Performing State Medicine During its ‘Frustrating’ Years: Epidemiology and Bacteriology at the Local Government Board, 1870–1900

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Summary. This article is about the performance—referring to the projection and reception—of state medicine in late Victorian Britain. Moving away from the lens of the ideas and policies historians have previously explored, I focus on epidemiological and bacteriological investigations of typhoid fever as they were conducted through the Medical Department of the Local Government Board, during the period historian Roy MacLeod characterised as a ‘frustrating’ one in the history of state medicine. The article focuses on two late Victorian epidemiological investigations, Richard Thorne Thorne’s 1879 study of an outbreak of typhoid fever at Caterham, and H. Timbrell Bulstrode’s 1896 study of an outbreak of typhoid fever at Chichester, to demonstrate the complex ways that epidemiology was constructed and defended vis-à-vis the emergence of laboratory science during the so-called Bacteriological Revolution.

Keywords: Victorian Britain; epidemiology; bacteriology; Medical Department; Local Government Board; performance

Introduction

In early February 1879 Richard Thorne Thorne descended into one of the wells of the Caterham Waterworks Company. Thorne is best known for representing the British Government at numerous International Sanitary Conferences from the mid 1880s, and for the time he spent as Chief Medical Officer of England and Wales, from 1892 to 1899. Throughout the 1870s though, in his formative years, Thorne was an ambitious epidemiologist with extensive fieldwork experience gained through his post as Medical Inspector to the Medical Department of the Local Government Board.

When, in 1879, Thorne undertook the arduous task of inspecting the Caterham well, he was chasing after the source of a violent outbreak of enteric, or typhoid fever.¹ Caterham, a sparsely populated London suburb in the Rural Sanitary District of Godstone, and its more populous neighbour Red Hill [sic], in the Urban Sanitary District of Reigate, had been

¹There was a pattern to outbreak investigations: the Chief Medical Officer would receive information concerning a local outbreak; the local authority would be warned; and an inspector would be sent. Investigations could last days or several weeks, per the severity of the outbreak. Such investigations could be dangerous; Gwynne Harries, for example, a promising young epidemiologist, died in 1873 after contracting scarlet fever while on investigation in the north of England. See, Obituary for Harries, BMJ, 1873, 2, 590.
attacked by an explosive outbreak of typhoid fever; upwards of 350 individuals were struck within a six-week period.\textsuperscript{2} Caterham had largely been free of typhoid fever the twelve months preceding; it was faced with a public health crisis. Such sudden, or fulminating outbreaks, according to Thorne’s colleague and prolific public health writer, Edward Cox Seaton, ‘attracted so much notice that no wonder the impression they created in this country has been deep and lasting’.\textsuperscript{3} Indeed, Thorne’s epidemiological fieldwork at Caterham served as a model of public health practice into the early twentieth century.

Thorne had descended the Caterham well because he believed it was there that the outbreak had commenced. He was looking for what epidemiologists now call the index case, and what the Epidemiological Society of London, the hub of a complex network for constructing, facilitating, and distributing epidemiological knowledge, described in 1863 as ‘tracing with scrupulous minuteness the history of the first cases’.\textsuperscript{4} It was by using basic statistical methods and case-tracing that Thorne had suspected the Caterham Waterworks Company. Early in the outbreak, Thorne found that of the 47 persons attacked from 19 January to 2 February, 45 received water from that source alone. He further interviewed Dr James Adam, Medical Superintendent at the Caterham Asylum, and Dr James Magill, of the Caterham Barracks, and found that although there were 2,000 patients at the former institution, and 500 soldiers at the latter—both of which were supplied by their own wells—no cases of typhoid fever had arisen. Moreover, Thorne found that in the neighbouring town of Redhill, typhoid cases were exclusive to those houses supplied by water from the Caterham Waterworks Company. With a ‘very strong presumption that it had been caused by the use of the Caterham Company’s water’, Thorne narrowed the investigation.\textsuperscript{5}

In late 1878 the Caterham Waterworks Company began constructing an adit from the well in question to a new bore being sunk. A number of men were employed in this work, some on the surface and others below. Enquiring into the health of these workers, Thorne interviewed one, initialled J.K., aged 32, a ‘loading man’ who had been suffering from a case of typhoid fever preceding the outbreak in early January 1879.\textsuperscript{6} While down in the well, J.K. confessed, he regularly used the loading buckets, meant for raising the excavated chalk to the surface, for his frequent diarrhoeal dejections—at least two or three times per shift—much to the complaint of his fellow workmen on the surface. With this knowledge in hand, Thorne conducted a simple experiment in the well. He found that every time a bucket was hoisted up the rope to be emptied, it oscillated to and fro, coming into violent contact with the walls of the well.\textsuperscript{7} About ten days after J.K.’s faecal mishaps in

\textsuperscript{2}Thorne’s earlier report was published in full by the Medical Department, see, \textit{Dr. Thorne Thorne’s Report to the Local Government Board on an Extensive Epidemic of Enteric Fever, Affecting Especially Red Hill, in the Urban Sanitary District of Reigate, and Caterham in the Rural Sanitary District of Godstone} (London: Eyre and Spottiswoode, 1879).

\textsuperscript{3}Edward C. Seaton, \textit{Infectious Diseases and their Prevention} (London, University of London Press, 1911), 96.


\textsuperscript{6}Ibid., 85–6. See also \textit{Transactions of the Epidemiological Society of London} (London: John W. Davies, 1863), 7.

the well, Thorne deduced from the statistical distribution of the typhoid fever cases and contemporary knowledge about the incubation period of the disease—about a fortnight—that the epidemic had become widespread across Caterham and Redhill, both of which received water from the Caterham Waterworks Company. Typhoid cases, Thorne found, were largely limited to those who received water from the faecally-polluted Caterham Waterworks Company. Such was ‘one of the most striking instances’ Thorne later noted, showing ‘how great was the potency for mischief of even minute portions of the specifically diseased evacuations of enteric fever patients’.  

Thorne’s public health practices at Caterham were emblematic of epidemiological investigations in the late Victorian period conducted by inspectors at the Medical Department. Such practices were observational and experimental; when, on 5 February 1879, for example, Thorne arrived in the Caterham and Redhill area—he left the day after the Medical Department received word of the outbreak from a local physician—he examined the local water supply, the milk supply, the house drainage, and the sewerage. He consulted local medical practitioners, especially E. L. Jacob, Medical Officer of Health for the combined sanitary districts of Surrey, and eminent geologist William Whittaker, on the soil composition of the area. Thorne tabulated the mortality statistics of the outbreak, and enquired from house-to-house about the particulars of every case of suspected or confirmed typhoid, which led him to the above-mentioned index case of J.K. Thorne and the late Victorian practitioners of epidemiology, as Anne Hardy has shown, championed careful case tracing, simple sanitary experimentation, and the marshalling of evidence predicated on statistical inference. Thorne’s investigation spanned urban and rural physical environments—and the administrative categories of Urban and Rural Sanitary Districts—it also included basic experimentation, quantitative statistical analysis, and qualitative case-tracing and interviewing. Though it was population centred, individuals, especially the search for the index case, were also the focus of Thorne’s study.

I begin with the example of Thorne’s 1879 Caterham investigation for two reasons. First, because it was characteristic—and later served as a model—of epidemiological practice at the Medical Department in an age when epidemiology, rather than the incipient practices and rhetoric of bacteriology, dominated British public health. Yet, in one critical way Thorne’s Caterham study diverged from the typical pattern of disease investigation conducted through the Medical Department; no bacteriologist or chemist was involved in the investigation. Thorne did not send a sample of Caterham water to be analysed by one of the Medical Department’s bacteriological or chemical analysts, a common, though inconclusive practice for field epidemiologists from the 1870s. This illustrates the second

10Both the rich and the poor had been struck by the disease, and inhabitants in Lower Caterham had been affected as had those living in Upper Caterham, which included the old village.  
reason to begin with Thorne’s study. By refusing to seek chemical or bacteriological confirmation of his aetiological hypothesis, Thorne was actively constructing the rhetorical claim that epidemiological knowledge alone best-informed practical decisions in preventive public health.

