how each dwelling in the town would communicate with the new sewers. Since Leicester's program was precocious, the protocol for interaction between Local Boards and the General Board was being invented as they went along. The Local Board was not working closely with the General Board so the demand for such specificity, however, desirable, came as a last minute surprise. Parliament granted the local act, but the General Board retained the right of final approval of the plans before the money could be borrowed.

Chadwick commissioned a senior inspector of the General Board, William Lee, to evaluate the Leicester plans before they could receive General Board approval. Lee reviewed the plans and toured Leicester in late 1851. On 26

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[35] Finer, The Life and Times of Sir Edwin Chadwick, 455-56.
[36] LRO Pamphlets vol. 49, Samuel Stone, Report...Repsecting...Scheme, iii-x.

January 1852, Lee made his report to the General Board of Health.[37] Lee had nothing positive to write about the proposed Wicksteed system; his numerous objections can be grouped into four general complaints.

The first of Lee's complaints was that Wicksteed's scheme was incomplete. In part this echoed Chadwick's demand that every building or court should be shown to communicate with the municipal sewerage system. Lee contended that without a house-to-house survey of Leicester no plan could predict either efficiency or economy. Moreover Wicksteed's "Preliminary Report" described a system that would be implemented incrementally as subscription funds became available. Ultimately the system was funded by loans against the rates but the ambiguity in the "Preliminary Report" allowed for a measure of local autonomy that could have been perceived as a challenge to the General Board's control over future sewerage systems.

Second, Lee pointed to problems that the system could have with rainwater. Lee contended that the sewer's capacity was inadequate for sewage alone and that rain could inundate and incapacitate the system. The inspector believed that Wicksteed had erred in his calculation of the ability of the system to dispose of rainwater because the engineer based his figures on average rainfalls rather than the greatest deluges on record. In Lee's opinion, a large storm would "impound" the sewage and prevent it from reaching the works.

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[37] LRO Pamphlets, vol. 49, William Lee, Report...Respecting...Scheme, 23-24. I have grouped Lee's points into four topics and will treat each individually but the source remains the same until otherwise noted.

Third, Lee did not like the plan for the treatment works. He objected to the size of the sewage reservoirs, claiming that their evaporation would be "contaminating the air." Lee was not really out of step from educated opinion with the pythogenic statement; indeed it is surprising how often pythogenic, or miasmatic, explanations accurately describe the conditions leading to disease, if not the actual mechanisms or vectors upon which transmission depends. Lee also doubted the efficacy of using lime as a purifier, but he was unfamiliar with the lime slurry method and had not troubled to acquaint himself with Taylor and Aikin's research.

Fourth, and a bit ironically, Lee objected to the expense of the Wicksteed system. As mentioned above, Wicksteed had opted for brick sewer lines. Glazed earthenware pipes were much less porous than brick but they were much more expensive. Wicksteed attempted to compromise between the two methods by proposing two overlapping layers of brick to minimize the amount of porous material exposed to the sewage. Lee thought that the second layer of bricks was an unnecessary expense. Moreover, Lee thought that the sewer lines ran unnecessarily deep in the earth under the streets. If the proposed lines were generally raised three feet, Lee foresaw great savings. Two months after his initial report, Lee added that Wicksteed had acted irresponsibly by leaving so much room for municipal growth in his scheme. Lee wrote that Wicksteed had allowed for a fourfold increase in Leicester's population. This was an unreasonable expenditure to Lee; it was "extravagant and full of injustice to the

existing ratepayers."[38] How Lee arrived at this population projection is no more clear than how Wicksteed arrived at his, but from the 1851 census figures, Lee thought that the system could accommodate up to 240,000 persons. As will be seen below, the system proved dangerous with less than half of that population level.

Lee urged the General Board to reject the proposed Wicksteed system in its entirety. His report was the first volley in a series of battles between Chadwick's General Board and Whetstone's Local Board. The General Board was victorious in this first skirmish. Writing for the General Board on 13 February 1852, Henry Austin informed Leicester that "[t]he General Board deeply regret the inconvenience to which the Local Board will have been put by the preparation of so imperfect, so wasteful, and so unsatisfactory a scheme; and by the necessity which the general board consequently feel for declining to sanction a mortgage for its execution."[39] Austin also took this opportunity to accuse the Local Board of being responsible for the delays in the General Board's actions.[40]

Immediately after Austin's pronouncement on the Leicester scheme, Wicksteed defended his plan before the Local Board. His correspondence to the Local Board is largely a point by point rebuttal of Lee's objections, but he prefaced all specific remarks by disclaiming, "I have abstained from personalities, which are as undignified as they are unnecessary in making a plain statement of

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[38] LRO Pamphlets vol. 49, William Lee, Report to the General Board of Health on a Scheme for the Drainage of Leicester, and the Conversion of the Sewerage Water thereof into Manure; also Remarks on Mr. Wicksteed's Reply to the above-named Report (1852), 33. [hereafter LRO Pamphlets vol. 49, Report...also Remarks].

[39] LRO Pamphlets vol. 49, Henry Austin, Report...Respecting...Scheme, 26.

acts, or in arguing upon a scientific subject."[41] Without rehearsing Wicksteed's technical disagreements with Lee, two points are worthy of mention: one notable, the other notorious. The first of these is that Lee reviewed the "Preliminary Report" (also called the "Printed Report"), in addition to the "Written Report," and criticized their inconsistencies. Wicksteed contended that the "Preliminary Report" was relatively superficial and only the "Written Report" should have been reviewed. The "Written Report" differed from the "Preliminary Report" not only because it was more detailed, but because the projected reservoirs at the works had been vastly reduced in surface area. This is notable because it demonstrates that Wicksteed's technology, informed as it was by pythogenic theory, changed over a relatively short period of time; there was no tried and true method of sewage treatment in the early 1850s. The notorious aspect of Wicksteed's rebuttal concerned the ability of the proposed system to handle the combination of sewage and rainwater. Wicksteed claimed that Lee's concerns about a great deluge would require sewer lines up to 26 feet in diameter to sufficiently drain the town. More to the point, Wicksteed expressed his belief that rainwater would "dilute" the sewage and make it less offensive. Dilution might appear to have salubrious effects within a pythogenic framework because it would weaken the smell. Of course dilution would have no helpful effects on the real agents of disease, and any volume incapacities of the system would serve to spread these agents to the extent that the system backed up.

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[40] Ibid., 25.

[41] LRO Pamphlets vol. 49, Thomas Wicksteed, Report...Respecting...Scheme, 28. The following information comes from this source also.

Wicksteed's defense of his proposed system meant nothing to the General Board; it was addressed only to the Local Board. But the Local Board was not cowed by the General Board. Having already secured Parliament's approval for a scheme in 1851, Whetstone was not about to let Lee, Austin, and Chadwick prevent Leicester from borrowing the necessary funds to get the system working. In the spring of 1852, Joseph Whetstone proved to be a masterful politician, marshalling his Local Board and outwitting the consummate bureaucrat, Edwin Chadwick.

In late March, Whetstone approached the Local Board with four potential responses to Austin's rejection of the scheme. First, they could meet with the General Board to see if their differences could be overcome. Second, the Local Board could petition Parliament to obtain the records of the General Board. The purpose of this was said to be a suspicion that the General Board would approve only plans that were drawn up by their staff engineers. Third, the Local Board could submit Wicksteed's plans and the General Board could submit Lee's objections to a mutually agreeable, impartial engineer for arbitration. Fourth, the Local Board could do nothing and hope for a change in personnel or philosophy within the General Board.[42] Scrapping the Wicksteed plan was not offered as a potential response.

By his initiative, Whetstone kept the Local Board's debate within the parameters of his proposed responses. Three of the four options were debated and supported by some members of the town council. Opinions were floated about

the high quality of Lee's report (Parker), the vindictiveness of Lee's report (Moxon), and Lees apparent hypocrisy, seeming to approve the scheme while he was in Leicester but denouncing it when he returned to Chadwick's London (Crawford). Whetstone's third response, independent arbitration, escaped debate, so the Alderman once again took the floor. Whetstone then presented his strategy. The Local Board should humbly ask the General Board for the audience mentioned in the first option. While there, the Local Board's deputation would suggest putting the plan to an independent engineer. Whetstone told the Local Board that its deputation should nominate the renowned railway engineer, Robert Stephenson. Chadwick would find the name of Stephenson rather distasteful,[43] but if the proposed referral would appear spontaneous it would be difficult for Chadwick to oppose such a celebrated name. Whetstone moved this plan and it was quickly adopted.

In May 1852, the Leicester deputation was met in London by Chadwick, Dr. Thomas Southwood Smith, and the chair, MP Lord John Manners. Leicester's deputation consisted of members of the Highway and Sewerage Committee led by Joseph Whetstone and Samuel Stone. According to Stone, the Leicester deputation complained about the General Board's delays and Lee's report. In Stone's account of the meeting, with its local viewpoint, Whetstone then put forward his suggestion of an impartial engineer; either Stephenson or Rendel would be acceptable. Lord Manners considered this idea to be "not at all

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[42] LC, 27 March 1852.

unreasonable." Stone records no objections from Chadwick or Southwood Smith, in fact they appear silent, and the Chair's opinion held sway. The Leicester deputation departed the meeting and went directly to meet with Stephenson.[44] Whetstone's strategy succeeded with ease.

On 26 May, Stephenson expressed his approval of the Wicksteed scheme; this was something of a foregone conclusion since he was Whetstone's handpicked arbiter. Despite Stephenson's endorsement of the scheme, the engineer editorialized about the conduct of both sides: General and Local Boards were both at fault. As an MP, Stephenson acknowledged the "transparently bitter feeling"[45] between the two boards. With pomposity befitting an MP, Stephenson went on to write that "it pains me more to trace a thread of acrimony running through the negotiation, uncalled for, I think, in the part of the Local Board of Health, although with provocation; and...altogether undignified and unworthy on the part of a General Board especially appointed to encourage and forward, and not to thwart and delay, or, as has sometimes happened within my own knowledge, altogether to stop improvements of a sanitary character."[46] Stephenson's approval was essentially a go-ahead for the Wicksteed system; it was expected that he would oppose Chadwick, but he did place some of the onus on the Local Board. His distribution of guilt was not echoed in Leicester.

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[43] Finer, Life and Times, 380, 445. Finer points to disagreements and animosity between Chadwick and the engineering profession generally as well as between Chadwick and Stephenson specifically.

[44] LRO Pamphlets vol. 49, Report of the Highway and Sewerage Committee of the Local Board of Health for the Borough of Leicester, with 1.-A Report from Robert Stephenson, Esq. Civil Engineer. 2.-Remarks on the Chemical Portion of Mr. Lee's Report, by Mr. Aikin and Dr. Taylor (1852), 3-4. [hereafter LRO Pamphlets vol. 49, 1 Report...2 Remarks].

[45] Ibid., 7.

Throughout 1852 writers in Leicester defended the Local Board and attacked the General Board. Regarding the problems between Wicksteed and Chadwick, Stone wrote, "[a]t the time of [Wicksteed's] appointment, it was not known, or even suspected, that any personal feeling of hostility existed towards him on the part of any influential member of the General Board."[47] The Chronicle was clear about whom it supported: "In vain does the Town Council persevere, with a laudable wish to promote the public health, in promoting a well-matured, carefully considered scheme, -there is a power which stands above it in the metropolis which throws obstacles in its way, with a pertinacity that would do honour to a better cause."[48] The Unitarian missionary Joseph Dare went so far as to blame the General Board for working class people patronizing a folk-healer, the "Wise Woman of Wing," for their ailments: "The London Board, by its dilatoriness and needless objections to the proposed Drainage Scheme, has been the best patron she has had in this neighborhood; for many here who visit her have no positive disease, but are oppressed with the languid disenjoyment of existence consequent upon malaria and undrained dwellings."[49] There are numerous examples of poor opinions of the General Board emanating from Leicester.

As the General Board had agreed to abide by Stephenson's decision, construction began on the system in 1852. It was 1855 before the Wicksteed

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[46] Ibid., 12.
[47] LRO Pamphlets vol. 49, Samuel Stone, Report...Respecting...Scheme, iv.
[48] LC, 4 September 1852.
[49] Joseph Dare (1852), quoted in Haynes, Working-Class Life, 44. Dare used the word 'malaria,' in its pythogenic sense of 'bad air.'

system was fully functional in Leicester. For much of the town the event was eagerly anticipated, but MOH John Moore was displeased that many water closets would not prove to be a link between a piped water supply and piped sewers. As mentioned above, the water company sold only an "all or nothing" package, showing no particular interest in public health for its own sake.[50] The Local Board could do little to influence the water company; its independence was perfectly legal.[51] Cesspools and middens remained but were reduced in the town, and dry conservancy, from regularly emptied pail closets, would emerge as a means of waste disposal.

In 1857, one year before the General Board's demise, the Wicksteed system in Leicester was presented in Parliament as a possible national model.[52] During the hearings it was conservatively estimated that more than £30,000 had been "necessary to bring the process to its present practical condition."[53] It was also claimed that Wicksteed could provide a similar system to a town of 500,000 people for £40,000.[54] In 1857, only three other towns in Britain had sewerage systems sufficiently comprehensive for the Royal Commission to consider as

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[50] LRO L.614, John Moore, MOH 1854, 6.
[51] Municipal water supply will be addressed in the following chapter, but as mentioned above, Whetstone did manage to get the corporation involved in the endeavor. It was not a completely municipal system until the mid-1870s under Alderman Windley.
[52] PP 1857 vol. xx, RCDUST, 354-55.
[53] Ibid., 24. Estimates of the cost of the Wicksteed system range from £30,000 to £60,000. I use the lowest figure because there can be no doubt that at least £30,000 was spent. Interestingly, £30,000 was equal to all corporation expenditures for 1846, before the corporation applied the Public Health Act of 1848 to itself. See also Simmons, Past and Present, 13; PP 1864 vol. xiv, Select Committee on Metropolis and Town Sewers, Minutes of Evidence, 213. [hereafter PP 1864 vol. xiv, SCMTS].
[54] PP 1857 vol. xx, RCDUST, 24.

models. In terms of profitability none of them had results that were compelling enough to form a technological consensus on sewage treatment.

Parliament's search for a generally accepted remedy on sewerage continued into the 1860s. Many towns still had no system in the early 1860s and the Wicksteed system continued to be evaluated. Testifying before the Select Committee on the Sewage of towns on 12 May 1862, engineer and farmer Edwin O. Tregelles observed that "chemically, the experiment at Leicester is a success; it has cleansed the town, and it has materially lessened the mortality in the town; but as a matter of pounds, shillings and pence, it is a loss; they are disappointed there."[55] Indeed Wicksteed's company was greatly disappointed. The concept of "sewage for profit" was taking quite a beating in Leicester. Original calculations valued the manure bricks at £2 per ton, but by this time the bricks were selling at 2 shillings per ton.[56] Wicksteed's company was realizing only 5% of ideal revenue per unit. So the system that the company expected to realize £10,000 per annum from in its first fifteen years (and double that figure per annum in the second fifteen years), was quickly operating at a loss.[57] Moreover there was no repeat business; "they sold it to fresh customers every time; that is to say, a man used it, and then would not buy anymore."[58] Tom Taylor, secretary to the Local Government Board, testified on 16 June 1864, that the "dry manure which was

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[55] PP 1862 vol. xiv, First Report from the Select Committee on the Sewage of Towns, 29. [hereafter PP 1862 vol. xiv, FRSCST].
[56] PP 1864 vol. xiv, SCMTS, 213. The price would eventually fall to 1s per ton. Read, Modern Leicester, 19.
[57] Read, Modern Leicester, 19.
[58] PP 1864 vol. xiv, SCMTS, 213.

produced at Leicester was next to useless."[59] Taylor was also asked if there was an exemplary sewage treatment process that the central government should apply to provincial towns as a sort of template. He replied there was not.[60]

In the 1860s the financial problems of the Wicksteed system continued to mount while hints of its chemical failure began to be heard. First, Wicksteed's private company "bugged out" of the project by turning it over to the corporation in 1865. The corporation inherited the company's buildings and machinery at no cost, but it also inherited a £2,000 annual expense to keep the system functional.[61] This £2,000 was equal to 15% of the corporation's entire annual expenditures in the period before the Public Health Act of 1848 had been applied. Second, non-pecuniary deficiencies of the system began to be noticed in Leicester. R. A. McKinley notes that by 1867 there were comments that the River Soar had smelled bad for several years.[62] These two developments did not bode well for Leicester's sewerage system. Moreover the man whose leadership on public health issues had been so critical to this point, Joseph Whetstone, died in the winter of 1868. Whetstone had been committed to "economy" as well as sanitation and his death occurred at the unfortunate time that the Wicksteed system was open to criticism on both counts.

As problems in Leicester's system were becoming more pronounced some other British towns were experiencing apparent success by a method of disposal

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[59] Ibid., 169.
[60] Ibid., 170.
[61] John Storey, Historical Sketch of some of the Principal Works and Undertakings of the Borough of Leicester since the Passing of the Municipal Corporations Reform Act (Leicester: W.H. Lead, 1895), 14-15.

known as sewage irrigation. By this method a town's sewage was drained or pumped to rural areas where it would be allowed to percolate into the soil. On this soil, which was perceived to be nutrient-enhanced, crops such as rye or hay were cultivated for sale. This method would come to serve as the basis for a generally accepted remedy on Victorian sewage disposal. The use of raw town sewage for agricultural irrigation was perceived to bring two benefits. First, it would ameliorate the problem of river pollution that came from imperfectly treated sewage.[63] Second, it revived the notion of "sewage for profit."[64]

River pollution, or rather lawsuits arising from river pollution, provided the impetus for many towns to initiate sewer systems. Christopher Hamlin has shown that it was a norm for towns to resist such projects until they were forced to act by court injunctions.[65] Indeed it was such a commonplace that Lord Robert Montagu of the Select Committee on Metropolitan and Town Sewers were surprised to learn that Leicester had not installed the Wicksteed system in response to such an injunction.[66] While Hamlin's thesis looks bad in Whetstone's Leicester there would come a time when the town would be forced to replace the Wicksteed system on the basis of complaints about the condition of the River Soar.

"Sewage for profit" was a dream that refused to die and it was given extended life by sewage irrigation systems. Lest we scoff at the tenacious notion of "sewage for profit" we should perhaps consider how our own society hangs much

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[62] McKinley, VCH 4, 278.
[63] LC, 20 January 1872.
[64] Ibid., 9 July 1870.
[65] Christopher Hamlin, "Muddling in Bumbledon: On the Enormity of Large Sanitary Improvements in Four British Towns, 1855-1885," Victorian Studies 32 (1988): 55-83.

of its commitment to the recycling of solid waste on the possibility of recovering costs.[67] Before 1870 it was already obvious that farmers had little interest in purchasing town sewage whether in solid or liquid form and the opportunity afforded by irrigation, selling agricultural products rather than fertilizer, provided an attractive alternative.

It is an intriguing but unanswerable question to ask how Leicester would have reacted to the dual problems facing the Wicksteed system had Joseph Whetstone survived. "Economy" and public health were the foundations of his political life and it is possible that the two issues could have dovetailed with regard to sewage irrigation. Leicester had invested early and heavily in its sewerage system; naturally there would be a reluctance to consider the efforts and expenditures on the Wicksteed system as merely expensive mistakes. Could or would Whetstone have led the town council decisively into a new era that would have required further large investments? Sadly we shall never know.

Without Whetstone's leadership the Local Board was cognizant of problems but hesitant to act. By 1869 the sheer cost of the Wicksteed system had induced the corporation to commission civil engineer Baldwin Latham to design a new sewerage scheme with the understanding that his experience was with irrigation systems.[68] Latham's proposal scheme would have made three important changes in the Wicksteed system without laying entirely new sewers. The change that

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[66] PP 1864 vol. xiv, SCMTS, 176.

[67] Dr. John Bohstedt draws an apt parallel between nineteenth century 'sewage for profit' and twentieth century reluctance to recycle, citing the abandonment of municipal recycling projects that did not break even financially. Moreover the parallel can be further drawn with reference to private companies in the recycling business with an eye to profit.

appeared so divisive in 1870 was the conversion from lime slurry treatment to agricultural irrigation. To the town this was the most expensive change in the proposal because of the cost of the irrigation land. The Latham system offered other farsighted opportunities. At the break from "high" land Leicester to "low" land Leicester Latham proposed an intercepting sewer that would direct the sewage to the existing "works" which would then become mere pumping stations for the new irrigation system. Ultimately this intercepting sewer would have prevented some of the worst human by-products from inundating the lower, primarily working class, sections of the town. Latham also proposed that rainwater from the lower sections be communicated directly to the river via new lines, while the lower sections' sewage should continue to be directed through the Wicksteed lines to the "works" and then to the irrigation farm.[69] By this strategy, Latham's proposal may have addressed the most telling deficiencies of the Wicksteed system. Amidst all the engineering subtleties and personal attacks, William Lee's report of 1852 had pointed out that Wicksteed "admits the sewers are neither adapted for the sewage alone, nor for the rain water; and he has failed to prove their adaptation for a practical combination of the two."[70]

With scant attention to the rain/sewage problem the Chronicle urged the adoption of the Latham irrigation scheme. Citing the pecuniary success of irrigation systems at Croydon, Norwood, Aldershott, and Worthing, the Chronicle proclaimed that a "very great improvement with the sanitary arrangements of our

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[68] Storey, Historical Sketch, 15.
[69] LC, 9 July 1870.
[70] LRO Pamphlets vol. 49, Report...also Remarks, 37.

large towns is on the eve of being adopted in many parts of England. Whether Leicester shall be foremost in the work or lag behind, depends upon the Town Council and the ratepayers."[71] The Lancet also heaped praise on Latham's irrigation proposal. In 1870 the medical journal based its argument not on strictly public health considerations but on cost-effectiveness and the devaluation of manure.[72] Consensus was forming in some circles, but not in Leicester, and never without reference to "sewage for profit."

The early 1870s witnessed fits and starts but little improvement in Leicester's sewers. Nothing was done about Latham's proposal; it was considered too expensive to rent the irrigation land.[73] The Lancet lamented:

> It is confidently affirmed that the sewers are exceedingly foul, that they are all but impervious [i.e., they were stagnant], that from insufficient ventilation the gasses escape into the houses through defective service drains, and that the single outlet is insufficient to take away the sewage when it is increased to any considerable extent by rain. Some time ago the subject of disposing of the sewage by irrigation was discussed; but, as usual, the landowners of the district are so blind to their own interests as to refuse to countenance the scheme. The Corporation is at this moment threatened with legal proceedings, the river Soar being in a very polluted state for many miles below the town.[74]

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[71] LC, 9 July 1870.
[72] Lancet, 5 March 1870, 358.
[73] McKinley, VCH 4, 278.
[74] Lancet, 17 December 1870, 864. No legal proceedings actually took place for several years.

Rather than invest a large sum to initiate an entire revamping of the Wicksteed system as Latham had proposed, the corporation contracted with the Phosphate Sewage Company to chemically treat the sewage at the existing works. The cost to the corporation was £1,000 per annum, less painful than the £6,312 annual estimate for Latham's system, but the corporation was still responsible for the maintenance costs and rather than receiving a projected revenue of £24,000 per annum from irrigation products, the corporation would receive nothing.[75]

The curious aspect of the decision to contract with the Phosphate Sewage Company was that the company itself did not advocate its own treatment method as an alternative to irrigation, but only as an adjunct to irrigation.[76] In fact, at Tottenham the treatment had failed to meet national River Pollution Commission standards for purity.[77] Clearly the corporation chose the less expensive means of treatment. They had been promised the stars with Wicksteed's scheme, so skepticism about Latham's scheme was not unreasonable in the early 1870s.

It can be argued that the Wicksteed experience jaded the Local Board into minimal activity. I would further argue that the initial investment in the Wicksteed system brought reluctance to invest in later potentially disappointing schemes. Even partially remedial efforts were dealt with primarily with an eye to parsimony. For example the Privy Council's inspector, Robert Rawlinson, recommended venting sewer lines in the middle of roadways, but Leicester opted for the less expensive method of ventilating the sewers through factory

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[75] LC, 1 August 1870, 20 January 1872.
[76] Lancet, 6 January 1872, 25.
[77] LC, 20 January 1872.

chimneys.[78] The health benefits of transferring backed-up sewer gasses from basements to open-air ventilation are not measurable, but the factory chimneys that were employed in 1872 were far more scattered than Rawlinson's suggested street vents.

In 1873 there was a reputed falling out between Leicester and the Phosphate Sewage Company for reasons that are unclear. This led the Local Board to consider anew the prospect of a revamped system of sewerage. The Highway and Sewerage Committee then sponsored a competition for a new scheme and the winner of the 200 guinea prize was the local architect J.B. Everard. It is said that a "modified version" of Everard's plan was submitted to Major Tulloch of the Local Government Board and this inspector rejected it on the grounds that it was too expensive and the raw sewage would be allowed to settle too close to the burgeoning town of Belgrave.[79]

By 1874 there was growing pressure from outside Leicester. In early January there was a written complaint from Belgrave, downstream of Leicester, to the town council about the poor quality of the Soar.[80] This was merely a harbinger of things to come. By March, the Leicester had implemented the "Rochdale system" of human waste removal, a form of dry conservancy.[81] By this method excreta

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[78] Lancet, 6 January 1872, 25. A brief comment about the central government's health authorities may be useful. After the demise of the General Board of Health in 1858, some of its functions were taken up by the Privy Council until 1871 when the Local Government Board took over.
[79] The singular source of this paragraph is Storey, Historical Sketch, 16-17. This information is repeated by McKinley, VCH 4, 278 and Elliott, Victorian Leicester, 71. The quote is from Elliott. I do not have independent corroboration of these events and Tulloch's role in them seems a bit out of character.
[80] LC, 3 January 1874.
[81] Ibid., 14 March 1874. For a full discussion of dry conservancy see Wohl, Endangered Lives, 95-101.

was regularly collected at night in pails provided by the corporation. According to Alderman Thomas Windley, chairman of the town council's recently formed Sanitary Committee, the Rochdale system was far less desirable than water closets, but the capacity of the water system to supply water closets was questionable and Leicester's sewers were clearly inadequate.[82] The Rochdale system was not exactly inexpensive for the corporation. Initially every landlord who chose to participate in the Rochdale system was charged 10 shillings for the original pail. Above that level the corporation absorbed the costs. Within a month the cost to landlords had dropped to 5s.[83] Landlords reveled in such an alternative to real improvements; by April there were 1,050 Rochdale pick-ups ordered.[84] This dry conservancy method did not expire for many years and neither did it solve the more expensive problem of the sewerage system.

Additionally in 1874, Leicester played host to the Midlands district chapter of the Association of Municipal and Sanitary Engineers. At this meeting the engineers were treated to a tour of the Wicksteed "works," which the Borough Surveyor, E.L. Stephens, claimed that he had spent seventeen years improving.[85] Responding to a revealing question from one of the guests, Stephens explained that the process took two years to compress and dry every single year's solid sewage.[86] In addition to this precarious lag time, the poor marketability of the manure bricks eventually led to an excess inventory of 5,000 tons of processed

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[82] LRO Pamphlets vol. 6, Thomas Windley, Notes on the Work of the Sanitary Committee of the Leicester Corporation from its Formation to the Present Time. 1873-1917, 2-3.
[83] LC, 4 April 1874.
[84] Ibid.
[85] LC, 21 March 1874.

sewage.[87] Thus both the wet and the dried sewage were creating bottlenecks in this troubled system.

If 1874 was a year of retrenchment and complacency, 1875 was a year of positive drama regarding the Leicester sewerage system. The Local Board commissioned yet another proposal for a new scheme. This time it was the venerable Sir Joseph W. Bazalgette, architect of the vaunted London system, who was hired to submit a plan. Ironically Bazalgette's scheme for the metropolis was based on Wicksteed's conceptions of intercepting main lines and steam powered pumps.[88] Moreover Baldwin Latham had based part of his proposal on the perceived success of the capital's new system. The problem with Bazalgette's plan for Leicester was most obviously the expense. The investment by the corporation for this scheme would have involved some £300,000.[89]

After quickly rejecting Bazalgette's scheme, the corporation moved to include several nearby towns in its 1875 sewage proposal; significantly all of these towns were upstream of Leicester.[90] Meanwhile, the Buck-Franklin report, which will be treated in greater depth later in this dissertation, accused the "imperfect outfall" (i.e., poor drainage due to too gentle a fall to the River Soar) of the existing system of being the prime cause in the town's excessive infant

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[86] Ibid.
[87] PP 1885 vol. xxxi, Royal Commission on Metropolitan Sewage Discharge, Minutes of Evidence, 9.
[88] The Engineer 32 (1 December 1871): 383; Proceedings of the Institution of Mechanical Engineers (1872): 23.
[89] Read, Modern Leicester, 20; McKinley, VCH 4, 279; Elliott, Victorian Leicester. Bazalgette's actual plan for Leicester eludes me so I am relying on these sources here.
[90] LC, 3 July 1875.

mortality.[91] But the Local Board, led by the Tory William Winterton, was more decisive in its effort to fully acquire the waterworks company rather than to undertake an expensive reworking of the sewerage system. While water supply turned a profit, sewage remained a financial loser.[92]

The devastating floods of late July 1875 returned attention to the sewerage system. In a town known for flooding the Chronicle observed that the inundation was the worst in twenty-three years.[93] The connection between this natural disaster and its attendant cost to public health was publicized and pointedly directed at sewerage deficiencies by the newspaper. Immediately after the floods, the Chronicle's rhetoric became more strident. The newspaper editorialized "that the evils arising from the defects in the sewerage system, in the low-lying districts, have again been alarmingly intensified and multiplied by such inundations, with their inevitable trail of disease germs."[94] A week later, the newspaper was replete with references to the flood and its effects. The "long neglected question of sewerage reform" should convince the corporation "that they are rapidly approaching a crisis, when no mere half-measures, or patchwork additions to the present costly and inadequate system will avail." Further, "[s]o clear, indeed, is the connection between the choked-up sewers, the excessive mortality among infants, and the wide prevalence of disease among adults, that the inevitable cost of the delay of 'six or seven years' may be roughly gauged in

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[91] LRO 20 D 72/60, W. Elgar Buck and George Cooper Franklin, Report on the Epidemic Diarrhoea of 1875 (Leicester: Spencer Brothers and Russell, [1875]), 31.
[92] The decision to buy the waterworks company outright was taken on 31 March 1875 but awaited parliamentary approval. LC, 3 July 1875.
[93] LC, 24 July 1875.

the sacrifice of hundreds of human lives, and a degeneration in the stamina of adults so great as it is incalculable."[95] The Chronicle used the disaster to again advocate irrigation; "[m]any schemes will doubtless be considered only to be sooner or later rejected; but there is only one which has no stood the test of practical application...and that is sewage irrigation.[96]

The Chronicle did not speak for the corporation of Leicester. The Tory Alderman William Winterton claimed that flood victims were "very much in the hands of providence"[97] but the corporation had "done its duty" if it did not "inflict too heavy taxation on them [the ratepayers] to get these alterations made."[98] Beyond that, "they must leave the rest to Providence."[99] Although the Liberals outnumbered the Conservatives by 36 to 20 in the 1875 town council, Alderman Winterton's fatalism spoke for the Local Board in the pages of the Liberal paper. The Chronicle printed Winterton's remarks in support of its own political position on public health, yet it is significant that Winterton's do-nothing approach was satisfactory to the Local Board as a whole. Moreover, in 1876, Winterton would be the first Conservative mayor elected by the reformed corporation. While no significant changes in Leicester's sewerage system occurred in 1875 the legacy of that year would only add to the pressures on the town to reform its system.

Fits and starts continued through the 1870s, but fits were becoming more frequent, and starts less convincing. Alfred Ellis, writing in 1876, complained

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[94] Ibid.
[95] LC, 31 July 1875.
[96] Ibid.
[97] LC, 7 August 1875.
[98] Ibid.

that "[t]he impurity of the river at Belgrave has been increasing with the population of Leicester."[100] In Belgrave, "[f]or many years past, during the summer months, the annoyance from the river has been very great, and as the evening vapour rises the stench is often sickening."[101] Dr. Sloane, a member of the town council and a physician, criticized the sewerage system for its inability to handle heavy rainfall; pumps at the "works" were inadequate to dispose of the untreated "liquid," so floodgates would be opened and raw sewage was communicated with the Soar.[102] While I might criticize Dr. Sloane's theory of disease transmission later in this dissertation, there is no reason to doubt his powers of observation.

When John Storey, Samuel Stone's eventual long-term replacement as town clerk, reflected on 1877 he wrote that a mere extension of the Wicksteed "works" enabled the Corporation to "drag on" for some few years without solving, or without making any great effort to solve, the difficult problem which lay before them as to an improved sewerage system."[103] In 1878, strengthened by Dr. William Johnston's "Zymotic Report," the Chronicle averred that a new "sewerage scheme is year after year laboriously struggling into birth."[104] The Local Board was no longer running contests or consulting with eminent engineers about the sewerage system; Borough Surveyor E.L. Stephens, the one who had

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[99] Ibid.
[100] LRO Pamphlets vol. 63, Alfred Ellis letter of 6 June 1876 quoted in John Sloane, Report on the Infantile Diarrhoea of Leicester [1876], 26.
[101] Ibid., 27.
[102] LRO Pamphlets vol. 63, John Sloane, Report on the Infantile Diarrhoea of Leicester [1876], 30.
[103] Storey, Historical Sketch, 18.
[104] LC, 30 March 1878.

been "improving" the Wicksteed system for decades, was the man responsible for the system. It would be too simple to blame Stephens for the recalcitrance of the entire town; Stephens was a functionary of the town and his actions were consistent with the councilors who were content to tinker with the ineffectual system since the 1860s.

Yet Stephens' death in 1880 ushered in an era of enthusiasm and innovation.[105] Stephens' successor, Joseph Gordon, immediately embarked on a program to flush and ventilate the existing sewers at an approximate cost of £12,000.[106] This began as the stench in Leicester had reached the point where "we must e'en hold our noses and open our mouths" according to one Robert Read.[107] By the time Gordon took the position, local reformers, neighboring towns, and finally the central government increased pressure on the town to make more far-reaching improvements and there were plenty of examples of more successful sewerage systems.

In the cleansing and ventilating project, Gordon exhibited the imagination that would characterize his later work. Not content with Rawlinson's recommended sewer vents, Gordon placed them in the streets twice as frequently as the inspector suggested.[108] Moreover, the surveyor set upon the separation of storm drains from foul sewers, laying 4.93 miles of new lines.[109] The first comprehensive

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[105] LC Supplement, 2 October 1880.
[106] Read, Modern Leicester, 21.
[107] Ibid.
[108] LRO 20 D 72/4, William Johnston, MOH 1881, 25-36. In one 4 ½ mile section of the existing sewer lines vents were increased from 2 to 51 and manholes, which provided access to the lines, were increased from 8 to 101.
[109] LRO 20 D 72/4, William Johnston, MOH 1883, 58. Eventually 11.53 miles of new sewers were laid of which 91% were storm lines. LRO 20 D 72/4, William Johnston, MOH 1884, 47.

cleansing of the Wicksteed system caused numerous cases of diarrhoea, and four cases of typhoid, among the workmen,[110] but led some observers to praise the improved flow of the lines and the reduced pressure for the lines to handle both sewage and storm runoff.[111]

Despite the apparent successes of the cleansing and ventilating project neighboring towns still lodged numerous complaints about the condition of the River Soar. The Local Government Board convened an investigation in Leicester at the behest of Belgrave and Barrow-upon Soar in 1884. Belgrave acted for both towns as the "complainant" before the Local Government Board inspector and arbiter of the dispute, Major Tulloch, while John Storey acted as the "defense" for Leicester. The proceedings were nothing if not adversarial. Belgrave presented witnesses testifying to the river's pollution and argued that Leicester, as the cause of the nuisance, was responsible for its rectification. Storey countered with a lengthy defense that mixed legalisms and a litany of excuses. One curious feature of Storey's defense was that he called Islington's MOH, Dr. C.M. Tidy, to testify that Leicester's sewage treatment was superior to irrigation. Leicester's MOH, Dr. Johnston, was present at the hearing, but was not called to testify. Johnston's criticism of the system may have forced Storey to search farther afield for a supporter. Following the hearings Tulloch toured the Soar and the "works." Ultimately, the inspector ruled against Leicester.[112] This binding ruling by an

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[110] LRO 20 D 72/4, William Johnston, MOH 1881, 36.
[111] LC, 31 March 1883. In addition to the Chronicle's editorial admiration the newspaper reprinted one Henry D. Dudgeon's letter to the London Echo bearing the same sentiments.
[112] LC, 27 September 1884.

agent of the central government would mark the beginning of the end for the Wicksteed system.

Joseph Gordon was obviously prepared for such an eventuality. Before the end of the year, the Borough Surveyor presented eight possible new sewerage schemes to the Highway and Sewerage Committee. All eight of the potential systems conformed to Tulloch's insistence that the sewage be put into an irrigation system, regardless of whether or not it was treated chemically. Tulloch's point was that chemical treatment was not at a state that sewage, treated or untreated, should be fed back into the Soar. Inexplicably, Dr. Tidy was now in full agreement with the consensus on irrigation. Gordon's proposals would have cost between £116,700 and £229,600 to construct, with an additional £100,000 or more for the irrigation land itself.[113]

In the mid-1880s, the Chronicle proclaimed that the "[s]anitary reformers are now a power in the borough."[114] This is probably most evident in the town's hiring practices at the time. Gordon was an innovator; his contemporary, Dr. Johnston, was a famed innovator; and Johnston's successor, Dr. Henry Tomkins, was that rare combination of scientist and practitioner. The town was less decisive in other matters. The Highway and Sewerage Committee wrangled over Gordon's proposals and submitted an incomplete plan to Tulloch in 1885. Rather than delay the process by requiring that every nuance of the plan be set forth in

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[113] LRO Pamphlets vol. 63, Joseph Gordon, Report to the Highway and Sewerage Committee on Various Schemes for a further Purification of the Sewage of Leicester (1884).
[114] LC, 31 March 1883.

great detail as had the General Board at mid-century, Inspector Tulloch approved the scheme and returned it to the Local Board for finalization.[115]

By early 1886 the council had honed down the eight Gordon proposals. Sewage irrigation was accepted as the method of treatment and Beaumont Leys was accepted as the site for the irrigation. The final point of dispute was whether to lay entirely new sewer lines or to extend the storm sewer lines of Gordon's cleansing and ventilating program. Gordon himself was polite but firm; 14.761 miles of entirely new sewer mains were essential.[116] The town council accepted this most expensive provision of Gordon's scheme and spent a great deal to acquire rights to the Beaumont Leys irrigation farm, but the lines that were laid were somewhat less expensive than state of the art glazed earthenware pipes.[117] A combination of brick and pipe were used on the new system, but the main lines were primarily pipe. With this final nod to "economy," Leicester embarked on a sewerage solution that, when completed in 1891, would remain in operation until 1965.

