

Media History Monographs 9:1 (2006-2007)

The Reporting of Mosquito–Vector Disease in the Anglo–American Daily Press, 1898–1904

***John Rankin,
McMaster University***

The discovery of the mosquito-vector in the transmission of malaria and yellow fever created a revolution in contemporary understanding of disease and placed the mosquito as a threat to public health. This study examines how two nationally circulated presses, the *New Times* and the *London Times*, reported upon the transformative discovery of the mosquito as the sole vector in the transmission of malaria and yellow fever. This coverage is contrasted with two leading medical journals the *British Medical Journal* and the *Journal of American Medical Association*. It was determined that both the British and U.S. press, although varied in their reactions, were not fully interested in disseminating ground-breaking scientific information that was of direct relevance to the public and were much more likely to publish articles focused on the actual outbreaks instead of information concerning scientific and public health developments.

©2007 John Rankin

The Reporting of Mosquito-Vector Disease In the Anglo-American Daily Press, 1898-1904

The nature, timing and extent of the reporting of scientific discovery by the daily press in the past is an important topic.¹ It constitutes one important approach to the questions: what did the public know, and when was it learnt? The topic of knowledge transfer and dissemination is currently one of great interest within scientific and public-policy communities, and the study of the history of press coverage of significant events is a worthy subject for investigation. Not all scientific advances can be assumed to have had equal significance for, or value to, the general public. Moreover, dissemination could have proceeded along multiple avenues: one cannot assume that minimal coverage in the press equaled lay ignorance. Nonetheless, the twin developments, in the nineteenth century, of the advent of mass-circulated daily newspapers and widespread adult literacy did produce an unprecedented opportunity for the dispersal of information. To what extent was this used to report on scientific innovation, particularly on topics of direct importance to the public? A study of newspaper coverage of the revolution in disease epidemiology tied to the discovery of the mosquito vector at the end of the nineteenth century provides a valuable test case. The scientific recognition of the mosquito-vector for malaria and yellow fever comprised two key developments in the history of public health, denoted by rapid acceptance and highly visible, extended, and laudatory coverage within the medical communities and their specialist organs of dissemination. Public health was a topic of direct concern to the public, and one reported upon extensively in nineteenth-century newspapers. Knowledgeable contemporaries of the scientific developments of 1898-1901 considered the conclusions to be transformative. The mosquito was now a central threat to public health. Should not the general public be informed? Was this not a newsworthy story?

It is valuable, therefore, to know what the public was told by the daily press on the theme of mosquito-vector disease. Few scientific discoveries of that era were as dramatic, as quick, or potentially as consequential for the general public. As an introduction to this subject, two of the leading English-language newspapers of the age have been selected for study: the *London Times* and the *New York Times*. Each was a reputable publication with wide circulation. Not infrequently, provincial or local newspapers depended upon these two papers, within their respective countries, for news stories. The chain of events in the detection of the role played by the mosquito was largely the work of British researchers for malaria, and American researchers for yellow fever. This facilitates a study in the reciprocity of knowledge transfer. Malaria was endemic to areas of both countries; yellow fever was epidemic in the southern United States. Both diseases were of crucial importance to the economies of the two nations' formal and informal empires within the tropical and sub-tropical world. This investigation begins with an overview of the contemporary coverage of the mosquito-vector diseases in two leading organs of the specialist press, the *British Medical Journal (BMJ)* and the *Journal of the American Medical Association (JAMA)*. This will be used to establish an approximate chronology of dissemination within the British and American medical communities, focusing upon the characteristics of the transmission of knowledge within the medical community. Following this, the transmission of medical information in the *London Times* and the *New York Times* will be described and evaluated. Finally, an assessment will be provided to explain the characteristics of newspaper coverage, and to address the broader issue of the significance of these findings.

Between the years 1898-1904, malaria was an

John Rankin is a doctoral student at McMaster University, Hamilton, Ontario. His thesis is on the topic of British perceptions and involvement in native health in Equatorial West Africa, 1800-1850. Mr. Rankin is currently researching an article on the reactions to yellow fever on H.M.S. *Eclair* in 1845.

ever-present force in the pages of the *British Medical Journal*, which witnessed extensive discussion and analysis of the mosquito-vector theory. Although at first the medical community did not always agree that the mosquito was the sole vector in the transmission of this disease, its members did eventually agree that the topic warranted sustained attention. Over this seven-year period, articles on the causes or the prevention of malaria were featured in this journal one hundred and twenty six-times, an average of eighteen articles a year. Malaria was the central topic of 10 articles in 1898; 7 in 1899; 41 in 1900; 25 in 1901; 22 in 1902; 11 in 1903 and 13 in 1904. The *BMJ* closely followed all developments in the establishment of the mosquito transmission proof. As early as 1898, the readership was told that it should consider changing their views to perceive mosquitoes, “as a positive source of danger [rather] than as an annoyance.”² This announcement that mosquitoes may pose a serious threat to the public’s health preceded the medical community’s decision to throw its weight fully behind the mosquito transmission theory.