Thorne’s 1879 investigation is a useful lens to begin a larger discussion—if at a very focused level—as to the practices of knowledge production in late Victorian epidemiology. Michael Worboys has recently implored historians of medicine to explore ‘the complex relations of different kinds of knowledge and practice … not just through programmatic statements, or generalisations about the successions of bedside, hospital, and laboratory medicine, but through studies of performance in the clinic as well as in the laboratory and the field’. As foremost a field-science, epidemiology, as it was practised at the Medical Department, seems an ideal case to explore Worboys’ call. Using performance as an analytical frame necessitates that we ask new questions about late Victorian public health. It is useful to reflect on both the actual methods of epidemiological enquiry during this period, which Hardy and others, such as John Eyler have done, and to the performative ways in which such practices were communicated by epidemiologists to larger political, professional, and public audiences, which historians have yet to fully examine. Performance, as it applies to late Victorian public health, and as I employ the conceptual term here, was about both projection—how epidemiologists displayed, pronounced, self-fashioned, and cajoled audiences into recognising epidemiological authority—as well as reception—how audiences responded, identified and ultimately placed trust in epidemiological authority. ‘What practitioners do to construct, maintain, and defend their practices’, as Iwan Rhys Morus has recently articulated for historians of science, ‘should be understood as performative acts’.

Recast as performative, as I do below, Thorne’s 1879 investigation reveals the way in which epidemiology, at perhaps its height in Britain, was, to borrow a phrase from Vassiliki Betty Smocovitis, ‘part of a culturally embedded belief system’ that Victorians used to understand the spread of disease. That Thorne did not appropriate chemical or bacteriological science, a practice others at the Medical Department often did, albeit ‘uninfluentially’, as Christopher Hamlin as shown, makes him emblematic of a practitioner who embodied the fullest expression of the scientific authority of epidemiology. Yet, the performances of Victorian epidemiology were not static in this period. Insofar as its representativeness, Thorne’s 1879 study was one investigation of a single—though critically important and ‘exemplary’—infectious disease by an epidemiologist at the Medical Department. It does not fully characterise, for example, all epidemiological research conducted by inspectors at the

15 Michael Brown’s recent use of performance as an analytical category is a useful example, although in his study, Brown conceives of performance as association and knowledge. See, Michael Brown, Performing Medicine: Medical Culture and Identity in Provincial England, c.1760–1850 (Manchester: Manchester University Press, 2011).
Medical Department, or epidemiological studies conducted by Medical Officers of Health during this period. Yet, in important ways, Thorne’s practices at Caterham, as well as the process by which his findings were communicated, represent a vision of epidemiological authority that was widespread in the period. What makes this an especially interesting case, furthermore, is that it was conducted and communicated at a time before the widespread acceptance of bacteriology. Carl Eberth only published his discovery of rodlike bacteria taken from typhoid patients in 1880, and Georg Gaffky isolated \textit{b.typhosus} in 1884; it will be recalled, a very short time after Thorne’s 1879 study. Even then, as James Stark has reinforced in his recent study of anthrax in Britain, the Bacteriological Revolution did not immediately constitute a major epistemic shift or reorganisation of medical practice.  

There has been much historiographical debate in the past three decades about a waning epidemiology and a burgeoning bacteriology in the late nineteenth century. William Coleman in his classic account, \textit{Yellow Fever in the North}, maintained that a ‘biomedical orientation’ shaped epidemiological practice after 1880.\(^{21}\) Alfredo Morabia, who has written extensively on the subject, has posed the question rather succinctly, asking, ‘epidemiology and bacteriology in 1900: who is the handmaid of whom?’\(^{22}\) Hardy and Worboys have pushed back on the claim that bacteriology overshadowed field-based bacteriology, a position recently articulated in Rosemary Wall’s \textit{Bacteria in Britain, 1880–1939}, which suggests that ‘the dominance of epidemiology over bacteriology … appears to have continued well into the twentieth century.’\(^{23}\) Yet, crucial questions abound for the late Victorian period: under what circumstances did epidemiologists and bacteriologists cooperate on outbreak investigations? Where were disciplinary boundaries drawn between the two public health activities? Hardy, using the co-practices of epidemiology and bacteriology at the Medical Department for the period 1890–1905, has extrapolated that British epidemiologists felt under threat from their bacteriological counterparts, even as competition between the two practices increasingly revealed a ‘close, but uneasy’ relationship in preventive medicine.\(^{24}\) This article seeks to move beyond Hardy’s characterisation of a trenchant and dichotomous relationship between epidemiology and bacteriology at the Medical Department in the last two decades of the nineteenth century. In this way this article contributes to Steve Sturdy’s critique that historians have tended to overstate the conflict between


\(^{24}\)Hardy, ‘On the Cusp’, 345.
science and medicine. The lens of performance nuances just why epidemiologists were willing to incorporate—or eschew—bacteriological methods and practices, rather than its theoretical underpinnings. In what follows I re-examine Thorne’s 1879 Caterham study in light of what it reveals about the performance of science, paying particular attention to the ways that Thorne defended epidemiological practices and presented epidemiological ways of knowing to various audiences. In the second half of the article I turn towards an investigation—also of an outbreak of typhoid fever—that occurred over fifteen years later, in 1896, by H. Timbrell Bulstrode, also of the Medical Department. Unlike Thorne’s 1879 Caterham investigation, in addition to traditional field-based epidemiological methods, Bulstrode relied extensively on bacteriology; he worked closely with Edward Klein, who examined the bacteriological counts in the Chichester water supply, and Sidney Martin, who analysed the presence of typhoid bacteria in samples of Chichester soils. Bulstrode’s contemporaries praised the epidemiological investigation at Chichester, particularly as a startling revelation of the continuing endemic threat of typhoid fever as the nineteenth century came to a close. Fully in the midst of the Bacteriological Revolution, Bulstrode’s epidemiological practices were braced by bacteriological tests of soil and water. Examining the performative aspects of Bulstrode’s epidemiology, as I do below, reveals two important conclusions. The first is that the shoe-leather practices of epidemiology at the Medical Department emblematic in Thorne’s 1879 study remained largely unchanged by the end of the century. The field-based, statistically-informed, and population-centred epidemiology of the 1870s was essentially that of the 1890s, suggesting a continuity of epidemiological practice. The second is that despite a relative continuity of practice, the performance of epidemiology was changing by the 1890s. Bulstrode sought to establish his credibility and authority at the Medical Department, and by extension the credibility of epidemiology, in a disciplinarily and historically reflexive way, one that was especially politicised. Both Thorne and Bulstrode, practising essentially the same epidemiological methods in similar institutional contexts, sought to confirm epidemiological ways of knowing and cajole audiences in different manners. This suggests, as I return to in the conclusion, both a reinterpretation of the relationship between epidemiology and bacteriology at the Medical Department, as well as a novel approach to understanding the performance of public health in this period.