If a moral can be inferred from Leicester's sewerage experience in the more than four decades from 1848 to 1891, it is not a rosy commendation of innovation. Innovation, pushed through on the strength of Wicksteed's vaunted engineering reputation and Whetstone's tenacity and good intentions, left Leicester saddled with an inefficient and ultimately dangerous scheme. But such "heroes" are only part of the explanation. Two concepts, that is two socially constructed

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[115] Lancet, 5 September 1885, 461.
[116] LRO Pamphlets vol. 63, Joseph Gordon, Report to the Highway and Sewerage Committee on a Proposed System of New Main Trunk Sewers for the Borough. (1886).

phenomena, proved decisive. First the early and durable consensus around "sewage for profit," made it possible for Whetstone to push through Wicksteed's system as an economically palatable solution. Second, the eventual development of a generally accepted remedy around irrigation highlighted the defects of the Wicksteed system and permitted at last the move to a different system.

"Sewage for profit" was clearly a consensual concept in the mid-nineteenth century. While sewerage reform was recognized as a boon to public health, it was not divorced from pecuniary gain in this period. In fact, Dr. Henry Tomkins, Leicester's MOH, visited Berlin's sewage irrigation farm in 1890 to see if the Germans' profits could be duplicated in the Midlands.[118] At mid-century, reformers such as Chadwick, engineers such as Wicksteed, and local leaders such as Whetstone, all sought a sizable recompense for the expenditure of money on a sewerage scheme. Sewage turned out not to be profitable, except in Berlin, and it was necessary for the idea to lose its untouchable status before real solutions could take its place.

By the late 1860s a generally accepted remedy had developed around sewage irrigation as a method of treatment. Although "sewage for profit," or at least to break even, remained a secondary goal, irrigation was proving to be a salubrious way to dispose of waste. While no disposal method could compensate for poorly designed sewer lines, an irrigation system permitted the percolation of transmitted waste into the subsoil in locations where it could do little harm. Thus, one of the great problems of Victorian towns, river pollution, could be ameliorated along

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[117] LRO 20 D 72/5, Henry Tomkins, MOH 1890, 28-30.

with the removal of dangerous waste products from residential areas. It should be remembered that river pollution was at least one of the most important driving forces in sanitary reform; this is evident from Hamlin's study as well as the "Great Stink" of the Thames in 1858. What made Leicester unique, and dictated so much of its sewerage history, was that the town did not wait for some private or corporate party to take it to court before it initiated its sewerage project. But by 1884, it would take neighboring towns and the Local Government Board to pressure the town council into another major investment in sewerage. The price for precocity was high. Evident failure in the 1860s was not enough to change the system. An accepted remedy in the 1870s did not excite the town to activity because it was deemed too expensive. Natural disaster in 1875 could not end indecisiveness. A changing of the guard in 1880 only brought partial measures. Only outside pressure, in 1884, could force Leicester to drastically re-work the system it had fought so hard for in mid-century. Hamlin is vindicated in this tale; extra-corporation action was eventually necessary to make Leicester conform to the accepted remedy, but it is a different tale from Hamlin's. Leicester was vigorous and innovative in the shadow of 1848; it was strong and independent, more independent than the General Board of Health would have liked. But once such a dramatic and expensive scheme had been put in place it was not easy to admit, and even more difficult to pay for, failure. We cannot know if the broad shoulders of Whetstone and Stone could have changed the council's actions; we do know that no one quite took their places.

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[118] Ibid., 31-32.

3. "The Interests of the Proprietary:" water supply[1]

Leicester's initial experiment in providing sewerage for the borough was a joint public and private venture. The municipality played the lead role in the venture, originating the idea, raising the capital, and pushing the scheme through parliament, although Thomas Wicksteed's private company was to handle the operation of the system and share in its profits. Members of the town council, which doubled as the Local Board of Health, sought to improve drainage in order to improve the health of Leicester's citizens, but the councilmen also believed that the sewer system would pay for itself over time. Ultimately, they believed that health and cleanliness would improve without excessively burdening the borough's ratepayers. Thus, they believed that sewerage would prove to be a wash, both physically and financially. Providing fresh water to the borough did not dovetail with sewerage as we might expect it to today. From the 1840s to the late 1870s, water supply to Leicester was more a matter of profit than it was a matter of public health. Leicester's fresh water supply, for these three decades, existed for the benefit of shareholders in the Waterworks Company, not for the so-called "general public."

Indeed, the general public would have to conform to the Waterworks Company's specifications to receive fresh, piped water supplies. Not all the potential consumers met the specifications. Many of the borough's residents rented their homes and therefore depended upon landlords to provide piped water

[1] Minutes of the Waterworks Company, 1847-1858, [hereafter WW Minutes], n.p., [26 May

if it was to come at all. Others tried unsuccessfully to use piped water for some purposes, but not all. The Waterworks Company often stood as an obstacle to improved public health from its inception until the borough purchased this utility in 1878. The Waterworks Company represented one public, its investors who had good reason to expect a profit from the investment. The town council, led by Joseph Whetstone until his departure, represented another public, the people of Leicester. After Whetstone died in 1868, it took another ten years for the borough to wrest the borough's water supply away from the company. Until 1878, profit triumphed over public health.

As we shall see, the early arrangements between the town and the Waterworks Company resembled a sort of Speenhamland system to protect the Company's shareholders as though they were paupers facing the ravages of capitalism. In this odd sort of outdoor relief, the town council pledged that all of Leicester's ratepayers would underwrite the profits of those who had the funds and the inclination to invest in the Company. The borough entered into a contract that assured a profit of at least four per cent per annum for every share purchased.

Though profit motivated the Waterworks Company, Victorians generally assumed that a fresh, piped water supply from the countryside would be healthier than polluted urban wells. In Leicester these were the only choices available. Therefore, both the town council and the company's directors desired a fresh water system for the borough. The Waterworks Company officially incorporated in 1846, but preliminary surveys for a reservoir and piping were completed in

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1854], Leicestershire Record Office [hereafter LRO], CM 43/1.

1845.[2] The incorporation date proved quite significant for the future of Leicester's fresh water supply. The Waterworks Clauses Act of 1847 passed parliament and provided a "template" for the establishment of private, local water companies.[3] By September of 1847, the Leicester Waterworks Company had fulfilled all of the Act's requirements. The Act precluded the establishment of municipal waterworks operations where private companies existed to provide such services. Therefore, the Local Board of Health could not control Leicester's fresh water supply, but could only act in a supporting role, by guaranteeing profits to those who bought shares in the Company. Members of the Local Board, led by Joseph Whetstone, were anxious to provide the town with piped water and would have preferred to be the ones taking the important decisions, but they also respected the Victorian cultural norm regarding private enterprise. Since the law favored private waterworks companies, the Local Board willingly became a junior partner in the Leicester Waterworks Company by buying unsold shares and ensuring the profitability of shares sold to the public in order to get the water flowing expediently.

Joseph Whetstone, a prominent worsted manufacturer, led a faction of the town council known as the "economists." Whetstone's group opposed a group known as the "improvers." The labels proved ironic; Whetstone's faction insisted that improvements in municipal sanitation take place before other, more cosmetic, improvements. The "improvers," led by John and William Biggs, sought

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[2] WW Minutes, LRO CM 43/1, 12.
[3] J.S. Phipps, Leicester in Parliament: A Record of the Use of Private Bill Legislation to Benefit and Improve the City, (Leicester: Leicester City Council, 1988), 115.

expenditures on projects such as a new building to replace the Tudor era town hall. Though Whetstone and the Biggs brothers were staunch Liberals and Unitarians, and the Biggs' vision conformed to the so-called "civic gospel," Whetstone managed to place his agenda close to the top of the borough's priority list.[4] Four members of the town council were accepted by the company's founders among the sixteen directors of the Waterworks Company in 1847. From the existing records of the nascent Waterworks Company and the records of the town council this seems mysterious; neither source makes mention of this arrangement in 1847. By 1850, the connection between the two would be contractually clear. The council's Local Board of Health used ratepayers' funds to purchase nearly a third interest in the Company and guaranteed profits to Company shareholders. In 1847, Mayor Joseph Fielding, Aldermen Whetstone, Harris, and Hudson joined the waterworks directorship. Fielding and Hudson never attended directors' meetings; Whetstone's input was noteworthy, if not influential, upon decisions taken by the directors.

In the summer of 1847, the directors, under the chairmanship of John Taylor, hired an engineer, Thomas Hawkesley, to formally propose a reservoir site and submit a plan for the implementation of a piped water system.[5] By October, the directors, parliament, and Her Majesty's Office of Woods, "after a most searching investigation," approved of Hawkesley's plan.[6] The approved capital outlay

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[4] For the "civic gospel," see E.P. Hennock, Fit and Proper Persons: Ideal and Reality in Nineteenth-Century Government, (London: Edward Arnold, 1973; reprint, Ann Arbor: UMI, 1991).
[5] WW Minutes, LRO CM 43/1, 1-2.
[6] Ibid., 3.

amounted to £80,000.[7] However, the directors believed that the "existing derangement of the monetary affairs of the Kingdom," made implementation of the scheme impractical at that time.[8] They shelved the plan until 1848. Meanwhile, the national Public Health Act of 1848 was before parliament. The directors appointed a subcommittee to watch the progress of the Act. In March of 1848, the subcommittee raised no objections to the Act, but by May they found that the Act's revised language would allow the municipality itself to organize and operate a waterworks system. The directors, over Whetstone's objection, directed the company's clerk, Mr. Loseby, to lobby Leicester's MPs to adjust the Act's language.[9] Minor alterations in the language of the Act, made at the behest of less than twenty individuals, allowed the company to maintain its monopoly. Loseby succeeded in his efforts and the final form of the Act kept the Waterworks Company legal, while permitting the newly formed Local Board of Health to have a supporting voice.

Once the Company's legal status seemed secure, the directors produced a telling, though private, mission statement. This 1849 document made it clear that the directors sought profit on two levels. The directors included some of the borough's leading manufacturers; these gentlemen expected direct profit from the sale of Company water and indirect profit from arising from improved economy in industrial production. They explicitly addressed this second objective by stating that "the necessity for an improved water supply in Leicester is daily

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[7] Ibid., 14.
[8] Ibid., 3.
[9] Ibid., 5, 7.

increasing – the present supply is diminishing – the springs are becoming more contaminated – [thus] the manufacturers are losing the advantages to be derived from a larger and better supply."[10] By establishing the Waterworks Company, the directors seemed to have obtained the best of all possible worlds. That is, they could improve health amongst the borough's residents, they could potentially realize a substantial return on their investments in the Company, and they could collaterally increase the competitiveness of their industrial investments. The Local Board had no objection to any of these goals, but Whetstone and his supporters prioritized differently from the directors.

By May of 1850, the Local Board queried the Company's directors about the plans and the timetable for implementation. The directors submitted Hawkesley's scheme to the Board, who, in turn, submitted the scheme to Thomas Wicksteed for his opinion. Wicksteed and Hawkesley were among the most respected Victorian civil engineers.[11] Wicksteed and Hawkesley were also engineering competitors. The Local Board had already contracted with Wicksteed to provide the borough with sewerage and obviously trusted his judgment in matters pertaining to pipes and pumps. Yet, Hawkesley would prove to be Leicester's water supply engineer for decades to come.

Not surprisingly, the two engineers disagreed on several issues. Wicksteed criticized Hawkesley's Thornton reservoir site because of expense, size, and water quality. Wicksteed argued that using the River Soar's water would be cheaper

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[10] Ibid., 15.

[11] For Wicksteed, see the chapter on Leicester's sewerage. For Hawkesley, see Malcolm Elliott, Victorian Leicester (London: Phillimore and Co., 1979), 62.

than building a reservoir, that the river could support a much greater population than could the Thornton reservoir, and that the river water's hardness would prevent the degradation of lead pipes. These issues merit individual consideration below. Moreover, Wicksteed characteristically suggested using a steam engine to pump Soar water into the town as opposed to Hawkesley's gravitational plan from Thornton. Wicksteed calculated the initial capital outlay for the engine, pipes, and sundry fixtures at £43,000. Hawkesley's Thornton proposal dropped to an initial £65,000; this was down from his original estimate of £80,000 because of a fall in the cost of pipes. Hawkesley's response to the expense issue was that Wicksteed's pumping scheme would cost £2,500 per annum to maintain, while the gravitational system would cost only £800 per annum.[12]

Wicksteed contended that the proposed Thornton reservoir could supply the needs of only 76,000 citizens. He further argued that Leicester's population would grow to 145,000 by 1880 and 320,000 by 1910. Hawkesley considered these population projections outrageous. From hindsight, Wicksteed's projections were wrong, but not so wrong as Hawkesley imagined. Hawkesley rebutted Wicksteed by saying that the directors had charged him with finding a water supply for 80,000 inhabitants; the Thornton reservoir could supply not only those 80,000, but up to 100,000. Moreover, Hawkesley asserted adamantly that any

[12] Thomas Hawksley, "Leicester Water Works. Report of Mr. Hawksley, [sic] C.E. to the Directors," 15 June 1850, LRO Pamphlets, vol. 50, 10-11. From these estimates, the Wicksteed system would cost £93,000 over twenty years and the Hawkesley system would cost £81,000.

attempt to plan beyond a generation would prove futile.[13] Both engineers' projections were flawed.

Wicksteed believed that the Soar's harder water would fare better with lead pipes than Thornton's softer water. Untreated Soar water tested at 33 grains of solids per imperial gallon, while untreated Thornton water tested at 16 grains per gallon. Employing Wicksteed's lime slurry method of purification, treated Soar water measured 16 grains per gallon and treated Thornton water, 7 grains. Hawkesley disagreed with Wicksteed's premise; he argued that soft water improved health. Hawkesley noted that other towns sought and used water that tested at one to four grains per gallon. Moreover, Hawkesley preferred a sand filtration system to Wicksteed's patented lime slurry method.[14]

Finally, Hawkesley argued, the Company had already paid the parliamentary costs of a local bill for the Thornton reservoir; changing to Wicksteed's scheme would necessitate another expensive act of parliament. The Company's engineer claimed that only one potential obstacle stood in the way of the Thornton project, that the owners of the Thornton property might demand exorbitant prices for the reservoir land. The Local Board found that Hawkesley's responses to Wicksteed's objections were satisfactory and Hawkesley won the contract.

Nonetheless, the obstacle that concerned Hawkesley materialized in the person of Lord Maynard. Two landowners, Lord Maynard and a Mr. Chamberlain, controlled the seventy acres planned for the reservoir in the Sparkenhoe Hundred,

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[13] Ibid. Hawkesley based his projections on the need for eighteen gallons per person per day with a 180 day reserve.

nearly due west of Leicester. Both landowners balked at the Company's offered purchase prices, but Chamberlain proved more amenable to negotiation.[15] The Company considered invoking the eminent domain powers of the Lands Clauses and Consolidation Act to force the sale because of the perceived urgency to break ground on the project. The directors claimed that such urgency arose from four immediate needs: first, the convenience and comfort of Leicester's inhabitants coming from indoor and perpetual supplies of soft water; second, so that an ample water supply would be available "in the calamity of fire;" third, to increase the facilities and advantages of the "staple manufacturers;" fourth, that the "sanitary habits of the people may be promoted and improved."[16] The directors made clear their priorities from this statement, but Hawkesley urged them to avoid using the Land Clauses Act because he had seen landowners extort money from railroad companies that had employed the Act.[17] Hawkesley favored an abandonment of the scheme rather than an invocation of the Act. The directors continued to negotiate with the landowners. Ultimately, in 1850, the directors' agent reached a settlement with Chamberlain and Lord Maynard's agent at the selling prices of £150 per acre including mineral rights from Chamberlain and £100 per acre excluding mineral rights from Lord Maynard's agent.[18] For a moment, the land purchase appeared settled.

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[14] Ibid., 3-5. Hawkesley's sand filtration system is closer to current practices than Wicksteed's lime slurry.
[15] The directors offered Lord Maynard £85 per acre and Chamberlain £80 per acre.
[16] WW Minutes, LRO CM 43/1, 21-22.
[17] Hawkesley, LRO Pamphlets, vol. 50, [14.]
[18] WW Minutes, LRO CM 43/1, 23-30.

This moment of apparent settlement proved illusory, but it sufficed to bring the Local Board into the aforementioned contractual relationship with the Waterworks Company. The Local Board of Health had begun naming four of the Company's sixteen directors in 1847 and the contract of October 1850 formalized this arrangement. In 1847, this concession by the Company seemed magnanimous at best, mysterious by other measures. By 1850, magnanimity and mystery evaporated. The Public Health Act of 1848 permitted local boards to levy rates or borrow against future rates for large public works projects. The directors knew the provisions of this Act as early as 1847. Therefore, the directors welcomed the Local Board's minority position on the board. Knowing that Whetstone was committed to an improved water supply for the borough, the directors saw a fail-safe method of financing their operation. Indeed, Whetstone found himself in a difficult position. Precluded from establishing a municipally owned water company because of the "grandfather" clause of the 1847 waterworks act, Whetstone could do little more than use borough funds to buy a stake in the Company.

The contract of 1850 gave the Local Board the power to name twenty-five per cent of the Company's directors which corresponded to the borough's ability to purchase twenty-five per cent of shares in the Company, should those shares remain unsold to private investors. The Company offered three thousand, two hundred shares at the rate of £25 per share.[19] The directors expressed their hope that municipal investment would not materialize, but they extracted further

concessions from the Local Board that solidified a return to private investors. In return for its stake in the Waterworks Company, the Local Board guaranteed a minimum shareholders' dividend of five per cent for each of the first three years and a minimum of four per cent per annum for the next twenty-seven years. Should profits exceed these minimums, the Company and the Local Board would split the excess.[20] This contract necessitated a new local act of parliament, obtained in May 1851. Though a majority of the directors approved of the contract, they wanted the Local Board's guarantee on returns to attract private investors, not the Local Board's influence on Company policy.[21] But the investing public did not buy enough shares to bring the Company to full capitalization; the Local Board purchased the final 680 shares, which amounted to 32% of the £80,000 at issue.[22]

As the Company settled the matter of its own finances, the arrangement to purchase the Thornton site became unsettled. Though Lord Maynard's agent accepted the Company's 1850 offer, Maynard himself rejected it. Ultimately, the directors invoked the Lands Clauses Act in early 1852. Pursuant to the provisions of the Act, the county sheriff summoned a jury to determine the value of the property. The jury finished its work in February, but the directors soon discovered "that Lord Maynard's Title was not in a state to enable him...to

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[19] Ibid., 33-37.
[20] Ibid.
[21] Ibid., 56.
[22] Ibid., 70. Malcolm Elliott believes that the reluctance of private investors stemmed from the reservoir's distance from the borough. Elliott, Victorian Leicester, 63.

complete the Conveyance."[23] The directors, already irritated by Lord Maynard's previous antics, bore the expense of clearing the title. On 28 April 1852 the Company paid Maynard £6,258 and took possession of the land.[24]

Well before the Thornton reservoir land legally passed into the hands of the Company, the directors began the search for and purchase of needed supplies. As it was with the other start-up ingredients of Leicester's water, obtaining supplies proved troublesome. The directors' first step was to solicit bids for iron pipes manufactured according to Hawkesley's specifications. In January 1851, the Company's clerk wrote directly to iron manufacturers, advertised in four newspapers, and placed an ad in the Mining Journal.[25] The directors accepted bids from the Cochrane and the Clayton companies, later supplemented by purchases from Oakes and Company.[26] By November, the manufacturers began filling the orders. Work had not yet commenced, of course, and the directors had to pay storage costs on miles of iron pipes. In December, an entire shipment of pipes fractured during the process of unloading; the rail carrier refused to unload more pipes and this expense then fell to the Company.[27] By early 1852, the iron pipe manufacturers began seeking payment for their products. The directors saw fit only to authorize payments amounting to seventy-five per cent of the value of unbroken pipes already delivered. This decision led to payments of £932 in February to Cochrane and Clayton, £2,258 in April to Cochrane, Clayton, and

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[23] Ibid., 84.
[24] Ibid., 80.
[25] Ibid., 44.
[26] Ibid., 68-69.
[27] Ibid., 70.

Oakes, and £3,026 in June to the three manufacturers.[28] The directors continued their policy of paying 75% on delivered materials, sometimes months after delivery, and the manufacturers fulfilled their contractual obligations. When the directors sought to purchase an additional thousand pipes from Clayton, his company "declined to execute any further orders."[29]

Familiarity with the Leicester Waterworks Company bred contempt among some suppliers. Yet, Thomas Holland submitted a bid, later accepted, for the borough's water mains and the firm of Tomlinson and Harpur successfully bid on the construction of the Thornton reservoir. By May 1852, the mains were being laid and ground was broken on the Thornton reservoir.[30] These "advances" led to more problems. The "magistrates at Market Bosworth...appointed a Special Constable at Thornton in consequence of so many persons being employed at the Works there."[31] The High Constable of Leicestershire determined that the Waterworks Company should pay the special constable's salary for six months; by July, the Company additionally was obligated to pay the entire Thornton poor rate.[32] The High Constable's decision created the unusual situation whereby Leicester's ratepayers became the guarantors of the Thornton poor rate. Ultimately, the Company's obligations lay upon the bedrock of the contract with

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[28] Ibid., 73, 79, 87.
[29] Ibid., [n.p.]
[30] Ibid., 75, 82.
[31] Ibid., 83.
[32] Ibid., 89.

the Local Board. These arrangements continued as reservoir construction continued for another year.[33]

The quantity and quality of the borough's potable water deteriorated during the construction. Unitarian missionary, Joseph Dare, wrote

> I have heard during the summer [of 1852] innumerable complaints of the failure of this indispensable element: quantity and quality are both at fault. I can speak feelingly here, for my own supply has failed every week for a long time. A person whom I regularly visit complains that fourteen houses in his locality are without a pump, and he is obliged literally to steal his water when the possessors of private pumps are out of the way. Another intelligent friend residing in quite a different part of the town, complains of water, "not fit to drink," for his own and a dozen other households.[34]

Dare recognized that Leicester's water problems threatened health but, ever the optimist, he asserted that "[t]he completion of the Water Works will be a great blessing to the town."[35]

The directors expected this blessing to be functional by May 1853, but further delays meant that the system did not begin operation until December 1853.[36] In November, the directors established the rules, regulations, and rates for

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[33] Ibid., 95, 102, [n.p.], [n.p.].
[34] Joseph Dare, [1852], quoted in Barry Haynes, Working-Class Life in Victorian Leicester: The Joseph Dare Reports, (Leicester: Leicestershire Libraries and Information Service, 1991), 43.
[35] Ibid.
[36] WW Minutes, LRO CM 43/1, 87, [n.p.].

Waterworks customers.[37] The Company would be responsible for all pipes from the mains to those laid up to six inches inside homes. Customers were responsible for plumbing within homes, but had to conform to the Company's specifications. For example, the directors mandated valves and cocks made of brass. Moreover, the directors specified that

> No plumber or other workman will be allowed to do or perform any work connected with the supply of water, till he shall have been admitted, enrolled, and published by the Directors, as 'an authorized Water Works plumber', and shall have entered into a written engagement to conform to and comply with the Rules and Regulations

of the Company. The Company would inspect interior plumbing at customers' expense. Should inspectors find rules violations, or if a plumber balked at providing the Company with information, the plumber's "name will be erased [and] forthwith advertized as so struck off." Though the Company rigorously enforced their regulations upon consumers and contractors, the directors proved flexible about the self-imposed promise to customers that the water supply would be constant unless unavoidably interrupted by pipe ruptures or repairs.

In setting the rules, the directors seemed very protective of their water. Waste was their enemy. To combat "waste," they prohibited overflow pipes, insisted that bathtubs be watertight, and demanded that bathtubs be constructed so that water could not simultaneously flow in and drain out of tubs. Water closets especially garnered the directors' attention. Company water could only be

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provided where wc's were designed to "prevent the waste, or undue consumption of water." Consequently, the directors approved only two types among the many patented wc's; the directors accepted only the "Pan Closet" and the "Selfacting Closet." Without going into detail about various types of wc's, suffice it to say that the two approved were efficient as measured by water usage and were largely indiscriminate concerning disposal. Both models flushed with piped water collected in service cisterns. Where the effluent went was not a concern of the Waterworks Company, so long as "the return of foul air and other noisome and impure matter into the mains, or other pipes of the Company" did not occur.[38] The legal and conceptual differentiation between water supply and sewerage persisted throughout the Waterworks Company's existence and postponed some of the health benefits that eventually arose once the two systems communicated.

The directors set rates for residential customers by the homes' rental values and the presence of certain amenities, rather than by the volume of water consumed. The Company based charges for large businesses, infirmaries, and workhouses upon consumption as measured by volume meters, but dwellings were on a fixed rate. Table 3.1 illustrates the original schedule of residential rates. As Table 3.1 shows, the fixed charge per quarter increased with the value of the dwelling, but not in proportional increments. The directors defensively explained to the shareholders "that [as] a good supply of Water to the Poor was calculated to improve the Sanitary condition of the Town, your Directors have

fixed the Rates upon Cottage Property very low, and they have no doubt that in doing so they have best consulted the interests of the Proprietary."[39] Yet the rates, though not flat, were regressive. The relative cost of Company water supply and, particularly the relative additional costs for water closets, were higher for lower valued housing units than for more expensive ones. Moreover, in homes with two wc's, the second water closet was supplied at half the rate of the first. The rate structure did not reflect some sort of "volume discount," that might be assumed as housing values rose, because it was common knowledge, and often decried, that population density was

Table 3.1. Quarterly residential rates for water supply, based on annual rents and amenities, in pounds, shillings, and pence, as set 8 November 1853[40]

Annual Rent	Quarterly Water Rate	Additional Charge if Bathtub Present	Additional Charge if WC Present
£ 10	0.2.9	0.1.0	0.1.0
20	0.5.0	0.1.6	0.1.6
40	0.8.6	0.2.0	0.2.0
80	0.15.0	0.2.6	0.2.6
Above £80	Varies by Rent	0.3.0	0.3.0

[38] Ibid., [n.p.].
[39] Ibid., [n.p.].
[40] WW Minutes, 1847-1858, LRO CM 43/1, [n.p.].

highest in the crowded courts of the working classes. Yet the rate structure did not reflect a "volume discount" to the benefit of the working classes either. The quarterly rate for a £80 per annum unit was 55% in the pound of a £10 per annum unit; thus a 45% discount accrued to the system's wealthiest customers. The directors did not rely upon volume for residential supply; moreover, Company piping for less valuable residences cost no more than Company piping for residents of homes valued at the rentable rate of £80 per year. Discounts on Company water accrued merely because of the value of residences. Wealthy householders paid 45% less for Company water, based on the directors' rate schedule. Should £20 housing units be used as the measure, the difference would remain that £80 householders paid 60% in the pound compared to their less affluent neighbors, so they realized 40% discounts on water from 400% more valuable residences regardless of the volume of water used.

Should it be argued that there existed some threshold quarterly water rate necessary to sustain the Company's operations, two contrary points can be raised. First, the directors never made an effort to ascertain whether or not there was such a threshold. Beyond the calculations of population, reservoir capacity, and Hawkesley's perception of gallons per person per day, the directors did not further explore residential water requirements, let alone specific cost to earnings ratios. The directors did not really know what a gallon, or a thousand gallons, cost them. Second, the directors relied upon the Local Board's promise of profitability. There was no risk whatsoever, at least for thirty years, to the

Company's shareholders. So, the directors set arbitrary rates for household water supply and they set marginal rates highest for those least able to afford them.

Joseph Whetstone objected to the rate structure on several grounds. Whetstone and Richard Harris, Jr. "protest[ed] against the minute subdivision of charges, and would rather that a higher rate should be fixed upon than so many extra charges be made."[41] In part this consideration reflected a multitude of rate variations for businesses that are not apparent from Table 3.1, but Whetstone's other priorities were shown at subsequent meetings. By 3 February 1854, Whetstone convinced a majority of the directors to drop the extra charges for bathtubs and limit the maximum extra charges for water closets to £0.1.6.[42] Later in 1854, Whetstone used his influence upon the town council's Highway and Sewerage Committee to have that body formally request that the Waterworks Company provide service to customers who wanted Company water solely for the purpose of flushing water closets. In September, "Mr. Whetstone moved a Resolution to the effect that an independent supply to Water Closets should be given, but the same was not seconded."[43]

The Waterworks Company, throughout its existence, refused to allow customers to lay on a supply of piped water merely to flush wc's. This obstinate position reflected the directors' failure to measure residential water use by volume

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[41] Ibid., [n.p.].
[42] Ibid., [n.p.].
[43] Ibid., [n.p.].

and their perception that water closets generally were wasteful. Two years after Whetstone's motion, director Thomas Angrave moved

> [t]hat in consequence of the complaints by the Public as to the terms and regulations under which the Company consent to supply water (the present rules virtually excluding a large number of persons from being consumers)...That all persons shall be supplied with water for any purpose they may think fit and whether for water closets or otherwise who will engage to for the water used by them.[44]

Angrave's motion included a reduced minimum charge per quarter of £0.2.6 and suggested a quarterly meter fee of £0.1.6 and subsequent charges based upon usage, but with Whetstone absent from this directors' meeting, Angrave's motion failed to find a second.

Whetstone, Angrave, and Leicester's Medical Officer of Health, John Moore, believed that the directors' position on wc's posed a serious hazard to public health. Moore believed that privy cesspools within the borough created health hazards, especially where such cesspools were in close proximity to well-heads. In the wake of Dr. John Snow's groundbreaking epidemiological studies of cholera as a water-borne disease, the Chadwickian public health calculus of water supply and drainage reached its peak. Snow, the father of epidemiology, was hardly Chadwickian, but his studies identified foul water as the source as the source of Britain's most frightening disease. Eliminating urban cesspools and wells also lay at the heart of Chadwickian sanitation. John Moore complained in

1859, and again in 1866, that "[a] vast number of our population obtain their supply of water from wells in the vicinity of privy cesspools, which have no drainage into the public sewer."[45] One function of the Local Board of Health was to make orders

> for the substitution of water closets in lieu of privy cesspools, and a great many more of these changes would be made, and privy cesspools to a great extent abolished, but for the stringent regulations of the Waterworks Company, who refuse to supply them with water for water closets unless it is also taken for household purposes.[46]

As mentioned above, Hawkesley's system began operation in December 1853. Some six months after the water began flowing, the directors told their shareholders that things were going very well. They praised the quality of the water and suggested: "when an artificial supply becomes better understood, and the fact is more fully appreciated that the removal of prejudices will have the effect of lightening the burdens on property, a very rapid increase of Customers may reasonably be expected."[47] This statement appears obtuse but, from the context of 1854 Leicester, one suspects that the "burdens on property" involved industrial enterprises; little burden on property was involved in a landlord's resistance to supply piped water to tenants, yet an unpredictable supply of water could affect production in a workshop or factory. The "prejudices" against

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[44] Ibid., [n.p.].
[45] John Moore, "Annual Report of the Medical Officer of Health for 1866," [hereafter MOH 1866], LRO 20 D 72/2, 12.
[46] Ibid.
[47] WW Minutes, LRO CM 43/1, [n.p.].

Company water did not reflect knee-jerk Luddite reactions to innovation, but reflected knee-jerk reactions to brown water. A full year later, the directors still fought the "prejudices," by telling shareholders that "[t]he quality of the water is greatly improved, and there is no reason to doubt that after a short period the pipes will have become thoroughly seasoned, [and] the remaining slight tinge of color [will] disappear."[48] The "slight tinge" of the water cannot now be measured, but its duration and the directors' statement imply that the origin of the discoloration came from the iron pipes, not the water in the Thornton reservoir. Edwin Chadwick consistently advocated the use of glazed earthenware pipes; Hawkesley's iron pipes needed seasoning and ultimately were prone to rust. Not everyone viewed the Company's brownish water as an improvement; nonetheless, at a meeting in 1854, the directors proclaimed to the shareholders that "the Rental already exhibits highly satisfactory results."[49] It is difficult to imagine what sort of "Rental" might have proved unsatisfactory, given the Local Board's guarantee of profitability to shareholders.

At its inception, the original Hawkesley system called for twenty miles of pipe laid within the borough. By May 1856, fifty-two miles had been laid. Far from being upset by the increase, the directors declared that "it is the true policy of the Company to anticipate the wants of the inhabitants in the new streets and districts," so the directors "have not hesitated to incur the additional outlay to accomplish this object."[50] The "additional outlay" and to a lesser extent the

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[48] Ibid., [n.p.].
[49] Ibid., [n.p.].
[50] Ibid., [n.p.].

ordinary operating costs of the system exhausted the Company's original capital outlay of £80,000 by May 1856. Though Hawkesley had projected that capital investments and operating costs should reach £81,000 by 1870 at the earliest, the directors did not hesitate to authorize the borrowing of an additional £5,000 in 1856. Many reasons could be offered for the discrepancy between Hawkesley's 1850 projection and reality of 1856. Such reasons might include the payment of the Thornton poor rate, the litigation with Lord Maynard, and the unspecified "additional outlay." Yet over time, all of Hawkesley's projections underestimated actual costs. Nonetheless, the directors, who were quite tight-fisted when it came to water closets, pipe breakage, or public use of Company water, had nothing to lose when it came to capital improvements that might lead to future revenue.

The contract with the Local Board guaranteed shareholders a return of £1.25 per £25 share per annum during the first three years of the contract. The Local Board guaranteed the subsequent twenty-seven years at a rate of £1 per share per annum. Shareholders knew these dividends were unrelated to the value of the company; they were absolute. Moreover, shareholders could favorably compare the guaranteed returns of 4% per annum from the Waterworks Company with the typical 2 ½% returns from provincial banks.[51] Investors who could afford patience had nothing to lose from a Company backed by governmental assurances of profitability.

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[51] B.L. Anderson and P.L. Cottrell, Money and Banking in England: The Development of the Banking System, 1694-1914, (Newton Abbot, U.K.: David and Charles, 1974), 248. Interest on deposits at London banks fluctuated, but except for the crisis of 1857, these rates were below those offered at provincial banks.

With their revenues secured, the directors were free to behave as unrepentant monopolists. In April 1854, one of the twenty-four inch mains burst. Although the water quit flowing, payments to the Company continued. The directors proclaimed that "this Company will not subject themselves to penalties in case of the supply failing."[52] Such a proclamation might seem fair, given that volume did not determine rates, but the Company demanded payment in advance for services. They never offered credit for service interruption regardless of the length of interruption.[53] Though defensive about their own shortcomings, the directors acted aggressively toward those who had wronged them. When municipal sewer construction inadvertently fractured a Company pipe in 1855, the directors immediately billed the Local Board. The directors expected cash on demand; they had no inclination to accept 75% remuneration some months after the accident.[54] In 1857, the Company acted against a plumber because the directors, in an extra-legal decision, "found him guilty of laying on a service without giving the customary notice."[55] The plumber, a Mr. Catlin, had not attempted to defraud the Company so was not stricken from the Company's list, but to stay on their list the directors forced him to pay a guinea "and sign a confession of his guilt and contrition for publication in the local papers."[56]

The directors negotiated with the Highway and Sewerage Committee of the town council about the use of Company water for public purposes. Whetstone

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[52] WW Minutes, LRO CM 43/1, 21 April 1854, [n.p.].
[53] Ibid.
[54] Ibid., [n.p.].
[55] Ibid., [n.p.].
[56] Ibid., 7 January 1857, [n.p.].

proposed that the Company supply such water at the rate of 1d. per thousand gallons. The directors rejected Whetstone's proposal. Eventually the directors and the Committee agreed upon a rate of 2.5d. per thousand gallons. According to town clerk Samuel Stone, "the Committee [did] not admit their obligation to pay so large a rate" in perpetuity.[57] "Public use" of Company water began with supplies to the railway station and the Lunatic Asylum; by 1857 it included street watering and sewer flushing. One year later the directors agreed to supply water to three public urinals in the borough at the rate of £1 per year per location.[58] This last arrangement appears financially trivial to both the borough and the Company, but it helps to demonstrate the Highway and Sewerage Committee's commitment to sanitation. Because unpleasant odors arising from organic decomposition formed the heart of pythogenic disease theory, activities such as street watering, sewer flushing, and providing flushable urinals would theoretically reduce disease incidence as they reduced unpleasant odors.

The Company's gross revenues exceeded operating costs for the first time in 1856, but the profit did not reach the 5% threshold established in the contract with the Local Board so the borough's ratepayers paid the bulk of the dividends to shareholders. In 1857, as the guaranteed return by the Local Board dropped from five per cent per share to four per cent, the Company showed a gross profit of £576 over expenditures.[59] Thus the Company's earned profit justified a dividend of 0.72%. The ratepayers of Leicester paid approximately £2,066 to the

[57] Ibid., 21 April 1854, 24 April 1857, 10 March 1858, [n.p.].
[58] Ibid., [n.p.].
[59] Ibid., 30 May 1857, [n.p.].

shareholders of the Waterworks Company in addition to what they paid for public water use and whatever expenses that individual ratepayers incurred as customers of the Company in 1857. To the extent that ratepayers were simultaneously landlords, these expenses likely would be reflected in rents. Renters, of course, were not consulted.

By 1864, the flow of dividend money from the borough to the Company reversed. In August the directors reported gross profits of £3,1000. This translated to dividends of six per cent per share, free of income tax. Moreover, the Company paid £643 to the Local Board as per the profit sharing agreement. Six per cent dividends continued until 1866, when the directors authorized seven per cent dividends. In late 1868, the directors returned to the six per cent level. Profits and dividends were substantial from 1864 on, despite a crisis in the Company's ability to supply the borough with water.[60]

As early as 1864, the directors called a special meeting because of the "gradually diminishing supply of water in the Storage Reservoir at Thornton." The directors considered interrupting or limiting the flow of water to Leicester but instead chose to print and post handbills encouraging conservation. At a follow-up meeting, Hawkesley told the directors that the water shortage was caused by "defective Water Closets and High Pressure Meters." Yet one month later, the directors told their shareholders that "[t]he unusual drought of the last two years has doubtless been the main cause."[61] Moreover, population growth might have drained the Thornton reservoir; in 1865, borough authorities estimated Leicester's

population at 80,500, almost the exact number of souls that Hawkesley originally had been charged to supply.[62] Though not every one of the 80,500 used Company water, the town clearly grew faster than Hawkesley had imagined. Likewise, during the disagreement with Wicksteed, Hawkesley erred in his assertion that Thornton could supply 100,000 residents. Regardless of the ascribed causes, the directors began the search for a new source of water in 1865.

Ample rain in 1866 brought Thornton to a more acceptable level, but preliminary efforts to obtain another reservoir were already underway. In May, parliament authorized the Company to raise another £120,000 of capital. This brought the total number of Company shares to 8,000. Existing shareholders purchased all but 188 shares from the new offering of 4,800, as the directors gave them the right of first refusal.[63] Clearly, shareholders had been pleased by the returns to their investments. Hawkesley agreed to oversee the new project at his Thornton rate: 3 ½% of all expenditures, including expenses incurred securing parliamentary approval.[64] The site at Bradgate (later called Cropston), northwest of Leicester, was selected and purchased with ease when compared to the acquisition of Thornton. The Company puchased 168 acres from the Earl of Stamford for £24,000, in January 1868.[65]

Hawkesley effused, "that if the Town of Leicester obtains possession of this very advantageous source no Town in the Kingdom will be better supplied with

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[60] WW Minutes, LRO CM 43/3, printed report affixed to pp. 24, 40, 72, 138, 194.
[61] Ibid., 33-42.
[62] LRO 20 D 72/2, John Moore, MOH 1865, [3].
[63] WW Minutes, LRO CM 43/3, 93-96, 129-130, 150-153.
[64] Ibid., 134-135.

water for many years to come and...I have no doubt that the undertaking will be highly remunerative notwithstanding the first outlay may appear to be considerable."[66] The project proved to be highly remunerative, but neither the quality nor the quantity of the reservoir's water lived up to the engineer's hyperbole. Quality problems arose as soon as the Company took possession of the land. Soil tests and borings prompted Hawkesley's obtuse comment that "the nature of the ground is unexpectedly peculiar."[67]

After Bradgate water came into general use in 1871, the directors told Hawkesley that their satisfaction with the project "has been somewhat marred by the complaints which have recently [been] made of the quality of the Water supplied by the new Reservoir."[68] The engineer responded that "[t]he water is good and daily improving, but for some time to come will present a slightly 'earthy' flavour to the palate in consequence of a small quantity of vegetable matter being dissolved by the water."[69] Privately the directors were placated, but in order to convince shareholders and skeptical customers "that this water, though temporarily disagreeable in taste and colour, contains nothing injurious to health, [the] Directors have forwarded samples for Examination to Dr. Letheby." Letheby, an analytical chemist and one of London's MOHs who was paid by the directors, reported "although turbid, the Water is excellent for domestic use, and may be drank and otherwise used without the slightest cause for apprehension."

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[65] Ibid., 171-172, 201.
[66] Ibid., 84.
[67] Ibid., 227.
[68] Ibid., 388.
[69] Ibid., 387.

Letheby blamed flooding for the "peaty" water even as sources closer to Leicester characterized the period as on "of unusual drought."[70] The Local Board of Health, not satisfied by assurances provided by Company hirelings, sent their own Borough Surveyor, E.L. Stephens, to test the waters at both Bradgate and Thornton. Stephens found problems at both sites; of Bradgate, he complained that the reservoir collected runoff from the unsewered village of Newtown Linford. But the borough of Leicester remained a junior, if not silent, partner in the town's water supply; concerned councilors could not affect Company decisions.

Hawkesley's projections about Thornton quantity had already proved wrong, but the directors accepted his Bradgate projections. Hawkesley contended that the addition of Bradgate would allow water supply for 160,000 to 200,000 people though he vaguely hedged this projection upon "the...number of Water Closets introduced." Bradgate never approached the 200,000 that Hawkseley imagined and Leicester faced water shortages before and after the reservoir came on line.

In the summer of 1869 Thornton was pressed beyond its capacity "to give a supply at all times to the highest portion of the Town and Suburbs."[71] In 1869 Leicester, the highest portions of the town roughly corresponded to the more affluent residential portions of the town. The directors responded by asking the town council to discontinue street watering and sewer flushing, activities directed toward cleansing the lower portions of the town. The council reduced the frequency of these activities, but by the late summer of 1870, the directors took a decision that contradicted their original mission statement. They had once

promised a continuous supply of water; now they flushed this promise. The directors posted large notices throughout the borough, informing customers that because of "the long continued DROUGHT" and "the low state of the Company's Reservoir, FROM THIS DATE [28 September 1870], the Water should BE TURNED OFF from the mains at 6 o'clock every evening until 6 o'clock the following morning."[72] Of course, using the word "should" did not make this a recommendation; twenty-four hour service became twelve hour service without further ado. But despite this reduction in service, there was no reduction of quarterly residential rates. Households paid the same regardless of the volume of water they used, while industries continued to pay only for the volume of water they used.

The circumstances of 1870 illustrate that such profit-driven private water companies as the Leicester Waterworks Company limited the potential public health benefits that might arise from piped supplies to municipalities. In theory, this limitation was structural; the directors had to protect the interests of the shareholders. In practice, the Local Board's four per cent guarantee was still in place; the shareholders were in no danger of losing money. So the directors based their decisions upon other criteria. I contend that in 1870, the directors chose profit over public health in three ways. First, the hours of water supply fit the needs of industry. The directors made no effort to ascertain what hours of operation would be most useful to residences, but six o'clock in the morning until

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[70] Ibid., 387-394.
[71] Ibid., 306.
[72] LRO CM 43/3, "Important Notice," found between pp. 377-378.

six o'clock in the evening worked well for the metered consumers and meter-generated revenues of industry. Second, residential consumers of Company water were obligated to pay quarterly rates in advance. During the "crisis" of 1870, no rebates were offered and residential consumers were not offered reduced rates for limited future supplies. Third, the directors rejected a petition from the town council to lower residential water rates. Council members were alarmed that builders of new homes were sinking new wells within the borough rather than preparing such homes for the introduction of piped water. The council had no power to prevent the sinking of wells; builders and buyers recognized that such wells seemed less expensive than Company rates and regulations.[73] Urban wells were notorious for disease causation long before 1870, but the Company's directors proved intransigent.

Within three years of Bradgate's completion, Hawkesley warned the directors that Leicester would soon face further water shortages. The engineer proposed that the reservoir be expanded. In order to finance the expansion, the Company again needed parliamentary approval. When, in 1874, the directors took their case to parliament, they used the opportunity to argue for an end to the profit sharing arrangement with the borough. The dividend guarantee from the borough's Local Board had served the Company well in its early years, but now the directors had confidence in their ability to attract investors based upon earned profit alone. The borough provided the foundation for the Company's success; by 1874, the directors perceived it as a drain on profits. Yet, the move to exclude the

borough from profit sharing awakened a sleeping giant. Though the Public Health Act of 1848 legally precluded the borough from establishing a municipally owned waterworks system, subsequent legislation had opened this door. Beginning in 1874, the borough engaged the Company for control of Leicester's water supply.

In his 1979 book, Victorian Leicester, historian Malcolm Elliott traces this struggle and describes Leicester's municipal water system after the borough fully purchased the system in 1878.[74] Elliott exploited the extant documents on this issue and I find his telling of the story to be insightful and sound. The only documents that Elliott did not consult on this issue, the Waterworks Company's minutes from 1872 to 1878, are missing. Therefore, this study recapitulates Elliott's findings on the transfer of the Company into municipal hands. I am not troubled by deferring to a summarization of Elliott's work because this study's thesis has been demonstrated by events prior to the municipalization of the water supply. Profit-driven, private waterworks companies were obstacles to improved public health while they improved public health. The paradox is not inexplicable. Clean water supplies benefited all those who had access to them; those who could not afford such amenities suffered. Water became a commodity in Leicester after 1850, it had not been a commodity in Leicester before 1850.

Elliott shows us the irony of the municipalization of Leicester's water supply. William Winterton, a Conservative, led the effort to municipalize. His effort gained the support of the conservative Leicester Journal and raised the ire of the

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[73] WW Minutes, LRO CM 43/3, 372.

liberal Leicester Chronicle. The Chronicle was suspicious of the coalition Winterton formed between Conservatives and radicals. Winterton, an abrasive individual, was not an ideologue; in 1876 he became the borough's first Conservative mayor since the Municipal Corporations Act of 1835. Whiggish Liberals, the late Joseph Whetstone's followers, decried Winterton's position because of the debt the borough would inherit. But Winterton used Whetstone's own logic to support municipalization. When the Whiggish Liberals protested that the acquisition of the waterworks would bring the borough into great debt, Winterton countered that the borough's rates would grow much larger from increases in disease and consequent poverty. Moreover, Winterton argued against Whetstone's position that municipal debt had to be erased with alacrity. Winterton argued that debt could be dealt with gradually. But, Winterton argued, urban wells had to be eliminated forthwith. Eliminating urban wells formed the basis of the mayor's municipalization position, but the Company's refusal to supply water to water closets furthered the public health argument.

Several court battles ensued, but by 1876, the Company seemed unwilling to pursue additional litigation. By 1878, the Leicester Waterworks Company passed into municipal ownership. The borough accepted new debt from this acquisition, but water revenue to the borough proved to be the greatest single source of revenue to the borough for many years.

Although Malcolm Elliott's history of the transition from private to municipal ownership of Leicester's water supply is triumphant and Whiggish, the history of

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[74] For this and below, see Elliott, Victorian Leicester, 125-134.

Leicester's private water supply is an unfortunate one. Time after time the Company's directors sought profit at the expense of public health. Of course investors hoped for a reasonable return on their money, but the directors seemed impervious to health concerns despite their original mission statement that indicated public health was one of their goals. From this one example of a private, for-profit utility we should be cautioned. Profit and public health were not necessarily complementary goals.

4. "Our Endemic Pest:" typhoid fever[1]

Typhoid fever was a disease that has been juxtaposed with cholera in that typhoid was labeled Britain's endemic disease while cholera was considered foreign and epidemic. Given these distinctions, one might think that typhoid was not capable of causing panic or significant change in Victorian society. Such assumptions would be wrong. If typhoid did not lead to panic in the sense of an exodus of the wealthy from infected areas, it led to frenetic activity on the part of wealthy householders, plumbing regulators, and aided in the development of a new profession, termed "Sanitary Engineer." Though some sanitary engineers would cause mischief in other public health issues, they helped reduce the incidence of typhoid fever as did the professionalization of plumbers. Typhoid fever was a common ailment in Victorian Britain, one that all urban areas experienced. Typhoid fever did not place Leicester in a unique or unusual position compared to other British towns. Nonetheless, when typhoid fever rose to national prominence in the early 1860s Leicester's health authorities addressed the problem. In Leicester, as in other locales, typhoid fever was combated largely by Chadwickian sanitation. Chadwick's emphasis upon safe excrement removal and untainted water supplies proved ameliorative for typhoid fever, despite Chadwick's misconceptions of disease transmission. In the case of typhoid fever, miasmatic and pythogenic theories of disease were close enough to the truth that simple cleanliness could indeed save lives. So in Leicester health authorities

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[1] See Lancet, 17 August 1872, 235, and Anthony S. Wohl, Endangered Lives: Public Health in Victorian Britain (Cambridge, Mass.: Harvard University Press, 1983), 125.

emphasized tainted water, that is, well water that was likely to be contaminated by human feces. Condemning foul wells became a large part of the borough's response to typhoid fever, at least by the 1880s. The town council and its MOHs had limited powers over the disposal of human excrement but, in 1879, gained the power known as Compulsory Notification, which allowed borough authorities to investigate all cases of typhoid fever. The efforts of Leicester's health authorities proved helpful; typhoid fever mortality was significantly reduced between 1861 and 1889.

The initial problem with the disease was that typhoid fever was confused with typhus; other fevers were confused as well. Typhoid fever and typhus exhibit similar symptoms, both cause severe headaches, high fevers, and a white "fur" on the tongue. Today, differentiation between the diseases would be clinical, but in the nineteenth century differential diagnoses might well have been based upon the "rosy" blotches produced by typhoid fever and the "bluish" blotches produced by typhus.[2] Both typhoid fever and typhus would qualify as "filth" diseases; typhoid fever communicates from human to human through fecal matter while typhus comes to humans from insects that infest rats. In large measure and within a confused medical community, the form of "fever" which attracted the most attention was typhus, at least until 1861. When Prince Albert contracted and died from typhoid in 1861, a spark was lit in regard to the prevention of typhoid. Historian Anne Hardy explains that some distinctions between typhus and typhoid

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[2] Clayton L. Thomas, ed., Taber's Cyclopedic Medical Dictionary, 13th ed. (Philadelphia: F.A. Davis, 1978) T-84-T-86.

had already been suggested by that point.[3] The Registrar-General recognized the subtle symptomatic differentiation between these diseases by late 1868, when he advocated the new name "enteric fever" for typhoid so as to reduce confusion with typhus.[4] Anthony Wohl contends that the differentiation between typhus and typhoid fever occurred in 1869, but to many Victorians the importance of typhoid fever dated from 1871[5]. It was in 1871 that Edward, Prince of Wales, contracted the disease and nearly met the same fate as his father.

Though ever present in nineteenth century Britain, typhoid fever spurred greater interest than summer diarrhoea because typhoid fever showed less respect to age and class. If an adult member of the royal family could contract the disease, surely everyone was at risk. Of course, not "everyone" merited the same concern as the royals. But historian Christopher Hamlin argues that in the Chadwickian notion of public health, many reformers focused upon adult working class males and the relationship between health and productivity.[6] Yet diseases which could transcend classes transcended the utilitarian focus on productivity. Typhoid fever indeed transcended classes; middle class and even upper class individuals could fall victim to a disease that was etiologically based on "filth." Thus the diminution or eradication of typhoid had more of a natural constituency

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[3] Anne Hardy, The Epidemic Streets: Infectious Disease and the Rise of Preventive Medicine, 1856-1900, (Oxford: Clarendon Press, 1993) 166-67.
[4] J. Wyatt Crane, Annual Report of the Medical Officer of Health for 1868 [hereafter MOH 1868], 16.
[5] Wohl, Endangered Lives, 127.
[6] Christopher Hamlin, Public Health and Social Justice in the Age of Chadwick: Britain, 1800-1854, (Cambridge University Press, 1998) 12.

among the middle and upper classes than did a working class "disease" such as summer diarrhoea.

Typhoid fever arises from the bacillus, Salmonella typhi. Unlike other members of the salmonella genus, S. typhi is specific to humans. The common link among infective sources is the contamination by tainted human feces. Infection can occur from contaminated water sources, contaminated foods, fecal-oral contact, or an insect vector such as a housefly. Outside of a human host, S. typhi survives well in sewage-contaminated water and it cultures well in milk or other dairy products. A typical incubation period (from exposure to the onset of symptoms) is in the neighborhood of ten to fourteen days. A person with typhoid fever experiences flu-like symptoms and an increasing fever usually occurs. Sometimes he or she has other symptoms that are not present in all cases. Death rates among untreated victims today approximate 15%. A further 3% of infected people might become "carriers" who retain the organism within their systems for as long as fifty years.[7]

The fecal to oral transmission of typhoid fever assures that this is indeed a filth disease. Yet the extended incubation period of typhoid complicated nineteenth century epidemiological investigations. Moreover, imprecise theories of disease causation and transmission created confusion among those who sought to limit or prevent the disease. Specifically, pythogenic theory allowed for the airborne transmission of typhoid, most importantly through the noxious medium of "sewer

gas." Nonetheless typhoid was a disease that could, at least in part, be ameliorated by the application of Chadwickian sanitation. Hygiene, both personal and public, had the eventual effect of reducing typhoid incidence and therefore mortality through the second half of the nineteenth century.

Unlike summer diarrhoea, typhoid did not bring particular notoriety to Leicester. Therefore, the health officials of the town were not in the spotlight to uniquely understand or deal with the problem. Because Leicester was not in a unique position among British towns regarding typhoid fever, we are ironically presented with a unique situation to observe how the borough's health authorities dealt with a "typical" public health problem. This does not provide us with a "control" population in the experimental connotation of the word, but it does contrast the responses to Leicester's typhoid problem with the spasmodic responses to summer diarrhoea and the borough's precociously aggressive response to scarlet fever. Though all responses to public health problems were "reactive," the difference here has to do with what impetus the officials were reacting to, beyond etiology or mortality. Summer diarrhoea was burdensome to Leicester's health officials because of its peculiar prevalence in the borough and adverse publicity; typhoid was not unusually prevalent in Leicester. Indeed on one occasion a Leicester Medical Officer of Health (MOH) congratulated himself and the Sanitary Committee of the Local Board for the remarkable "immunity

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[7] Paul R. Hunter, Waterborne Disease: Epidemiology and Ecology (Chicester, U.K.: John Wiley & Sons, 1997) 116-123; Roger Webber, Communicable Disease Epidemiology and Control (Cambridge: CAB International, 1996) 115-117.

from Fever fatality here evidenced."[8] During that year, 1879, only twenty-two inhabitants died from typhoid. For the embattled MOH, J. Wyatt Crane, such a low number of fatalities was evidence that he was not powerless against all diseases. Though summer diarrhoea was uniquely rampant in Leicester, Britain's endemic filth disease was not an embarrassment to the town.

Leicester's MOH's varied in time, ability, and resources.[9] The first, John Buck, was a pioneer in the MOH profession, he was not a leading light in epidemiology. His successor, John Moore, might have had more imagination and insight than Dr. Buck, but Dr. Moore was a product of his time. When Moore reported on the 354 "fever" deaths between 1861 and 1865 in Leicester, he argued that "it should be borne in mind that cases are not infrequently registered as Typhus Fever who only become Typhoid near the termination of some other disease."[10] This confusing statement indicates that Moore had little concept of typhoid fever as its own disease; it seems as through he believed in the mutability of disease within the course of an individual illness. He gave further explanation of this thinking about typhoid in 1866: "it is ascertained that out of this number of deaths [53 in 1866] there were many that did not arise from any miasmatic cause, or from contagion, but were cases which became typhoid from the depressing effects of other diseases."[11]

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[8] Crane, MOH 1879, 46.
[9] The Leicester MOHs varied in time spent in office and, of course, chronologically. Here the important distinction is chronology because of the evolution in theories of disease causation.
[10] John Moore, MOH 1865, 6.
[11] Moore, MOH 1866, 6.

From Moore's statements about typhoid fever, two more or less tenable inferences can be drawn. First, Moore may have had some awareness of the varying fatal complications that can arise from a case of typhoid.[12] Yet Moore did not personally attend the victims and, of course, Moore did not perform post-mortem examinations on them. So it is unlikely that Moore's statements reflect a knowledge that death from typhoid can come from liver abscess, intestinal hemorrhage, or other immediate causes. Second, and more important, Moore's dismissal of both miasmatic and contagionist causes meant that public health officials in Leicester had no role to play in the prevention or limitation of typhoid. Indeed, Moore argued that the level of typhoid mortality, 0.633 per 1,000 in 1866, "plainly shew a satisfactory condition of our public health."[13] Given Moore's unusual causation theory and the fact that the borough's typhoid mortality did not attract scrutiny from outside, we should not be surprised that typhoid fever received little official attention during Moore's watch.

This is not to say that no one paid attention to the disease while Moore was in office. Aside from those directly affected by typhoid, the Unitarian missionary, Joseph Dare, let it be known that he believed the disease was preventable. Dare was Chadwickian in his association of filth and disease and he was part of the "shoe-leather" tradition of urban investigators stemming from Southwood Smith to Rowntree. Dare's concern was about the conditions of the poor and working classes rather than comprehensive public health per se and in his annual reports he

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[12] See Hunter, Waterborne Disease, 188.
[13] Moore MOH 1866, 6.

did not often overtly offend his middle class patrons. Yet indirectly his 1866 report accused the borough's landlords of allowing typhoid mortality to persist through their neglect. In this report, Dare cited several cases of filthy and overcrowded rental properties that were "home" to fever, but with one particularly telling case he suggested that the property's owners were merely the dupes of an unscrupulous property manager. In this case a father had succumbed to "fever," no doubt typhoid.

> The wife thought, very properly, that the house should be well cleaned, as it had not been whitewashed for seven years. But the house-agent peremptorily refused to have it done, and threatened her with immediate expulsion if she made any to do about it. Nothing is done, she leaves; another family comes in and inherits the filth and disease of the pre-occupiers, through the ignorance and inhumanity of the collector.[14]

The unnamed owners of this property were guilty, in Dare's couched phrasing, merely of ignorance of the conditions and insufficient oversight of their overseer. But, Dare's implications were clear. The widow understood that typhoid-producing conditions existed on the site and, when able, she removed her family from the environment. The owners of the property demonstrated no such understanding. Though Dare placed blame, perhaps correctly, upon the owners' agent he was simultaneously urging lessors to visit and improve their properties.

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[14] Joseph Dare (1866) quoted in Barry Haynes, Working-Class Life in Victorian Leicester: The Joseph Dare Reports (Leicester: Leicestershire Libraries and Information Service, 1991), 48.

We cannot ascertain how many landlords took interest in the sanitary state of their properties on the heels of Dare's report. It can be imagined that Moore's odd etiological description of typhoid, carrying with it the presumed expertise of a Medical Officer of Health, would have a greater effect upon complacent landlords than would the vague accusations of a sectarian missionary, particularly since the MOH's position placed no financial burden upon landlords to improve their properties.

The year 1867 brought a new MOH to Leicester and with him a new view on typhoid fever causation. In J. Wyatt Crane's first annual report he explained that "it is now well understood that both Typhoid Fever and Cholera are propagated as much from impure water, contaminated by faecal matter, and containing the germs of these diseases as from aerial emanations from these agents."[15] So Crane acknowledged the fecal-oral nexus of typhoid while simultaneously holding to pythogenic theory which demanded acceptance of the notion that typhoid fever can be an airborne disease. Though typhoid is not an airborne disease and it was still not peculiarly problematic in Leicester, Crane's view allowed for the activity on the part of public health authorities. Moreover Crane's view determined that for at least the next ten years, the borough's health authorities would combat typhoid fever as a product of human filth.

The practical ramifications of Crane's ideas about typhoid fever meant that water supply and excrement disposal were the keys to eradication of the disease. Indeed these were culprits in the spread of typhoid, so improvement in these areas

would prove beneficial regardless of the disease theory that informed such improvement. Moreover, Crane's misconception that typhoid fever could be airborne or waterborne was far from unique. Peter Baldwin has competently established that despite the apparent polarity of miasmatic and contagionist disease theories, most practitioners fell somewhere in between the two theoretical extremes in this period.[16] It is also noteworthy that Crane's more respected, indeed revered, successor, William Johnston, subscribed to the notion of multiple media transfers of typhoid fever pathogens. So, Crane's belief that typhoid could be ingested or inhaled did not place him on the medical fringe in the same way that his "simple heat" theory of summer diarrhoea did.

Regarding water supply, Crane believed throughout his tenure that the Leicester Waterworks Company provided a product free from typhoid. In hindsight there is no reason to doubt Crane's assessment. So, one might presume that Crane might have suspected that infection came from the many wells, public and private, within the borough. As early as 1867 Crane argued that the contamination of one particular well led to three typhoid deaths within the same family, "no other cause being discovered."[17] But, the borough's power to close wells under the Nuisances Removal Act of 1846 was clumsy and rarely invoked.[18] By 1874 Leicester did receive more efficient authority to inspect and close wells,

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[15] Crane, MOH 1867, 9.
[16] Peter Baldwin, Contagion and the State in Europe, 1830-1930 (Cambridge: Cambridge University Press, 1999) 9.
[17] Crane, MOH 1867, 10.
[18] For example, in 1873 only one well in the town was closed. Crane, MOH 1873, 14. The borough did have the power to order property owners to provide a supply of "pure" water to their

and did so with much greater frequency than under than Nuisances Removal Act,[19] yet Crane steadily backtracked on his 1867 assertion that typhoid arose equally from water supply and "aerial emanations." Ironically, Crane seemed to be burrowing more deeply into pythogenic theory at the same time that other medical practitioners began drifting toward germ theory. So, for the most part, Crane set his sights on excrement removal, because of its fumes, rather than on water quality.

Crane's emphasis on excrement removal undoubtedly had beneficial effects for Leicester's residents even though it was not as energetic as it might have been and it was based on erroneous principles. Moreover his principles, though consistently pythogenic, showed variation. Pythogenic disease theory was, in its infancy, merely a refinement of miasmatic disease theory. To the arch-miasmatist Edwin Chadwick, bad smells were disease. In pythogenic theory, bad smells arising from decaying organic matter led to disease because such vapors contained putrefying organic materials. In and of itself this shift in thinking was not earth-shattering. Yet pythogenic theory had important flexibility with regard to the contagionist-localist debate within medical circles. Pythogenic theory could accommodate germ theory; it could be, and was, argued that a deposit of pathogenic microbes into decaying organic material could, under the right

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tenants. This power was used with somewhat greater frequency and usually involved the application of Waterworks Company product.

[19] During the years 1874-79, from the date of the expanded power to the end of Crane's tenure, some 760 wells were inspected and 309, or 41%, of these were closed. Crane, MOH 1878, 22; MOH 1879, 60.

conditions, become airborne and thus infectious when inhaled.[20] On the other hand, pythogenic theory allowed for anti-contagionism in that person-to-person contact was irrelevant unless an infected individual was spewing putrefied organic material into the air. In one sense this was a step up from miasmatic theory because disease did not spontaneously arise from decaying organic material; some introduction of the disease had to be presented. Assuming that to be the case, the temperature and moistness of the soil in an affected area could be sufficient to explain the incidence of disease.[21] This aspect of pythogenic theory was localist and fatalistic; it was the very soil upon which people lived that would cause and explain their experiences with zymotic diseases. Somehow, through the right combinations of meteorology, topography, and filth, typhoid fever was propagated.

Crane was a thorough believer in the pythogenic origin of typhoid fever despite his "waterborne" statement in 1867. Nonetheless, he deserves some credit because of his acceptance of the difference between typhus and typhoid, his ruminations on typhoid, and his concern with the town's sanitation. Beginning in 1868, Crane expressed his belief that typhoid was the only "fever" disease affecting Leicester.[22] Indeed this proved to be true; typhus was not a problem in Leicester though a few doctors erroneously continued to label it a cause of death

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[20] See Crane's own synthesis in Crane, MOH 1877, 32.
[21] See Richard J. Evans, "The Challenge of Cholera in Hamburg," chapter in Richard M. Golden, ed., The Social Dimension of Western Civilization, vol. 2, Readings from the Sixteenth Century to the Present, 4th ed., (Boston: Bedford/St. Martin's, 1999), 180-181.
[22] Crane, MOH 1868, 16.

well into the 1870s.[23] Crane never proclaimed the existence of a louse vector for typhus, it was sufficient to the MOH that typhus symptoms were rare in Leicester and never implicated natives. No constituency had to be convinced that typhus was a problem for Leicester's public health officials to solve.

Crane's ruminations on typhoid were consistent with his pythogenic theory. This MOH was a firm adherent of the "sewer gas" ramification of pythogenic theory. In 1868 Crane claimed that Leicester's sewer system was "fraught with danger" because sewer gas escaped into homes.[24] The MOH regularly argued that homes with untrapped or imperfectly trapped waste drains invited typhoid fever with the rising fumes from sewer connections.[25] Even in the best of homes, Crane lamented "the negligence of servants in kitchens and sculleries leaving off the traps and thus admitting the gases into the houses."[26] This was the way that Crane explained the majority of typhoid fever in Leicester. But, Crane allowed that sewer gas could infect the town's atmosphere more generally. During an outbreak in 1878 the borough's sanitary inspectors, Buxton and Braley, were unable to correlate the sites of fatal cases with defects in plumbing or cleanliness. So Crane argued that for this outbreak the air in the town was "the only possible medium which could have conveyed the infection."[27] In the same way though, in 1871, Crane argued that "in Leicester Diarrhoea is not caused by the entry of sewer

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[23] Crane, MOH 1871, 10; MOH 1874, 9.
[24] Crane MOH 1868, 16.
[25] For example, Crane MOH 1867, 10; Crane MOH 1868, 17; Crane, MOH 1877, 37; Crane, MOH 1878, 23.
[26] Crane, MOH 1868, 17.
[27] Crane, MOH 1878, 23.

gases into the houses."[28] On the one hand, the clean and well plumbed houses of victims implied that typhoid was diffused throughout the borough's atmosphere, while on the other hand, the same conditions meant that his "simple heat" theory explained summer diarrhoea without reference to any pathogenic microbes. Yet over time Crane came to the conclusion that summer diarrhoea was "a disease of similar origin and closely allied to Typhoid fever."[29]

Given Crane's notoriety from "simple heat" theory, this epiphany deserves brief exploration. From the beginning of his tenure as Leicester's MOH he was convinced of the ability of sewer gas to cause typhoid and he never wavered from this belief. Ten years into his term he could assert that "[m]any cases of Zymotic disease, especially Typhoid fever, have occurred in my own practice...whose origin I could distinctly trace to sewage-gases."[30] Armed with this erroneous but quasi-clinical conviction, numerous medical investigations, the seasonal and geographical correlations between the two diseases, and the observation that "[t]he one forms the most constant symptom of the other," Crane would come to assert that he had "a strong conviction that the majority of the cases of infantile Diarrhoea are but forms of Typhoid fever, rendered irregular in their course and fatality."[31] Crane's appeal to authorities on sewer gases regarded typhoid fever in the main, but implicated summer diarrhoea and scarlet fever as well. The actual seasonal correlation between typhoid fever and summer diarrhoea was sometimes consistent. The geographical correlation within the lower parts of Leicester

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[28] Crane, MOH 1871, 34.
[29]Crane, MOH 1877, 34.

became more consistent with the passage of time. The MOH's contention that diarrhea was the most definitive symptom of typhoid was not correct, nor was his association of scarlet fever with typhoid fever and summer diarrhoea. Yet by the end of his tenure, Crane considered most, if not all, infectious diseases to be connected to sewer gas. Ultimately he argued that typhoid could arise from milk or fruit, which indeed it can, but Crane believed that these sources of infection must have been exposed to the bugaboo of sewer gas.[32]

One might correlate Crane's epiphany over milk and fruit with the arrival in 1877, of an Assistant MOH, Dr. William Johnston, rather than significant new epidemiological evidence. Leicester's MOH reports took on new depth and length in 1877. Moreover, Crane's views, beginning in 1877, became more like Johnston's views. That these views were pythogenic is not surprising. When Johnston became the borough's lead MOH for the 1880 report, pythogenic theory and germ theory seemed thoroughly compatible.

Still, Crane generally maintained an interest in the borough's excrement, or at least removing it, because of its association with typhoid fever. To be sure, Crane's emphasis upon the removal of human waste linked with the dangers of sewer gas, but it encompassed more. In his first year, the MOH expressed his shock that in one Leicester neighborhood "there were only two privies to 27 houses!"[33] Christopher Hamlin suggests that such shocked indignation at the

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[30] Ibid., 37.
[31] Ibid., 22, 32-37, 56.
[32] Crane, MOH 1878, 42.
[33] Crane, MOH 1867, 20.

discovery of deplorable conditions was a useful fiction in sanitary reform.[34] Such "discovery" absolved blame all around; to the extent that conditions had heretofore been unknown, no one need be held responsible. Hamlin's argument is specific to initial investigations pursuant to the Public Health Act of 1848, but it translates easily to the situation of a new MOH taking responsibility for a borough. Crane's "discovery" did not implicate his employers, the Local Board of Health, and if any aspersions were cast at all they would be toward John Moore, not J. Wyatt Crane. It should not be forgotten that Joseph Whetstone was very near the end of his life when Crane's initial report was promulgated; less conscientious officials could more easily feign ignorance.

In the late 1860s, Crane thought it impractical to imagine that water closets would replace privies and cesspools in Leicester.[35] Moreover, Crane thought that the sewer gas associated with water closets was sufficiently dangerous to recommend that they be constructed out of doors.[36] But in lieu of these, Crane suggested "earth closets" for indoor use because they had no connection to the sewer system.[37] Earth closets would soon be implicated in the spread of typhoid yet Crane never retracted his view that sewer gas was more dangerous than the collection of feces within homes.[38]

Though well closures were rare under Crane's watch, Sergeants Buxton and Braley, the Local Board's inspectors, were active. As early as 1868 the inspectors

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[34] Hamlin, Public Health and Social Justice, 281.
[35] Crane, MOH 1867, 10-12.
[36] Crane, MOH 1868, 17.
[37] Crane, MOH 1867, 12.
[38] Lancet, 7 January 1871, 7.

were taking some contractors before magistrates because of poorly constructed water closets.[39] By 1874, Buxton and Braley were annually issuing more than five hundred repair or cleansing orders for water closets and privies.[40] It remains difficult to assess the relative prevalence of water closets, earth closets, or privies in 1870s Leicester. The census of 1871 counted 19,287 inhabited houses which corresponded closely with the borough's own count of 19,289 at the end of 1870.[41] But the borough counted a total of 9,900 wc's and 9,929 privy cesspools.[42] This count was almost certainly inaccurate because a similar count in May 1872 identified only 5,090 wc's. As Table 4.1 indicates, by the end of 1878 there were still only 7,476 wc's in Leicester. Yet Table 4.1 also shows a striking reduction in the number of privies and cesspools in the borough during the 1870s. Though some of the decrease is explained by the increase in wc's, much more is explained by the increase in ash pits (earth closets) and the introduction of the pail system.

By the time of his last annual report in 1879, Crane remarked upon the numbers of typhoid fatalities in the borough (21) and addressed the borough's new power of compulsory notification of infectious diseases with regard to scarlet

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[39] Crane, MOH 1868, 29.
[40] Crane, MOH 1874, 16; Crane MOH 1876, 15.
[41] Given the 1871 population of 95,083 and the 3,200 acres of the borough, it is clear that Leicester's overall population density and population density per house were relatively low compared to other urban centers and England generally. In 1871 Leicester's population density was 19,071 per square mile while Manchester's was 100,000 per square mile. Leicester's housing density in 1871 was 4.8 while England as a whole averaged about 5.3 Crane, MOH 1871, 12; MOH 1874, 17; Wohl, Endangered Lives, 288-281.
[42] Crane, MOH 1871, 12.

Table 4.1. Prevalence of domestic waste disposal systems in Leicester, 1872 and 1878[43]

System	1 May 1872	31 December 1878
Privy Cesspools	4,297	1,100
Privies	6,309	1,500
Water Closets	5,090	7,476
Ash Pits	3,660	7,388
Pails	0	5,040

fever,[44] but spent most of his remarks on typhoid, congratulating himself and the borough for the low local mortality. Crane selected several years of low mortality rates to impress his audience. In 1860 Leicester's typhoid mortality was 0.162 per 1,000 living, in 1877 0.17 per 1000, and in 1879 0.159 per 1,000.[45] Crane took this opportunity to explain how he and the Local Board had triumphed over typhoid. The MOH listed four reasons why Leicester was "very remarkable" with regard to fever mortality and he listed them in order of the importance he placed upon them.[46] The order of this enumeration was not arbitrary; it clearly reflected

[43] Crane, MOH 1878, 22.
[44] Leicester acquired compulsory notification powers in the middle of 1879 from a local bill. Several zymotic diseases were included under this bill, typhoid fever being one. The particulars of the bill will be more thoroughly addressed in chapter 5.
[45] Crane, MOH 1879, 44. These numbers differ slightly from figure 5.1 because Crane always subtracted out county residents who died within borough limits.
[46] See Crane, MOH 1879, 46.

Crane's priorities with regard to typhoid. The first claim for such "immunity" was that it was "very rare indeed" to find house drains directly connected to the sewer system in the low lying areas of the town; thus sewer gas was mitigated. Second, "very few" cesspools remained in Leicester by 1879 (the 1,100 in 1878 might not seem to be "very few," but the reduction between 1872 and 1878 was indeed substantial). Third, without explanation, Crane declared Leicester "absolutely free of 'slums'." What he meant by this is vague but in 1887, MOH Henry Tomkins was able to state that of "[c]ellar dwellings in the Borough there are none."[47] Whether or not the two MOH's were remarking upon the same conditions is impossible to say. Fourth, and last on his list, Crane complimented Leicester's "good supply of water of pure quality" which was "in almost general use."

Crane's final, 1879, report was replete with self-congratulation with regard to typhoid fever. The MOH might have failed in the area of summer diarrhoea, but Crane thought he had brought England's "endemic pest" down to a reasonable level. In his mind this was a sincere belief; typhoid killed fewer Leicester residents in 1879 than it had killed in 1867. But, Crane was not the type of MOH to search for data which might challenge his assumptions.

Crane's replacement, William Johnston, was more flexible than Crane, his previous boss. Johnston, the famed originator of the "Leicester Method" of smallpox control, was a man caught between pythogenic and germ theory. With regard to typhoid, this confusion was not a major problem. That is, typhoid could

be reduced by Chadwickian methods. With proper sanitation and personal hygiene, typhoid could nearly be eliminated, though the existence of carriers was unknown in 1880.