‘via exclusionis’; Richard Thorne Thorne’s Performance of Epidemiology at Caterham in 1879

Addressing the Epidemiological Society of London in 1878, a year before his Caterham investigation, Thorne admitted that he had ‘little acquaintance with the laboratory’, and that he relied ‘for most of his data on experience gained in what I may perhaps term the fieldwork of epidemiology’. Such a programmatic dismissal of laboratory science both reflected a shared disciplinary awareness amongst British epidemiologists and refied the


role of field-based knowledge-making over laboratory-based knowledge-making. In this way we can more fully understand the epidemiological practices Thorne employed at Caterham in the course of his 1879 investigation.

That Thorne descended into the Caterham well and conducted an experiment with water buckets used for diarrhoeal dejections was tantamount to fulfilling the duties of what Thorne’s colleague at the Medical Department, John Netten Radcliffe, called a ‘day labourer’ or ‘journeyman worker’ in Victorian epidemiology. 28 Although he had not previously served as a Medical Officer of Health—his colleagues Edward Ballard, John Burdon Sanderson, and George Buchanan, for example, had—Thorne was trained as a medical student on the continent and at St Bartholomew’s Hospital. He qualified for MRCS in 1863 and MRCP in 1865. From the mid 1860s, while working at the London Fever Hospital, he was called upon occasionally by John Simon to undertake investigations of local outbreaks of infectious diseases. He was hired by the department as a full-time inspector in 1871, until he was appointed Chief Medical Officer in 1892 to replace George Buchanan.

Thorne’s 1879 practices of case-tracing to find and interview the index case, J.K., were constitutive performances of epidemiology that both guided practice, as well as provided a corporeal and gestural basis for how such practices were communicated to larger audiences. 29 But how was Thorne’s study communicated, and how was the epistemic claim made that Thorne ‘has perfectly succeeded in proving his case’, as Ernest Hart, the sagacious medical reformer and editor of the British Medical Journal, noted in 1879? 30 In part, Thorne himself provided the agency for rationalising the epidemiological findings; his colleagues—at the Medical Department and in the wider community of epidemiologists and medical writers—also justified the conclusions and public health outcomes that followed the Caterham study.

Thorne’s report was published in the Ninth Annual Report of Medical Officer of the Local Government Board, and separately as a pamphlet. In his commentary, George Buchanan, as Chief Medical Officer, responsible for collating and communicating inspector reports, noted that Thorne’s investigation at Caterham had offered ‘conclusive proof of the manner of its distribution … from this one case [J.K.] the deep water was specifically contaminated, and fever was spread over a large district’. 31 The legitimacy of Thorne’s study, judging from Buchanan, lay in Thorne’s ability to convince contemporaries that he had discovered the index case. Not only was such a finding integral to the basis of making epidemiological knowledge in this period, it was also very much predicated on the performative reality of descending into a well, conducting experiments, and interviewing individuals. Such praise was likewise seen in the contemporary medical press. The Medical Times and Gazette found it ‘difficult to escape from accepting the conclusion that the Caterham works were infected by this workman’. 32 ‘The conditions of this huge and involuntary experiment’, the article noted, ‘seem to have been as nearly perfect as may be, and the indictment against the implicated

water-supply appears at least fair and justifiable’. This referred to the discernable outcome of Thorne’s Caterham investigation, namely public health action by the Caterham local authorities. Thorne was able—through persuasion that rested on the basis of his epidemiological methods—to convince the local Sanitary Authorities to issue public notices that the Caterham water had been ‘accidentally contaminated’. Residents were recommended not to use the company’s water until further notice, or, if necessary, to boil water before use. Thorne also successfully prompted the Caterham Waterworks Company to pump a large portion of their water to waste for three weeks, at an economic loss, and to thoroughly cleanse, scour, and disinfect the walls of the wells, adits, reservoirs, and surrounding soil with chloride of lime and permanganate of potash. Thorne noted, in no little triumphal tone, that ‘the Company acted with considerable energy and promptitude in adopting all measures which were found possible to do away with the results of the accidental contamination to which their water had been subjected’. It is worth reflecting on the complex and delicate relationship between Thorne’s epidemiological field-practices, the communication of his methods and results, and the political outcome of his recommendations. As an inspector for the Medical Department, Thorne could only make recommendations to local authorities; that the Caterham authorities, as well as the local water company, fully complied with Thorne was the product of a shared valuation of Thorne’s epidemiological methods, which rested on the performative nature of Thorne’s experiments, interviews, and statistical tabulations. The local authorities at Caterham and Redhill responded favourably to Thorne even though, or perhaps because, he only relied on an epidemiological way of knowing to convince contemporaries of the necessary and sufficient cause of the local outbreak. In this way, Thorne’s performances at Caterham, to further reflect, embody what Steven Shapin has recently called the ‘practices of securing and maintaining credibility’.

Much of the contemporary approbation of Thorne’s 1879 study focused on his methodology, which, as we saw above, was dependent on routine epidemiological performance. The Practitioner was direct in praising Thorne’s epidemiological methods, stating that his investigation exhibited ‘in a perspicuous and intelligible manner the method of inquiry which is usually adopted by the Medical Inspectors of the Board, and which has hitherto been attended with results which leave little to be desired’. Later that year Edward Ballard, Thorne’s colleague and close friend at the Medical Department, addressing the Section of Medicine at the Annual Meeting of the British Medical Association held in Cork, echoed such remarks as were published in The Practitioner and Medical Times and Gazette. Ballard called Thorne’s epidemiological methodology at Caterham the ‘via exclusionis, the favourite method in the department, and indeed the only one applicable to such difficult

33Ibid., 507.
35Ibid., 91.
36Thorne’s 1879 study in this way fulfils Richard Doll’s criteria of an epidemiological study that provided, at least according to Thorne’s 1879 contemporaries, proof beyond reasonable doubt. See, Richard Doll, ‘Proof of Causality: Deduction from Epidemiological Observation’, Perspectives in Biology and Medicine, 2002, 45, 499–515.
37Steven Shapin, Never Pure: Historical Studies of Science as if it was Produced by People with Bodies, Situated in Times, Space, Culture, and Society, and Struggling for Credibility and Authority (Baltimore: The Johns Hopkins University Press, 2010), 9.
inquiries’. 39 It was, put another way, quoting an early twentieth-century description, ‘the Sherlockian method in epidemiology’, which typified the deductive basis of epidemiological practice in the late Victorian period. To his contemporaries, Thorne’s success rested on a sound methodology, one that in 1875 John Netten Radcliffe pronounced, signalled ‘the gold of scientific epidemiology’. 40 Such professional back-patting of Thorne by his contemporaries suggests important ways in which epidemiological methods were standardised in this period. It is clear that the activities of infectious disease investigation conducted through the Medical Department were crucial to such standardisation of practice. So too was the performative ways that local studies were made known to wider medical, scientific, and public audiences. 41

Even outside of his cadre of like-minded public health workers at the Medical Department, where we might expect praise, Thorne’s Caterham investigation garnered a great deal of interest and acclaim. 42 This was due to the complex ways that Thorne projected epidemiology to larger audiences. In May of 1879, for example, he was requested to present a paper at the Annual Conference on National Water Supply, Sewage and Health, held in London by the Royal Society of Arts, a special conference at the request of the Prince of Wales. 43 Thorne summarised his Caterham findings by noting that ‘in short there can be no doubt that the pollution of this water, as the result of the man’s disease, and the epidemic in question, were related to each other as cause and effect; indeed the several essential incidents recorded are linked together in point of date, with a precision characteristic of the results which might have been expected to have followed a scientific inoculation’. 44 Presenting before a large and prestigious audience, Thorne was at pains to defend epidemiological ways of knowing, particularly the authority of proving cause and effect. The eminent sanitary engineer Baldwin Latham was supportive of Thorne’s claims, noting in the minutes of the meeting that Thorne’s was ‘a very valuable paper … the lessons to be drawn from it would be of great use in the future’. 45 Thus, Thorne’s 1879 Caterham study was both emblematic of epidemiological practices, and one that many practitioners recognised as indicative of the power of epidemiological methodology.