Johnston's views on typhoid strongly resembled those expressed by Crane during his last years in office, whether this was due to Johnston's influence upon Crane or possibly coincidence. The new MOH did not argue that typhoid and summer diarrhoea were different forms of the same disease, as had Crane, but Johnston did argue that they were meteorologically correlated. Hot and dry summers led to increased mortality from both maladies; he believed both were primarily airborne.

Though in his mind the primary medium of infection was air, Johnston believed that floods during 1880 produced "a considerable number of cases of Typhoid fever reported to the Health Authorities during the year [that] resulted from the drinking of polluted well-water."[48] The connection between flooding and the incidence of typhoid was epidemiologically sound. Floodwaters could spread S. typhi to wells in two ways. First, the Soar itself could harbor the microbes to be diffused when the river overran its banks. That the Soar actually contained S. typhi would have been likely, though in what concentration cannot be measured. Even though Leicester was sewered and the sewage treated before re-entering the Soar, the same cannot be said for small villages upstream. Second, the sewers undoubtedly contained S. typhi in varying concentrations. In the low-

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[47] Henry Tomkins, MOH 1887, 47.
[48] Johnston, MOH 1880, 39-40.

lying areas of Leicester the Wicksteed system had long been notorious for being unable to accommodate even a heavy rain without backing up. Such back-ups of untreated sewage would then diffuse into wells. This diffusion probably would have been due to the porosity of both the Wicksteed system and the various wells in the borough rather than outright inundation of the wells.

So one of Johnston's concerns about Leicester's typhoid incidence was the continued use of well water for drinking purposes. While MOH, Johnston did not simultaneously hold the office of Borough Analyst; that position was filled by a Dr. Meadows.[49] Still, the MOH was quite interested in the testing and analysis of well water within Leicester. Since the inception of the borough's power to test and close wells in 1874, the town's officials used the "Wanklyn method" of testing for impurities. From 1875, the first full year of the power, until mid-1881, 944 wells were analyzed and 403 condemned.[50] The Wanklyn method of testing thus yielded a closure rate of 42.7%. But Johnston did not consider the Wanklyn method to be the most rigorous and advocated a type of testing that would include borings. In 1881 the MOH convinced Meadows and the Sanitary Committee of the Local Board to adopt a modified "Frankland method." This new type of analysis began in mid-1881 and by the end of 1889 some 733 wells had been tested and 535, or 73%, condemned.[51] But the disparity of well condemnations arising from the methodological change is even more striking when appraised

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[49] Johnston, MOH 1883, 48. The two positions were combined when Henry Tomkins succeeded Johnston in 1884.
[50] Johnston, MOH 1881, 38-39.
[51] Ibid,; MOH 1882, 42; MOH 1883, 49; MOH 1884, 49; Tomkins, MOH 1885, 24; MOH 1886, 77; MOH 1877, 60-61; MOH 1888, 99; MOH 1889, 106-107.

under the first few years of the Frankland method. Between mid-1881 and the end of 1883, 492 wells had been analyzed and 409, or 83%, were condemned. Thereafter the number of wells analyzed (241) and the percentage condemned (52%) declined through 1889. These declining figures did not represent flagging interest in the purity of well water by Johnston or his successor Henry Tomkins. Rather, the declines show that many of the most offensive wells in the borough had already been identified and condemned.

The actual number of wells in Leicester remains difficult to ascertain, though later figures are more reliable than earlier ones. Crane's count of 5,589 houses (out of 19,829), being supplied by well water in late 1870 is dubious in and of itself, but likewise tells us nothing about the number of wells which existed at that time. Yet we may infer that many of the houses supplied by wells were among the more crowded courts of the working classes, particularly before 1874 when the borough acquired the power to close wells. Johnston claimed that by the end of 1882, 846 wells remained in Leicester, serving households numbering in the thousands.[52] By the end of 1883 wells supplied 1,400 houses, or approximately 7,000 people. According to Johnston, at the end of 1884, some 1,200 houses were supplied by well water.[53] The most reliable numbers actually come from Johnston's successor, Henry Tomkins. Tomkins, simultaneously holding the posts of MOH and Borough Analyst, reported in 1885 that 469 wells remained and they

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[52] Johnston, MOH 1883, 48.
[53] Johnston, MOH 1884, 49.

supplied 978 houses.[54] By the end of 1888 Tomkins could find only 297 wells in Leicester.[55] The upshot of the quest to analyze and condemn polluted wells can be lost in these statistics; the mere subtraction of condemned wells from existing wells did not yield the next year's existing wells. The numerical anomaly between wells condemned by the borough and those that remained actually indicate an increasing concern about the quality of water. For example, in 1886 some 88 wells were closed without the expressed orders of the MOH. These wells were closed largely by informal recommendation by borough authorities, but at least nine were closed by proprietors without any borough activity.

The second important development which occurred while Johnston was the lead MOH in Leicester was that the fruits of the Compulsory Notification Act were more fully realized in 1880, beyond the partial data available in 1879. Typhoid, unlike summer diarrhoea, was one of the diseases that fell under Leicester's private bill to require that victims and/or physicians acknowledge incidence of the disease. Though doctors in Leicester railed against the idea of compulsory notification they complied. The doctors' complaints were twofold: first, the doctors argued that compulsory notification could embarrass their patients. This argument was not very strong with regard to typhoid because it seemed to be a classless disease. Second, doctors objected to the idea that they

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[54] Tomkins, MOH 1885, 24.
[55] Ibid., MOH 1888, 94.

might incur a £5 fine for failure to report the disease to the MOH. Private doctors apparently wanted to avoid such responsibility.[56]

Nonetheless Johnston was privy to information that Crane was not because of the legal mandate to report cases of, in addition to deaths from, typhoid fever. Thus it became possible for Johnston and his successors to ascertain the case-fatality rate in Leicester.[57] Through the 1880s the average case-fatality rate of typhoid fever in Leicester was 15.1%[58] Unfortunately Leicester's case-fatality rate of typhoid fever is unknowable before 1880, but even this one decade's worth of data proves useful. Paul Hunter's research indicates that typhoid fever, untreated by antibiotics, typically yielded a case-fatality rate of 15% in the late twentieth century.[59] Leicester's mean case-fatality rate actually fell below 15% from 1886 to 1890, to 13.8%, but this diminution is not statistically significant. Thus we can infer that typhoid fever's virulence has been consistent for at least a century. Yet the value of early notification and reasonable responses in reducing typhoid fever incidence and mortality should not be underestimated. Compulsory notification did not mean that all typhoid fever victims were taken to the borough's fever hospital, far from it; the fever hospital was generally off-limits for typhoid patients. But compulsory notification raised awareness of typhoid fever and the borough's health personnel then visited residences where cases of

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[56] This issue is treated in greater detail in the following chapter dealing with scarlet fever.

[57] Epidemiologists now calculate case-fatality rates from deaths per new cases of a disease. For nineteenth century case-fatality rates, deaths per all known cases are used.

[58] Johnston, MOH 1883, 25; Tomkins, MOH 1885, 9, 53; MOH 1886, 61, 63; MOH 1887, 9, 12; MOH 1888, 11; MOH 1889, 15, 93; MOH 1890, 48. This mean is taken from 1880-1883 and 1885-1890. The number of cases was not reported in 1884, so that year has been omitted from the average and the year 1890 has been added to the average.

typhoid, rather than fatalities, occurred. Some of the most obvious sanitation defects could then be addressed with the families of victims and some fecal-oral connections broken. Such hygienic information proved ameliorative without necessarily being founded on accurate disease theory.

By 1886 the new MOH, Henry Tomkins, initiated a blanket house-to-house inspection, far beyond the case-by-case survey of the early 1880s. This extraordinary measure surpassed what might be expected from a Liberal local government, but Tomkins was determined to obtain a comprehensive overview of Leicester. The MOH used data from compulsory notification to prioritize inspections, but still managed to have 22,773 out of 27,000 homes inspected in 1886.[60] Such a feat might imply that the inspections were cursory, but this seems unlikely because 40.6% of the homes inspected were ordered to make improvements. Most of the improvements that were ordered, 83.2%, pertained to excrement removal or faulty drainage. Tomkins noted that "these discoveries are [often] made in the best class of houses." But Tomkins contended that such faults would fade away in time; [n]o such blunders or errors of construction and sanitary arrangements are permitted now, in the building of new houses."

Tomkins had good reason for optimism. In response to nationwide fears of typhoid fever "sanitary engineering" was developing as a profession. Moreover in 1887, Tomkins applauded the voluntary testing of plumbers established by the "Worshipful Company of the City of London," and hoped that such testing would

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[59] Hunter, Waterborne Disease, 118.
[60] For this and below, see Tomkins, MOH 1886, 29, 34.

become compulsory.[61] Typhoid fever declined among cause-specific death rates in Leicester.[62] Typhoid fever case-fatality rates declined in the borough. Leicester was, at worst, average in annual typhoid fever mortality rates among large British towns, but more often than not it was below the national average. Yet typhoid fever did not go away. In 1890 some 165 cases were reported and 24, or 14.5%, were fatal.

Tomkins used information made available from Compulsory Notification to provide home inspections and hygienic education, but he also actively inspected the borough's supply of milk. Milk can be the source of typhoid fever and by 1882 an outbreak of the disease in Leicester could be traced to milk.[63] From 1881 to 1884 the borough inspected milk shops if complaints were made; this complaint-based inspection system resulted in 6.8% of the product being condemned. Tomkins undertook an inspection of all 176 licensed milk shops in Leicester and between 1886 and 1889 some 11.7% of milk was condemned, an increase of 72%.[64] This data should not be interpreted as though the milk that was condemned tested positive for s.typhi as such a test did not exist. The MOH commented that "the abstraction of cream or the addition of water are the common mal-practices." But it is logical to infer that comprehensive inspections likely had a positive effect on the handling and storage of milk in the shops and

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[61] Tomkins, MOH 1887, 54.
[62] By 1886 typhoid ranked 18th among causes of death in Leicester. Tomkins, MOH 1886, 59.
[63] Lancet, 15 April 1882, 621.
[64] Tomkins, MOH 1885, 15-16; Tomkins, MOH 1886, 77; Tomkins, MOH 1888, 99; Tomkins, MOH 1889, 106.

one suspects that those purveyors who illegally diluted milk with water might not have exercised great care in selecting the purest water available.

Some outbreaks of typhoid fever in the 1880s were traced to workers cleansing and reconstructing the sewerage system, an unpleasant but very real reminder of the fecal-oral nexus of typhoid fever. Unprotected sewerage workers would unavoidably contact the sewage and we could hardly expect them to avoid touching their own faces. But in Tomkins' mind there was an even more dangerous nexus for typhoid fever transmission: pails for excrement collection within homes. This once-heralded excrement collection and removal system was undoubtedly an improvement over open cesspits, but hardly an effective substitute for water closets. The collection of feces within a home necessarily increased the likelihood of fecal-oral transmission of typhoid fever. So Tomkins lamented that some 7,000 pails were still in use in 1889, but he was gratified that new pails were no longer being introduced.[65] Yet the borough's full conversion to water closets was not even accomplished by the completion of the Gordon sewerage system in the 1890s.[66] An ideal sewerage system and the universal use of water closets would have hampered the transmission of typhoid fever considerably; Chadwickian sanitation could lessen, but not eradicate the disease completely.

To some extent typhoid fever remained the "endemic pest" in Leicester throughout the Victorian period and was impervious to sanitation improvements because it can exist in a carrier state. Yet, the borough's rate of typhoid mortality

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[65] Tomkins, MOH 1889, 45-46.

declined over time. Given typhoid fever's endemicity and that it can exist in a carrier state, Leicester's dealings with the disease can be counted as a qualified success. For researchers it would be useful to have rates of incidence as well as rates of mortality, but since such information is unavailable before 1880, we make due with the information at hand. Yet some historians might question the value of chronicling Leicester's successes in dealing with the ravages of typhoid fever. Indeed this is the type of case study that Christopher Hamlin considers redundant at best.[67] Hamlin does not perceive a need for more chronicles of the success of the sanitary idea. He sees such histories as "Whiggish" in that they tell a winner's tale. Hamlin seeks a history of public health that is more integrated with political and social history, thus more problematized. With respect, I disagree with Hamlin's position as it regards typhoid fever in Victorian Leicester.

Hamlin does not approve of viewing nineteenth century public health as a contest between right and wrong to be judged by twenty-first century historians. But Leicester's tale of typhoid fever is not a teleologically informed story of right triumphing over wrong. Ironically it is a story of largely wrong thinking that led to a measure of success against a disease that was only vaguely perceived as a specific disease in the beginning of the period. It was a happy accident that Chadwickian notions of improvement actually helped to control the disease. Such was not the case for all of the so-called zymotic diseases in Victorian Leicester. Indeed it was the success of Chadwickian sanitary measures against typhoid fever

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[66] Wohl, Endangered Lives, 95. According to Wohl, some 6,700 pails remained in Leicester in 1895.

that make this story newsworthy. Because pythogenic theory was in the mainstream of medical thinking and because Leicester's health authorities ultimately acted vigorously, Leicester was not notorious for typhoid fever mortality in Victorian Britain. With due respect to Hamlin, it is the pedestrian nature of the history of typhoid fever in Leicester that aids this dissertation.

Many Victorian public health problems placed Leicester in a national spotlight; typhoid fever did not. The whole of the nation worried about typhoid fever; Leicester was fairly anonymous. So the borough's leaders were free to deal with typhoid fever as they saw fit. Some actions were vigorous, such as Compulsory Notification; some were complacent, such as blaming the "atmosphere." The responses by Leicester's leaders to typhoid fever form only a part of the story that needs to be told; this was how they reacted to problems that were not posed as unique to Leicester. During the 1860s, and certainly after 1871, typhoid fever was perceived as a problem for all Britons; given Leicester's unique position with regard to other public health issues, such anonymity was a godsend.

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[67] Hamlin, Public Health and Social Justice, 9-10.

5. "A Necessary Evil Incidental to Childhood:"[1] scarlet fever

Scarlet fever presents one of many paradoxes in Leicester's public health history. On the one hand, an interventionist preventive and therapeutic policy was initiated in the 1870s and gained widespread public compliance before 1890. Leicester's mortality rates from scarlet fever decreased. On the other hand, the "better class of people" resisted the initiative and recently historians have made the claim that intervention was useless concerning scarlet fever.[2] Taking England as a whole, scarlet fever mortality decreased by the 1890s. This study shows that the paradox mentioned above is more apparent than real. The streptococcus responsible for scarlet fever most likely decreased in virulence in the late nineteenth century without human intervention. But, this diminished streptococcal virulence can not explain why some children in Leicester had a better chance of survival than others. The interventionist and ultimately class-based approach taken by Leicester's public health authorities in the 1870s and 1880s succeeded in reducing scarlet fever mortality.

Scarlet fever incidence does not statistically correlate with social class, but the treatment of scarlet fever victims in Victorian Leicester depended upon the victims' social class. The improvements in Leicester's scarlet fever mortality

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[1] Henry Tomkins, Annual Report of the Medical Officer of Health, 1886 [hereafter MOH 1886], 11. LRO 20 D/74.

[2] Tomkins, MOH 1890, 14. Anne Hardy, The Epidemic Streets: Infectious Disease and the Rise of Preventive Medicine, 1856-1890 (Oxford: Oxford University Press, 1993), 66. Anthony S. Wohl, Endangered Lives: Public Health in Victorian Britain (Cambridge, Mass.: Harvard University Press, 1983), 129. Wohl also credits heightened levels of immunity and hints that intervention was another ameliorative factor.

occurred because of the activity of several medical professionals in service to the borough and the willingness of working class parents and the town council to accept these doctors' recommendations. The borough and its ratepayers erected a "fever hospital." The fever hospital was originally a facility for the isolation of smallpox victims, but became a facility that handled scarlet fever patients as the bulk of its business. The town council acquired the "powers of compulsory notification of infectious diseases." Explained in detail below, for the moment, it suffices to say that "compulsory notification" led to the borough's Medical Officers of Health being informed of every new scarlet fever case in the borough. The knowledge gained from compulsory notification and the isolation made possible by the fever hospital led to reduced scarlet fever mortality in Leicester, especially in the 1880s.

Historian Anne Hardy contends that scarlet fever diminished in virulence as the result of microbial (in this case streptococcal), change rather than human social change. She argues that preventive public health measures did nothing to reduce deaths from scarlet fever; that decreases in scarlet fever mortality, though not scarlet fever incidence, arose from the competition between various streptococcal strains. Therefore, according to Hardy, common scarlet fever did not produce high mortality before 1840 or after 1870.[3] An earlier historian acknowledges the naturally occurring decrease in virulence, but also credits preventive and isolationist methods for reducing the disease's mortality.[4] For

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[3] Hardy, The Epidemic Streets, 66. Wohl, Endangered Lives, 129.
[4] Jeanne L. Brand, Doctors and the State: The British Medical Profession and Government Action in Public Health, 1870-1912 (Baltimore: Johns Hopkins University Press, 1965), 58.

reductions before 1889, Hardy supports her argument by anecdotal evidence and mortality rates. After 1889, she supports her argument with incidence data and case-fatality rates. The differences between these types of evidence are significant. Cause-specific mortality rates usually identify deaths per population at risk, but it is difficult if not impossible to determine the Victorian population at risk. Hence, Hardy uses the number of deaths from scarlet fever divided by overall population to calculate mortality rates. Oftentimes historians consider themselves fortunate to have enough information to calculate the type of mortality rates that Hardy uses to 1889; such rates are preferable to raw mortality numbers because rates are comparable, whereas raw numbers are not. Epidemiologists define case-fatality rates as the number of deaths occurring among new cases of the particular disease. Hence, the calculation of case-fatality rates requires knowledge of how many people contract the disease. Though historians often rely upon mortality rates per population, changes in disease virulence are best measured by reference to case-fatality rates. Given the knowledge of how many people were stricken with a particular disease, relative mortalities can be calculated. This is because variables of time or treatment become measurable. That is, case-fatality rates become the best measures of success or failure of preventive and therapeutic actions because an artificial, but historical, control group can be identified. While not the same as experimental control groups, historical "control" groups can suggest whether intervention succeeded.[5]

[5] Experimental control groups rarely can be used in historical studies, none are available here.

It is hard to calculate case-fatality rates for Victorian Britain. Often, the only available data comes from raw mortality and population estimates. Important exceptions arose from some municipalities that achieved parliamentary approval for "compulsory notification of infectious diseases." Compulsory notification acts varied because they were local acts until a template was established by parliament in 1889. What local compulsory notification acts had in common was that local authorities had to be alerted to the presence of an infectious disease within their communities. That is, once a municipality gained the powers of compulsory notification, anyone who knew of a case of a disease perceived to be contagious (so-called "zymotic")[6], was required by law to notify the borough's Medical Officer of Health. Compulsory notification proved to be a grand step in epidemiology because, for the first time, public health officials could track all cases of disease incidence. Leicester joined several other pioneering British towns when the borough acquired compulsory notification powers in 1879.

Hardy's reliance upon raw mortality rates until 1889 can only suggest that scarlet fever virulence was decreasing; it cannot measure the effectiveness of interventionist policies with any accuracy. Moreover, Hardy's study focuses on London and London acquired the power of compulsory notification of infectious diseases only in 1889. The borough of Leicester acquired the power of compulsory notification of infectious diseases a full ten years before London and consequently an analysis of Leicester and scarlet fever reveals more than Hardy's

[6] "Zymotic" currently implies fermentation, which would have dovetailed with Victorian pythogenic disease theories, but "zymotic," could also be defined as gastroenteric, or infectious.

masterful analysis of London could. I contend that in Leicester, after 1879, scarlet fever mortality decreased because of intervention and isolation by the borough's public health authorities.

The interventionist approach employed by Leicester's Sanitary Committee and the borough's Medical Officers of Health (MOHs), produced positive results with regard to scarlet fever mortality and the attendant publicity probably led to heightened awareness of scarlatinal symptoms among victims' parents. Given the borough of Leicester's Liberal political bent such an interventionist strategy might seem out of character. Historian Erwin Ackernecht posed a paradigm that correlated liberal politics and anti-interventionism, but more recently, historian Peter Baldwin has demonstrated that such a position oversimplifies the problem.[7] Ackernecht's paradigm suggests that authoritarian governments would be likely to accept the contagionist theory of disease because it would lead to quarantine strategies, but liberal governments would be likely to accept the localist, or quasi-miasmatic, theory of disease because such a theory would allow for greater individual freedom. Baldwin contends that the liberal position could hold in the abstract that the healthy community's right to freedom from infection outweighed the infected individual's right to freedom of movement. One might suspect that this position merely reflects the historical evolution of liberalism toward greater governmental involvement in social matters. The actual development of public health policies shows such formulaic suspicions to be unfounded. At a national

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See Clayton L. Thomas, ed. Taber's Cyclopedic Medical Dictionary, 13th ed. (Philadelphia: F.A. Davis, 1977), z-4.

level, Liberals led the movement to repeal the interventionist laws requiring smallpox vaccination. Within Leicester, the development of public health policies did not follow a straightforward path toward greater governmental intervention in people's lives. Though Baldwin's argument is more convincing and more explanatory than Ackernecht's in a general sense, it can not be supported by direct evidence from Leicester. The evidence from Leicester indicates no philosophical balancing act between the rights of the individual and the rights of the community until the element of social class is considered. In Liberal Leicester, middle class citizens were accorded freedom of movement rights, but working class victims' rights were subordinated to the community's rights. As shown below, by the late 1880s, this disparity became explicit. So Baldwin's sophisticated and comparative analysis of epidemic diseases is useful but remains above the level of practical implementation, British public health problems were addressed locally according to local priorities. Baldwin's argument allows for variation between interventionism and non-interventionism within particular political viewpoints, but it says less about how different segments of the general public were treated. One of the lessons learned from Leicester's experience is that some people were treated differently from other people. This is not an earthshaking historical finding, but in the historiography of public health, it is too often overlooked that the "public" was not a seamless amalgam of citizens. Rather, the "public" was a construct, and a construct with a great deal of flexibility in definition.

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[7] See Peter Baldwin, Contagion and the State in Europe, 1830-1930 (Cambridge: Cambridge University Press, 1999), 12-36.

Scarlet fever is a streptococcal disease arising from a Group A hemolytic streptococcus bacterium.[8] Typical symptoms include sore throat, rash, and fever. Scarlet fever is clearly an infectious or contagious disease; thus in Victorian parlance, it was a "zymotic" disease. Often the transmission from person to person gives the appearance of an airborne disease, but the bacteria are actually in colloidal suspension in heavier than air droplets coughed or sneezed by an infected person. Thus the bacteria do not aimlessly float about the environment with the ability to infect, but droplets from a human sneeze can travel as far as thirty feet. Infected milk or food can also transmit scarlet fever. Once introduced, the disease incubates in people from one to three days before symptoms appear.[9] No universal, untreated case-fatality rate can be posed as a baseline because the bacteria indeed vary in virulence. Other Group A hemolytic streptococci affect human beings with rheumatic fever or tonsillitis, among other maladies, so a diagnosis of scarlet fever is both clinical (implying the laboratory identification of particular microbes), and symptomatic in the twenty-first century. Strep microbes, such as the infamous "flesh-eating" bacteria, continue to challenge modern researchers, but George and Gladys Dick identified the scarlet fever streptococcus in the 1920s.[10]

Scarlet fever, or scarlatina, is and was a childhood disease; it was not a filth disease and it did not respect social stratification. Leicester's MOH, J. Wyatt

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[8] Clayton Lay Thomas, ed., Taber's Cyclopedic Medical Dictionary, 13th ed. (Philadelphia: F.A. Davis Company, 1977), S-15.
[9] Roger Webber, Communicable Disease Epidemiology and Control (Cambridge: CAB International, 1996), 335.
[10] Clayton, Taber's, S-15.

Crane, reported 174 scarlet fever deaths in 1875; 98.9% of these deaths were of children under the age of fifteen.[11] Such age-specificity was not unusual; for England as a whole, 95% of fatalities were children under ten years of age.[12] Yet, infants under one year of age were not the primary victims of scarlet fever mortality; they represented only 7% of Leicester's 1875 deaths, while 74% of the deaths were children between the ages of one and five. Some 18% of fatalities were "school aged" children between five and fifteen.[13] This information tells us that mortality was highest among ambulatory children who had yet to enter school, but that notwithstanding, mortality from scarlet fever could be significant among students and potential students.

Parliament might have facilitated the spread of scarlet fever by the establishment of secular school boards in 1870 and compulsory education of children between the ages of five and ten beginning in 1880. As might be expected, these parliamentary measures led to more children attending schools and therefore more opportunities for the transmission of scarlet fever. As early as 1869, the Lancet recognized that schools provided forums of communication between those infected and those yet to be infected. Characteristically, the journal recommended that panels of doctors, rather than school administrators, should decide when and for how long schools should close during epidemics.[14] As schooling increased in Leicester, so did concern and scrutiny about scarlatina increase.

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[11] J. Wyatt Crane, MOH 1875, 26.
[12] Wohl, Endangered Lives. 128.
[13] Crane, MOH 1875, 26.

In 1869, scarlet fever was not a large problem in Leicester; only eight deaths were recorded from the disease. Indeed scarlet fever claimed only seventy-four lives in the five-year period 1865-1869, and the majority (40) occurred in 1867.[15] However, 1870 was an epidemic year; some 263 died in this year alone. Dr. John Barclay, an elected member of the town council and a physician who had served the council, recommended the construction of a "fever hospital."[16] Barclay and MOH J. Wyatt Crane advanced the idea of a fever hospital because victims of scarlet fever, smallpox, and erysipelas were not admitted to the borough's infirmary. This local initiative echoed the sentiments of John Simon, the lead physician to the Privy Council. Simon was "frustrated by the failure of sanitary measures to contain" scarlet fever.[17] Chadwickian sanitation could be effective against filth diseases such as typhus, but in the late 1860s some medical professionals were recognizing that the transmissibility of other diseases did not involve pythogenic media. Pythogenic disease theory was a logical step between miasmatic disease theory and germ theory. Pythogenic theory supposed that decaying organic material, if the requisite microbial disease agent was present, could release such an agent in something akin to an unseen miasmatic cloud. Perhaps Barclay and Simon were developing sophisticated notions of disease causation. Crane's ideas were not always sophisticated. Yet, the point of this study is not to provide a rehearsal of the diffusion of germ theory among medical professionals. Rather, this study is largely about political salesmanship. Dr.

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[14] Lancet, 6 November 1869, 663.
[15] Crane, MOH 1874, 21.
[16] Lancet, 19 November 1870, 718.

Barclay had to persuade his fellow councilors that a fever hospital would be economical and practical improvement upon contemporary conditions.

In late 1870, Barclay was able to convince the town council that a facility for the isolation of both smallpox and scarlet fever patients was necessary. The managers of the Leicester infirmary proved unwilling to accept such an addition to their grounds because they recognized the potential of person to person transmission of these diseases.[18] The town council's Local Board of Health was likewise "foiled" in the attempt to purchase an existing building on another site.[19] Barclay then led a campaign to erect a fever hospital, supported by both borough and private funds, on an undesirable piece of real estate known as "Freake's Ground." But, a public meeting of ratepayers, held in the midst of a scarlet fever epidemic in December 1870, rejected the purchase of land and construction of the hospital; the proposal "negatived by a large majority."[20] Despite Barclay's successful efforts to convince the Local Board of the need for a quarantine facility and his recruitment of "country gentlemen" to support its construction financially, Leicester's local ratepayers rejected his initiative to build the Freake's Ground hospital.

In 1871, the scarlet fever epidemic in Leicester coincided with an outbreak of smallpox. Smallpox was different from scarlet fever in that scarlet fever remained a childhood disease. Adults died from smallpox and everyone knew that smallpox transcended social classes. Moreover, many people doubted the

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[17] Wohl, Endangered Lives, 128.
[18] Lancet, 3 December 1870, 793
[19] Ibid.

value of their own smallpox vaccinations. Thus when, in 1871, Barclay repeated his call for the construction of a fever hospital, this time as a facility for the isolation of smallpox patients, the hospital was approved by ratepayers, erected, and opened before year's end. As mentioned above, Crane and Barclay always hoped that the fever hospital would accommodate victims of other zymotic diseases, but while smallpox was epidemic in the early 1870s, the hospital simply did not have space for scarlet fever patients.

Leicester's scarlet fever mortality was still high in 1871, with 173 fatalities, but then there was a dramatic drop-off, so that only twenty-nine children died between 1872 and 1874.[21] By 1875, a new epidemic of scarlet fever began, but by then the smallpox epidemic had long since passed and scarlatinal patients could be admitted to Freake's Ground. By 1877, most of those patients "removed" from their homes to the fever hospital were stricken with scarlet fever.[22] Such children were not removed by force; borough inspectors convinced the victims' parents that such isolation would protect their other children. This trend toward Freake's Ground as a scarlet fever hospital continued throughout the Victorian period. That is, except for those rare occasions when smallpox was epidemic, scarlet fever was the diagnosis that led to the overwhelming majority of cases admitted to the hospital.

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[20] Lancet, 17 December 1870, 864.
[21] Crane, MOH 1874, 21.
[22] Crane, MOH 1877, 14.

It was Leicester's good fortune to have hired Dr. William Johnston as superintendent of the fever hospital in 1876.[23] Likewise in 1876, the Sanitary Committee of the town council appointed Johnston the borough's first assistant MOH to aid the aging J. Wyatt Crane.[24] Johnston was youthful and energetic. By 1878, he persuaded Leicester's town council to apply for a local act of parliament to require the "compulsory notification of infectious diseases." As Johnston's municipal positions were part-time he was also a private practitioner. But this young Irish doctor who lived in "the artisan area of the town"[25] came into conflict with the established private practitioners of Leicester.

Private practitioners and MOHs had already come into conflict about scarlet fever in other parts of England. In 1869, one London practitioner complained that MOHs wanted to be notified of the presence of the disease yet, once notified, the MOHs were slow to respond and their responses included nothing more than a "call at the door, and ... a printed paper of directions as to disinfection."[26] Yet the opposition to compulsory notification of infectious diseases by doctors in Leicester had little to do with the actions an MOH might or might not take after being notified of the presence of a disease. Rather, private practitioners objected to the provision of the bill that would assess a penalty to doctors, as well as the families of victims, for failure to notify the MOH.

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[23] For this and other biographical information on Johnston, see S.M.F. Fraser, "Dr William Johnston (1846-1900) of Leicester – an Unknown Victorian General Practitioner," Journal of the Royal College of General Practitioners, 33 (1983): 369-371.

[24] Crane was becoming challenged physically, but more important he was becoming obstinately out of touch with contemporary medical opinion. See the chapter on summer diarrhoea.

[25] Fraser, "Johnston," 370.

[26] Lancet, 11 December 1869, 825.

Technically, the Sanitary Act of 1866 made it illegal for anyone to expose the public to an infectious disease.[27] Yet only the infected person was bound by this Act and there was no requirement to notify health authorities of the existence of infectious disease. The local act advocated by Leicester's Sanitary Committee included a £5 fine upon those who failed to notify the MOH, whether that fell upon the victim's family, the victim's doctor, or both.[28] At the time the Sanitary Committee approved this action, five English towns already had compulsory notification powers, including nearby Nottingham.[29]

Johnston's argument for compulsory notification, presented under Crane's name, stressed the importance of the early detection of potentially epidemic diseases and was closely tied to the notion that victims of such diseases should be removed quickly to the isolation hospital. Yet within the report Crane's prejudices overshadowed Johnston's pragmatism. Crane took pains to castigate "the lowest classes of a community" whose "ignorance, filthy habits, and over-crowding" led to epidemics.[30] Crane contended that "[i]n nine cases out of ten, epidemics are imported, fostered, and subsequently spread amongst the inhabitants of a town by its poorer classes,"[31] who were unlikely to be under a doctor's care except in the last resort.

Objection to compulsory notification did not come from the general public, rather it was the medical community who raised "well-nigh unanimous

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[27] See Hardy, The Epidemic Streets, 68.
[28] Crane, MOH 1878, 14.
[29] Ibid.
[30] Ibid., 13.
[31] Ibid., 14.

objection."[32] As the proposal for compulsory notification made its way to the floor of parliament, doctors from Leicester petitioned parliament to reject the clauses of the bill that contained penalties for medical professionals. They argued that these clauses "imposed upon them new and onerous and unnecessary obligations" and such obligations were "inquisitorial in character, uncalled for, and likely to lead to endless mischief and complication."[33] The Lancet, a professional journal at its root, supported the Leicester doctors, accusing the corporation of "blundering management" by attaching financial penalties to medical professionals who failed to comply with compulsory notification.[34] The lines were drawn between the MOH, with the backing of the city, and private practitioners, with the backing of the Lancet. In this instance parliament sided with the interventionist approach to public health. The Leicester Corporation Improvement Bill passed committee on 23 May 1879 and became law on 13 September 1879.[35] Though not required by the compulsory notification law, the removal of scarlet fever patients to the hospital increased. Moreover, once compulsory notification became law, "not a single complaint...reached the ears of the Sanitary Authority from either the general public or the medical men themselves of any mischievous result or complication having arisen from their compliance with the newly-imposed duties."[36]

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[32] Lancet, 8 February 1879, 206.
[33] Crane, MOH 1879, 17.
[34] Lancet, 8 February 1879, 206.
[35] Crane, MOH 1879, 17.
[36] Ibid., 18.

With the power of compulsory notification and having the fever hospital in place, Crane and Johnston were quick to praise their combined effects. They compared scarlet fever deaths to the borough's population during three epidemic periods (see Table 5.1). From the data shown in Table 5.1, they argued that compulsory notification had saved forty-one lives in the fifteen weeks from the inception of the law to the end of 1879. In 1875, scarlet fever mortality had amounted to seventeen per ten thousand living. At that rate, the epidemic of 1879 would have led to 213 deaths. Instead, in 1879 mortality was but eight per ten thousand living, leaving 105 children dead.[37] Extrapolating from this information, and with the knowledge that scarlet fever mortality was typically highest in the fourth quarter of the year, Crane and Johnston stated that expected mortality in the fourth quarter should have been 107. However actual fourth quarter deaths were sixty-six. The MOHs failed to

Table 5.1. Scarlet Fever Deaths and Population in 1870, 1875, and 1879[38]

Years	1870	1875	1879
Deaths	263	186	105
Population	93,000	110,000	126,000
Raw Mortality Rate from Scarlet Fever	28.3 per 10,000 living	16.9 per 10,000 living	8.3 per 10,000 living

[38] Crane, MOH 1879, 31.

mention that the rate of scarlet fever mortality was twenty-eight per ten thousand living in 1870, and that rate was substantially higher than the 1875 rate without recourse to compulsory notification. Given this diminution from 1870 to 1875, one might assume that mortality from scarlet fever decreased naturally and, other things being equal, that intervention produced no real benefits.

Yet, circumstances had indeed changed between 1870 and 1875. The borough's fever hospital accepted scarlatinal patients by 1875. This might have had a beneficial effect on scarlet fever mortality, but without corroborating evidence one might still suppose that the decrease in mortality was natural. The MOHs saw "it [as] highly satisfactory to note the marked augmentation in the number of admissions during September [1879] and following months, a period concurrent with the application of the powers for the compulsory notification of infectious diseases."[39] Could the MOHs have been biased in attributing the drop in mortality rates to compulsory notification and isolation in the fever hospital? Perchance, but if scarlet fever virulence naturally decreased and human intervention played no role, as Anne Hardy argues, there should exist no discernable difference in mortality between hospitalized children and children who were not hospitalized.

Did the removal of scarlet fever patients to the fever hospital produce any real benefits? An epidemiological analysis of scarlet fever mortality in Leicester, in the 1880s, suggests that interventionist public health measures produced positive

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[39] Crane, MOH 1879, 19.

results. From 1880, the first full year of Leicester's compulsory notification law, to 1889, when London received compulsory notification powers, the overall case-fatality rate from scarlet fever in Leicester was 9.3%. The overall rate was typical for Victorian England. Among sick children removed to the fever hospital, one in twenty died (5.0%). Among those children not removed to the fever hospital in this period, more than one in eight died (13.5%). Thus, other things being equal, children left in their own homes were almost three times as likely to die from the disease as those who were taken to the fever hospital.

There was an obvious comparative advantage in survival based on removal to the fever hospital, yet the hospital's benefits appear to have largely evaporated by 1888. Ironically, this might be explained in part by the very success of the Freake's Ground hospital. Whereas in 1880, only 29% of scarlet fever patients were removed to the fever hospital, this percentage rather steadily increased so that by 1888, 65% of all cases were removed and in 1889, 80% were removed.[40] Except for certain rare and specific situations, the borough never had the power to force removal to the isolation hospital, so persuasion was the chief means available to MOHs and their agents to effect removal. In 1881, Johnston lamented that 657 householders refused to have their scarlatinal children taken to the hospital,

> that in these cases the disease ran its course unimpeded, for the great majority of them were in houses of the artizan [sic] class, having from two to six rooms and the scanty space which such dwellings can afford,

> together with the inability of the parents to provide a separate nurse for the sick, render it quite impossible either to properly isolate the sick, or to prevent the extension of the disease to other houses in the locality.[41]

This MOH, who lived among the "artizans" and worried about the effects upon children of working mothers, was sympathetic to their plight. He wrote, in 1883, a year when 48% of all scarlatinal patients were removed to Freake's Ground, that working class mothers were diligent in their efforts to isolate children who had scarlet fever. Indeed, according to Johnston, investigations revealed that such children were quarantined and that mothers took care to wear special "sick room" clothing.[42] Nonetheless, Johnston wrote, mothers eventually let their guards down. By relaxing isolation measures too early in the course of the disease, mothers facilitated the spread of scarlet fever by child to child communication or by the contact of previously uninfected children with the "sick room" clothing. Johnston redoubled his efforts to educate the parents of scarlatinal patients about the perceived communicable period of the disease; as shown below, communicability was thought to last approximately a month.