In the lively discussion that followed his presentation at the Annual Conference on National Water Supply, Sewage and Health, Thorne was asked about the chemical state of the Caterham water. His response was that he had ‘specially avoided having the water analysed’, as ‘you might have taken 100 samples and never found any evidence of specifically

41 See, Anon., ‘Typhoid Fever Spread by Water’, The Bristol Mercury and Daily Post, 1897, 9669, 3. See also, John Tyndall, ‘Cholera and Disinfection’, Daily News, 1883, 11641, 6. Edward Klein, presenting evidence before the Royal Commission to Inquire Into the Water Supply of the Metropolis in 1893–94, argued that Thorne’s typhoid study at Caterham was ‘perfectly sufficient to establish the proposition that water fouled with cholera dejecta or typhoid dejecta may produce infection, the one with cholera, the other with typhoid fever’. Edward Klein, minutes of evidence, Royal Commission to Inquire Into the Water Supply of the Metropolis, Parliamentary Papers (London, 1894), 417.
44 Ibid., Discussion of Minutes of Conference, 174.
diseased matter in it; but in the one hundred and first you might have discovered it. 46 Such apathy to the chemical analysis of water was common, as Hamlin has shown. 47 W. F. Bynum has claimed that ‘Britain remained a relative bacteriological backwater through the last third of the century, and clinical and epidemiological features of what were often called the ‘acute specific fevers’ were just as important as the French, German and British laboratory evidence’. 48 Assessing Bynum’s claim lies outside of the scope of this article, though Thorne’s 1879 study—both his projection and self-fashioning of the investigation, as well as its reception by contemporaries, including local political authorities and scientific colleagues—is suggestive confirmatory evidence of such ‘bacteriological backwater’. By examining the projection and reception of epidemiology, how Thorne and others defended, constructed, and maintained epidemiological ways of knowing, we are better able to understand the reasons why the Caterham local authorities placed trust and authority in Thorne’s recommendations, and to the larger significance of his study. Without the often-inconclusive practices of chemical or bacteriological analysis, Thorne could, through performance, command public health recommendations. To Thorne, a quintessential Victorian epidemiologist, ignoring bacteriology and chemistry was a deliberate strategy.

The public health lessons that contemporaries gleaned from Thorne’s Caterham study were fourfold: (1) even a minute quantity of the germ, or poison of typhoid fever, under favourable conditions when introduced into a water supply, could lead to an extensive outbreak; (2) mild, or ‘perambulatory’ cases of typhoid fever represented a special public health danger, by reason of their intensely poisonous diarrhoea; (3) all sources of excremental pollution near water sources should be extensively investigated, and; (4) no persons suffering from diarrhoeal complaints should work for the construction or storage of water. 49 To contemporaries, Thorne’s 1879 investigation was one of a series of confirmations of the developing water-borne aetiological hypothesis; into the early twentieth century it remained a classic study in Victorian epidemiology. 50 Late Victorian epidemiological investigations of typhoid fever reinforced the cultural assumptions that typhoid was bred of filth, and, as Hamlin has argued, that the protection of water supplies and the revamping of sewerage systems in rural and provincial areas was behind advancements made in numerous metropolitan ones. 51 The image of Thorne, who only a few years later became the administrative leader of British state medicine, climbing into a well in 1879 forms more than just an interesting anecdote; it was a both routine epidemiological fieldwork, as well as a powerful performance that Thorne used to convince local authorities to act on his powerless recommendations. Such performances by Victorian epidemiologists accompanied experimentation, interviewing, case-tracing, map-making and statistical tabulation, which we must also treat as performative. Field performances were accompanied by rhetorical strategies of self-promotion by Victorian epidemiologists. Through his

46 Ibid., 173.
epidemiological methods, Thorne had also placed his finger on one of the more controversial aspects of state medicine that continued into the twentieth century; the index case, J.K., whose perambulatory case of typhoid fever enabled him to continue working in the Caterham well whilst being highly infectious, was the late Victorian precursor to the infamous Typhoid Mary, the latter being a healthy carrier. To Thorne and his contemporaries around 1879 the perambulatory problem loomed larger than the identification of the typhoid ‘germ’ or ‘poison’. And, while this was a product of the belief in the epidemiological practices employed by Thorne at Caterham, in the next two decades, American, French and German bacteriologists began to discover some of the specific microbes responsible for many major infectious diseases.

### Endemic Typhoid Fever and the Emergence of Bacteriology at the Medical Department

Hardy has argued that ‘reductionist bacteriological methods encountered criticism and resistance from an already well established [epidemiological] tradition’. My reading of epidemiological investigations at the Medical Department in the last two decades of the nineteenth century, a period Hardy has concluded most historians still believe was ‘devoid of epidemiological enterprise’, confirms that while epidemiological practices remained the standard for outbreak investigation, there was significant room for cooperation between the two practices. As I articulate below, epidemiologists at the Medical Department began to seek bacteriological confirmation of their epidemiological studies only as a strategy of reaffirming the knowledge and authority of their emerging discipline. Thorne’s 1879 scoff at laboratory evidence is suggestive of the trend Hardy has articulated, though as I argued above, the reasons for resistance were part of a complex matrix of performative posturing, not necessarily a challenge to laboratory practices. While it is clear that ‘the impact of bacteriology on the English epidemiological tradition was rather less impressive’ than on continental Europe or in North America, we still know very little about the complex ways British epidemiologists navigated the partial acceptance of bacteriological methods and findings in the last two decades of the nineteenth century. Thorne’s performative act of having ‘little acquaintance with the laboratory’, and having ‘specially avoided having the water analysed’ should not cloud the reality that auxiliary scientific, and particularly laboratory research was integral to the daily activities of medical science at the Medical Department. Terrie Romano, for example, through an analysis of John Burdon Sanderson’s research activities, has detailed the Medical Department’s support of physiological and pathological research, particularly during the most intense period of debates over germs. Even a cursory examination of Medical Department investigations from 1870 to 1900 reveals that inspectors frequently sent water or milk to be analysed by the department’s scientific analysts, at times either Burdon Sanderson, the chemist J. L. W. Thudichum,


54 Ibid.

or later the proto-bacteriologist Edward Klein. Hardy’s claim, in other words, that epidemiologists were resistant to bacteriological approaches not only fails to address why, but more importantly, obscures the ways that the performative aspects of epidemiology often dictated whether a practitioner advocated for, or denounced laboratory evidence. In the last two decades of the century it became increasingly difficult for British epidemiologists to simply ignore bacteriological practices the way Thorne did for water analysis during his Caterham investigation. While epidemiologists at the Medical Department remained committed to field-based, observational, and statistical practices, the investigation of epidemic diseases became increasingly influenced by bacteriology. The second half of this article explores the ways in which British epidemiologists cautiously engaged with bacteriological practices. Under focus in what follows is an investigation by H. Timbrell Bulstrode—who like Thorne was an inspector for the Medical Department—into an outbreak of typhoid fever in Chichester in 1896. It is worth briefly exploring, however, why both investigations were on typhoid fever.

After 1866, the final visitation of cholera in Britain, British epidemiologists believed that investigations of typhoid fever held the key to answering unresolved debates over the nature of water-borne disease. Moreover, because of what John Simon called their ‘close aetiological affinity’, protecting the country from typhoid, which continued in Simon’s mind to have a ‘deplorable and disgraceful power of spreading among our population’, would provide Britain with better security ‘against cholera than any imaginable system of quarantine’. Typhoid was an insidious endemic disease throughout the Victorian period; while outbreaks were often sporadic, at times they were highly virulent.

William Stewart, Honorary Surgeon to the Beckett Hospital in Barnsley, put it best in 1877, saying that typhoid was universally prevalent ‘in hot and cold climates, in town and country, in the houses of the rich and the hovels of the poor’. Typhoid was particularly remarkable to contemporaries because of its capacity to strike the rich and also the poor, the urban and the rural. It killed those who were atrociously dirty and those who were impeccably clean. The disease was mapped onto the Victorian social body through the ubiquity of filth.


58 Hardy and Luckin have shown that there was a slow, but unsteady post-1870 decline in the incidence of the disease in Britain. By 1907, the Registrar-General claimed that the mortality from typhoid fever fell from a rate of 384 per million in 1869 to 89 per million in 1905. The use of such mortality statistics should be deployed with serious caution for most of the Victorian period. It was not until 1869 that the Statistical Office of the Registrar-General officially distinguished between typhoid, typhus, and simple continued fever. See, William Luckin, Pollution and Control: A Social History of the Thames in the Nineteenth Century (Bristol: Adam Hilger Press, 1986), especially ch. 6, and Hardy, Epidemic Streets, 152–4.


To be sure, linking typhoid fever to filth was a moral gesture. Gerry Kearns put it best when he noted, ‘the sewer and the slum were part of a moral as well as a medical topography’. Alfred Haviland, Medical Officer of Health for Northamptonshire, famously quipped in the *British Medical Journal* that typhoid was ‘a national disgrace’, typifying the ways that typhoid, as the preeminent filth disease, was connected to both material conditions such as inadequate sewerage and water supply, and crucially, to behaviour and class. By the 1880s though, the older Chadwickian notion of indiscriminate filth was gradually being adapted to fit a multiplicity of germ theories. ‘Destroy the specific germs before they mix with the filth’, Robert Hudson, Medical Officer of Health in Redruth noted, ‘look on filth as the agent for the dissemination of the poison, not the poison itself, and you are more likely to be rewarded by success’. But whereas ‘it has long been an accepted doctrine that filth was in some way related to the production of disease’, late Victorian epidemiologists sought to show the specific ways that filth could cause disease.

While typhoid fever became a model disease for epidemiological research in the second half of the nineteenth century, British sanitarians remained puzzled by the nosological, pathological, and diagnostic aspects of the disease. As is well known in the history of medicine, pathological research dominated the study of fever in Britain in the middle decades of the nineteenth century. For many, Charles Murchison’s 1862 *Treatise on the Continued Fevers* was the definitive work on sorting out the often-muddled nosological categories of fever. Murchison’s ‘pythogenic theory’ represented an aetiological compromise; typhoid fever was a distinct disease capable of transmission through air, water, or foodstuffs, but only after it underwent a fermentation-like process in the soil. So contentious was the nosology and aetiology of typhoid—rural Britons were notoriously charged by their urban counterparts in maintaining a belief in spontaneous generation—that many British medical practitioners, particularly epidemiologists at the Medical Department, preferred to call the disease enteric fever, denoting the organs with which the lesions occurred. Here nomenclature mattered, as those physicians who preferred enteric fever allied themselves with the French School of pathological specificity. Enteric remained the favoured name for many British public health officials throughout the second half of the nineteenth century, although by the 1880s most used typhoid and enteric interchangeably.

While the diagnosis of typhoid fever remained controversial throughout the second half of the nineteenth century, an epidemiological—relating to the origin and communication of the disease—approach dominated public health practice from the 1870s. Instead of avoiding the problematic diagnostic question regarding the fevers, this turn reinforced the need

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for proper diagnosis and death certification as paramount for making informed statistical arguments and successful public health interventions.  

Interest in typhoid as a model disease was nowhere more apparent than at the Medical Department. Nearly one-half of all department investigations from the 1870s to the 1890s were local outbreaks of the disease. The Times, for example, noted in 1873 that these investigations ‘throw much light upon the particular conditions under which enteric fever is developed and propagated both in towns and in rural districts’. The pressing public health question surrounding the disease in the last two decades of the nineteenth century was its persistent and endemic nature. This was framed as an epidemiological problem; one of discovering the mediums with which typhoid fever spread, such as water, milk, or, as it was still often believed, sewer gas. By the 1890s, the threat of typhoid-charged soil was increasingly the focus of epidemiological and bacteriological inquiry at the Medical Department. As I demonstrate below, by examining an outbreak of typhoid fever at Chichester in 1896, epidemiology and bacteriology could cooperate during outbreak investigations at the Medical Department.

H. Timbrell Bulstrode and the Chichester Typhoid Study of 1896

By the late 1890s Chichester held a poor sanitary reputation amongst the staff at the Medical Department. The city possessed, as A. C. Houston later noted in 1904, ‘the unenviable reputation of being one of a number of places in England and Wales in which enteric fever prevails in endemic and epidemic form to a notable extent’. Edward Seaton, one of the department’s earliest inspectors hired by John Simon, was the first to investigate the sanitary state of Chichester, in 1865. Seaton, no doubt seeking to shock his readers, noted in his report that, the ‘death-rate which, for a small city well situated, not overcrowded, but comprehending within its bounds even fields and open country, in which no large manufactures are carried on, gives strong evidence of something radically amiss in the sanitary conditions of the place’. As of 1865 Chichester had no system of drainage and no extraneous water supply; Seaton found nuisances of every sort, no little due to Chichester’s large cattle market, held every other Wednesday. Several years later, in 1879, when Seaton had replaced Simon as Chief Medical Officer, Hubert Airy visited Chichester to investigate an explosive outbreak of typhoid fever. Airy’s investigation localised the 1879 outbreak to an infected milk supply; he ended his report by noting that ‘there yet remain grave defects in the sanitary condition of the city’.

68 The Department’s Annual Report for 1874 focused exclusively on Typhoid Fever, and included John Simon’s famously reprinted, Filth Diseases and their Prevention.
Between 1870 and 1890 vital statistics from the Registrar-General’s Office showed that the death-rate from typhoid fever in Chichester was one of the worst in England and Wales. During both Decennial periods—1871–1880, and 1881–1890—Chichester had the highest death rate of all the Registration Districts in Sussex. Moreover, compared with all of England and Wales, only 31 of 630 Districts had a higher death rate from 1871 to 1880. Chichester was worse-off in the decennial 1881–1890, whereby the city ranked in the top twenty of districts with the highest incidence of typhoid fever. When therefore, Thorne, by then Chief Medical Officer, was informed by the Mayor of Chichester in July 1896 that an explosive outbreak of typhoid fever was on the rise, he quickly responded by sending a member of his epidemiological staff, H. Timbrell Bulstrode.

Herbert Timbrell Bulstrode served as an inspector at the Medical Department for nearly twenty years, from 1892 and until his sudden death from heart failure in 1911. Thirty years old and fresh from a medical degree at Cambridge, Bulstrode was the first inspector hired by Thorne, when the latter became Chief Medical Officer. ‘He had a notable characteristic of independently investigating’ his obituarist noted, and was part of a cadre of epidemiologists who—following in the footsteps of Simon, Ballard, Netten-Radcliffe, Buchanan and Thorne—considered themselves professional epidemiologists. Although perhaps less well-known today, Bulstrode is best remembered for providing epidemiological confirmation of the role of shellfish in transmitting typhoid fever, and, as Morabia and Hardy have shown, for using novel methods of epidemiological inquiry such as questionnaires.