By the late 1880s it would become commonplace for working class people to see their children removed to the fever hospital because of scarlet fever. By 1886, under the auspices of MOH Henry Tomkins, 53% of scarlatinal patients were removed to the fever hospital. Thereafter the majority of victims were isolated in the hospital, except for those years after 1890 when smallpox was epidemic. The

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[40] Ibid. Calculations made by the author.
[41] Johnston, MOH 1881, 14-15.
[42] Johnston, MOH 1883, 38-39.

MOHs credited compulsory notification for this trend. One early side effect of the compulsory notification law was that any household reporting a case of scarlet fever would receive a visit from the borough's sanitary inspectors, Buxton and Braley. The inspectors advised householders of the potential of contagion, the risk of spreading scarlet fever at schools, the benefits of the fever hospital, and in the last resort, the possibility that parents could be prosecuted for allowing "desquamating" children to move about in public.[43] Yet, Johnston's successor, Henry Tomkins, believed that a "serious obstacle to our successfully coping with this disease is the apathy and ignorance of the people themselves. Small Pox they fear, Typhus Fever and Cholera they dread, but by too many Scarlatina is looked upon as a necessary evil incidental to childhood."[44]

So Tomkins implemented tactics that might have had greater preventive potential than those employed by his predecessors. The year 1885 brought a new epidemic of scarlet fever as well as a new MOH. Rather than waiting for returns arising from compulsory notification, Tomkins placarded the town with handbills. Tomkins hoped to create heightened awareness among Leicester's residents before their individual families were struck with scarlet fever, rather than letting them wait for the visits from Buxton or Braley after cases were reported. These handbills extolled the virtues of the fever hospital and, not subtly, reminded parents of the £5 penalty attached to the concealment of cases. Tomkins also initiated an interventionist approach in schools located within the borough. He

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[43] Crane, MOH 1879, 28; Johnston, MOH 1884, 38; Tomkins, MOH 1886, 12. "Desquamation" is the shedding of skin; in this context it meant shedding skin from areas where rashes had been present.

had students inspected for scarlatinal symptoms, he sent notices to all teachers describing the symptoms, he extended the schools' Christmas holiday to three weeks, and he had all school buildings disinfected during the extended holiday.[45]

Tomkins had two goals from these measures implemented in 1885. First, he wanted to extend the therapeutic benefits of the fever hospital to a larger number of victims. Second, he wanted to minimize the spread of the disease arising from child to child communication. His efforts led to conditions that had the potential to realize his goals. That is, in the midst of the 1885 epidemic more parents than ever before proved willing to permit their scarlatinal children to be removed to Freake's Ground, and the epidemic of 1885 passed more rapidly than previous scarlet fever outbreaks. Nonetheless, Tomkins' therapeutic efforts were frustrated in part because the fever hospital was unable to accommodate the demand for beds. One thousand eight hundred and sixteen cases of scarlet fever were notified in 1885. Of these, 933 found beds in the fever hospital, and an unknown number were turned away due to lack of space. The borough hastily constructed a twenty-bed addition to one of the hospital's five "blocks" at a cost of £430.[46] The Freake's Ground facility ultimately housed 51.4% of scarlatinal patients in 1885, at a mean cost of £2.5 per patient and with an average stay of 39.5 days.[47] These annualized figures suggest that there were unoccupied beds at the fever hospital in 1885, and there were, but scarlet fever in 1885 was at its peak in the fourth quarter of the year. This was not only typical of 1885, but typical of scarlet fever

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[44] Tomkins, MOH 1886, 11.
[45] Tomkins, MOH 1885, 9-10.
[46] Ibid., 26.

generally. Scarlatinal patients were not turned away from the hospital throughout the year; they were only turned away when the epidemic was in full force during the fourth quarter. So, at the height of the epidemic, not all who wanted to take advantage of the hospital's services could.

Tomkins complained that the fever hospital was built as a temporary structure during a smallpox epidemic and that it was "makeshift" and "unsatisfactory."[48] He believed that it had outlasted contemporary structures of wholly wood construction because it was partly covered by corrugated iron. For this durability, he was grateful, but Tomkins found fault with the design of the five Freake's Ground blocks. Three of the blocks contained "one large ward each, and the other two [were] only partially divided."[49] The problem then, was that "it [was] entirely without such small wards as might be set apart for the reception of patients of a better class."[50] Without accommodations of a "superior and more private character...patients of a better class...[would not] make much use of this means of isolation."[51] Tomkins did not complain about the therapeutic measures taken by the hospital staff; the benefits of fever hospital isolation were self-evident by the mid-1880s.

Middle class resistance, rather than working class obstinance, explains why the fever hospital peaked at about an 80% removal rate in the late 1880s. In Tomkins' first year as MOH, 51.4% of reported cases were removed to the fever

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[47] Ibid., 28-29. Expenses averaged 9s. 6d., per patient per week.
[48] Ibid., 26.
[49] Ibid., 25.
[50] Ibid., 26.
[51] Tomkins, MOH 1886, 37.

hospital. In 1886, the rate increased to 53% and, in 1887, to 56%. In 1888, fully 65% of all notified scarlatinal cases were removed to the fever hospital. At this time, in a non-epidemic year, Tomkins became more sanguine about removals. He wrote that the "public, and especially the lower classes, are being slowly educated" to the precautions necessary to limit the spread of scarlet fever.[52] His perception was correct; during the following three years the average removal rate was 80%. In 1884, Johnston had proclaimed that the 374 refusals were "scattered...over every district in the town."[53] Of the forty-six refusals in 1888, Tomkins decided that "there existed satisfactory means of isolating [the victims] from the rest of the family."[54] Tomkins decried the limitations of the Freake's Ground facility, but he came to accept the idea that middle class families would deal with scarlet fever without recourse to the fever hospital.

Middle class parents of scarlatinal children were not pressured to allow removal of their children in the same way that working class parents were. The borough's inspectors not only counseled working class parents to allow removal; they threatened prosecution. Parents could not be prosecuted merely for refusal; rather prosecution arose from allowing a scarlet fever victim to encounter members of the general public. As might be expected, the potential for person to person contact was greatest in the more densely populated areas of Leicester and these were the working class areas. Scarlet fever was ubiquitous. Moreover, scarlet fever was not a disease that stigmatized the victim; there was no

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[52] Tomkins, MOH 1888, 9.
[53] Johnston, MOH 1884, 38.
[54] Tomkins, MOH 1888, 17.

motivation for middle class parents or doctors to conceal or misdiagnose the disease. Thus, it is likely that the number of notified cases of scarlet fever bears close resemblance to its actual prevalence. Therefore, that prosecutions fell only upon working class parents suggests that there was a double standard.

No evidence exists that might even hint at prosecution threats toward middle class parents.[55] The MOHs always provided warnings before prosecutions commenced. When the magistrates imposed fines, such fines were in the range of £3 to £4, rather than the £5 allowed by law.[56] Logic and housing patterns implied that middle class parents were capable of preventing the spread of scarlet fever because of the roominess of their dwellings and, thus, their ability to provide isolation for victims. Yet, there is no mention in the records of domestic servants as victims. It would seem that domestics, to the borough's public health officials, did not rise to the level of the "general public." The extent to which domestic servants were exposed to scarlet fever was not a matter of public record. The MOH, J. Wyatt Crane, had expressed his view that zymotic disease passed from the working class to the middle class; no one worried that disease could spread from the middle class to the working class.

One specific occupation concerned Henry Tomkins more than others did. Tomkins was Borough Analyst as well as MOH and he thought that milk spread scarlet fever. In 1885, he tested milk supplies that were connected to scarlet fever cases. He found no correlation.[57] William Johnston had suspected a correlation

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[55] For example, see Tomkins, MOH 1888, 45.
[56] Tomkins, MOH 1886, 12; MOH 1889, 12-13.
[57] Tomkins, MOH 1885, 11, 52.

as early as 1883 in Leicester, and had implemented a special penalty for milk purveyors. Milk shop owners whose children came down with scarlet fever were required to permit the children to be removed to the fever hospital or face the closures of their businesses.[58] By the 1880s, it would be appropriate to label milk shop owners whose shops adjoined their residences as working class.[59] These families were the targets of the health authorities. In 1886, an epidemiological investigation in North London seemed to confirm the potential of milk-borne scarlet fever.[60] By 1888, Tomkins asserted that it was "certain" that milk could transmit the disease.[61] Tomkins believed that scarlet fever was a disease that cows shared with humans; he discounted the idea that milk became contaminated after human contact.[62] Though it would later be shown that milk could indeed convey scarlet fever, Tomkins erred in his conception of the etiology. Nonetheless, milk shop owners who lived adjacent to their retail shops were coerced to allow their scarlatinal children to be removed to Freake's Ground.

Tomkins applauded efforts to expand compulsory notification throughout the kingdom. In 1887, the Local Government Board advanced such a proposal; Tomkins welcomed such a move because it would provide comparable data on disease incidence among municipalities. The MOH also hoped that it would lead to information from the villages and other unincorporated areas on the outskirts of

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[58] Johnston, MOH 1883, 26-27. Anne Hardy shows that milk supplies had become suspected of transmitting scarlet fever as early as 1867. Hardy, The Epidemic Streets, 78.
[59] For the separation of businesses from middle class residences, see Leonore Davidoff and Catherine Hall, Family Fortunes: Men and Women of the English Middle Class, 1780-1850, (Chicago: University of Chicago Press, 1987), 364-369.
[60] Tomkins, MOH 1886, 12.
[61] Tomkins, MOH 1888, 18.

Leicester.[63] Tomkins summed up compulsory notification in commandment form; "in effect it says 'Thou shalt not conceal a case of infectious disease, which unknown and unguarded against may kill needlessly another person.'"[64] Parliament passed a "national" compulsory notification law, but the compulsory provision only applied to London and only attached to London in November 1889. For the rest of the country, "compulsory" notification remained permissive.[65]

November 1889 marks the time when historian Anne Hardy can trace the effectiveness of compulsory notification. She claims that the "declining fatality of scarlet fever in the later nineteenth century bore no relation to sanitary reform, or to preventive medical strategy."[66] Indeed, the declining fatality of scarlet fever in the late nineteenth century was likely related to the diminution of virulence of the streptococci. This is a reasonable conjecture and can be supported from evidence throughout England in the 1890s. Indeed, Hardy cites the low mortality rates in Leicester and Nottingham, for 1888, as indicators of a nationwide trend toward lessened scarlet fever virulence.[67] Yet, these two towns were among the earliest to acquire powers of compulsory notification. Hardy did not know that "preventive medical strategy," in the form of the Freake's Ground hospital was clearly effective from 1879 to 1888. That the effectiveness of fever hospital removal declined after 1888, does not diminish its success during that decade.

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[62] Ibid.
[63] Tomkins, MOH 1887, 8, 10.
[64] Tomkins, MOH 1889, 11.
[65] Ibid.
[66] Hardy, The Epidemic Streets, 66.

Leicester was unusual with regard to many public health problems, but the borough's response to scarlet fever can be considered relatively successful. Mortality from scarlet fever decreased throughout England by 1890, but Leicester's experience shows that not all the credit need be given to the streptococci. The fever hospital was important, the compulsory notification law was the essential factor, and the ability of the MOHs and their agents to induce people to let their children be removed to the fever hospital saved many lives.

Though this study shows that intervention was helpful with regard to scarlet fever mortality, it also shows that such intervention proved to be class-based. Leicester's MOHs first attacked scarlet fever by attacking the working classes. Crane blamed the working classes for all "zymotic" disease. Johnston was more thoughtful and sympathetic, but ultimately found fault with working class mothers. Tomkins initially acted as a crusader to hospitalize all victims, but his resolve wilted in the face of middle class refusals. In the matter of scarlet fever, the public was not defined as the population at risk. To so define the public would mean that all children would have been treated in the same way. This was not the case. This was a case of successful public health interventionism, but the level of intervention applied bore an inverse relationship to the wealth of the victims' families.

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[67] Ibid., 61.

6. "The blot [on] their otherwise fair escutcheon:"[1] summer diarrhoea

Perhaps no nineteenth century public health issue was more problematic to British reformers than infant mortality. In at least one sense it remains so for historians today. Composite and adult death rates dropped in the second half of the nineteenth century, most markedly after 1870, but infant mortality remained stubbornly high into the twentieth century.[2] From 1849 to 1891 infant mortality averaged about 151.7 per 1,000 live births in England and Wales.[3] For the fifteen year period 1846 to 1860 the figure was 155.7, from 1861 to 1875 it was 153.7, from 1876 to 1890 it was 142.7. This slight but seemingly steady decline was reversed in the next fifteen year period to 148.3. Pronounced and continuous declines did not begin until after that point.[4] There were many causes of the high infant mortality rates in Britain; only one "cause" and one town will be explored here.

For better or worse the one cause of infant mortality that brought notoriety and consternation to Victorian Leicester is one of the more provocative challenges to medical history; the one cause that perennially placed Leicester among Britain's most lethal towns for infants was diarrhoea. This is a problem for medical historians because of the multiplicity of disorders that could lead to a Victorian

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[1] Thomas Windley, quoted in the Leicester Chronicle [hereafter, LC], 4 September 1875.
[2] General discussions of infant mortality can be found in Anthony S. Wohl, Endangered Lives: Public Health in Victorian Britain (Cambridge, Mass.: Harvard University Press, 1983), 10-42 and F.B. Smith, The People's Health 1830-1910 (London: Croom Helm, 1979), 65-135. A chapter on infant mortality in Leicester can be found in Malcolm Elliott, Victorian Leicester (London: Phillimore & Co., 1979), 86-99.
[3] Smith, The People's Health, 65.

diagnosis of diarrhoea. It is a problem in the history of public health because of the stresses and interactions within a community that concerned itself with this "disease." The community was made up not only of Leicester's residents and their leaders but also health officials on local and national levels repeatedly goaded by the local and medical press. Because diarrhoea seemed to respect socio-economic boundaries it was sometimes considered to be a predictable, if painful, consequence of nature and poor breeding. But because diarrhoea defied attempts rationally and conclusively to determine its cause, numerous more or less vague theories were posited. In the absence of a known agent of disease (as in smallpox) or a known vector of disease (as in cholera) much attention was directed to the site where diarrhoea was most destructive. Whereas all British towns suffered the loss of children from diarrhoea every year, it became a problem associated specifically with Leicester in part because of Leicester's very high death rate but also from a lack of other targets.

To Leicester, the dialogue of diarrhoea was as important as the "disease" itself. There are two ways to substantiate the importance of discussion and debate in the construction of the "disease" as a problem that Leicester became responsible for solving. First, documentary evidence will show that local office holders explicitly responded to negative characterizations of the town in the medical press. Second, critics focused on Leicester's "excess" mortality, although diarrhoea was common in English towns. That Leicester could have an excess of the "disease" implies

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[4] Ibid.

that there was an acceptable level of diarrhoea mortality. Certainly there were levels of diarrhoea mortality that would not bring national attention to a town.

One critical reason that diarrhoea was often treated with rhetoric and theorizing is precisely because the "disease's" victims were infants. Adults might have felt sadness and frustration in dealing with diarrhoea but they would not have felt panic.[5] Unlike cholera or smallpox, diseases that could cause panic, adults did not see their peers dying from diarrhoea; they did not fear for their own lives. This slight emotional detachment and the predictable visitations of the "disease" helped to make diarrhoea the subject of a number of inquiries with varying degrees of rationality and limited urgency. Since the children who died were almost exclusively working class children, middle class town leaders were further detached from the victims. But Leicester was the town in Britain with the highest summer diarrhoea mortality. So whether the investigations were conducted by local, national, or independent investigators, the investigations into summer diarrhoea mortality always involved Leicester.

In his annual report for 1884, Leicester's MOH William Johnston provided a twelve step description of the course of the "disease" and the symptoms associated with each phase:

1. Irritable, feverish, sleep disturbed
2. Bowels slightly loose, odor worsens
3. Vomiting episodes, sour odor
4. After 2 days, symptoms 1 through 3 become more pronounced

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[5] For a discussion of parental reactions to the deaths of children see Ellen Ross, Love and Toil: Motherhood in Outcast London 1870-1918 (New York: Oxford University Press, 1993), 181-94.

5. Frequent crying, high fever
6. Very frequent bowel movements, bad odor, unable to keep baby clean
7. Vomits all nourishment
8. Extreme thirst
9. All "baby fat" lost, extremities shrivel, fontanelle sinks
10. Continuous moaning rather than crying
11. Purging continues unabated
12. Death or recovery (first sign of recovery is a less offensive odor from excreta).[6]

Whether death resulted from pitiful dehydration or violent convulsion the condition that caused such mortality was referred to as "infantile" diarrhoea or "summer" diarrhoea. These terms merely categorize rather than define a disease. The adjectives are hardly specific; mortality was highest among infants and in hot weather but that does not narrow the field of potential causative agents greatly. Several diseases that resist eradication in our society have etiologies that resemble that of diarrhoea. Salmonella, shigella, E-coli, and cryptosporidium could all have been spread in the conditions that existed in Victorian Leicester. These are cited as examples rather than hypotheses but any diarrhoea-like disease would be exacerbated by poor waste and refuse removal or poor hygienic practices. In a densely populated, poorly drained town with low-lying sections that experienced periodic flooding it is not surprising that Leicester had high rates of diarrhoea.

This paper will be concerned with the conditions that were favorable to the diffusion of the "disease" rather than with a full biological description, or etiology. Naturally it would be helpful to have such an etiology and perhaps Dr.

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[6] LRO 20 D 72/4, William Johnston, MOH 1884, 22-23.

David C. Reeder's current work on the problem will yield a solution.[7] But a history of public health in Leicester can hardly be written if one waits for definitive etiological explanations that were unavailable to the aforementioned community. Just as it is impossible to understand Leicester's reticence to install a "modern" system of sewerage without knowing the history of the Wicksteed system, it is impossible to understand other public health issues in Leicester without recognizing the reputation that the town acquired because of its diarrhoea mortality. Anne Hardy's recent volume on infectious diseases, The Epidemic Streets, sidesteps diarrhoea because it "has a hugely complex history, and merits more detailed attention than can be given here."[8] But Hardy's work focuses on London; such a proviso will not suffice in a discussion of Leicester.

The reputation that Leicester acquired was based on the very real mortality that existed in the town to be sure, but without the visibility afforded to the town by the statistical reports of mortality by the national Registrar-General (formally known as the General Register Office) the pressure to solve the problem would have been less intense. The Registrar-General's comparative mortality statistics were compiled weekly, monthly, quarterly, and annually and made available to the press. The independent medical press, represented by the Lancet, seized upon the statistics to criticize the Leicester's "sanitary authorities." The local press publicized the Registrar-General's data and often editorialized on the problem.

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[7] David C. Reeder, "Infant Mortality in Leicester 1860-1920," (1993), unpublished paper, photocopy obtained from the Centre for Urban History, Leicester University. As of 2002, it does not appear that any new findings have been reached.

[8] Anne Hardy, The Epidemic Streets: Infectious Disease and the Rise of Preventive Medicine (Oxford: Oxford University Press, 1993), 3-4.

Such attention made Leicester's health officials self-conscious and led directly to some investigations.

Through the second half of the nineteenth century the problem of diarrhoea received more and more attention as it refused to yield to "progress." Raw mortality from the "disease" in Leicester does not appear to have been a simple function of population growth. Moreover the town consistently ranked first or second in mortality from diarrhoea whether this was calculated per thousand living or per thousand births.[9] Agents of the town made numerous attempts to ascertain causes for the malady with a heightened sense of urgency when the medical community was most vocal but the community had no remedy. The complexity of diarrhoea hampered all such investigations. Crude miasmatic theory was falling out of favor (a gradual and variable process) but notions of disease that replaced it tended toward a unicausal approach, that is, that a particular organism, biological reaction, or vector was anticipated for a particular symptom or disease. Identifying such an association often led to the development of an accepted remedy, at least as far as causation was concerned. The best example of this would probably be cholera. After Dr. John Snow's detailed investigation of cholera in 1854 it became roundly accepted that contact with an infected water source was the mechanism of transmission.[10] But investigations of

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[9] The Leicester Chronicle regularly reported the Registrar-General's comparative returns as did the Lancet. Sparing use will be made of the returns from short periods here and annual figures will be taken generally from MOH reports.

[10] M. W. Flinn, introduction to Report on the Sanitary Condition of the Labouring Population of Great Britain, by Edwin Chadwick [1842] (Edinburgh: Edinburgh University Press, 1965), 63. For the period before Snow's investigation, see R. J. Morris, Cholera 1832: The Social Response to an Epidemic (New York: Holmes & Meier, 1976).

diarrhoea did not yield such definitive results and therefore no accepted remedy developed during the period under study. These investigations will be considered in their temporal contexts.

It is difficult to determine exactly when diarrhoea mortality came to be perceived as a notable problem in Leicester. Local deaths were first tabulated in 1850 by Leicester's Medical Officer of Health (MOH), John Buck. Dr. Buck was sufficiently familiar with the "disease's" patterns that he made note of the fatalities only between August and October of the years 1850 and 1851. The third quarter of the year would remain by far the most fatal from diarrhoea throughout the period.[11] In addition to the time of year Buck considered little more than the agent of the victims in his analysis. Recognizing that only the very young and the very old perished from the "disease," and that these victims were more homebound than the general population, Buck speculated that some type of "organic poison" was acting in people's homes.[12] He hesitated to make bolder statements than this and showed some foresight but he seemed to expect a single cause. "Whatever may be the qualities of the subtle and hitherto unrecognized agent which operates in producing such dire effects, will probably long remain a matter for scientific investigation."[13]

Through the 1850s annual diarrhoea deaths never dipped below 100 and in 1857 topped 200. Nonetheless concern about the deaths during this decade was restricted to a circumscribed group. Of course families of victims experienced

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[11] This is shown graphically in Hardy, The Epidemic Streets, 185.

immeasurable loss but few civic leaders in Leicester raised an alarm. Joseph Dare, Unitarian missionary to the working class, wrote in 1852: "I have officiated at the Cemetary when as many as sixteen children have been buried in one day. The districts of the poor in this town are... filled with the lamentation and weeping of mothers over the loss of their little ones."[14] Dare's implied social distinction of the "disease" was geographically corroborated by the new MOH and former town councilor, John Moore, in 1853. Dr. Moore looked a bit more closely at the deaths than did Buck, and by "comparing the localities where Fever and Diarrhoea have been most prevalent during the years 1851, 1852, and 1853, I find but little difference; they prevail principally where sewerage is either entirely wanting or very defective."[15] While these conditions might have described much of the town in 1853 they would have been particularly acute in poor or working class neighborhoods which tended to be overcrowded and often built on land with poor natural drainage.[16]

Diarrhoea occasioned little more comment from Moore in the 1850s. The MOH dutifully recorded the deaths each year but did not expound on the problem again until 1861. The year 1861 was not good for diarrhoea mortality in Leicester but it was still short of the 202 deaths in 1857. What prompted Moore to comment in 1861 was a sharp jump in fatality compared with 1860 that could not

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[12] LRO L.614, John Buck, Annual Report of the Medical Officer of Health for 1851, 11. [hereafter MOH 1851].
[13] Ibid., 10.
[14] Joseph Dare (1852); quoted in Barry Haynes, Working-Class Life in Victorian Leicester: The Joseph Dare Reports (Leicester: Leicestershire Libraries and Information Service, 1991), 44.
[15] LRO L614, John Moore, MOH 1853, 4.

be correlated with hot weather or anything else. As yet Leicester was not experiencing any outside pressure on the matter, so Moore had no reason to be less than forthcoming in his assessment that

> [t]he increase of mortality from this disease, so far as it respects our own locality, does not appear to arise from any known cause. Hot and sultry weather certainly predispose to it, and an indulgence in Fruits, etc., when they are abundant is frequently an immediate cause; but neither of these existed in 1861, on the contrary, the Summer and Autumn were most congenial and fruit very scarce, but nevertheless, we find an increase in the mortality from this disease of from 56 in 1860 to 160 in 1861.[17]

Moore's candor about his own ignorance of the cause enabled him to objectively address other contemporary notions. How firmly anyone held to a "fruit theory" is open to question but by 1865 Moore believed that he had enough experience with the "disease" to eliminate this as a cause.[18] The MOH encapsulated his view

> That it should arise from some epidemic cause, of which we have no cognizance. At the season of the year when these diseases are most prevalent, there is always a large amount of vegetable refuse, which is frequently allowed to accumulate until decomposition takes place: a more

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[16] Elliott, Victorian Leicester, 101-03. Elliott writes that overcrowding in Leicester was not as bad as in some other towns such as Manchester.
[17] LRO 20 D 72/2, John Moore, MOH 1861, 5.
[18] LRO 20 D 72/2, John Moore, MOH 1865, 8.

> frequent removal of this refuse would tend, in some measure, to lessen the amount of these diseases, as well as others of a zymotic character.[19]

In the 1860s average annual diarrhoea mortality increased by some 71% from the previous decade.[20] This outpaced population growth from 1861 to 1871 by 31%, and total growth from 1851 to 1871 by 14%.[21] By 1868, Leicester crossed a threshold that had less significance numerically than it had rhetorically. In 1868, three hundred forty-nine people died of diarrhoea in Leicester. Not only was this 140 more than in the previous year but this was the first time that more than 300 deaths had been reported in any single year. In raw numbers, this was four times as many deaths as in London in 1868[22] a fact which caught widespread attention.[23]

Notice was taken of the situation in 1868 by the Registrar-General and this information was given publicity by the Lancet.

> In his September Quarterly Report, the Registrar-General, referring to the excessive diarrhoeal mortality in Leicester, remarked that there must exist 'conditions exceptionally favorable to the diffusion' of that disorder. The Local Board of health, acting upon this suggestion, forthwith nominated a

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[19] Ibid. "Zymotic" is a term that was coined by Dr. William Farr and for the purposes of this paper it may be loosely defined as infectious.

[20] Average annual diarrhoea mortality from 1852 to 1861 was 128.6, from 1862 to 1871, 219.5. Averages are used here because of annual variability.

[21] Population growth from 1861 to 1871 was 40%, from 1851 to 1871, 57%.

[22] Jack Simmons, Leicester: Past and Present, vol. 2, Modern City 1860-1974 (London: Eyre Methuen, 1974), 13.

[23] Comparative figures over short or relatively short periods of time were very important in heightening awareness, more important for this purpose than their statistical significance. Because of a myriad of factors affecting specific outbreaks only trends are of ultimate importance. Thus the drastic sounding comparison between Leicester and London in 1868 could have been an

> Sub-committee (including members of the medical profession) to take the matter into consideration, and to report thereon. A document now before us, addressed to the Board by Mr. James Thompson [Chronicle publisher and council member], at whose instance the Sub-committee was appointed, shows pretty clearly that the Registrar-General's surmise was correct. Mr. Thompson speaks of 'the enormous number of open cesspools scattered all over the town;' the number of pigsties, slaughter-houses, and stables; the inefficiency of some of the main sewers; and 'the introduction into wells, by percolation, of the emanations from cesspools, the water being drunk by the inhabitants of the locality.' Little wonder, then, that diarrhoea should abound particularly during a season of unusual dryness and heat. Judging from Mr. Thompson's statements, the main sewer, instead of being, as it ought to be, an instrument of defence against disease, is, by its bad construction, a source of constant danger.[24]

While neither the Registrar-General nor the Lancet could be specific about any causative agent it is clear that the medical journal endorsed Thompson's association of the "disease" with the troubled sewage system. The Lancet was especially concerned with the lack of mortar to cement the bricks in the deeper sections of the Wicksteed system. This deficiency permitted sewage to leach directly into soil and indirectly into basements.

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aberration and carries less significance than the perennial ranking of Leicester at the top of the list in terms of diarrhoea deaths per 1,000 population or 1,000 live births.

[24] Lancet, 20 March 1869, 418.

The Medical Officer of Health of Leicester in 1868 was the recently appointed Dr. J. Wyatt Crane. The annual report of the MOH for 1868 could hardly ignore that year's death toll from diarrhoea but Crane went far beyond his predecessors in assigning a cause to the "disease." Where Buck had timidly offered a "homebound theory" and speculated on the complexity of the disorder, and Moore had dismissed the "fruit theory" and correlated the problem with refuse, Crane brought forth another theory that assured subsequent controversy. Seeming to belong to an earlier era, the bold statement that served as Crane's emblem for a decade was "I believe that simple heat is the cause of Summer Diarrhoea in this country."[25]

Crane's "simple heat theory" was open to criticism on its face but the doctor added fuel to the fire. According to Crane, solar heat relaxed the digestive tract giving rise to an inability to digest foods that would be innocuous in cooler temperatures. Crane expected that all ages of people would experience diarrhoea in hot weather but the disorder would prove fatal to "weakly children."[26] As Crane was forced to defend his theory he developed and elaborated it; "weakly children" were the result of factory labor. The MOH conceived of factory work as a physically degenerating way of life, that is, robust individuals who worked in factories (or workshops) gradually weakened in strength and stamina. Moreover, Crane believed that this weakening was somehow heritable, so that the second generation of factory laborers would be more susceptible than the first, the third

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[25] LRO 20 D 72/2, J. Wyatt Crane, MOH 1868, 23.
[26] LRO 20 D 72/2, J. Wyatt Crane, MOH 1871, 15.

more degenerated than the second, and subsequent generations would spiral ever downward in their ability to resist this "disease."[27] So Crane's "simple heat theory" became more complicated as it implicated an economic and social system.

Crane's theory appeared to be eminently vulnerable with regard to "simple heat" so many of his detractors did not indulge themselves in the issue of progressive factory debilitation over generations. "Simple heat" made skeptics of laymen as well as medical professionals and laymen felt qualified to comment on a theory that sounded as simplistic as "simple heat." In September of 1871, Crane appeared before the town council to justify his position. Prior to this episode Crane's theory had been the subject of three rather negative editorials in the Lancet.[28] While the Lancet articles were not blatant personal attacks on Dr. Crane (perhaps out of professional courtesy) in the September meeting one town councilor took the "simple heat theory" to its logical yet absurd conclusion. William Barfoot, the councilor who had requested Crane's presence at the meeting, acknowledged that criticism from outside Leicester led him to raise the subject and read an anonymous letter from "a gentleman of very high scientific attainments."[29] The letter, dripping with sarcasm, read in part:

> Don't let the ratepayer's money be squandered in what up to now has been called sanitary reform. Don't let us waste our time in ventilating the sewers, in examining the system of drainage and the details of it; let the cesspools flourish and the wells in their close proximity be left for the

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[27] LRO L.614, J. Wyatt Crane, MOH 1874, 8.
[28] Lancet, 20 March 1869, 418; 24 April 1869, 577; 8 April 1871, 489.

> inhabitants to drink from. It is the heat, and the heat alone that is the cause of this plague. I should suggest that the Board of Health advertise for a square mile of awning to shade the town of Leicester from the sun's rays, and agree with the Waterworks Company to keep it constantly wet with streams of water from Bradgate. 'Then' I confidently predict there will be no more 'massacre of the innocents' and Leicester will be the healthiest town in England, and the Officer of Health will have immortalized himself as a sanitary reformer.[30]

Barfoot continued the sarcasm a bit farther by saying "[i]f they adopted the heat theory, it would give the Local Board very little trouble. They might dispense with their sanitary inspectors certainly."[31]

The humorous tone that Barfoot's letter brought to the council meeting was continued by Dr. Crane. I suggest that any use of humor helps to illustrate that there was no panic in the town despite the hundreds of annual deaths. After Barfoot's remarks Crane set about to defend his position but he prefaced his argument with a witty rejoinder to Barfoot on the long-windedness of politicians. From the account that was published in the Chronicle it would appear that Crane's demeanor diffused at least some of the criticisms leveled against his theory. The thrust of Crane's defense of "simple heat" was a comparison of Dublin and Leicester. The MOH said that Dublin's diarrhoea mortality, far lower than Leicester's, was due to the Irish town's cooler temperatures. Crane emphasized

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[29] LC, 30 September 1871.
[30] Ibid.

that Dublin was a much larger town, had a sewage system that was worse than Leicester's, but averaged about 4 or 5 degrees Fahrenheit lower than Leicester in the summer. He went on to predict that his next annual report would prove that "simple heat" was fact not theory. In reference to Barfoot's sanitation sarcasm, Crane stated his belief that sewerage improvements should still be a goal for the borough because there was a connection between drainage and "fever" even though there was no connection between drainage and diarrhoea.

Barfoot offered more rational criticism of "simple heat." Temperatures within Leicester would have had little variation but diarrhoea mortality varied by wards within the town. Using the MOH's own statistics from 1870, Barfoot showed that the variation ranged from 1 death in All Saints' ward to 90 deaths in Middle St. Margaret's ward. Crane countered this meteorologically by contending that cooling breezes acted favorably on high ground and where relatively few buildings existed to block the flow of the wind. All of St. Margaret's was on low ground and Middle St. Margaret's was surrounded by urban development which impeded air flow.

Councilors C. R. Crossley and Dr. G. Pierce rose in part to defend Crane and in part to further the non-meteorological dialogue of the "disease." Dr. Pierce "did not think that Dr. Crane meant that heat was directly the cause of diarrhoea; but it certainly did cause a great increase in fermentation."[32] It sounds as though Pierce did not want to believe Crane's unequivocal pronouncements of his

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[31] Ibid.

[32] Ibid. Dr. Pierce's name is sometimes spelled Pearce but Pierce occurs more frequently.

position. Pierce went on to posit that "[t]he increased temperature had a great effect upon milk, and where, as was now the practice, infants were fed so much from the bottle, they were likely to get sour milk, and in that way diarrhoea."[33] Pierce's "milk theory" was one which would gain currency among Victorians but there would be several different explanations advanced for the dangers caused by milk. Pierce also suggested that Barfoot convene a "meeting of medical men to discuss that important question."[34]

Crossley argued that heat was undoubtedly involved in diarrhoea mortality but that it was wrong for investigators to expect to attribute the "disease" to only one cause; he recommended that mortality statistics be compiled more narrowly than by wards. He also brought soil composition into the debate; noting that Middle St. Margaret's had a fairly large amount of open space, Crossley introduced the "made ground theory." Areas such as Middle St. Margaret's were located where clay pits or quarries had been worked in times past. The pits were surrounded on the sides and bottom by unharvested clay which allowed for precious little natural drainage. All types of garbage had been dumped into the pits, including dead animals, and then buildings had been erected on top of this. It was Crossley's belief that the garbage (or "made ground") decayed, was trapped by the clay, and released toxins upward by evaporation in hot weather. He contrasted the mortality in this ward with a ward that was built on soil with much natural gravel.

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[33] Ibid.
[34] Ibid.

In the ward built on gravel, cesspools had always been self-draining and there were few diarrhoea deaths.

In the wake of the 1871 town council debate there was no new activity by the borough, not even the meeting of medical men that Pierce had advocated. Crane's annual report for 1871 cannot realistically be considered to have proven the "simple heat theory" and he tended to emphasize the poor "vigour of the infantile population" more often than "simple heat."[35] Historian Barbara Thompson finds that Crane was not alone among medical men in this perception. In 1873, a Dr. Bridges, onetime physician to the Bradford Infirmary and later Medical Inspector of the Local Government Board, wrote that the population was "damaged at or before birth by the factory system."[36] However, Barbara Thompson notes, "by the 1870s the emphasis in explanations of causation had gradually shifted from working mothers to the home environment."[37] Elements of both sorts of explanations, as well as others, can be seen in 1870s Leicester.

MOH Crane eventually took Crossley's advice and in 1873 sent the local sanitary inspectors, Sergeants Buxton and Brayley, to conduct a survey of the homes of infant victims. I label this seminal study as Crane's "paradox enquiry." The inspectors were able to obtain information regarding 283[38] of the 314 deaths

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[35] LRO 20 D 72/2, J. Wyatt Crane, MOH 1871, 19-20. Crane argued that the 'infantile population' was "still undergoing a marked and progressive deterioration."
[36] Barbara Thompson, "Infant Mortality in Nineteenth-Century Bradford," in Urban Disease and Mortality in Nineteenth-Century England, eds. Robert Woods and John Woodward (London: Batsford Academic and Educational, 1984), 129.
[37] Ibid.
[38] LRO 20 D 72/60, W. Elgar Buck and George Cooper Franklin, Report on the Epidemic Diarrhoea of 1875, (Leicester: Spencer Brothers and Russell, [1875]), 5-6. [hereafter Buck-Franklin, Report].

in 1873.[39] "Simple heat theory" was thoroughly vindicated in this enquiry, not because it was proved in a positive sense but because all other theories seemed to be disproved. Little remains of Crane's data but on no less than five counts his conclusions earn the label of "paradox enquiry": houses with good air circulation were more deadly than confined houses, clean homes were more fatal than average or dirty homes, houses with piped water were more dangerous than those which relied upon wells, mothers who did not work outside the home lost more children than those who did, and breast-fed infants died with greater frequency than did bottle-fed infants or infants fed by a combination of breast and bottle.[40] The Lancet considered Crane's "paradox enquiry" to be "at variance with professional theories."[41] The Lancet was kind to Crane on this point. Yet, "professional theories" had proved no more effectual at retarding diarrhoea than had "simple heat theory" in the 1870s.

Another enquiry of 1873, presumably impressionistic, was offered by Joseph Dare from conversations with an unnamed "medical gentlemen" of twenty years' experience.[42] It is possible that this effort was meant to compete with the "paradox enquiry" because it also offered five points of explanation. According to Dare's source, diarrhoea mortality arose from early marriages that produced

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[39] LRO 20 D 72/2, J. Wyatt Crane, MOH 1873, 7.
[40] Ibid., 7-8. In 1871, 28% of Leicester's married women worked outside the home. Nancy Grey Osterud, "Gender Divisions and the Organization of Work in the Leicester Hosiery Industry," in Unequal Opportunities: Women's Employment in England 1800-1918, ed. Angela V. John (Oxford: Basil Blackwell, 1986), 58.
[41] Lancet, 27 June 1874, 908.
[42] Joseph Dare (1873), quoted in Haynes, Working-Class Life, 49.