In 1896 the population of Chichester stood at just over 10,000. While typhoid was a common occurrence, between July and August over 100 new cases of the disease were reported, most of which occurred in ‘the same streets and areas in which had been attacked when Seaton reported on the city 30 years ago’. Bulstrode’s Chichester investigation began much like the hundreds of others conducted by the inspectorate at the department. He convened with Mr E. Prior, the Mayor, Mr Davy, the Board’s General Inspector, members of the local Sanitary Committee, and with the Chairman of the Water Company, who combined to provide Bulstrode with an up-to-date list of fever cases, their addresses, and the sanitary condition and source of water supply of each house. Such assistance from local officials—although not always forthcoming—was a central feature of late nineteenth and especially early twentieth century epidemiological investigations. Bulstrode visited and interviewed individuals on the list, and also inspected the public waterworks.

Bulstrode’s initial focus was on the water supply and drainage of Chichester. The city was supplied, he found, with water from both private shallow wells, and the Chichester Waterworks Company. The shallow wells, ‘imperfectly protected against filth soaking through the soil’, were of particular concern, as many were located near privies or cesspools, and fitted with loose, wooden lids. Chichester possessed a recently constructed sewer system, but privies were still in wide use, Bulstrode found, and even in places where household privies

had been abandoned, ‘the privy vaults had, together with their contents, perhaps the accumulation of some years, been simply filled in, and not, as they should have been, carefully emptied, their bricks removed, and their sites carefully cleansed’.77 ‘Chichester must, I fear’, Bulstrode lamented in his report, ‘still be regarded as not differing substantially from an undrained city’.78

Bulstrode found nothing illuminating as to the distribution of the disease via sex, though he noticed that 63 of the 111 attacks belonged to those between the ages of 5 and 20.79 The public water supply was largely free from suspicion, a conclusion Bulstrode reached using epidemiological, chemical and bacteriological evidence. Of the 682 houses within the walls of Chichester, 494 were supplied by the public water company. Of that number, Bulstrode found, only three were invaded by typhoid. Altogether, of the 76 houses invaded, 39 were supplied by private wells (2.9 per cent case incidence) and 37 (2.6 per cent case incidence) with water from the public company. Although the epidemiological evidence was inconclusive to indict the public water supply, Bulstrode sent samples of Chichester water to Edward Klein. On 29 July 1896, with the incidence of typhoid fever in Chichester on the rise, Klein, at his laboratory at St Bartholomew’s Hospital, performed three routine bacteriological tests on the Chichester water. He first made a gelatin plate with \( \frac{1}{4} \) c.c. water to determine the number of aerobic microbes. After a 48 hour incubation period, Klein found, the plate yielded only 23 colonies, or 92 aerobic microbes per 1 c.c., a small number of harmless bacteria.80 Klein then took 1,200 c.c. of Chichester water and forced it through a Berkefeld filter, using gelatin culture media—phenolated broth, phenolated gelatin, and iodised potato gelatin—to test for the typhoid bacillus. He found no typhoid microbes. Lastly, Klein took the particulate matter of 120 c.c. and tested it for the presence of anaerobic microbes, none of which were found. Klein ended his report, which was compiled at the end of Bulstrode’s, by soundly declaring that ‘the sample of water delivered here was of excellent quality as far as bacteriological tests go’.81 Klein’s bacteriology, in other words, was sufficient in guiding epidemiological practice—it took Bulstrode’s attention away from the waterworks company. But insofar as its applicability to epidemiology, bacteriology was only used here to confirm epidemiological methods.

Bulstrode’s rhetorical strategies at Chichester relied on a historical epidemiological claim, in which typhoid prevailed in 1896 in places where it had in former years. Neither the construction of a new sewerage system, or the public provision of water to parts of the city, affected the preventive change necessary to curb outbreaks of the disease. Seemingly progressive sanitary improvement, Bulstrode suggested, had failed to prevent the disease. ‘There would, indeed,’ Bulstrode concluded, ‘appear from consideration of the past history of Chichester in respect to enteric fever, no need to seek out in explanation new agencies of dissemination, such as, for instance, the public water supply, or the recently constructed sewerage’.82 It was clear that typhoid fever was endemic in Chichester, but that its

77 Ibid.
78 Ibid, 92.
79 Although a higher incidence in children and young adults suggested dissemination via milk, Bulstrode found no evidence that milk played a role.
81 Ibid.
cause, Bulstrode feared, ‘is not easy to determine’. With filthy cesspools and privies still in abundance, Bulstrode lamented that ‘not until the cesspits and cesspools of the place have been abolished, and their sites and the soil in the neighbourhood thoroughly cleansed, can it be hoped that enteric fever will be banished from the city’. 83

Compared to Thorne’s 1879 Caterham investigation, Bulstrode’s Chichester study failed to elicit a dramatic response from local authorities. This was partly, it seems, from the rhetorical and performative strategies Bulstrode used to communicate his study. Like Thorne, Bulstrode provided a list of recommendations to the Chichester town council, issued 21 July 1896. He included generic sanitary suggestions, such as the removal of all ‘accumulations of filth’, and specific remedial measures increasingly used to combat infectious diseases, such as the removal of early cases to the local isolation hospital. Bulstrode’s chief concern was the state and preponderance of privies in Chichester. He noted in his report that the Chichester Sanitary Committee adopted a formal resolution to ‘carry out these recommendations in their entirety’, but further epidemiological study in 1900 by Theodore Thomson indicated that such measures largely went unfulfilled. 84

In the course of Bulstrode’s investigation bacteriology was relied upon, but only in an ancillary way. Klein’s analysis of the Chichester public water supply failed to detect the specific germs of typhoid fever, and hence all but rule out suspicion of the company. But, Bulstrode’s statistical analysis satisfied him to the same conclusion. In this way, the new methods of bacteriology did not serve to push the boundaries of disease investigation. It was rather quite the opposite; the defining feature of Bulstrode’s 1896 Chichester investigation was that it localised the outbreak to the endemicity of Chichester soils. Thorne, for example, in his summary, highlighted that Bulstrode’s study ‘goes to show that enteric fever, though mainly distributed in epidemic form by means of water or of milk, is by no means always a ‘water-borne’ disease; and it raises anew the question as to how far recurring prevalences of enteric fever in one town or spot can be due to the persistence in more or less active form in certain soils of the organism of that disease’. 85 Cotemporaries, such as William Henry Corfield, saw Bulstrode’s 1896 study as a powerful example of the endemicity of typhoid fever, and one that provided aetiological clarity on the role of soil in transmitting the disease. 86 It was epidemiological investigation—the methods and practices exhibited by both Thorne in 1879 and Bulstrode in 1896—that pushed aetiological boundaries and pointed to the role of soil in maintaining outbreaks of typhoid fever. Yet, this was a matter left up to bacteriology and microbiology to further investigate in the twentieth century.

It is worth reflecting on the performative aspects of Bulstrode’s 1896 Chichester investigation, especially as it compares to Thorne’s 1879 Caterham study. The shoe-leather practices of Victorian epidemiology—what Ballard called the ‘via exclusionis’ method—was still at the centre of disease investigation as the nineteenth century came to a close. And, while we usually claim that the ‘new’ public health of the early twentieth century was obsessed with individuals—and the resultant public health practices of isolation and disinfection—Bulstrode’s epidemiology was firmly population-centred. But, unlike Thorne, Bulstrode was

83 Ibid.
85 Thorne, ‘Enteric Fever at Chichester’, xiii.
much more keen to use epidemiological findings to engage in politicised arguments. Perhaps because Thorne’s recommendations were actively pursued by the Caterham authorities, largely a result of his ability to provide causal proof using only epidemiological evidence, he felt little need to engage in a larger debate over public health. Bulstrode, however, used the rhetoric of historical epidemiology to substantiate the conclusions to be drawn from his 1896 Chichester study. This positioning had important methodological and performative ramifications, and indicates that while the methods of epidemiological inquiry had not substantially changed from the 1870s to the 1890s, the way in which epidemiologists at the Medical Department substantiated epidemiological ways of knowing were changing. Of particular interest are three maps Bulstrode prepared for his 1896 report (Figures 1–3).  