"poor, weakly, sickly, fragile things,"[43] poor nursing care afforded by old women and young girls in lieu of working mothers, feeding problems from unclean bottles and water mixtures that contained arrowroot or flour, preventives and remedies that contained metals or opium, and dirty or poorly ventilated houses.[44] Dare's exposition, continuing the tradition established by Edwin Chadwick of marshalling evidence to support an agenda, was intended to support the notion that local boards should have the power to raze slums in pursuit of public health.[45]

In 1874, Crane believed that he was on top of the game. His annual report for that year proclaimed "[t]hat it is heat which gives rise to summer diarrhoea is, I believe, now almost generally acknowledged. The Society of Medical Officers of Health, in London, met last year to consider the question, and [their] verdict was, I believe, almost unanimous in the affirmative."[46] Crane, feeling vindicated and secure, pontificated: "[t]he inhabitants of the factory towns...owe their debility to the gradual degeneration of themselves, and their forefathers and mothers by a factory life, until a race is generated which is so debile as to be unable to resist the first shock of disease."[47] Their children "were in fact born dying, and no carefully selected diet or medical skill could avert the inevitable result."[48] The only attack on Crane's theory from within Leicester in 1874 came from a new member of the town council/Local Board, Mr. Richardson, who advocated a variation of "milk

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[43] Ibid.
[44] Ibid.
[45] Ibid., 55.
[46] LRO L.614, J. Wyatt Crane, MOH 1874, 5.
[47] Ibid., 8.

theory" by making the rather absurd claim that all infant mortality "was entirely owing to the dilution of milk with water."[49] While Richardson's assertion was absurd it implied a correctable situation as proposed to Crane's fatalism.

Three factors contributed to make 1875 an important year for Leicester and the diarrhoea question: recognition that "infantile mortality...has now unhappily become chronic in Leicester,"[50] increased pressure from the medical profession, and the flood of 1875 which created fears of epidemic. Deaths from the "disease" were high in 1875, reaching 308, but this figure was by no means unprecedented.[51] Moreover, the level of concern about diarrhoea, shown by press references in the spring and early summer, was rising before the traditional season of high mortality. To an extent concern was rising because actual deaths were occurring but it would be wrong to conceive of this concern as a straightforward and rational reaction to current conditions.

By 1875 there was a clear pattern of unusually high diarrhoea mortality in Leicester relative to other towns. Week after week and year after year the Registrar-General listed the town at or near the top of the kingdom in infant mortality and the "excess" of mortality was due almost exclusively to diarrhoea. Constant repetition of comparative statistics was not lost on the Leicester Chronicle and made the Lancet focus its attention on the town. The Lancet might not have taken a different editorial viewpoint without Crane's "simple heat

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[48] Ibid., 5.
[49] LC, 7 march 1874.
[50] Ibid., 17 July 1875.
[51] LRO L.614, J. Wyatt Crane, MOH 1875, 10. Raw mortality from diarrhoea had been above 300 in four previous years: 1868-349, 1871-303, 1872-305, and 1873-314.

theory" but the MOH made sure that Leicester became a target rather than just a topic for the journal.

That the Lancet motivated Leicester's leaders toward action on diarrhoea mortality is hardly questionable. The contemporary chairman of the town council's Sanitary Committee, Councilor Grimsley, acknowledged "public attention having been called to this matter by the medium of the Lancet."[52] Thomas Windley, who would become the Sanitary Committee's chairman for thirty years, said in 1875 that he moved for a subcommittee to investigate diarrhoea because of what he had read in the Lancet.[53] While the chronic appearance of the "disease" and its publicity in the Lancet motivated intensive investigation into the problem, it was the flood of 1875 that pushed concern to a new level.

Before the flood, the Chronicle reported on impure milk samples, the national Factory and Workshops Commission's report, Crane's rebuttal to that report, and the creeping diarrhoea death toll in Leicester. The purity of retail cow's milk was analyzed by Dr. Meadows along with other types of consumables. In his position as Leicester's public analyst Meadows tested products from flour to beer. Of the milk samples submitted to Dr. Meadows nearly 65% were found to be impure for unspecified reasons; among other products only bread (7%) contained any impurities.[54] Regarding the Factory and Workshops Commission's report the Chronicle summarized the findings as contrary to Crane's supposition that factory

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[52] LC, 4 September 1875.
[53] Ibid.

work led to debility.[55] Crane responded in the next issue of the newspaper by claiming that he had been misunderstood. The MOH said that by "factory life" he did not mean factory work per se but the lifestyle associated with working mothers.[56] The Chronicle did not bother to attack this clear contradiction of the fourth tenet of Crane's own "paradox enquiry" but noted sadly the imminent return of the annual mortality.[57]

After the July flood both dialogue and activity increased in Leicester. As mentioned above the Chronicle predicted that disease would be epidemic in the wake of the flood. Moreover, A. Buchan's "The Mortality of the large towns of the British Isles in relation to weather" appeared and refuted "simple heat theory" by a comparison of temperature and mortality between Bristol and Leicester.[58] But the most significant occurrence in post-flood Leicester was the commissioning of the Buck-Franklin investigation.

The Buck-Franklin investigation emerged from within Windley's diarrhoea subcommittee of the council's Sanitary Committee in August 1875. The field work was well underway by the time the entire council discussed the merits of such a study in the first week of September and publicity preceded the discussion.[59] Councilors Windley, Grimsley, and Richardson all told the council about the perceived pressure from the Lancet to take some action with regard to

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[54] Ibid., 3 July 1875.
[55] Ibid., 10 July 1875.
[56] Ibid., 17 July 1875.
[57] Ibid.
[58] Ibid., 14 August 1875. It appears as though Buchan's analysis was not greatly more sophisticated than Crane's comparison of Leicester and Dublin but I have only seen a summary and not the entire report.

diarrhoea.[60] Richardson also spoke of the medical profession's dim view of Crane's "simple heat" explanation. Grimsley complained of "certain writers" who censured the town "in a way [it] did not deserve." The chairman spoke defensively about Leicester's mortality rate and stated that diarrhoea did not arise from unsanitary conditions in the town. In his opinion the Buck-Franklin investigation might exonerate the borough's sanitary authorities and thus "efface the blot from their otherwise fair escutcheon." Windley added that he thought it unlikely that Buck and Franklin would successfully determine the cause of diarrhoea.

Grimsley told the council that the subcommittee had first approached Crane to conduct the investigation but the doctor was too busy with his MOH duties and his private practice.[61] Richardson said that Leicester's MOH also believed that there was nothing of value to be gained from another study of the problem. Aldermen Stevenson and Winterton both spoke in support of the Buck-Franklin investigation with Winterton adding that £10 was too cheap to pay for an important matter such as this. Windley replied that on the odd chance that Buck and Franklin were successful they would be paid in fame rather than pounds

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[59] Lancet, 21 August 1875, 291; LC 14 August 1875 and 21 August 1875.

[60] The following comments by council members were reported in the LC, 4 September 1875 until otherwise noted.

[61] It is an interesting point that the MOH position remained part-time in Leicester until 1885 when Dr. Henry Tomkins took the position for £500 per annum. Despite Leicester's early employment of a MOH some observers considered the town to be rather miserly in its remuneration for the job. See Alexander P. Stewart's comments in Alexander P. Stewart and Edward Jenkins, The Medical and Legal Aspects of Sanitary Reform (London: Robert Hardwicke, 1867; reprint with an introduction by M. W. Flinn, Leicester: Leicester University Press, 1969), 42. At the time Stewart was writing John Moore was receiving £100 per annum, by 1874 Crane was receiving £200 per annum and had been turned down for a raise to £250. When Crane was replaced by William Johnston the salary was set at £250 until Tomkins took the job with increased responsibilities.

sterling. The council's discussion of the fait accompli was punctuated with the mayor's derogation that if Major Tulloch could find the time to travel from London to meet with the subcommittee then surely Dr. Crane should be able to attend but he had not done so.

To the historian, the report which Dr. W. Elgar Buck and Mr. George Cooper Franklin compiled is worth far more than the £26 5s. that each of the gentlemen were ultimately paid for it. The statistical data alone provided a demographic picture of the "disease" that outweighs their not insignificant conclusions. Extensive exposition of the report is warranted in this dissertation. The essence of Leicester's problem was that the town was generally not unhealthy; overall mortality was 24.1 per 1,000 living compared with 25 per 1,000 for the 18 largest towns in Britain. But 36.5% of all deaths in Leicester were of children under one year of age compared with 26.3% in the 18 towns. Specifically, diarrhoea deaths in Leicester amounted to 8.5 per 1,000 living, more than twice the national urban mean of 3.8 per 1,000. Moreover, well over 1 child in 5 in Leicester did not live to see their first birthday.[62] The investigators made house-to-house inquiries of all homes which suffered a reported diarrhoea fatality of a child under five years of age between 1 July 1875 and 30 September 1875. Of 238 such cases, Buck and Franklin were able to report on 216.[63]

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[62] LRO 20 D 72/60, Buck-Franklin, Report, 35.

[63] Ibid., 5. Of the 22 cases that could not be included: 11 families had moved away, 8 of the children were illegitimate (rendering family data "useless"), 1 mother had since dies, and 2 cases were considered to have been misdiagnosed as diarrhoea.

Of the 216 deaths, 86% or 186 were under one year of age (in Crane's "paradox enquiry" 95% had been less than one year old.)[64] Before they succumbed 42.6% suffered for one week or less, 27.8% from 1 to 2 weeks, 9.3% from 2 to 3 weeks, and 20.4% for longer than 3 weeks. The average age of the father was 30.8 years and the mother 29.9 years. Fifty-three of the mothers (24.5% compared with the "paradox enquiry's" 28.9%) worked outside the home, 24 or 11.1% worked for wages within the home, and 139 or 64.4% did not work for wages at all. Only 22 or 10.1% of the victims had been exclusively breast-fed, while 133 or 61.6% were partially breast-fed, and 61 or 28.2% had never suckled from the breast. Of particular note is that only 3 or 4 of this last group were fed cow's milk exclusively. Another tantalizing statistic is that 39% of the victims' mothers were "in the habit" of using opium laced cordials for their children but it is unclear exactly what "in the habit" means.

There was no such ambiguity in "that all these infants who died were those whose parents belonged to the so-called working classes; so it would seem that those infants whose parents were of the middle or upper class, did not suffer equally with those of the lower. They suffer to some extent, of course, but the disease is not fatal among them."[65] Buck and Franklin could not reconcile this observation with the "simple heat theory." Moreover, Buck and Franklin were forced to reject the opinions of the victims' own mothers because "[if] we had taken the explanations of the mothers, we might return 80 per cent of these fatal

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[64] Ibid., 5-15 until noted.
[65] Ibid., 28.

cases as having been due entirely, or in great part, to teething."[66] A third theory that Buck and Franklin were forced to reject was general uncleanliness of the victims' homes; mortality could not be correlated with individual families' hygienic practices regardless of their impressionistic relation to poverty.[67] A fourth idea that was discredited was the "working mother theory." In their own words:

> We wish to draw particular attention to this: That 24.5 per cent of nursing mothers [this would be potentially nursing mothers] go out to work is a fact much at variance with current opinion. It is stated often that anyone can tell how it is the infants die, 'that their mothers go out to work, and that the infant does not receive proper food and attention'...We here do not hesitate to state our opinion that the nursing mothers do not, as a rule, neglect their children.[68]

In addition to the assertion that diarrhoea mortality was a function of class Buck and Franklin observed that "[g]enerally speaking the distribution of the disease is determined by the course of the river. The higher parts of the town have but little."[69] They went on to a geological/geographical explanation that supported the "made ground theory." Middle St. Margaret's ward was still the most fatal part of town with its clay perimeters and its "landfill' soil composition. If the entire Buck-Franklin report could be reduced to one statement with regard to causation it might be: mortality from diarrhoea was highest where the subsoil

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[66] Ibid., 18.
[67] Ibid., 28.

was saturated from stagnated sewage or where "made ground" filled the clay pits that could not be drained.[70]

Buck and Franklin went on to write of their belief that there was more than one malady involved in diarrhoea. They described three types of the "disease." First, diarrhoea could be merely a symptom of another disease. Second, diarrhoea could be a "sequel" to another disease; that is some other disease could run its course but leave the child in such a weakened state that he or she would be very susceptible to diarrhoea. Third, "which is of the greatest importance...with regard to the present enquiry" was a condition that they termed "specific diarrhoea."[71] Specific diarrhoea was deemed to be present in those cases in which the child had relatively healthy parents, had been healthy herself prior to the attack, and died within one week of the onset of symptoms.[72] Four conditions were considered to contribute to specific diarrhoea: decomposing organic material, heat, air, and moisture. Quoting a Dr. Parkes, Buck and Franklin wrote that "'probably they [the agents of disease] are low forms of life which grow and propagate in these conditions.'"[73] The investigators lamented public resistance to postmortem examinations which they believed would shed more light on the organisms involved.[74]

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[68] Ibid., 9.
[69] Ibid., 38.
[70] Ibid., 44.
[71] Ibid., 16-17.
[72] Ibid., 26.
[73] Ibid., 45.
[74] Ibid.

Reaction to the Buck-Franklin report was something of a mixed bag but it would seem that no writers really changed their minds in the wake of its publication. The Chronicle blamed the sewage system for the problem before Buck-Franklin and argued that without "sewerage reform, more additional 'reporting' cannot but be regarded as less than useless."[75] It did not change its focus after the report. Joseph Dare wrote that he concurred with Buck and Franklin yet maintained that "[o]ne great cause, if not the chief cause, will be found in the vice and immorality, the drink, bad food, and irregular habits of numbers of the human family."[76] Dr. Crane, not surprisingly, disparaged all aspects of the report from saturated subsoil to specific diarrhoea. Claiming support from Councilor Grimsley he reiterated "simple heat theory" with special attention to the lack of cooling breezes in the low-lying, high mortality districts.[77]

The Lancet reported a host of likely contributing causes from maternal neglect to narcotics but recognized that these problems, unlike drainage, were not unique to Leicester. The journal tentatively accepted Buck-Franklin's conclusions but recognized that the report did not attempt to identify a specific organism responsible for specific diarrhoea.[78] About six months later, the Lancet was more enthusiastic in its support of the report because Leicester appeared to be "in remission" from diarrhoea deaths relative to the previous year. While the journal gave credit to Buck and Franklin's work on saturated subsoil it contended that, since no improvement could have been made on that account, the house-to-house

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[75] LC, 14 August 1875.
[76] Joseph Dare (1876), quoted in Haynes, Working-Class Life, 50.

investigation had proved to be a preventive measure by educating parents. "Much of the excessive infant mortality among the working classes is directly due to the ignorance and neglect of parents, and the apparent result of the recent Leicester inquiry very forcibly suggests that much good might result from more frequent investigations."[79] When diarrhoea mortality in Leicester rebounded the following month the Lancet made no mention of Buck and Franklin or their conclusions.[80]

One member of Leicester's Sanitary Committee, Dr. John Sloane, decided to launch his own investigation of diarrhoea in 1876. Sloane seized upon the Buck-Franklin statistics to support his own hybrid of "sewage theory" and "milk theory." He attacked Crane's "simple heat" with a crude comparison of average third quarter, or July to September, temperatures and mortality.[81] He attacked Crane's attendant notion of factory life debility without recourse to evidence: "I do not think the people in Leicester are physically degenerating."[82] Sloane decided that Leicester's infant diarrhoea mortality was most likely caused by children drinking milk which had come from cows that grazed on land that was contaminated by its proximity to the sewage laden River Soar.[83] It would seem that Sloane wanted to believe this explanation rather than being empirically convinced of its veracity. Buck and Franklin had indeed shown that exclusively

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[77] LRO L.614, J. Wyatt Crane, MOH 1875, 6-8.
[78] Lancet, 29 January 1876, 183.
[79] Ibid, 15 July 1876, 95.
[80] Ibid, 26 August 1876, 304-05.
[81] LRO Pamphlets vol. 63, John Sloane, Report on the Infantile Diarrhoea of Leicester [1876], 9.
[82] Ibid., 31.
[83] Ibid., 33.

breast-fed children had low mortality but they had not shown that cow's milk was dangerous at its source by any stretch of the imagination since exclusively milk-fed babies comprised less than 2% of fatalities in their study. Sloane merely associated infant mortality with his impression that infants were heavy consumers of milk. He did not refer to Dr. Meadows' analyses which, in their published form, did not distinguish between milk samples that were impure because of adulteration and those that were impure because of spoilage. On a more useful note, Sloane advocated that the nuisance inspectors, Sergeants Buxton and Brayley, assess the milk consumption of diarrhoea victims in the future.[84]

While the aging Dr. Crane began to lose interest in diarrhoea and the controversy that surrounded the problem, a youthful Dr. William Johnston represented new blood in Leicester's concern to resolve the problem.[85] New to Leicester in the mid-1870s the Ulster-born Johnston would become Crane's assistant in 1877 and his successor by 1880. Although Johnston's fame would come primarily from the "Leicester Method" of smallpox containment, he was a vociferous critic of the sewerage system and its relationship to diarrhoea mortality even before he was in a position to effect any changes in the town's response to smallpox.[86] His initial foray into the diarrhoea debate criticized "made ground theory" and attacked the sewer system.[87]

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[84] Ibid.

[85] For Crane's flagging interest see the Lancet, 27 April 1878, 618. For brief biographical information on Johnston see Stuart M. F. Fraser, "Leicester and Smallpox: The Leicester Method," Medical History 24 (1980): 317-18 and especially note 15.

[86] Perhaps I use the word "fame" a bit loosely. Despite the fact that Dr. Johnston unintentionally became a hero to the anti-vaccination movement, his name is almost universally misspelled, from contemporaries such as the Lancet (with the odd exceptions of August 1878 and June 1885) to

Johnston's classic "Report on the Principal Zymotic Diseases during 1877" was the doctor's first project on becoming Leicester's assistant MOH. Presented to the Sanitary Committee of the town council on 18 January 1878, this document spelled out the "Leicester Method," advocated low-cost day care for children of working mothers, and provided a reasonable breakdown of causation of diarrhoea mortality. Sensing the complexity of diarrhoea Johnston assigned 1/3 of the blame to improper feeding of children. Rather than attack the intelligence of working-class parents as Winterton did in 1875,[88] or the debility associated with factory life as did Crane, Johnston claimed that it was not reasonable to criticize parents simply because the mother had to work outside the home to support the family. Though he thought it regrettable he understood that such labor was necessary and posited that the remedy was in "Crèches or public Nurseries."[89] At the heart of Johnston's problem with mothers who could ill afford to breast-feed was the reliance upon arrowroot and water formulas. Should there be made available "fresh unadulterated cow's milk" in crèches with trained attendants, offered at minimal expense, diarrhoea mortality should surely decrease.[90]

Johnston placed responsibility for the remaining 2/3 of diarrhoea mortality squarely on the shoulders of the sewer system. His opposition to Buck-Franklin

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historians such as Bill Lancaster, Radicalism, Cooperation and Socialism: Leicester Working-Class Politics 1860-1906 (Leicester: Leicester University Press, 1987), 82 and Dale L. Ross, "Leicester and the Anti-Vaccination Movement, 1853-89." Transactions of the Leicestershire Archaeological and Historical Society 43 (1967-68): 35-44. Moreover, Anne Hardy, The Epidemic Streets, 124, believes that Johnston's smallpox strategy was not original.

[87] Lancet, 7 October 1876, 516.

[88] LC, 4 September 1875.

[89] LRO L.614, William Johnston, A Report on the Principal Zymotic Diseases During 1877 (Leicester: J. Fleming & Co., [1878]), 18.

[90] Ibid., 17.

on this account appeared greater at the time of his study than it does today. While Johnston disagreed with "made ground theory," he described conditions that posed the same hazards: organic material, heat, and moisture (air was left out.)[91] The "Zymotic Report" shows historians that germ theory was increasing in practical acceptance because decomposing organic materials were not assumed to be the culprits per se, rather it was infected organic material coming into contact with people that caused the "disease." This can be construed as a step away from pythogenic theory and toward germ theory. But Buck-Franklin and the "Zymotic Report" shared the condemnation of poor drainage. Whatever organisms were living in stagnant sewage managed to make their way back to the working-class citizens of Leicester. To Buck and Franklin they were non-specific "low forms of life" but to Johnston they were bacilli (Johnston made no distinction between bacteria as a general category and bacilli as the rod-shaped members of that category), capable of becoming airborne in sewer gas. Johnston's appreciation of bacteria as an agent of disease demonstrates an increasing sophistication in Leicester's approach to diarrhoea specifically and germ theory generally, but it was also indicative of the times that he looked to microbiology to find one particular bacillus, similar to typhoid, that would prove to be the agent of the "disease."

The Chronicle was immediately enamored with Johnston, presumably because his conclusions indicted the sewage system that the editors disparaged so stridently. The newspaper gave extensive coverage to the "Zymotic Report" in its

issue of 30 March 1878, without once mentioning the doctor's method of smallpox containment. Referring to Johnston's diarrhoea investigation the newspaper chose terms such as "courageous" and "exhaustive" as it praised the doctor's "scientific skill...indefatigable industry and perseverance."[92] No doubt the new assistant MOH seemed quite impressive juxtaposed with Dr. Crane.

The Lancet was also taken with Dr. Johnston albeit not to the same extent as the Chronicle and with quite some delay. As the summer diarrhoea season began in 1878, the Lancet busily set about the annual bemoaning of Leicester's seemingly permanent position at the pinnacle of the Registrar-General's list of town mortality from the "disease." Indeed, the journal considered that such attention had "lost its novelty" yet it remained "a duty [to] again and again...call attention to this preventable loss of infant life."[93] The Lancet refused to accept excuses such as "meteorological conditions" or "infant feeding" to explain the problem because these were not "exceptionally vicious" in Leicester. The editors were emphatic that they did not wish to discourage efforts to improve infant feeding but Leicester's problem was "an exceptionally insanitary condition which imperatively calls for amendment."[94] So the journal was pleased with the "Zymotic Report" when it was finally addressed in the issue of 17 August; they were pleased with Johnston's correlation of disease with sewerage deficiencies but also cautious because "Dr. Johnston's results have not been accepted

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[91] Ibid., 19-53.
[92] LC, 30 March 1878.
[93] Lancet, 20 July 1878, 97. The journal compared statistics from 1870 to 1877 and found that Liverpool was higher in infant mortality (deaths per 1,000 births) than Leicester but that this was from a variety of causes rather than the almost unicausal mortality in Leicester.

unreservedly by the sanitary authority."[95] As we have seen, the "sanitary authority" of Leicester inclined away from expensive remedial measures during this period. Nonetheless, two examples show that there was at least some concern among the more well-to-do citizens in Leicester about the plight of working-class infants. First, evidence exists of a crèche that was opened in response to Johnston's recommendation. According to an anonymous corporation source the crèche opened on Metcalf Street in June of 1878 funded by £197 of charitable contributions.[96] While independent corroboration of the opening of the Metcalf Street crèche is difficult, it was claimed that during 1879 the crèche served 20 children daily and that both parents of these children had to work outside the home or, in the case of widows, the mother had to work outside the home.[97] Second, in 1879, the Sanitary Committee began to make available an anti-diarrhoea "mixture" for use as a remedy at no cost to the consumers.

In 1880, the diarrhoea mixture was again made available free to the public from 31 July to 29 September. During this particularly fatal year there were 8,284 persons treated with the mixture and 346 deaths from diarrhoea during the period of distribution. Table 6.1 shows the ages of the recipients of the mixture and the ages of diarrhoea victims during the third quarter of 1880. Johnston's data does

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[94] Ibid., 27 July 1878, 130-31.
[95] Ibid., 17 August 1878, 228-29.
[96] LRO 20 D 72/56, City of Leicester, Notes on Annual Reports of Medical Officers of Health, 1854-1900, 9. [hereafter Notes on MOH].
[97] Ibid., 9-10. The problem with corroboration arises with the Leicester Chronicle of 21 August 1880. The newspaper announced the opening of this crèche at the time and cites Dr. Johnston's approval of such a measure. The details from Notes on MOH suggest independent knowledge: the name of St. Luke's Day Nursery, the rules, the philanthropic subscription, and the attendance figures for 1879. In the long run exactly when the crèche opened is of less importance than the

not attempt to link the deceased with use of the mixture so inferences on the efficacy of the mixture would be unwarranted but certain demographic information is revealed. Johnston's data on the number supplied shows that infantile diarrhoea struck all ages of the population even though mortality, shown just as clearly, was quite age-specific. In 1880, something near 7% of the entire population availed itself of the diarrhoea mixture. Some 36% of the recipients were under the age of five, the group with fully 98% of the mortality. However,

Table 6.1. Mixture distribution, 31 July to 29 September 1880, and diarrhoea deaths, 1 July to 30 September 1880[98]

Age	<1	1-2	2-3	3-4	4-5	5-10	10-15	15-20
#Supplied	486	761	763	553	411	1076	645	397
#Deaths	244	76	14	4	1	1	0	0
Age	20-25	25-35	35-45	45-55	55-65	65-75	75-85	85<
#Supplied	368	796	899	515	352	187	70	5
#Deaths	0	0	0	0	1	2	2	1

fact that it opened as a response to Johnston's plea and that it was a charitable venture rather than a form of municipal socialism.

only 6% of the recipients were children under one, the group in which 70.5% of the deaths occurred. Still, the data shows that a great many parents attempted to treat their children's "disease" via this civic program and it can be assumed that others received some treatment by private practitioners. The Sanitary Committee continued its program of mixture distribution "in the poorer districts of the town" until 1891 with more than 10,000 persons receiving the treatment in at least one year, 1884.[99]

The year 1880 would record Leicester's highest numerical level of diarrhoea deaths in the period under study but the season of mortality occurred rather later in the year than usual. As late as 14 August, the Chronicle had high hopes for the children in this year. So constant had been the association between diarrhoea fatality and the town that in its review of the Registrar-General's weekly report the Chronicle considered it newsworthy to print: "Leicester is not mentioned in connection with this disease."[100] But any celebration would have proved premature for by the end of the month deaths in the town were strikingly high.[101] As September began "Leicester has once more regained its unenviable place" at the top of the Registrar-General's list.[102] The Chronicle began to lose some of its

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[98] Johnston, MOH 1880, unpaginated insert between pages 38-39.
[99] LRO 20 D 72/4, William Johnston, MOH 1880, unpaginated insert between pages 38 and 39; LRO 20 D 72/5, Henry Tomkins, MOH 1887, 17; LRO 20 D 72/5, Henry Tomkins, MOH 1889, 18; LRO 20 D 72/5, Henry Tomkins, MOH 1890, 18. For the discontinuation of the distribution see LRO 20 D 72/5, Henry Tomkins, MOH 1891, 30.
[100] LC, 14 August 1880.
[101] Lancet, 28 August 1880, 353. For the month of June there were only 2 diarrhoea deaths, in all of July there were 25, in the first week of August the figure was 19, for the second week 26, and for the third week 50.
[102] LC, 11 September 1880.

zeal for the "old, old story."[103] In a fatalistic tone the newspaper wrote "[a]s for the origin of the periodic visitation, where doctors still differ, it would be useless for the unprofessional student to attempt to decide."[104] The Lancet was equally exasperated with "this annual sacrifice of infant life in Leicester" but pleaded "[i]t should not surely be impossible to discover why infant mortality in Leicester is so high."[105]

Johnston's report for 1880 could not provide a simple solution to the problem. Still citing the sewerage problems in the town he blamed ignorance and neglect of mothers for deaths that could not be explained by the "fungoid impurities" in sewer gas.[106] But Johnston was able to point to two noteworthy features of 1880: first, the summer of such dire mortality had been a relatively cool one and second, that all ages of Leicester's population had suffered bouts of diarrhoea.[107] So, another nail was placed in the coffin of "simple heat theory" by temperature comparison but Johnston was not trying to resurrect the specter of "weakly children" by his age comparison. The age specificity contained in Johnston's report was meant to show that fatalities alone did not revel the prevalence of the "disease."

In 1881, when diarrhoea deaths in Leicester dropped to a raw figure of 193, there was some relief expressed in the town.[108] Yet this feeling did not spread to those watchdogs of national public health, the Registrar-General and the medical

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[103] Ibid.
[104] Ibid.
[105] Lancet, 16 October 1880, 632-33.
[106] LRO 20 D 72/4, William Johnston, MOH 1880, 46, 37.
[107] Ibid., 33, 37.

press, because 1881 was a light year for such mortality throughout the kingdom. The death toll in Leicester remained proportionately high so the Lancet reported the

> Annual death-rate from diarrhoea in the twenty large English towns...averaged 2.8 per 1000 [living of all ages]. Whereas however, the rate of this fatality did not exceed 0.7 in Plymouth, 0.9 in Bradford, and 1.1 in both Oldham and Bristol, it ranged upwards in the other towns to 3.4 in Hull, 4.0 in Leeds, 4.3 in Nottingham, and was no less than 6.8 in Leicester. The excess of diarrhoea fatality in Leicester is of annual occurrence, but the proportion of this excess is larger than ever this year.[109]

Implicit in these statistics is a rebuttal of the factory life component of "simple heat theory" because of the relative health of towns such as Bradford and Oldham. As in the case of the sewage system, by the 1880s, the Local Government Board (LGB) had heard enough complaints to launch their own investigation. During the 1881 diarrhoea season the LGB commissioned Dr. Ballard and Mr. Power to get to the bottom of the problem.[110]

Ballard and Power were unable to provide any kind of quick fix to the diarrhoea problem a la Major Tulloch and the sewerage problem in 1884. The reason for this was that no accepted remedy had developed on the prevention of diarrhoea in the way that sewage irrigation had come to be a well accepted

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[108] LRO 20 D 72/4, William Johnston, MOH 1881, 16.
[109] Lancet, 24 September 1881, 566.

solution for town drainage. It would take Ballard (Power was no longer in the project) eight years to produce a 130-page report that the doctor himself considered provisional and subject to retraction or modification.[111] The length of time involved in the Ballard project, besides recommending his industriousness, indicates the complexity of the problem much as his equivocation on the conclusions indicates its mysterious nature. Nonetheless, it was hoped in Leicester that Ballard would uncover a panacea.

Citing Dr. Ballard's ongoing investigation during several years of low or moderate death rates provided Leicester with a brief respite from internal pressure to new activity. Johnston's 1882 and 1883 annual reports did little more than give mortality statistics and mention Ballard's ongoing study.[112] But the Registrar-General's statistics took no holiday. In the midst of the particularly cool summer of 1882 the town was more than three times as fatal as the national average for large towns and the Lancet was as vocal as ever in calling attention to the situation.[113]

In 1884, the death toll again rose above 300 to 344, nearly 200 more fatalities than in the previous year. Dr. Johnston "hoped that some practical and unmistakable recommendations for the mitigation of the evil may be included in the exhaustive Report which Drs. Ballard and Power have been engaged upon for

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[110] Ibid. Also LRO 20 D 72/4, William Johnston, MOH 1881, 16.
[111] LRO 20 D 72/5, Henry Tomkins, MOH 1889, 23.
[112] LRO 20 D 72/4, William Johnston, MOH 1882, 32; LRO 20 D 72/4, William Johnston, MOH 1883, 39.
[113] Lancet, 22 July 1882, 113.

several years past."[114] He also reiterated "sewer theory" with emphasis on the transfer of "living organic ferments" from sewers to subsoil to humans.[115] He noted that of the retail cow's milk tested in 1884 only 6% of the samples were found to have impurities.[116] But in an otherwise unambitious annual report Dr. Johnston provided the twelve step description of the course of the "disease" mentioned above.

The summer of 1885 brought the usual attention from the Registrar-General and the Lancet.[117] The year also brought a new MOH to Leicester as Johnston left the post to devote more time to a successful private practice.[118] Dr. Henry Tomkins, the first truly full-time MOH in Leicester, brought renewed vigor to the problem although it reached only a moderate mortality level in his first year.[119] While Leicester's diarrhoea mortality was twice the average of the large towns in 1885 it was not the most fatal town in that year, being surpassed in that capacity by Preston.[120] Tomkins mentioned heat as an exciting cause of diarrhoea but his annual report was well received in the Lancet nonetheless.[121]

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[114] LRO 20 D 72/4, William Johnston, MOH 1884, 39.
[115] Lancet, 16 May 1885, 914.
[116] LRO 20 D 72/4, William Johnston, MOH 1884, 48.
[117] Lancet, 25 July 1885, 163.
[118] There was some contention regarding the reason for Johnston's departure. Apparently the Leicester Advertiser claimed that Johnston left the post because of "bullying and hectoring" by the Sanitary Committee, Lancet, 13 June 1885, 1096. In a letter dated 17 June 1885, Thomas Windley, chairman of the Sanitary Committee, stated that Johnston himself had cited the growing demands of this private practice as the reason and the MOH said that he was grateful for the cooperation that he received from the committee while he held the post. Lancet, 27 June 1885, 1183.
[119] Simmons, Past and Present, 11 would appear to be wrong about claiming that Crane was the first full-time MOH in Leicester. See also Elliott, Victorian Leicester, note 19 to chapter 5.
[120] LRO 20 D 72/4, Henry Tomkins, MOH 1885, 53-55.
[121] Lancet, 28 August 1886, 420.

Dr. Tomkins' tenure as Leicester's MOH was challenged early on because of the "excellent work" of his predecessor.[122] The new doctor from Manchester was warned that it would "not be an easy matter to follow Dr. Johnston."[123] But starting in 1886, Tomkins made a most comprehensive study of the "disease" which included experimental as well as observational methodology. He explained that he believed that the population of Leicester had become numbed to the annual tragedy because of its incessant repetition. He dismissed many of the conclusions of the investigators who had preceded him but of Johnston's "fungoid impurities" he said "[i]t is more than probable that this statement will ultimately be proved.[124] To indicate the imprecision of previous studies and to educate his employers he added

> Already grave suspicions had fallen upon some aerial contamination as being the probable cause. But sewer gas, effluvia, miasms, malaria, bad smells give us no real explanation, these terms are little better than cloaks for our ignorance. The Scientist of the present day demands something more tangible and real than this.[125]

First, Tomkins located a section of the town which he called the "diarrhoea area" because it contained 33% of the population but 84% of the diarrhoea deaths in 1886. Predictably this area was low-lying and flat. He collected air samples from this area and compared them with samples from areas of higher elevation and lower death rates. Air from the diarrhoea area contained "various micro-

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[122] Ibid., 13 June 1885, 1096.
[123] LC, 1 August 1885.

cocci and bacilli" numbering between 2,000 and 7,000 per cubic meter while air above higher ground had between 60 and 900. Tomkins cultivated these organisms in a laboratory setting. He did postmortems on an unspecified number of victims of diarrhoea and found that some victims had these organisms in their spleens and kidneys but all victims had them in ulcerations or the mucous membranes of their intestines. Still unable to isolate individual culprits, Tomkins injected someone (himself?) with small cultivated doses from both air and postmortem sources. The result was that "I have been able to induce with certainty a sharp attack of Diarrhoea, lasting from twelve to twenty-four hours." The MOH realized that he did not have incontrovertible proof of the agent of disease but there were four positive assertions that he could make: first, these organisms existed in vastly larger numbers where diarrhoea was prevalent than where it was not, second, they were present in the bodies of the victims, third, they could be shown to reproduce under laboratory conditions, and fourth the cultivated specimens caused diarrhoea. He further claimed that sewage would make an ideal medium for the organisms to procreate and the warmer the sewage the more the organisms would prosper.[126]

In his next annual report Tomkins looked back at the history of the "disease." Because natural deaths were not tabulated by cause in Leicester until 1851, Tomkins looked for the traditional bulge in mortality during the third quarter of the years before diagnostic statistics were kept. What the MOH found remains as

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[124] LRO 20 D 72/4, Henry Tomkins, MOH 1886, 14.
[125] Ibid., 17.

suggestive as it remains ambiguous. Table 6.2 shows that from 1845 through 1850 "diarrhoea season" was not an especially fatal time of year; the traditional bulge in quarterly mortality statistics did not exist in the late 1840s. During those six years the third quarter was the most deadly on only one occasion and in 1849 it was the least deadly. This led Tomkins to posit that summer diarrhoea was significantly less virulent in Leicester's past. As Tomkins already subscribed to "sewer theory" generally this information reinforced his perception that the deficiencies of the Wicksteed sewer system could indeed be translated into the loss of human lives as the Chronicle had said some years before.[127] Yet Tomkins realized that this data was subject to another interpretation: that improvements in

Table 6.2. All deaths by quarter 1845-1850[128]

Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1845	445	432	458	354
1846	342	305	436	460
1847	442	327	343	345
1848	353	379	353	401
1849	516	411	360	402
1850	351	302	367	393

[126] Ibid., 14-20. The quote is from page 18.
[127] LC, 31 July 1875.

death rates from causes other than diarrhoea created the third quarter bulge by reducing their totals in the other quarters. While the MOH believed that diarrhoea had worsened to create the third quarter bulge he had to remain tentative on this point.[129]

His adherence to "sewer theory" gave Tomkins an optimistic view about the future of diarrhoea in Leicester. The Gordon sewer system was the single most important remedy to Tomkins and construction of the system continued apace during his tenure. In the meantime the Sanitary Committee made several attempts to stave off the "disease." In 1886 disinfectant was added to sewage in the low-lying districts with no apparent effects.[130] In 1887 water mixed with carbolic acid was sprayed on the streets of those districts and mortality did decrease. Tomkins was unable to make a direct connection between the spraying and improved mortality but the project was continued in 1888.[131] Milk analysis continued in a more efficient manner as it was placed under the auspices of the MOH. Purity infractions were treated more as health transgressions rather than commerce deceptions.[132]

Tomkins continued his research for the next several years and was able to limit potential disease agents to a smaller group of "micro-cocci and small bacilli." Without intentionally commending pythogenic theory he acknowledged an

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[128] Tomkins, MOH 1887, 22.
[129] LRO 20 D 72/5, Henry Tomkins, MOH 1887, 18-26.
[130] LRO 20 D 72/4, Henry Tomkins, MOH 1886, 21.
[131] LRO 20 D 72/5, Henry Tomkins, MOH 1887, 17-18.
[132] LRO 20 D 72/4, Henry Tomkins, MOH 1886, 76. The length and temperature of storage continued to be unregulated even after the permissive 1890 legislation. LRO 20 D 72/5, Henry Tomkins, MOH 1891, 42-48.

extremely offensive smell that came from his cultivated microbes.[133] He also tested a more sophisticated heat theory and found that diarrhoea season could be correlated with a sustained temperature of 60°F at a level of one foot underground.[134] His continual experimentation, his conclusions, and his cooperation with Dr. Ballard won him considerable praise from the medical press.[135]

Dr. Ballard's report finally appeared in April of 1889. Except for some quite minor disagreements the three main causal factors that he found for diarrhoea agreed with Tomkins' assessment of the situation. The first causal factor was constantly damp soil that had contact with sewer or cesspool leakage. Loose or fine soil exacerbated the transmission of micro-organisms that manufactured "virulent chemical poison[s]." Where Ballard and Tomkins disagreed was on the heat and depth of the soil that optimized the production of these organisms. Tomkins believed that the critical point was when the temperature at one foot maintained 60° but Ballard thought that a depth of four feet reaching 56° was the catalyst. The second causal factor had to do with cleanliness and ventilation especially with regard to food storage. The quality of food and milk that babies were fed had long been considered germane to the issue but Ballard emphasized the spoilage of originally healthy foodstuffs to a far greater degree than had previous investigators. The third causal factor, more tentative than the first two, concerned feeding and family life. Like other researchers Ballard noted that

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[133] LRO 20 D 72/5, Henry Tomkins, MOH 1888, 25.
[134] LRO 20 D 72/5, Henry Tomkins, MOH 1889, 20.

exclusively breast-fed infants died in the fewest numbers and that the children who had never suckled tended to fare the worst. He saw this as a problem of working women only insofar as surrogate caregivers were less conscientious about feeding than mothers. Illegitimate children were in the most precarious position, presumably because their living conditions would be more squalid and a single parent less able to devote the requisite attention to the child.[136]

Ballard's recommendations were not earth shattering for the most part either. Sewerage improvement and the elimination of cesspools headed the list. Drainage of ground that was still left damp was another priority and the sealing of basements with concrete or cement would further protect homes. Other housing recommendations included the widening of streets, increasing the distance between buildings, and eliminating "back to back" housing. He advocated higher standards of cleanliness for cow sheds and dairies (included in 1890 legislation) as well as private homes. Within households Ballard recommended that food not be stored in basements and that pantries be ventilated, moreover he cautioned that milk might need to be boiled.[137]

Later comments about the Ballard report are generally favorable. The anonymous author of Notes on MOH writes that the "report is an excellent piece of work, and it is interesting to see how nearly the author came to putting his finger on the real cause. He mentions that all the conditions which produce

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[135] Lancet, 6 August 1887, 284; 15 December 1888, 1202; 15 June 1889, 1199-1200.
[136] LRO 20 D 72/5, Henry Tomkins, MOH 1889, 23-35. The quote is from page 31.
[137] Ibid.

flybreeding."[138] Moreover, historian David Reeder's current work also involves consideration of a fly vector.[139] If flies should prove to be the important vector for diarrhoea it, of course, remains to be seen why flies would be more prolific in Leicester than other parts of Britain. The failed system of sewerage now as then, appears to be the most reasonable answer.