The maps depict the Registration Counties of England and Wales; Figure 1 shows the annual death-rate of typhoid fever per 100,000 persons during the decade 1871–1880, with the rates on different counties indicated by five sets of colours, and ranging from 70 deaths or more per 100,00 to under 30 deaths per 100,000. The second map (Figure 2) provides the same data for the period 1881–1890; what is striking was that only two of the five colours in the first map remained, as three of the highest incidences of death had altogether disappeared. Bulstrode, and by extension Thorne, used the tools of epidemiology—including cartography—to depict what was seemingly a successful narrative of Victorian public health, namely, the dramatic decrease in the incidence of typhoid fever from 1860 to 1900. The rhetorical claim behind the use of such representations was that epidemiology, as the central science of state medicine, was in part responsible for the decrease in the disease. Yet, Bulstrode used map three (Figure 3) to construct a rather different public health argument; it showed those Registration Districts in the period 1881–1890 which had the highest incidences of typhoid fever, and were thus lagging behind the general trend.  

This was no doubt also part of Bulstrode’s attempt to situate and self-present his epidemiological practices at Caterham, and by extension, what he saw as the continual forging of the relationship between epidemiology and bacteriology. In his Annual Report, Thorne noticed that they served ‘to indicate that whilst enteric fever has been undergoing enormous diminution in this country, the areas of both its maximum and its minimum incidences have remained practically the same during the 20 years 1871–90’. The rhetoric of condemnation here is particularly interesting, especially in light of Keir Waddington’s analysis of practices and conceptualisations of rural public health in late Victorian Wales.  

Thorne played a significant role in guiding the surge of soil-based studies of microorganisms in late nineteenth and early twentieth century Britain from his perch at the Medical Department. Although increasingly bacteriological, these studies remained committed to public health.  

87 Medical geographers have recently made cogent claims about the epistemic role of epidemiological maps in making arguments about the causation and spread of disease. See, Tom Koch, Disease Maps: Epidemics on the Ground (Chicago: University of Chicago Press, 2011).


furthering epidemiological claims, although, as Thorne noted in his Twenty-Sixth Annual Report of the Local Government Board, Supplement Containing the Report of the Medical Officer for 1896–97, 107. Source: Image courtesy of the University of Minnesota’s Wangensteen Historical Library.


furthering epidemiological claims, although, as Thorne noted in his Twenty-Sixth Annual Report in 1897, ‘there has been rather discouragement’ of bacteriological evidence confirming epidemiological suspicion. 91 During the Chichester study, Bulstrode— instructed by

91Thorne, ‘Enteric Fever at Chichester’, xxi.
Thorne—sent samples of soils thought to be infected with typhoid microbes to Sidney Martin, the Jamaican-born, University College London and Viennese trained bacteriologist working on a part-time basis for the department. The role of soil in spreading infectious diseases such as typhoid fever was not new to the 1890s, but resurged as a result of epidemiological studies such as Bulstrode’s.


Source: Image courtesy of the University of Minnesota’s Wangensteen Historical Library.
From the late 1860s epidemiologists at the Medical Department—Ballard, Netten Radcliffe and Buchanan—argued that outbreaks of water-borne or milk-borne typhoid fever were the result of dangerous germs gaining access to water supplies through the medium of the soil. The connection between soil and sewage was far from new. Polemical chemist Alfred Smee, of Croydon, for example, maintained from the 1870s that cows fed
with sewage-contaminated grasses could spread typhoid through their milk. Smee’s aetiological theory combined Charles Murchison’s and Max von Pettenkofer’s belief that disease-causing germs had to undergo a period of fermentation, or incubation, in the soil to become infective. Early theories such as Murchison’s and Pettenkofer’s, which were environmentally-driven, have been chalked up to the lasting strength of localist doctrine in the late nineteenth century. As Worboys has shown, there was a multiplicity of germ theories. It was still aetiologically viable, after all, to suggest that the germs of typhoid and similar diseases multiplied in favourable soil conditions rather than in the bodies of patients, a view which had crucial public health implications for stopping the spread of infectious diseases through disinfection and isolation practices. Yet it would be misleading to think of soil-based aetiological theories that persisted into the 1890s as aligned with the Murchison/Pettenkofer camp, as aetiological hold-outs who maintained a belief in spontaneous generation long after it was scientifically fashionable. Instead, soil-based research was undertaken by the vanguard of British bacteriologists—Sidney Martin, A. C. Houston and Edward Klein—often on a contractual basis with the Medical Department, who sought to prove more exclusivist aetiological theories and to explore fundamental biological questions about the life cycle of germs. It was only in the 1890s that the role of soil was again considered, but it was in light of epidemiological specificity.

With the soil samples he received from Bulstrode at Chichester, Martin began to test what soil conditions—temperature, soil bacteria, water levels—were productive or inimical to the development of \textit{b. typhosus} outside the human organism. Martin’s research demonstrates cooperation between epidemiologists and bacteriologists at the Medical Department. Martin received eight samples of soil; four from houses where typhoid had been extensively present during the 1896 Chichester study and four from houses free of the disease.

Martin found that the typhoid bacillus could remain alive and virulent for long periods of time in sterilised cultivated soils (normal garden soil, for example that might be found near households), but that ‘in virgin, uncultivated soil it rapidly dies’. Bacteriological testing of...
*b. typhosus* in soils was a confirmation of the long-held doctrine by John Burdon Sanderson that certain diseases ‘possess the wonderful property of passing into a state of persistent inactivity or latent vitality, in which they perform no function, but can at any moment be wakened up into active function, whenever they are brought under favourable circumstances’. Reflecting on the importance of Martin’s soil-based studies of typhoid in his Annual Report for 1897, Thorne noted that, ‘whilst much of the diminution in enteric fever has gone hand-in-hand with the abandonment of water services which, being subject to receive specific pollution, served for wide diffusions and sudden outbursts of enter fever,-much of the persistent prevalence of that disease is associated with those systems for the disposal of excreta and refuse which still find favour in certain parts of this country, and which inevitably involve organic pollution of the soil’. Soil-based research highlighted one of the most pressing public health problems that occurred in late nineteenth-century Britain, namely, sporadic but persistent outbreaks of endemic diseases such as typhoid fever. This was, as Hardy has claimed, originally a ‘specific epidemiological problem’ and one to which ‘bacteriology had failed to provide the answer’. Yet, in the last two decades of the nineteenth century bacteriological studies at the Medical Department on disease-causing organisms in soil succeeded in elucidating further aetiological clarity, and reinforcing remedial measures in public works. This confirms Worboys’ claim that a ‘seed and soil’ botanical metaphor dominated the understanding of germs in the second half of the nineteenth century. Yet ‘seed and soil’ was more than simply a metaphor; it guided epidemiological as well as bacteriological practice. Whereas Hardy has seen the failure of bacteriology to confirm the aetiological role of soil in spreading typhoid as a plausible rationale for the growing ‘uneasiness’ between the two groups of practitioners, it is more likely that this episode confirms that epidemiological rather than bacteriological practices dominated the scope of the Medical Department.

In his annual report for 1897, Thorne summarised Bulstrode’s epidemiological research alongside Martin’s fledgling bacteriological research, noting, these facts go to indicate the need for systematic study of a question which has gradually come to acquire considerable importance, and which may be put thus:—What are the local conditions by reason of which certain areas, whether registration counties, town, or villages, have, for at least a generation, become identified with such persistence or periodic recrudescence of enteric fever, as has continued to secure for them death-rates from that disease in excess of other districts with some at least of which they may not unfairly be compared?

Epidemiological practices played a key role in answering Thorne’s plea, but so too did the new practices of bacteriology, particularly soil-related studies and those that sought to understand the survival of germs outside of the human body. That Bulstrode actively yoked his epidemiological field-work to the practices of bacteriology signifies a shift in the

100 Hardy, ‘On the Cusp’, 343.
performance of public health at the Medical Department. By the 1890s epidemiologists like Bulstrode could not claim, for example, that they had ‘little acquaintance’ with the laboratory. Increasingly, bacteriology and epidemiology sought to answer the tough questions in public health, such as the persistence of typhoid fever. Ultimately, however, from the perspective of performance, Bulstrode’s inclusion of bacteriology only muddied the aetiological waters of his epistemological claims. Although he sought to ‘receive support at the hands of the bacteriologist’, he ultimately found little value in bacteriological justification. Epidemiology had suggested the endemicity of typhoid in the Chichester soils, and bacteriology was too premature to provide more than preliminary causal evidence. Unlike Hardy’s claim, this was not by itself reason for fissure between epidemiology and bacteriology. Hence Bulstrode’s appeal to historical epidemiology, and to the aesthetics of map-making. Relying on the traditional posturing of epidemiologists, mutually intelligible to Thorne and Bulstrode, the Chichester study could be used to make a politicised argument that denounced laggard local authorities such as those in Chichester, and perhaps throughout Britain.

Conclusion

Hardy has called the last two decades of the nineteenth century a ‘neglected’ period in the history of British epidemiology. Whereas German and American practitioners of High Victorian Epidemiology were more willing to incorporate the new methods—and results—of the burgeoning field of bacteriology, Hardy has argued, English epidemiologists remained committed to field-based, observational, and statistically-informed methods that focused on populations, as opposed to individuals. In the examples under scrutiny here, both Thorne in his 1879 Caterham investigation and Bulstrode in his 1896 Chichester investigation relied on the widely practised traditions of field epidemiology. This suggests a confirmation of Hardy’s hypothesis. Yet, this article moves us beyond Hardy’s characterisation of a Janus-faced discipline. By focusing on the performative aspects of epidemiology at the Medical Department, a different picture emerges as to how, why and when epidemiologists chose to incorporate or eschew the claims, methods, and practices of laboratory science. In this light, Thorne appears less concerned that new bacteriological reductionism would overtake traditional, field-based methods of tracking disease. Where we have previously understood such statements as professional turf battles, perhaps they were instead part of a complex process of performing state medicine. Thorne’s official pronouncement that he had ‘little acquaintance with the laboratory’ was thus part of a complex justification of the merits of epidemiological ways of knowing, not necessarily a growing rift between epidemiology and bacteriology, which appears less a late Victorian phenomenon than an Edwardian or even inter-war one. Thorne’s posturing reveals an epidemiology that was self-reflexively confident in its ability to answer aetiological questions about public health problems. Thorne’s descending into the Caterham well to provide proof of the index case was as much a part of that posturing as was his official testimony before scientific and public audiences. To the Medical Department of 1879, and to the epidemiological

profession at large, Thorne’s Caterham study was a success, both methodologically and rhetorically.

By the 1890s, as the case of Bulstrode’s Chichester study demonstrates, epidemiologists at the Medical Department were re-fashioning epidemiology alongside bacteriology, not, as Hardy suggests, against it. There was room, some thought, for both ways of knowing in the state appropriation of medical science. As the case of soil-based bacteriological studies suggests, bacteriological approaches to understanding disease were rather unproblematically adopted to the problems traditionally handled by field epidemiology.  

The Medical Department is a useful site to begin a re-evaluation of the performances of broader trends in late Victorian public health. Although the department was one central node in the construction of epidemiological knowledge in Britain, we still need more studies devoted to the ways in which Medical Officers of Health, particularly in rural areas, practised and defended epidemiology. Not universally, but as the nineteenth century came to a close, the staff at the Medical Department was keen to deploy the new science of bacteriology in answering still unresolved aetiological questions, although it is clear from this article that new approaches often followed epidemiological practice, not the other way around. As I stated at the outset, the two narratives under examination here were part of a much larger set of epidemiological and bacteriological activities that were conducted through the Medical Department, and doubtless more studies of different disease practices are needed to draw definitive conclusions about the way that the Medical Department represented epidemiology at large. Yet, these two studies nonetheless allow for careful examination of the performative aspects of public health.

Examining the projection and reception of epidemiological ways of knowing in the period when bacteriology was ‘on the cusp’ suggests a reinterpretation of Roy MacLeod’s characterisation of the Medical Department. By following new tenets in the cultural history of medicine, such as the local production of scientific knowledge, and its performative posturing and appropriation, the epidemiologists at the Medical Department can be understood as having a new agency we have not afforded them in the past. Epidemiologists such as Thorne and Bulstrode were at the centre of epidemiological knowledge-making and circulation in the late Victorian period; although based out of the department’s Whitehall office, they travelled throughout Britain, and interacted with a wide range of local medical practitioners, politicians, private business owners and, of course, everyday Britons. How these practitioners obtained their authority, and how their knowledge was recognised by various local, regional, national and international groups are questions this article only begins to answer. Moreover, as I have argued here, such practices—including the methods of epidemiology as well as how investigations were discussed, debated and disseminated—need to be understood as dynamic activities, and part of a widespread network of knowledge circulation in the Victorian period. By the early twentieth century Anglo-American epidemiology took a distinctly biostatistical turn. As this article suggests, perhaps we ought to look more closely at the continuity of

109Anne Hardy and M. Eileen Magnello, ‘Statistical Methods in Epidemiology: Karl Pearson, Ronald
late Victorian epidemiological field practice, as opposed to assuming—as we have for the case of bacteriology—that it too was overshadowed by the biostatistics of Major Greenwood and Karl Pearson.

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FOR AUTHORS

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Haldane, J. S. (1917). *Organism and Environment as Illustrated by the Physiology of Breathing* (New Haven: Yale University Press). This is a single-authored works with the title italicised.

Author(s): J. S. Haldane

Title: Organism and Environment as Illustrated by the Physiology of Breathing

Publication: Yale University Press

Year: 1917

Page(s): 99

NB: Provide full author name if available; if only initials available one space after full stop for each initial. Italicise title. Capitalise proper words for English-language titles; otherwise follow rule appropriate to title's language. Publication details in brackets in following order – Location: Publisher, Year. Page number(s) outside brackets if appropriate. References to multiple articles/books separated by a semi-colon.

References.


2. Ibid., 105.


NB: Example of format for multiple volume publication.


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10. C. M. Jackson to G. S. Ford, 8 November 1917, folder 32, Guy Stanton Ford Correspondence, University of Minnesota Archives, Minneapolis, Minnesota (henceforth Ford Correspondence).


12. Jackson to Ford, 8 November 1917, Ford Correspondence.


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Not ... France, Italy, etc.

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- Titles should be concise. Include a place and date range, if applicable.
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It is a pleasure to accept your revised manuscript entitled 'Performing State Medicine During its 'Frustrating' Years: Epidemiology and Bacteriology at the Local Government Board, 1870-1900' in its current form for publication in the Social History of Medicine. The comments of the reviewer(s) who reviewed your manuscript are included at the foot of this letter.

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Thank you for your fine contribution. We look forward to your continued contributions to the Journal.

Sincerely,
Pratik Chakrabarti
Graham Mooney
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