But Ballard could not merely assume the validity of "sewer theory" and as a consequence his investigation had to be more comprehensive than originally intended.

> The form in which I received my first instructions was to inquire into the cause of the annually recurring high mortality from diarrhoea in Leicester; but it very soon became obvious that the diarrhoea of Leicester did not differ in its nature from that of other places....Leicester, however carefully looked at, could not be interpreted by itself. The attempt had been made by local observers over and over again, but had failed of any satisfactory result....[nonetheless] Leicester and its misfortune had still to occupy a notable place.[140]

In striking fashion, Dr. Ballard encapsulated the entire dialogue of diarrhoea, the dialogue that made the "disease" into a local problem as much as the mortality itself. Leicester was never the only town that experienced visitations of summer diarrhoea and it was not always the most fatal town. But the repeated listing of Leicester at or near the top of the Registrar-General's returns made local leaders,

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[138] LRO 20 D 72/56, City of Leicester, Notes on MOH, 18.
[139] Reeder, "Infant Mortality in Leicester 1860-1920."

the medical press, and ultimately the Local Government Board focus their concern about the "disease" as though it was unique to the town. I would suggest that this situation continued as long as it did because diarrhoea remained a mystery, albeit slightly less mysterious over time, throughout the period 1849 to 1891.

The terminal point of this examination, 1891, was not chosen because diarrhoea was suddenly cured at that time. The malady diminished in virulence but it did so gradually.[141] The year 1891 was chosen primarily because the Gordon sewer system was completed and to a lesser extent because Henry Tomkins died in office shortly thereafter.[142] Continuing this study beyond the completion of the Gordon system would not produce the answer to the problem because "causes of infant diarrhoeal mortality [were] multifarious."[143] While I strongly support the notion that "sewer theory" goes farthest in explaining the difference between Leicester and other towns, it is insufficient to account for the "disease" as a whole. F.B. Smith believes that the availability of sterile foodstuffs for infants was the most important ingredient for the diminution of diarrhoea and this argument cannot be ignored.[144] By 1905, Leicester had a municipal milk

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[140] Dr. Ballard (1889), quoted in LRO 20 D 72/5, Henry Tomkins, MOH 1889, 21-22.
[141] See infant mortality statistics from all causes 1893-1900 in Isabel C. Ellis, Records of Nineteenth Century Leicester (Guernsey: The Star and Gazette Co., 1935), 33-35. The year 1912 has been cited as when diarrhoea ceased to be a major problem in Leicester. R. A. McKinley and C.T. Smith, "Social and Administrative History," in the Victoria History of the Counties of England, A History of the County of Leicestershire, vol. 4, Leicester, ed. R.A. McKinley (London: Oxford University Press, 1958), 280.
[142] LRO 20 D 72/56, City of Leicester, Notes on MOH, 21. Tomkins died from influenza on 27 March 1892.
[143] Dr. Ballard (1889), quoted in LRO 20 D 72/5, Henry Tomkins, MOH 1889, 23.
[144] F.B. Smith, "Health," in The Working Class in England 1875-1914, ed. John Benson (London: Croom Helm, 1985), 47.

depot that provided sterilized or powdered milk to infants whose mothers could not breast feed.[145] Moreover, Anne Hardy remarks on the overall diminution of fly-breeding as horses on public streets were replaced by automobiles.[146] So three possible solutions to the problem were taking place at roughly the same time and it does not seem possible to consider any in isolation. Again, this is a function of the "disease" being more than a singular effect from a singular cause.

We may or may not come across definitive answers in the quest for the agents of diarrhoea but if we do they will likely involve both stagnant sewage and tainted food. We can say for certain that some of the early remedies such as purgatives or opium cocktails would have only exacerbated the problem. But for all the principals in this story, when the problem went away so did the need to determine its cause. To Sanitary Committee Chairman Thomas Windley, looking back at his forty-four years of service, the Gordon system seemed to be the essential ameliorative factor but his main concern was that overall infant mortality in Leicester had declined from over 20% to something approaching half that number.[147] Windley's relief was evident.

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[145] LRO Pamphlets vol. 6, Thomas Windley, Notes on the Work of the Sanitary Committee of the Leicester Corporation from its Formation to the Present Time, 1873-1917, 10. [hereafter Work of the Sanitary Committee].
[146] Hardy, The Epidemic Streets, 186.
[147] LRO Pamphlets vol. 6, Thomas Windley, Work of the Sanitary Committee, 10.

7. "Time will show who is right - Leicester or the world:" smallpox vaccination[1]

On 17 May 1876, Frank Palmer was released from gaol. Some 15,000 of his supporters made ready for the celebratory procession that would begin at six-thirty in the evening from the town's market-place.[2] Banners were made, carts and marchers queued, and speakers arranged for each stop along the parade route. Palmer himself was seated in the lead cart in full prison garb alongside such notables as the Rev. William Hume-Rothery and Amos Booth. As the procession moved forward a band marched and played, a cart full of small children waved flags, and some of the banners in the crowd read, "Down with Medical Despotism," "The Parent the First Guardian," and "Down with State-poisoning." After stops at the important "gates" of Leicester, the procession returned to the market, where Booth urged the crowd to remain peaceful despite Hume-Rothery's fiery accusations of blasphemy against the central government and the medical profession. Booth stressed the longevity of the cause and restraint; he argued that seven years of diligent work should not be destroyed by one night of righteous violence. Motions to petition Parliament for redress were made, seconded, and carried and then a copy

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[1] Lancet, 22 September 1888, 585.

[2] The description of the demonstration is taken from the Leicester Chronicle (hereafter LC) of 20 May 1876. The estimate of crowd size is from Bill Lancaster, Radicalism,

of the noxious 1871 Act was burned. Frank Palmer, martyr to the cause, was given the honor of seconding one of the motions.

Palmer was a riveter in the shoemaking industry in Leicester; now he was also a bona fide working class hero. His imprisonment had given him the opportunity to communicate directly with Leicester's radical MP, Peter Alfred Taylor. His release was the occasion for joy and rededication to the cause. One of the resolutions passed by the assemblage condemned his tormentors, the Leicester Board of Guardians. Frank Palmer had served twenty-four hours in gaol rather than pay a twenty shilling fine for refusing to have his child vaccinated against smallpox. He had not been dressed in prison garb until after his release.

There are several ways to view the anti-vaccination movement in Leicester. Superficially it appears both irrational and dangerous. Why would anyone oppose the clearly beneficial practice of smallpox vaccination? Even among historians who hold low opinions of the value of nineteenth century medical interventions, vaccination for smallpox is seen as one of the few success stories. Contemporary medical opinion also found anti-vaccinationism absurd. What was wrong with vaccination that made thousands in Leicester applaud Frank Palmer's gesture toward martyrdom? The answer involves two distinct issues: first, the efficacy of

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Cooperation and Socialism: Leicester Working-Class Politics 1860-1906 (Leicester:

vaccination; second the 1867 Vaccination Act which added penalties for those who refused to comply with the previous and already compulsory vaccination acts.

The efficacy of vaccination was not as apparent to the working class residents of Leicester as it was to the mainstream of the medical profession. Two reasons for this were first, improper vaccination could actually transmit disease, and second, vaccination only protected an individual for about seven years. Those who complained to Unitarian missionary Joseph Dare were well aware that recently vaccinated people developed diseases.[3] Nineteenth century proponents of vaccination did not clearly advertise the need for periodic revaccination; ordinary people could see that those who had been vaccinated in infancy were not forever immune from smallpox. Historians Anne Hardy and F.B. Smith recognize these shortcomings of vaccination and argue that additional methods were necessary to eradicate the disease.[4] Hardy places greater emphasis on isolation of cases than does Smith, but ultimately they both conclude that while additional methods were necessary smallpox could not have been eradicated without vaccination. Indeed the World Health Organization's

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Leicester University Press, 1987), 83.

[3] See Joseph Dare, 1869 quoted in Barry Haynes, Working-Class Life in Victorian Leicester: The Joseph Dare Reports (Leicester: Leicestershire Libraries and Information Service, 1991), 47.

(WHO) eradication of smallpox in the 1970s relied upon both vaccination and the timely isolation of smallpox victims, a strategy proposed by Leicester's Medical Officer of Health (MOH), William Johnston, in the 1870s.

The second issue, the 1867 Vaccination Act, initially stimulated little anti-vaccinationist protest in Leicester; in 1869 fewer than twenty people attended the first meeting of the Leicester Anti-Vaccination League at Temperance Hall.[5] But in 1871, in the midst of an epidemic, parliament strengthened vaccination sanctions and Leicester's Temperance Hall was filled to capacity with anti-vaccinationists.[6] Moreover the movement continued to grow; the 15,000 who cheered Frank Palmer in 1876 would be dwarfed by the estimated 80,000 to 100,000 for a demonstration in 1885.[7] By the time of the 1885 demonstration, Leicester had become the acknowledged capital of British anti-vaccinationism and compliance with the law was the exception rather than the rule.[8]

These two facets of the vaccination issue, efficacy and compulsion, have been advanced by historians Stuart M.F. Fraser and Bill Lancaster as

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[4] Anne Hardy, The Epidemic Streets: Infectious Disease and the Rise of Preventive Medicine (Oxford: Oxford University Press, 1993), and F.B. Smith, The People's Health: 1830-1910 (London: Croom Helm, 1979).
[5] J.T. Biggs, Leicester: Sanitation Versus Vaccination (London: National Anti-Vaccination League, 1912), 79.
[6] LC, 22 July 1871.
[7] Christopher Charlton, "The Fight Against Vaccination: The Leicester Demonstration of 1885," Local Population Studies 30 (1983): 63.

the reasons for working class resistance and middle class resistance respectively.[9] Yet neither of these capable authors have taken the Leicester anti-vaccinationists as their primary focus of investigation. Fraser believes that the anti-vaccinationists tended to obscure a more important issue, that of Johnston's "Leicester Method" of smallpox containment which will be discussed below. Lancaster argues that the working class-middle class alliance of anti-vaccinationists represented the last occurrence of the cross class cooperation mobilized in the educational and religious campaigns of the 1860s.

These historians illuminate important points in their studies, but more thorough investigation of the Leicester anti-vaccinationists reveals four additional points. First, the increasingly professional and scientific medical practitioners in the mainstream advanced new explanations for the causation of diseases that were at variance with formerly mainstream ideas, ideas of practitioners on the medical fringe, and, in the eyes of some lay people, at variance with common sense. At the same time that Robert Koch, William Johnston, and Henry Tomkins were elaborating the theory that invisible microbes caused disease, many people, including some physicians, still held to miasmatic or pythogenic theory. Smallpox vaccination, despite its grounding in the belief that the disease was

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[8] See the vaccination/birth data presented by Stuart M.F. Fraser, "Leicester and

communicable from person to person, evoked little resistance until the advent of the 1870s anti-vaccination movement. Second, the Liberal-radical axis of Leicester politics was zealous in its defense of local autonomy after the town's experience with the General Board of Health from 1848 to 1858. Third, politicians in Leicester, from members of parliament such as P.A. Taylor and J.A. Picton to the town council and the Board of Guardians, were sensitive and responsive to the desires of their constituencies in this era of expanding democracy. Fourth, and more tentatively, Leicester's middle class co-opted an essentially working class movement because of the increasingly intrusive parliamentary provisions regarding vaccination.

It might seem surprising that Leicester would become Britain's anti-vaccination capital by 1885. After all under the guidance of Alderman Joseph Whetstone, the town had been one of the first municipalities to apply to itself the Public Health Act of 1848. But the 1848 Act combined permissive application with central government supervision and a veto power lodged in the General Board of Health.[10] The town encountered much opposition from the central government on sewerage and without Whetstone's dogged commitment to health and sanitation, the original

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Smallpox: The Leicester Method," Medical History 24 (1980): 328.
[9] Ibid., 327, and Lancaster, Radicalism, Cooperation and Socialism, 83.

Wicksteed system might never have been built. Central government pressure also led to the showdown of 1885, when the Local Government Board finally forced extensive and expensive remedial measures on the borough.

Between 1848 and 1885 the town was also periodically pilloried by the medical press for its unusually high rate of infant mortality. This "excessive" mortality was due almost exclusively to the malady known as summer diarrhoea and also occasioned serious scrutiny by the Local Government Board. The twentieth century disappearance of summer diarrhoea remains something of a mystery, but it is clear that for many years the town's leadership was quite defensive about the attacks from the medical profession and the central government. Thus though the borough of Leicester was one of the pioneers of Victorian public health practices, important relationships among the interested parties had soured and, at least on some issues, had become adversarial.

The Vaccination Acts came to include sanctions after their initial introduction in 1840.[11] In 1840 Parliament had determined that local Poor

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[10] See John Prest, Liberty and Locality: Parliament, Permissive Legislation and Ratepayers' Democracies in the Nineteenth Century (Oxford: Oxford University Press, 1990), 24-47.

[11] See R.M. MacLeod, "Law, Medicine and Public Opinion: The Resistance to Compulsory Health Legislation 1870-1907, Part I" (Public Law, Summer 1967): 107-28. This paragraph and the one that follows owe much to this source, but MacLeod considers Cheltenham to be the early capital because it was the home of Hume-Rothery and his National Anti-Compulsory Vaccination League. I disagree with this characterization by 1875, because of the actions of the Keighley Guardians.

Law Boards of Guardians would be responsible for their communities' smallpox vaccinations, and in 1841 had decreed that the services should be free of charge. By 1853, on the heels of a widespread smallpox epidemic, parliament made the vaccination of infants compulsory, but no provision was made for penalties arising from non-compliance. By 1867 parliament added penalties of a twenty shilling fine or fourteen days in gaol for non-compliant parents. Then in 1871, during another epidemic and with minimal debate about the issue, parliament compelled the Guardians to appoint local Vaccination Officers with the ability to prosecute parents. The prosecution of parents by local Vaccination Officers was made mandatory by a further act of 1874, in response to the recalcitrance to the Keighley Board of Guardians.

In 1875 the Keighley Board of Guardians voted eight to six to defy the statutes and subsequently seven of the Board members were gaoled. At this point Keighley was clearly Britain's anti-vaccination capital; prosecutions of parents in Leicester had begun as early as 1869 and followed in other places throughout the country. One aspect of the 1874 act confirmed an 1873 court decision which allowed for the repeated prosecution of the same parent for refusing vaccination. This provision in particular drew the ire of the anti-vaccinationists.

The social composition of the anti-vaccination movement defies simple characterization. Early opponents to vaccination included Quakers,

Primitive Methodists, Secularists, homeopaths, hydropaths, "Electric Practitioners," and undifferentiated members of the working classes.[12] As we shall see below resisters came to include Anglican, Baptist, and Unitarian clergy, some medical doctors, Conservative, Liberal, and radical politicians, middle and working classes, men and women. I do not wish to imply that anti-vaccinationists comprised a majority of any of these groups, except in Leicester and at specific times. Nonetheless, for a sympathetic characterization of anti-vaccinationism we must understand the types of boundaries which the movement transcended. For some, vaccination represented a type of single-issue politics that has become quite familiar in the early twenty-first century, while to others vaccination was but one issue among many and perhaps emblematic of other concerns.

Agitation against the gender-specific Contagious Diseases Act has been well documented in other studies; it need only be mentioned here that there was a bit of overlap in membership.[13] But a major difference between the two protests was that the Contagious Diseases Act affected only women, and particularly only women in naval ports, whereas the

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[12] Ibid., 117, Dorothy Porter and Roy Porter, "The Politics of Prevention: Anti-Vaccinationism and Public Health in Nineteenth-Century England," (Medical History 32, 1988): 232-39, Joseph Dare, 1869 quoted in Haynes, Working-Class Life, 48.

[13] For example, MP Charles Hopwood was active in both movements. MacLeod, "Law, Medicine and Public Opinion," 126 n. 85, "Speeches of Mr. P.A. Taylor and Mr. C.H. Hopwood on Vaccination. In the House of Commons, June 19th, 1883," Leicestershire Records Office (hereafter LRO) Pamphlets vol. 67. The movement for repeal of the Contagious Diseases Acts is best described by Mary Lyndon Shanley, Feminism,

vaccination acts affected a much greater number of people. This distinction makes it easier for historians to rail against the Contagious Diseases Act because it was clearly discriminatory, but it leaves historians of the anti-vaccinationists in something of a muddle. By hindsight we can argue that the anti-vaccinationists were wrong in their rejection of vaccination and their rhetorical reliance upon "sanitation" as a palliative, but as mentioned above, vaccination did not confer the immunity from the disease that its proponents sometimes alleged. Some historians, notably Fraser and Christopher Charlton, might give the anti-vaccinationists more credit than they are due. This credit again stems from the imperfect immunity afforded by vaccination, but is closely connected to the Leicester Method of isolation of smallpox patients introduced in 1877 by Dr. William Johnston. Similarities between the Leicester Method and the method eventually adopted by the World Health Organization one hundred years later tend to cloud the issue of Victorian anti-vaccinationism because the anti-vaccinationists might then be viewed as visionaries. However, an analysis of the anti-vaccinationists reveals that they were far from visionary and despite their admiration of Dr. Johnston's Method, isolation alone was not sufficient to rid the world of smallpox. Indeed, Johnston himself was no anti-vaccinationist. The anti-vaccinationists could see that

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Marriage and the Law in Victorian England, 1850-1895 (Princeton: Princeton University

vaccination did not eliminate the disease, but they came to argue that it was unnecessary where the Method was used, and this conviction has proved to be as fallacious as the notion that vaccination conferred perfect and life-long immunity.

Following the epidemic that occasioned the 1853 legislation to make vaccination compulsory, Leicester's Medical Officer of Health (MOH), John Moore (MOH 1853 to 1866), expressed his belief in the ameliorative value of vaccination and his hope that parliamentary legislation would encourage further vaccination in Leicester. Fifty-two of Leicester's inhabitants had perished in the epidemic, but Moore took comfort in the accelerating vaccination/birth ratio that moved from approximately 75% to 91% between 1853 and 1854. Yet by the time that Moore left office in 1866 the vaccination/birth ratio had dipped below 50%.[14] Indeed the vaccination/birth ratio displayed peaks and valleys, sometimes quite sharp ones, up to the 1880s. The peaks corresponded with new legislation and/or the waning of epidemics while the valleys represented times when epidemics were raging or times when epidemics were becoming faded memories. It is not paradoxical that vaccination should wane during epidemics and wax immediately thereafter because it was always considered dangerous to "weaken" children by vaccination during the

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Press, 1989).

periods that the disease was most prevalent. What is worthy of note is that between epidemics and new legislation, for example from 1854 until 1868, vaccination/birth ratios had a generally downward trend.

Thus it does not follow that Leicester was always a well vaccinated town as historian Stuart Fraser and contemporary anti-vaccinationist J.T. Biggs contend. To be sure, Fraser is more concerned with the period after 1877, but to properly address the epidemic of 1871-2 it must be considered that prior to the 1867 Act vaccination in Leicester had dipped to 36% of births. Biggs and other anti-vaccinationists would claim long after the epidemic of 1871-2 that the high levels of vaccination in 1869 should have prevented the 42 deaths in Leicester if vaccination were effective.

Moore's successor, Dr. J.Wyatt Crane (MOH 1867-1879), has previously been shown to be a less than model MOH.[15] Generally an adherent of miasmatic theories of disease,[16] Crane was elderly, and had little regard for the thousands of working class citizens for whom he was nominally responsible. He had neither the inclination nor the energy to pursue the issue of vaccination amongst the lower orders. Fortunately for Dr. Crane, and less fortunately for his successors, the responsibility for vaccination devolved onto other authorities. In the non-epidemic periods

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[14] John Moore, Annual Report of the Medical Officer of Health 1853 (hereafter MOH 1853), LRO L.614, Moore, MOH 1858, LRO L.614, Moore MOH 1866, LRO 20 D 72/2.
[15] See earlier chapters in this dissertation, particularly chapter 6 on summer diarrhoea.
[16] Porter and Porter, "The Politics of Prevention," 235.

of his tenure Crane raised little attention to vaccination. During the 1871-2 epidemic Crane did little. While we might expect that the borough's MOH would be a leading light on all matters of public health, as were his predecessors John Buck and John Moore, and his successors, William Johnston and Henry Tomkins, Crane consistently argued that most things were fine, and those that were not were the fault of Providence. Indeed one might argue that Crane made every effort to ignore or deny public health problems that confronted him.

It was during Crane's nine year watch that anti-vaccinationism gained an organizational foothold in Leicester and smallpox killed more people than it had in the previous two decades or would in the following four decades. Prosecutions under the 1867 Act were sporadic; by 1869 only three parents had been gaoled. But on 16 June 1871, Sarah Annie Wrigley,[17] an anti-slavery advocate and widow of a doctor, went to gaol rather than be fined for refusing to have her child vaccinated. Sentenced to fourteen days, but released in less than four, Mrs. Wrigley became the first of the Leicester "martyrs" who were celebrated by the movement. At the "well attended" celebratory meeting at Temperance Hall, Mrs. Wrigley claimed that she was bound to follow any

English law not opposed to Nature's laws, and which are God's

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[17] Biggs, Leicester: Sanitation Versus Vaccination, 103.

> laws,...but tell her of any [English law] opposed to Nature's laws, which had caused disease, suffering, and death - a law which had made healthy children unhealthy, and which brought many to an early grave – and tell her that she, an English mother, must obey that law, she said, 'No."[18]

Mrs. Wrigley went on to say that she had personally witnessed death and disease resulting from vaccination. Her speech, the sixth of the meeting, was an emotional high point. Amos Booth, the most eccentric anti-vaccinationist,[19] in a "lengthy speech," argued that no "medical man" could prove that vaccination was effective. Other speakers decried the treatment of Mrs. Wrigley at the "hands of the Mayor and the Borough Magistrates, for no criminal offense, but for wishing to exercise liberty of conscience and parental right."[20] The Leicester anti-vaccinationists did not explicitly seize upon Mrs. Wrigley's sex to underscore her martyrdom; one speaker, a Mr. Clarke, said that she was fulfilling a role that her husband would have undertaken had he survived, and Mrs. Wrigley said that she was fulfilling a promise to her late husband, but at no time during the meeting did any speaker argue that her sex made her punishment or her treatment more or less onerous. The symbolic value that her sex had on her

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[18] LC, 22 July 1871.
[19] See LRO Miscellaneous 546 for a scrapbook of Booth's odd career as an anti-vaccinationist
[20] Ibid.

martyrdom can only be inferred from her presence at the speakers' platform and the comments about English motherhood. I suspect that her sex made her a desirable martyr to put on parade, but the exploitation of her sex was decidedly understated.

Anti-vaccinationism in Leicester continued to grow after the epidemic in the early 1870s. The frequency of vaccinations to births declined from 105% in 1872 to approximately 69% in 1877.[21] Clearly the epidemic had made believers out of some skeptics, yet the traditional pattern held: vaccination decreased as memories of epidemics faded. Anti-vaccinationist rhetoric remained unchanged; vaccination was decried as unhealthy and intrusive.

This was the climate during the martyrdom of Frank Palmer. Palmer was not the only anti-vaccinationist gaoled during his brief incarceration; Charles Eagle remained behind on Palmer's release. Eagle was a leader of the Anti-Vaccination League and has been described as a working class secularist.[22] But it was Palmer who became the martyrs' conduit to parliament. Frank Palmer's correspondence with P.A. Taylor became a matter of public record because Taylor, ever the politician, sent copies of the correspondence to the Leicester Chronicle. Taylor took the matter as a constituency problem; he wrote letters to Home Secretary Cross and

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[21] Fraser, "Leicester and Smallpox," 328.

Leominster's MP, Blake, who was due to meet with the Home Secretary. The gist of these letters concerned not the law, but the treatment of Palmer and Eagle. The MP wanted to know if and why the two had been handcuffed. Moreover, he wanted to know why Eagle had not paid his fine to be released as had Palmer.[23]

One week later Taylor addressed his constituency about anti-vaccinationism in an open letter published in the Chronicle. Taylor had been among the parliamentarians on the Select Committee that had framed the 1871 act. In 1876 he did not express overwhelming support for the act, but he did not declare for the anti-vaccinationists either. He argued both sides of the issue, but he told the Chronicle's readers that repeal of the law was impossible regardless of his particular stance. He added that he thought the fine should be changed to a ten shilling stamp that could be purchased rather than imposed by a magistrate. Taylor contended that this had been his position in 1871 as well.[24] Another letter in the same issue of the Chronicle, from a J. Smith, argued that the efficacy of vaccination was "not so much the point with the anti-vaccinators, as their desire to be delivered from the yoke of what they regard as a ruthlessly cruel and tyrannical law."[25] Both Taylor and Smith missed the pro-vaccination

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[22] Lancaster, Radicalism, Cooperation and Socialism, 83.
[23] LC, 20 May 1876.
[24] LC, 27 May 1876.
[25] Ibid.

point. Medical opinion held that because smallpox was a contagious disease, refusing vaccination put communities rather than individuals at risk. To them it was not a matter of individual conscience.

This was an issue that allowed little room for compromise. Historians Dorothy and Roy Porter write that the theory of disease that informed the anti-vaccinationists was "Chadwickian," or a blend of miasmatic and pythogenic.[26] This position is confirmed by the rhetoric of the Leicester anti-vaccinationists until at least 1877.[27] But in 1877, Dr. William Johnston, Leicester's new and energetic Assistant MOH, introduced what would come to be known as the Leicester Method. The Leicester Method included prompt notification to the MOH (within twelve hours), by the victim's family or physician and subsequent isolation of smallpox cases at the borough fever hospital. If at all possible the victim's family and contacts were to be removed to the fever hospital as well. Failing that, the victim's contacts were to be quarantined at home, but either way the victim's home was to be disinfected with sulfur.[28] Johnston's Method was clearly predicated on the assumption that smallpox was contagious, yet the anti-vaccinationists came to rally around the Method as an alternative to

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[26] Porter and Porter, "The Politics of Prevention," 236.
[27] See for example, LC, 17 February 1872 or LC, 16 March 1872. Anne Hardy disagrees with this assertion, Hardy, The Epidemic Streets, 113.
[28] William Johnston, "A Report on the Principal Zymotic Diseases During 1877," (Leicester: J. Fleming & Co., [1878]), 10-13. LRO L.614. [Hereafter, "Zymotic

vaccination. Rather than discard their conception of infectious disease arising from filth, the anti-vaccinationist spokesmen tended merely to append the Method onto it. This implied a rather muddled theory of disease, part miasmatic and part germ theory. Stuart Fraser argues that rhetoric and actions of the anti-vaccinationists confuse analysis of the more important issue of the Leicester Method. This is due to his conviction that the Method should be considered in its more modern context; the Porters rightly argue that the anti-vaccinationists were themselves confused.[29]

Dr. William Johnston was "a thorough believer in the value of vaccination."[30] He believed that he had originated the Method, but some historians have disputed his originality.[31] Though Johnston was pleased with the performance of the Method in 1877, he advocated a Local Act of Parliament to require householders and doctors to report cases of certain diseases such as smallpox to the MOH so that isolation at the fever hospital could begin forthwith. Johnston was aware that Bolton had

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Report]. The Method was modified in 1884 to allow family members to be quarantined in their homes rather than the fever hospital.

[29] Fraser, "Leicester and Smallpox," 332, Porter and Porter, "The Politics of Prevention," 246.

[30] Thomas Windley, "Notes on the Work of the Sanitary Committee of the Leicester Corporation from its Formation to the Present Time. 1873-1917," 13. LRO Pamphlets vol. 6.

[31] Dale-L. Ross, "Leicester and the Anti-Vaccination Movement, 1853-89," Transactions of the Leicestershire Archaeological and Historical Society 43, (1967-8): 36-37, and Hardy, The Epidemic Streets, 124.

already acquired such an Act and apparently Huddersfield had as well.[32] The Lancet claimed that Leicester doctors were nearly unanimous in opposing such an act because it applied the ten pound penalty to doctors as well as householders, but there is little evidence of this unanimity.[33] This Leicester Corporation Act, requiring notification, was passed on 13 September 1879 and became an integral part of the Leicester Method although the Act did not specifically mention the isolation of smallpox patients and contacts.[34] I find it curious that there was no outcry against compulsory notification, except for those doctors who did not want to be financially liable. It was surely clear that upon notification, isolation would soon follow and this went against miasmatic theory. Moreover, this would be a rather drastic intrusion of the government into the lives of English citizens who happened to be victims and their families. Perhaps the principle of resistance to governmental intrusion was advanced only when sufficient numbers were affected, or perhaps it varied with who the affected individuals were likely to be.

Fraser argues that the Leicester anti-vaccination movement has been wrongly characterized as a movement that inexorably grew from its

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[32] Johnston, "Zymotic Report," 10-13.
[33] Lancet, 8 February 1879, 206. For the problems with the Lancet's assertion see Fraser, "Leicester and Smallpox," 318, n. 19. The British Medical Association withdrew its objection to Compulsory Notification in 1886 as doctors were no longer to be held financially liable, Henry Tomkins, MOH 1886, 8-10, LRO 20 D 72/4.
[34] Ross, "Leicester and the Anti-Vaccination Movement," 37-38.

humble beginnings in 1869 to an apex in the 1890s.[35] He relies upon the introduction of the Leicester Method in 1877 to explain the precipitous and lasting decline of the vaccination/birth ratio that became indisputable in the 1880s. Indeed Fraser's vaccination/birth numbers would seem to support this assertion; after the epidemic of 1871-2, vaccinations/births tumbled from the panicked 105% to 60% in 1880 to 3% in 1890. This decline in vaccinations would appear to correlate with the introduction of the Leicester Method, but for one measure that Fraser did not consider: the penalties for non-compliance were significantly reduced just before the Method was introduced. It suddenly became less expensive to be an ardent anti-vaccinationist.

William Henry Maskell had been the Leicester Union's Vaccination Officer since 1868.[36] He was not only responsible for providing free vaccinations, but also for prosecuting those parents who were non-compliant. Maskell contended that the watershed year for non-compliance was 1876 rather than 1877. In 1876 some members of the Board of Guardians, whom Maskell called a deputation, went to the borough

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[35] Fraser, "Leicester and Smallpox," 315. The characterizations that Fraser disputes can be found in Jack Simmons, Leicester: Past and Present vol. 2 Modern City 1860-1974, (London: Eyre Methuen, 1974), 17-19, and R.A. McKinley and C.T. Smith, "Social and Administrative History," in The Victoria History of the Counties of England, A History of the County of Leicestershire IV, (London: Oxford University Press, 1958), 251-302.

[36] LC, 17 March 1883. Biggs contended that Maskell was hired in 1872, see Biggs, Leicester: Sanitation Versus Vaccination, 164.

magistrates to advocate a reduction in the twenty shilling fine to the ten shillings that Taylor had proposed for the stamp.[37] The magistrates introduced the ten shilling fine by September, 1876. After March of 1877 the twenty shilling fine was never again imposed.[38] Maskell served 138 summonses in 1876 as compared with 54 in 1875, a 156% increase. In 1877 the number of summonses increased by another 48% as the ten shilling/seven day penalty fully replaced the twenty shilling/fourteen day penalty. In fairness to Fraser, I should mention that the vaccination/birth ratio rose to 75% in 1877 and would never again be that high.[39] But, Maskell was in a position to know to what extent and why Leicester's working class population resisted compulsory vaccination. It was his opinion that the reduction of penalties in 1876 coupled with an increasingly anti-vaccinationist Board of Guardians greatly exacerbated the trend toward non-compliance in Leicester.

It would beg the question to argue that anti-vaccinationism became a political force in Leicester only after such candidates were elected to the town council or the Board of Guardians on an anti-vaccinationist platform. Bill Lancaster argues that the first local politician to exploit the issue in a

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[37] LC, 25 September 1880.
[38] See the table in Biggs, Leicester: Sanitation Versus Vaccination, 103-105.
[39] LC, 25 September 1880, Fraser, "Leicester and Smallpox," 328.

campaign was a Conservative in a race for town council.[40] Such an eventuality would surely be an anomaly in Leicester were it not for the power that the anti-vaccinationist movement could mobilize in the town by the 1880s. Nonetheless, it should be recognized that there were anti-vaccinationist Liberals already in office by the time that elections came to be decided upon the issue.

In Maskell's 1880 complaint to the Board of Guardians, he accused several of the Guardians of fanning the anti-vaccinationist flames by attending their rallies. Guardian Lennard replied that he was perfectly within his rights to attend such meetings and Guardian Wright said that as for himself he had not attended too many; Wright added that a "paid official" such as Maskell had no right to criticize his employers. Maskell argued that in his thirty-eight years of public service he had "never come into contact with the amount of antagonism that he had met with in this [anti-vaccination] situation."[41] Yet in 1880 pro-vaccination forces still represented a majority of the Guardians and the town council. The Leicester Union Guardians had been among the nation's most industrious in enforcing compulsory vaccination since the 1867 Act. Britain's first gaoled anti-vaccinationist, William Johnson, was prosecuted in Leicester.[42]

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[40] Lancaster, Radicalism, Cooperation and Socialism, 83. Lancaster may be referring to the 1882 East St. Mary's race discussed below, but it is unclear from his citation.
[41] LC, 25 September 1880.
[42] Biggs, Leicester: Sanitation Versus Vaccination, 116 .

Disraeli's Home Secretary, Richard Cross, once complained that Leicester's magistrates were "'guilty of a petty abuse of power,'" by enforcing penalties with "unusual severity."[43] It has also been advanced that the sixty-four (or sixty-one, according to Dale-L. Ross) parents who eventually were gaoled in Leicester amounted to more than any community in Britain.[44] Again it would appear that the penalties for non-compliance may have been more intimately related to public sentiment about vaccination than was the introduction of the Leicester Method. This sentiment translated to hostility when enforcement was at its harshest (from 1869 to 1884) and to widespread non-compliance when penalties were reduced.

Poor Law Guardians, and one third of the town council, were elected annually until 1883 when Guardian elections became triennial. Anti-vaccinationist J.T. Biggs identified the East St. Mary's Ward election of 1882 as "[o]ne of the earliest municipal contests where the subject was brought into prominence."[45] In this campaign the Conservative candidate and ardent anti-vaccinationist, Mr. Hughes, had switched parties in order to challenge the Liberals, Dr. Lankester and Mr. Walker, whom he considered to be too equivocal on the issue. A campaign "poster that was

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[43] Richard Cross, quoted in MacLeod, "Law, Medicine and Public Opinion," 195, and MacLeod, ibid.
[44] Biggs, Leicester: Sanitation Versus Vaccination, 77.
[45] Ibid., 82.

placarded all over the Ward" urged Liberals to "'lay aside party for principle.'"[46] To reassure voters in the ward the poster argued that, "'[t]here is no political crisis in this contest for the Liberal Party. If they lose [these] seats, they still retain their great majority in the Council.'"[47] Mr. Hughes won his seat on the town council. The Guardians' elections in the following year would prove to be something of a referendum on the vaccination issue.[48]

A significant occurrence in the anti-vaccination movement might well have influenced all local elections after 1881. The sitting MP for Leicester, P.A. Taylor, amended his previous position on vaccination and became the de facto leader of Britain's anti-vaccination movement.[49] Whether Taylor became the champion of anti-vaccinationism through a thorough study of the issue as he claimed or whether it was the result of his acute political barometer cannot be proven. What is clear is that, by 1881, Taylor, more than Amos Booth, George Bernard Shaw, or even the Rev. Hume-Rothery, was the national leader of the anti-vaccination movement. The Unitarian Taylor, the "Dean of [the] Radical Wing of [the] Liberal Party," began to be the primary financial supporter of the

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[46] "An Anti-Vaccinator," quoted in ibid., 83.
[47] Ibid.
[48] See in particular, Dr. Lakin's comments, LC, 3 March 1883.
[49] P.A. Taylor, "Vaccination. A Letter to Dr. W.B. Carpenter, C.B.," (1881), LRO Pamphlets, vol. 67.

London Society for the Abolition of Compulsory Vaccination in 1881.[50] Indeed it could be argued that the Society might have been unable to function without his frequent two hundred and fifty pound contributions. This Society pushed for complete repeal of the laws rather than the reduction of penalties that had been the stated aim of the National Anti-Compulsory Vaccination League. In 1881, Taylor argued that

> the general faith in vaccination amongst the middle and upper classes is their firm belief that the medical profession...are almost unanimously convinced by their personal experience of the protection afforded by vaccination....[but,] it is clear that the enormous proportion of the profession have neither time, opportunity, nor inclination for the real scientific examination of the results of vaccination.[51]

Biggs believed the Board of Guardians' elections of 1883 to be a monumental victory by returning a majority of anti-vaccinationists. He argued that the majority of candidates elected had pledged to be anti-vaccinationist and had been supported for that reason, but some later reneged.[52] The critical vote on prosecutions ended in a tie, but the pro-vaccination forces roused the Chairman of the Board from his sickbed in order to cast the deciding vote in favor of prosecution. I would suggest

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[50] MacLeod, "Law, Medicine and Public Opinion," 191 and n. 95.

that the number of parents awaiting prosecution grew to unprecedented levels, several thousands of parents, because of the perceived victory in the 1883 elections. Local vindication of the anti-vaccination cause appeared to be at hand. It might well have appeared that anti-vaccinationism had triumphed in Leicester, for the Guardians decided that Mr. Maskell should receive an annual stipend of ninety pounds rather than the 6d. per vaccination that he had been hired upon, as he now spent more time pursuing those in default than he did vaccinating those in compliance.[53] The effect of changing penalties and changing leadership upon non-compliance in Leicester should not be assigned to Johnston's Method, although anti-vaccinationists did advocate the Method as an alternative to vaccination.[54] Biggs argued that anti-vaccinationism had won the day in Leicester in 1883. There is merit in his argument; the narrow margin that held for prosecution in 1883 had fallen apart well before the next election and after 1884 no prosecutions for non-compliance took place in Leicester.[55]

In 1883 Johnston, for several years Leicester's chief MOH, recommended the extension of the Leicester Method to all of Britain based

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[51] Taylor, "Vaccination. A Letter," 31-32.
[52] Biggs, Leicester: Sanitation Versus Vaccination, 150-152.
[53] LC, 17 March 1883.
[54] See for example, Biggs' comments in LC, 10 March 1883.
[55] Biggs, Leicester: Sanitation Versus Vaccination, 105.

on its local success.[56] In 1883 Taylor brought anti-vaccinationism to the floor of the House of Commons. Biggs would later argue that the ambivalence of the Guardians in 1883 was the result of Taylor's utter failure to persuade the Commons toward repeal.[57] Taylor's measure, supported by Jacob Bright and C. Hopwood among others, secured the votes of but 18 of the 652 MPs.[58] Yet Taylor's comments in the debate surrounding his proposed measure are revealing in two ways: one historiographical, the other historical.

First, Taylor argued that the medical profession was reticent to tell what it knew about the efficacy of vaccination. In an earlier document he termed this a "conspiracy of silence...[that was] avowed and defended by the Lancet."[59] By 1883, Taylor argued "that the fallacies and falsehoods by which vaccination is upheld is the work of some dozen fanatics, whose whole function consists in upholding a crumbling superstition."[60] In his 1881 letter to W.B. Carpenter, Taylor had maintained that most doctors were simply too busy to apprise themselves of vaccination data and therefore followed the orthodox "Jennerian" line. In 1883, Taylor extended this argument to include the MPs who relied upon the "dozen

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[56] William Johnston, MOH 1883, 32. LRO 20 D 72/4.
[57] Biggs, Leicester: Sanitation Versus Vaccination, 104.
[58] "Speeches of Mr. P.A. Taylor and Mr. C.H. Hopwood on Vaccination. In the House of Commons, June 19th, 1883," (1883), 41. LRO Pamphlets vol. 67.
[59] Taylor, "Vaccination. A Letter," 4.
[60] "Speeches," 13.

fanatics." Historian R.M. MacLeod somehow fitted this argument with the silence of the British Medical Association to conclude that the medical profession and the central government refused to engage in the vaccination debate.[61] This is patently untrue with regard to the medical profession[62] and unlikely with regard to the Local Government Board.[63] Yet, MacLeod's interpretation has been accepted by many historians.

Taylor's 1883 speech in the Commons also raises the question of who the anti-vaccinationists were. Clearly a diverse group represented their interests at elections. As mentioned above, a Conservative was elected to the town council on this single issue, yet the quintessential radical, Taylor, had little trouble being returned to Parliament. By 1883, Taylor had decided that the penalties for non-compliance were thoroughly class based. He argued that the working classes suffered most heavily because the ten shilling fine was insignificant to the middle and upper classes.[64]

I have argued that the anti-vaccinationists were diverse in both religious affiliation and political party. Neither non-conformity nor Liberalism provide sufficient explanations for the breadth of anti-vaccinationist sentiment in Leicester. Moreover, social class does not

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[61] MacLeod, "Law Medicine and Public Opinion," 197.
[62] See the arguments for vaccination in the Lancet, 10 February 1883, 248; 27 June 1885, 1183; 5 September 1885, 451; 3 October 1885, 625; 17 October 1885, 738; 29 May 1886, 1036; and many others.
[63] For example, see LC, 25 October 1884.
[64] "Speeches," 41. See also LC, 25 September 1880.

suffice as a predictor of resistance. It is often advanced that the working class and the middle class resisted for different reasons, the working class because of the fear that vaccination caused disease and the middle class because of the central government's intrusion into private life. Before accepting that scenario contemporary evidence should be considered. But, evidence from the rank and file anti-vaccinationists is indeed hard to come by as attitudes or explanations usually were offered by only the most vocal. Nonetheless, some inferences can be drawn about the composition of, and rationale for, anti-vaccinationism.

As mentioned above, the Unitarian missionary to the poor of Leicester, Joseph Dare, considered early anti-vaccinationism to be a working class phenomenon that was encouraged by medical fringe practitioners and individual perceptions that disease had been spread by vaccination. Neither of these factors can be considered as peculiar to the working class. Practitioners on the medical fringe, hydropaths, homeopaths, and others, cannot be characterized as appealing primarily to the working class. Rather it might have been that the working class were a minority of their patients.[65] The idea that vaccination spread disease was also embraced by

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[65] For example, see Adrian Desmond and James Moore, Darwin: The Life of a Tormented Evolutionist (New York: Warner Books, 1992), 374.

many members of the middle class.[66] Likewise it cannot be assumed that the middle class and small shopkeepers were the only people who objected to the interventionist public health measures of the central government,[67] although the working class witnesses from Leicester before the Royal Commission in 1891 mentioned only the spread of disease as a motive for resistance.[68]

Anti-vaccinationist J.T. Biggs argued that the middle and upper classes in Leicester eschewed vaccination more rapidly and completely than did the working class. His argument was based on a comparison of the drop in vaccinations performed by the Vaccination Officer and private physicians. Biggs assumed that vaccinations performed by the Vaccination Officer, Mr. Maskell, represented working class vaccinations and those performed by private doctors represented middle or upper class vaccinations. These statistics showed that from 1876 to 1886, annual public vaccinations had dropped from 2,188 to 559, or 75%, while private vaccinations had dropped from 1,462 to 39, or 97%. Biggs concluded "that the intelligent middle and upper classes of Leicester have abandoned the practice to a

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[66] See the testimony of the Leicester witness to the Royal Commission presented in Biggs, Leicester: Sanitation Versus Vaccination, 155-172, and especially Biggs' own views, 570-573.
[67] Anthony S. Wohl, Endangered Lives: Public Health in Victorian Britain, (Cambridge, Mass.: Harvard University Press, 1983), 170-171, 188.
[68] Biggs, Leicester: Sanitation Versus Vaccination, 155-172.

greater extent even than the working classes."[69] While Biggs' assertion might be accurate, it might be contested on statistical grounds as well as the dubious assumption that intelligence was class based. One very intelligent man, MOH Henry Tomkins, merely countered the argument by denying that educated and well-to-do people had abandoned the practice.[70] Such a simple style of argumentation was uncharacteristic of Tomkins, but he had clearly become exasperated with Leicester's anti-vaccinationists since he was hired as the borough's MOH in 1885. Similar impressionistic characterizations would also be used to describe working class anti-vaccinationists.

Mr. Maskell, who encountered more vaccination opposition than any magistrate or Guardian, wrote to the Local Government Board that "he found the greatest objection to vaccination among the lowest classes - [especially] 'shoe hands.'"[71] Leicester had once been virtually synonymous with the hosiery trade, but after mid-century boot and shoe manufacturing assumed an increasingly important role in the town's economy.[72]At some points in the Victorian period as many as 41% of Leicester's reported jobs were in the footwear industry, though the industry was itself diversified among factories, workshops, and outwork.

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[69] J.T. Biggs, "Vaccination and Smallpox in Leicester During the Years 1867-1886," (1887, unpaginated), LRO Pamphlets vol. 36.
[70] Henry Tomkins, MOH 1887, 13-17. LRO 20 D 72/5.
[71] LC, 16 August 1884.

Maskell had been a Metropolitan policeman for many years before coming to Leicester, yet maintained that he had never come across "a more disreputable lot than the shoehands of Leicester who opposed this vaccination."[73] G.H. Ellingworth confirmed that of the twenty-one parents gaoled between October, 1883 and September, 1884, most were indeed shoehands, but questioned what Maskell expected in Leicester: "colliers or shipbuilders?"[74]

Maskell's dim view of the anti-vaccinationists was challenged by some of the Guardians. The "agent" to Leicester's Anti-Vaccination League said that the "disreputable" class would sooner submit their children to vaccination than face the ten shilling fine; his visits to the homes of working class anti-vaccinationists proved to him that they were largely hard-working and sober.[75] Guardian Leeson suggested that the anti-vaccinationists were the most intelligent members of the working classes. Moreover, Leeson cited Alderman Stratton as one magistrate who had determined that the resisters who appeared before him were "decent" and "hard-working."[76] Historian Dale-L. Ross supports this position, at least with regard to Leicester's martyrs, and argues that of the sixty-one gaoled (Biggs lists sixty-four), between 1869 and 1884, most had chosen gaol

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[72] For particulars see Lancaster, Radicalism, Cooperation and Socialism, 24-46.
[73] LC Supplement, 23 August 1884.
[74] LC, 16 August 1884.
[75] Ibid.

rather than pay the fine.[77] Ross' implication, of course, is that the martyrs had ten shillings to spend, or seven days to spend idle, on this matter of principle.

It would be very difficult to extend Ross' position to cover the whole of Leicester's anti-vaccinationists, but in a few cases the behavior of the Guardians sheds a little light. The anti-vaccinationists among the Guardians, and the anti-vaccinationist leadership in general, repeatedly encouraged martyrdom and celebrated the martyrs upon their release. At one of these meetings, J. Lunn termed it a "high honour" to be incarcerated for the cause and M.H. Bunton said that to be a martyr took a "moral courage superior" to that of paying the fine. The five martyrs being celebrated each took the podium to impart "amusing stories" of their time in gaol. Moreover, those present collected forty-two shillings for the benefit of martyrs.[78] In another situation a father in poor health failed to appear before a magistrate to answer his summons and was sentenced in absentia. He was taken to gaol, but his wife paid the fine the next day and effected his release. J.T. Biggs brought the matter to the attention of the Guardians at their next meeting and the Guardians themselves put together enough money to reimburse and reward the couple.[79] These activities of

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[76] LC Supplement, 23 August 1884.
[77] Ross, "Leicester and the Anti-Vaccination Movement," 37.
[78] LC, 2 February 1884.
[79] LC, 5 January 1884.

the Guardians not only reflected the strength of anti-vaccinationism in Leicester, but reinforced it. If, as Leeson had said, the Guardians considered the anti-vaccinationists to be the most intelligent members of the working class and if, as Bill Lancaster has argued, middle class and working class political agendas remained similar in this period, non-compliance with the Vaccination Act could be interpreted as a sign of working class respectability, despite Maskell's derogation of the resisters. To the extent that martyrs were feted and to the extent that resisters were remunerated by the Guardians and others, it becomes less important to know the actual income levels of the anti-vaccinationists and more important to consider their aspirations. This would be a desirable, if daunting, topic for further research.

The leaders of Leicester anti-vaccinationism are less opaque than the rank and file, yet some ambiguities remain. Many leaders have been mentioned above, but I shall say more here. Bill Lancaster cites the working class martyr Charles Eagle and elastic web manufacturer Michael Wright as the movement's leaders.[80] There might be some truth in Lancaster's assertion as to the origin of the movement, but some skepticism is appropriate because his source, the autobiography of a

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[80] Lancaster, Radicalism, Cooperation and Socialism, 83.

secularist, selects these two secularists and no others.[81] Subsequent leaders are less ambiguous and less likely to be characterized as members of the working class. Engineer J.T. Biggs joined the local league as secretary in 1870 and later became a Guardian and a Councilor. Amos Booth had the resources to traverse throughout the country speaking on behalf of anti-vaccinationists.[82] William Lakin was a physician, as was latecomer Henry Lankester. Joseph Leeson and James Leavesly, both Guardians and Councilors, were footwear manufacturers. The Rev.'s Albert Smith, Robert Caven, and J. Page Hopps, were Anglican, Baptist, and Unitarian respectively. Charles Lunn was a hosier and Thomas Wright was a solicitor, alderman, and twice the mayor. Charles Eagle was still active in 1891, but his words went largely unnoticed in the press.[83] By the 1880s anti-vaccinationism in Leicester had become a dominion of the middle class, but the minions and the martyrs were still working class.

The "Great Leicester Demonstration" against vaccination in 1885 has been adequately explored in previous studies and the details need not be recapitulated here.[84] Nonetheless, nuances and numbers deserve mention. From retirement, P.A. Taylor sent encouragement; forty or fifty other

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[81] Ibid. This source is F.M. Gould, The Life Story of a Humanist (1923). Eagle did continue to play a role in the movement throughout the period.
[82] Biggs, Leicester: Sanitation Versus Vaccination, 81.
[83] Ibid., 156-170.

towns sent delegations; historian Christopher Charlton writes that between eighty and one hundred thousand people took part in the demonstration. It was a mark of anti-vaccination agitation in Leicester that no violence took place in any meeting or demonstration. Despite parades that featured symbolic lynchings and graphic displays of doctors as demons, there were no reports of injury or damage in 1885, 1876, or at any other anti-vaccinationist event. By 1885 the Leicester Method was a cornerstone of the anti-vaccinationist argument; Leicester's Method had so far been successful in containing almost all "importations" of the disease. The "Great Demonstration of 1885" brought more attention to anti-vaccinationism, and Leicester's role in it, than any previous event; the Times covered the demonstration and the Lancet was subsequently moved to send a special commissioner to investigate the situation in Leicester. Though a direct link cannot be established, the demonstration in 1885 blazed a trail that would arrive at the Royal Commission on the Vaccination Laws that began in 1889.

The path to the Royal Commission was not smooth. The Lancet, the Local Government Board, and Leicester's Board of Guardians engaged in heated and frequent debate about the merits of the Method and the possibility of epidemic. In Parliament, Taylor's successor,

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[84] See especially Charlton, "The Fight Against Vaccination." Although the 1885

Congregationalist minister J.A. Picton, continued to press for reform or repeal. The Royal Commission would begin work in 1889, hear the Leicester delegation in 1891, and present its findings in 1897. The result of the Commission was an amendment to the Vaccination Law that permitted parents to declare themselves to be conscientious objectors and escape prosecution. Staunch anti-vaccinationists such as J.T. Biggs were not satisfied by anything short of repeal, but the controversy became much quieter as many Leicester parents availed themselves of the conscientious objector clause.

There is one postscript to the anti-vaccination story in Leicester. A smallpox epidemic coursed through Britain in 1892-93. Advocates of the Method and anti-vaccinationists in general were pleased to report only 357 cases and 21 deaths from the disease. On a sadder note, of the cases that occurred in Leicester, 66.6% of the victims were under ten years of age. This percentage of cases in children under ten, in a town which had been almost completely unvaccinated for a decade, was between two and three times as high as in towns that did not abandon vaccination.[85]

Perhaps no other political issue attracted such broad and diverse support in Victorian Leicester as did anti-vaccinationism. It would appear

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demonstration was on a far grander scale, the messages were not different from the 1876 demonstration.

[85] Fraser, "Leicester and Smallpox," 321-322, and n. 28.

that the combination of interests that comprised the anti-vaccination movement did not coalesce on other issues. Though the vaccination of infants remained compulsory in Britain until the 1940s, the anti-vaccinationists of Leicester could claim political success because of the appointment of the Royal Commission and the resultant conscientious objector amendment. There is irony in the "triumph" of the anti-vaccinationists; their success was due to their dogged allegiance to a muddled and incorrect theory of disease, yet the Method that came to symbolize an alternative to vaccination eventually became such a critical adjunct to vaccination that the world would not now be rid of smallpox without it.

8. Conclusion

Leicester's awkward position in Victorian public health provides researchers with a unique blend of activity and passivity in response to health problems. This checkered past illustrates that the history of public health is a history of trial and error rather than the history of "progress" by design. The story of Leicester in the nineteenth century provides examples of advances and reversals, pioneering and complacency. Sometimes the pioneers were wrong; sometimes reformers could not overcome inertia. Nonetheless, the Victorian borough was a crucible where contemporary medical thought, "sanitary science," political economy, and public opinion were forged together to produce diverse responses to public health problems. No knowledgeable historian would argue that Leicester was typical among English towns as its leaders, their agents, and the citizens addressed the pressing health issues of the second half of the nineteenth century. In many ways Leicester was unique. But the history of public health in Leicester from 1849 to 1891 is more than a story of an odd Victorian borough; it is a story of life and, all too often, death.

The singular determination of one civic leader, Joseph Whetstone, led the borough of Leicester to pioneer a mid-century sewage system; the irony is that his efforts might have placed the borough behind the curve in implementing effective sewerage. Whetstone was ahead of his time. He defied what has been termed the "civic gospel" of improvement by insisting that municipal sewerage take precedence over municipal grandeur. Following Whetstone's

leadership, the borough poured tens of thousands of pounds into a drainage system that later backed up sewage into the homes of residents who lived in the town's low-lying areas. Though he had the best of intentions, the Wicksteed system that Whetstone fought for failed. Whetstone did not survive the Wicksteed system and his successors on the town council proved themselves weaker than this "strong shouldered" man. Whetstone was indeed ahead of his time; his expensive failure led the town council to resist improvements until a court injunction forced them to revamp the system.

Joseph Whetstone was also an early advocate of a piped water supply for Leicester, but in this case he was not quite early enough. Private profit literally took precedence over public health. By its earlier incorporation the Leicester Waterworks Company established itself as the sole legal supplier of piped water to the borough. So Whetstone's town council, in order to assure that there would be a piped water supply, guaranteed a stream of profits to the Waterworks Company's investors. The profit-driven Company faced competition only from urban well water, and the wells became increasingly polluted during the Victorian period. By its rules and rate structures the Company showed favoritism toward industry and well-to-do residential customers over the less affluent residents and municipal sanitation projects. By its refusal to supply water to those residents who wished to use Company water merely to flush water closets, the Company probably inhibited public health improvements. Though such potential health benefits can not be measured, we can reasonably imagine that the incidence of typhoid fever

could have been reduced by the presence of more water closets in Leicester at an earlier time. Moreover more children might have survived the threat of summer diarrhoea had excrement been more universally flushed away rather than collected in insect-breeding havens. The piped water supply from the Company probably provided health benefits to its consumers; it certainly benefited the investors. Although the municipal takeover of the Waterworks Company in the 1870s remains an somewhat mysterious, the period of the private, profit-oriented Company shows that public health took a back seat to profits.

Typhoid fever was effectively diminished in Leicester by clean water and the efficient removal of sewage, the cornerstones of Chadwickian sanitation but, irony was again part of the story. This filth disease was prevalent in Leicester but not more so than in other British towns. Once a poorly understood fact of life, this endemic disease became a cause celebre after it claimed the life of Prince Albert in 1861 and nearly claimed that of Crown Prince Edward in 1871. Leicester's public health authorities attempted to diminish typhoid fever by relying on misguided theories of disease causation that, in this case, did no harm. While Dr. J.Wyatt Crane was Leicester's Medical Officer of Health (MOH), he was often satisfied, or possibly relieved, that the borough was not unusual among British towns because of typhoid fever mortality. The borough's sanitary inspectors and Crane's successors in the MOH position were not so complacent. Inspectors Buxton and Braley, and MOHs Johnston and Tomkins, closed polluted wells and forced

residential proprietors to improve sanitary conditions. The town council aided these health authorities' endeavors by obtaining parliamentary approval for the local Compulsory Notification of Diseases Act in 1879.

The value of compulsory notification was more clearly and again ironically, shown in combating scarlet fever mortality rather than that of typhoid. Scarlet fever is not a filth disease as is typhoid fever. Nonetheless, amalgamating pythogenic disease theory with germ theory led toward the reduction of scarlet fever mortality. Like typhoid fever mortality, Leicester was not notorious among British towns for its scarlet fever mortality. In hindsight, Leicester was remarkable for its success against this disease that claimed the lives of many British children. Scarlet fever was endemic in nineteenth century Britain, but occasionally flared to epidemics. Crucially, and unlike typhoid fever, scarlet fever can be airborne. Not surprisingly then, scarlet fever presented danger in school settings because of the proximity of infected children to other children who had no immunity. Still, Leicester's health authorities made great strides toward reducing scarlet fever mortality even while incubation times and contagious periods were poorly understood. The borough's private parliamentary Act of Compulsory Notification, in 1879, forced all health providers in the borough to report cases of certain diseases to the borough's Medical Officer of Health. Scarlet fever was among these enumerated diseases. Leicester's MOHs, Johnston and Tomkins, would then send inspectors to the homes where scarlet fever had been reported, or visit the houses themselves. Moreover these MOHs took pains to warn

schoolmasters of scarlet fever symptoms. With a rudimentary understanding of the contagious nature of scarlet fever, the borough's health authorities would then urge the parents of scarlet fever victims to allow stricken children to be removed to the borough's fever hospital. This was an imperfect system; no child could be taken to the fever hospital without the parents' permission and the fever hospital was itself periodically overrun by smallpox patients. Yet the system demonstrably worked between 1879 and 1889.

Ultimately, this did not mean that "progress" was assured. Despite the ultimately measurable success of this public health measure it was at the level of trial and error at its inception in 1879. Though working class parents accepted the system, its effectiveness had peaked by 1889. Middle class parents refused to allow their children suffer the indignities of the fever hospital so scarlet fever mortality plateaued. The value of this interventionist strategy has been overlooked in the historiography of scarlet fever. The eminent historian of public health in London, Anne Hardy, could not have been aware of Leicester's success with scarlet fever mortality because she did not have the relevant data. She explained Leicester's unusually low rate of scarlet fever mortality in 1889 by inferring decreased virulence of the disease-causing agent. I accept the notion that scarlet fever decreased in virulence over time. But given the strong evidence that scarlet fever mortality decreased in Leicester from 1879 to 1889, during the very same period that compulsory notification was initiated in Leicester and ending when only the

middle class refused to have their children isolated, I believe that Hardy misinterpreted the limited information that she had. Hardy argues that the decreased virulence of scarlet fever originated in Leicester and Nottingham; this is true, but Leicester and Nottingham both had the powers of compulsory notification well before 1889 when London, the focus of her detailed study, first gained compulsory notification powers.

Anne Hardy detours around summer diarrhoea in her book The Epidemic Streets, but summer diarrhoea cannot be avoided in a study of nineteenth century public health in Leicester. This "disease's" etiology proved completely opaque to health professionals throughout the nineteenth century. Yet Victorian society was a record-keeping society and all the statistics indicated that Leicester perennially had the nation's highest rate of infant mortality. Most of that infant mortality was directly attributed to summer diarrhoea. Given the medical profession's inability to explain or ameliorate the "disease," the profession merely pointed an accusing finger at the borough where infants were most likely to die. This condemnation came from the medical journal, the Lancet, and was echoed by the health officials of the central government and Leicester's own Liberal newspaper, the Chronicle. The town council and its MOH, J. Wyatt Crane, were largely fatalistic about this "disease." When Crane posited his theory that "simple heat" caused summer diarrhoea, the councilors did not take the explanation seriously but remained unwilling to devote substantial sums of taxpayers' money to uncover a more reasonable explanation. Town leaders explicitly bowed to

external pressure to investigate its causes but did so on the cheap. I believe that the leaders' complacent posture can best be explained by recognizing that this was a class-based "disease." Working class parents saw their babies die in alarming numbers. Middle class leaders could afford complacency; their children did not die. When investigations pointed toward shoddy housing and backed-up sewage as causative agents nothing was done. Improvements would have been very expensive. By the turn of the twentieth century, summer diarrhoea mortality in Leicester was declining. Was this due to the new Gordon sewerage system? Was this related to more widespread use of water closets in the 1890s? Was this due to the introduction of supervised day-care for working mothers and milk depots in the 1880s and 1890s? Was the diminution of summer diarrhoea merely a consequence of diminishing horse traffic and dung in the borough as automobiles replaced horses in the twentieth century? Did all these factors combine to reduce insect vectors of disease by the twentieth century? We do not know. We do know that infants with diarrheal symptoms need treatment with re-hydrating agents rather than purgatives or opiates, but that does not explain why Leicester was particularly susceptible to summer diarrhoea mortality. We know that many mothers in Leicester worked outside the home, but that does not explain the "excess" summer diarrhoea mortality in Victorian Leicester.[1] Was there one disease at the root of the "disease" known as summer diarrhoea in Victorian Leicester?

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[1] See Anthony S. Wohl, Endangered Lives: Public Health in Victorian Britain (Cambridge, Mass.: Harvard University Press, 1983), 26-32.

We might not know today why so many babies died in nineteenth century Leicester, but the answer might come in the near future.

The answer to the world's smallpox problem seemed to be finalized in the 1970s and it had a clear connection to Victorian Leicester. The "Leicester Method" was to identify and isolate smallpox victims at the same time that the general public was being vaccinated; this formed the basis for the World Health Organization's eradication of smallpox some three decades ago. Yet the effort to deal with smallpox had a bizarre history in Leicester. Edward Jenner published his findings on smallpox vaccination as early as 1798 and by the 1860s Leicester was what some contemporaries called a "well-vaccinated town." Every MOH in Leicester, including William Johnston who founded the "Leicester Method," supported wholesale vaccination of the population. Yet once more, public health "progress" could be thwarted and indeed reversed. When the central government made the vaccination of children compulsory, some of Leicester's residents rebelled and formed an anti-vaccination movement. Its middle class leaders complained about the coercive powers of the central government and the prevailing "medical establishment." When parliament introduced significant fines for parents who refused to have their children vaccinated, Leicester's middle class anti-vaccinationists only became more vocal. They identified and celebrated working class "martyrs" to the cause. While middle class leaders such as Amos Burke feted such martyrs with parades against "medical tyranny," ordinary people simply recognized that vaccination did not confer the

promised lifelong immunity from the disease and had the potential to introduce other diseases. Burke and his eccentric cronies, such as J.T. Biggs and the Baptist Rev. Hume-Rothery, led a charge against the central government's role in public health. Due to anti-vaccinationist pressure, the financial penalty for refusing to have a child vaccinated was halved in 1877. Once the penalty was reduced, Leicester's working class parents refused, en masse, to have their children vaccinated. Only then did Leicester become the anti-vaccination capital of Britain.

William Johnston's "Leicester Method" followed soon on the heels of the government's reduction of penalties. The chronological proximity between the reduction of fines and the introduction of the Leicester Method has caused confusion. Johnston never proposed identification and isolation of smallpox victims as an alternative to vaccination. Yet later anti-vaccinationist rhetoric posited part of the Leicester Method, isolation, as a rational alternative to vaccination. Should we then assume that the majority of Leicester's parents read Johnston's "Zymotic Report," accepted the isolation part of the Method, and rejected the vaccination part? Historians such as S.M.F. Fraser, Dorothy Porter, and Roy Porter, have taken the position that the Method explained the near-universal refusal of Leicester's parents to have their children vaccinated. I believe that the evidence indicates otherwise. When the penalty for non-compliance became affordable many parents simply chose to pay the fine rather than expose their children to what they perceived to be the dangers of vaccination. Such decisions were as rational as reliance upon the Leicester

Method of isolation. Yet the existence of Johnston's Method provided wonderful rhetorical fodder for the leaders of the anti-vaccination movement. The anti-vaccinationists focused upon what Peter Baldwin would term the "neo-quarantinism" of victim isolation,[2] but Johnston himself believed in universal vaccination in addition to victim isolation. It was Johnston's complete program that enabled the WHO to eradicate smallpox from humankind.

Still, the smallpox virus survives. Vaccination became optional in Britain a century ago; it is not widely practiced anywhere in the twenty-first century. But smallpox is a threat in the twenty-first century as a potential weapon of mass destruction. A smallpox-laden bomb or missile might be very unlikely, but a less dramatic release of the virus into an unvaccinated population could have devastating results. Universal vaccination as a preventive measure would also bring unwanted results. A tiny fraction of those vaccinated, even under optimal hygienic conditions, would succumb to the disease. So in an imperfect world, if smallpox is re-introduced into twenty-first century populations William Johnston's nineteenth century Leicester Method, in its complete form, might be our best defense against this historical scourge of humankind.

Thus I argue with alacrity, the study of public health in Victorian Leicester remains relevant. Not all of the problems and responses that arose in the

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[2] Baldwin acknowledges that the anti-vaccinators would have been loathe to use this term, but he also terms the Method as the "acme of antivaccination...institutionalized." Peter Baldwin,

nineteenth century borough suggest a blueprint for the twenty-first century. Many do not. But understanding the messy processes that influenced and limited public health initiatives is very relevant. In Victorian Leicester such factors included medical knowledge, political leadership, public opinion, and cost. The way that these factors mixed varied by context; the most consistent factor in Leicester's nineteenth century public health was that deductive logic was irrelevant.

The state of medical knowledge at any given time might superficially appear to be gradually developing and universally disseminated among professionals in the field, but such has not been the historical case. Occasionally new developments have been serendipitous, but more often developments have come in response to specific problems. So the first step in changing the state of medical knowledge was usually the identification of a circumstance as a problem. The mere existence of a health-threatening condition did not lead directly to efforts to ameliorate the condition. Rather other considerations, such as whose health was threatened, how many were threatened, and how severe the threat was to victims, all played a role in the definition of a circumstance or condition as a problem. Moreover new medical conceptions, which with hindsight appear "cutting-edge," were not necessarily or readily accepted by all medical professionals. One need only compare the thinking of J. Wyatt Crane with his contemporaries Pasteur and Lister, to see that not all doctors followed the leading lights. And it was J.

Contagion and the State in Europe, 1830-1930 (Cambridge: Cambridge University Press, 1999),

Wyatt Crane rather than Louis Pasteur who was advising Leicester's political leaders.

Fortunately or unfortunately, political leaders have had a profound influence on public health policies and consequently on the public's health. Most politicians of course seek to placate constituencies, but Joseph Whetstone was different. Whetstone might have been altruistic and something of a visionary; had his desires translated directly into realities he might be considered a hero. He did try to save lives, but the contemporary level of knowledge and contemporary legalities impeded his vision. When Joseph Whetstone passed from the scene in Leicester, no one else with such "strong shoulders" replaced him. Thereafter most public health policies in the borough of Leicester were guided not by visionaries, but by the purse and public opinion.

The importance of public opinion on matters of public health should not be underestimated. Of course the public rarely spoke with one voice in the Victorian era, nor does it today. Various "publics" weighed in on public health issues in different ways and with different results. In nineteenth century Leicester the relevant publics ranged from investors in the Waterworks Company to the press, from the middle class alone to the borough's population as a whole. Public health issues were addressed in piecemeal fashion; they were defined as problems individually and each proposed remedy met with its own relevant public. Only rarely was a public

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290. Baldwin cites Fraser and Porter and Porter.

health issue shaped by the opinions of the borough's populace as a whole and we should view the anti-vaccination movement with some degree of cynicism because of its unbalanced leadership. Far more often than not, the public opinion that mattered was the opinion of that segment of the public who had wealth. Though the study of public health in Victorian Leicester reveals many things, perhaps none is more obvious than the connection between health and money.

The value of public health in Victorian Leicester was most often measured in pounds and shillings rather than in life or well-being. Sewerage was intended for profit. Fresh water was intended for profit. Typhoid fever was defined as a serious problem when wealthy people suffered from it. The effectiveness of scarlet fever intervention melted when middle class parents refused to have their children hospitalized under conditions that were beneath their station. Summer diarrhoea could be a laughing matter for the town council because only working class children died. The anti-vaccination movement was led by members of the middle class for abstract doctines rather than for the health of the general public. This dissertation shows that money and wealth were privileged determinants of public health responses in nineteenth century Leicester.

In this borough that might correctly be deemed "progressive," we have seen that working class infants' lives were marginalized by the paltry sum paid for the Buck-Franklin investigation into summer diarrhoea. We have seen Henry Tomkins' frustration with middle class priorities about scarlet

fever hospitalization. We have seen that the Waterworks Company refused to allow their product to be used in a way that was often recommended and truly might have decreased typhoid fever mortality. We have seen that the town council had to be forced by injunction to improve Whetsone's expensive failure with sewerage. And we have seen that single-issue middle class anti-vaccinationists sometimes turned the town into a circus for their own ends. The common thread throughout these disparate issues is that money talked and found a listening ear.

This study of Victorian Leicester has discovered three major findings about the study of public health. First, that public health history is complicated and inextricably connected to political history, social history, and cultural history. The borough passed from one equilibrium in 1849 to another equilibrium in 1891, but this passage did not occur by straight paths nor by parallel paths.

Second, that public health is a societal construction and the construction follows a pattern. First, a problem is defined. Second, a response is advocated. Third, the response is implemented. Fourth, people must cooperate with the response. Above all, the construction is complicated because there are a great many publics involved. In Victorian Leicester public health responses had great variation because of the number and different interests of the publics and because health issues were addressed in piecemeal fashion. Moreover responses were not necessarily ameliorative for the original problem.

Third, more local studies should be done to flesh out the complicated history of public health in nineteenth century Britain. It was largely at the local level that the drama of public health played out. Such studies, and indeed this study, are relevant to current public health issues.

Health for profit remains the paradigm. Some elements of public health, such as sewerage and fresh water, have been accepted largely as public responsibilities, but not without cost to consumers. They are not "rights" in twenty-first century parlance, but they are not typically profit-directed ventures either. Indeed there is no "right" to health. Ironically, HMOs (Health Maintenance Organizations) today have more say about people's health than did the MOHs of the nineteenth century. MOHs were concerned about expenses, they were employees of the town council, but they did not limit the way that money could be spent on health with the same power that HMOs can do today. Indeed MOHs and HMOs have one thing in common: an interest in health. But MOHs were concerned with public health, HMOs are concerned with individual health within the parameters of their profitability.

Throughout this dissertation some issues remain problematic beyond the level of medical knowledge and beyond the dissemination of medical knowledge. Public health issues remain in the realms of politics, economics, and public opinion. Many public health issues not currently defined as problems could be so defined. Malnutrition among children is one such issue; to the extent that ketchup was accepted as a vegetable in 1980s school lunch

programs, we can imagine laughter reminiscent of William Barfoot and Dr. Crane about summer diarrhoea in nineteenth century Leicester. Many other public health issues are clouded by politics and public opinion. For example, many people object to the widespread availability of condoms to prevent sexually transmitted diseases. Armed with the notion that condoms might prevent some communicable diseases, some people argue that such a preventive leads directly to promiscuity and this barrier to disease should be removed. William Johnston advocated and initiated what could be called a day-care for working mothers in nineteenth century Leicester, but in the twenty-first century a certain working woman tells millions of her radio listeners that mothers who work do irreparable harm to their children. So some public health issues have advanced very little in the last one hundred and fifty years. Working mothers continue to be targets for those with social agendas far beyond public health agendas, but the two have often been confused.

Indeed public health has ramifications for many aspects of society. All too often history is written without reference to public health. Histories continue to be written as though health and disease are matters of Providence. Yet politics, economics, and social change occur within the poles of health and disease. Disease can be, and has been, a limiting parameter to the possible. It remains so today. Moreover health remains in the realm of cost-effectiveness to the point that pounds or dollars are used to measure health and human life. Death and disease are uncomfortable subjects, but necessary parts of life. In

this dissertation I have tried to show the connection between the living and the dead. Moreover I want to show a connection between those who are alive, those who died, and those who will live on. Many thousands of people died in Victorian Leicester from what contemporaries called "zymotic" diseases. Sadly, many of these victims were children. Their families, in many cases lived on. A full rehearsal of public health in Victorian Leicester would show that those who had money were the least likely to see their children die. The borough, as a political body, came to care more about the middle class than it did about the working class. This might not be right, but it was real.

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