On 24 September 1898, the *Journal* announced that the two leading researchers in Britain, Dr. Ronald Ross and Dr. Patrick Manson, agreed that malaria was transmitted by mosquitoes. Manson explained that at first the transmission of malaria via the mosquito was merely a theory, but it had now grown to the status of concrete scientific fact.³ Almost immediately this position achieved near unanimous acceptance within the *Journal*. Over the successive years, *The British Medical Journal’s* coverage on the cause of malaria and corresponding stories was thorough. The *Journal* never limited itself to examining the work and views of British researchers, but was careful to follow developments around the world. In particular, the investigations of Italian and German researchers, as they demonstrated the mosquito-vector, were praised for their persistence in the struggle against malaria.⁴ *The British Medical Journal* was not only speedy in transmitting this new knowledge to its readership but it did so in a thorough and conclusive manner.

The Journal of the American Medical Association was also up-to-date on developments in regards to proving the validity of the mosquito transmission theory. Although a little slower in publishing new developments made in malaria research, the depth and detail of the reporting in *JAMA* was comparable to the *British Medical Jour-*

nal. JAMA was much more cautious than its British counterpart in declaring that mosquitoes had been conclusively proven to play the central role in the transmission of malaria. In February 1899, the *Journal* released its first article which suggested, but did not completely endorse, that mosquitoes were an agent in the spread of malaria: “as experiments of Ross in India, and Grassi and Bignam, in Italy seem to have almost proven, the mosquito is the chief if not sole agent in the spread of malaria.”⁵

Only in February of 1901, when the focus of the *British Medical Journal* had long since turned to proving that the mosquito was the sole vector of malaria transmission, did *JAMA* finally stated that the validity of the mosquito transmission theory could not be doubted: “the evidence is now so complete that there can be no further doubt as to the part played by mosquitoes in the propagation and transference of malaria.”⁶ In all, *JAMA* printed eighty-nine articles on the new developments in malarial research between 1898 and 1904. Malaria was the central topic in 11 articles in 1898; 8 in 1899; 25 in 1900; 16 in 1901; 6 in 1902; 14 in 1903 and 4 in 1904. It was not lack of interest or the inability for *JAMA* to keep up with current research that made the *Journal* slow to endorse the mosquito transmission. Rather, the conservatism of the *Journal* made it cautious in supporting theories that had not been completely accepted as scientific fact.

Both *JAMA* and *BMJ* reflected a professional focus on the prevention of malaria. Even before the discovery that mosquitoes transmitted malaria, each journal ran articles on ways to prevent the spread of this disease. The prevention techniques that these journals preferred ranged from the enforced segregation of Europeans from native populations, to the construction of “malaria proof houses.”⁷

Neither journal revealed an interest in ending malaria for humanitarian reasons; each was focused on tangible benefits available through the expansion of trade, safer military deployment and the like. *JAMA* explicitly focused on the economic, political and military benefits that could be achieved by destroying malaria, which, “stands as an insurmountable barrier to the occupancy and civilization of a large part of the globe.”⁸ The *BMJ* emphasized the extent to which malaria endangered the control and development of valuable British possessions with telling statements like, “malaria is the greatest scourge of our tropical colonies.”⁹ In 1903 Ronald Ross was quoted to the effect, “how to contend

against the scourge was one of the greatest economic importance to the Empire.”¹⁰ Never in any article in the *Journal of the American Medical Association* or the *British Medical Journal* was the prevention of malaria focused on the elimination of human suffering. The center of attention was, first upon the scientific establishment of the mosquito-vector and second on a geo-political demonstration of the value of, and opportunity for, mosquito eradication.

The case of the mosquito vector in yellow fever in the two journals was somewhat dissimilar. The debates of 1899 between Professor Guiseppe Sanarelli of the University of Bologna, and the American medical community forced the *Journal of American Medical Association* to be active in supporting one particular theory of the transmission of yellow fever. By 5 January 1901, the journal gave its support to the American government’s assertion, based on the earlier theory of Finlay and developed and confirmed by American bacteriologist Walter Reed, that yellow fever was spread by mosquitoes.¹¹ Although it did side with this position, *JAMA* carried many articles written by Sanarelli, which allowed the pages of the journal to be filled with lively debate, one wholly absent from the *British Medical Journal*. Sanarelli’s responses to the acceptance of the mosquito transmission theory illuminates how lively and intense of a debate there was within the pages of *JAMA*:

was it worthwhile to make such a fuss and call attention of the world to a theory which the most superficial investigation shows to have no serious foundation, but which leads its authors to proclaim absurd deductions, such as the uselessness of disinfection in the prophylaxis of a disease that from the remotest times has always shown itself one of the most highly contagious in human pathology.¹²

Scathing remarks and intense debate within the medical community were eagerly reported by the *Journal of American Medical Association* and characterized the coverage of yellow fever in this journal until Sanarelli’s theory disappeared from view early in 1904, when it was completely dismissed. In all, yellow fever, the debate over the role played by the mosquito in transmission, and the issue as to whether it was the sole vector, provided fifty-seven contributions to the pages of *JAMA* in the years 1898-1904.¹³

The *British Medical Journal*’s reporting on yellow fever was different. Although yellow fever made the pages of the British journal frequently with forty contributions on the mosquito vector and related issues between 1898 and 1904, the *Journal* did not focus on scientific developments. The lively debate that characterized the pages of *JAMA* was completely absent. The *BMJ* showed more concern for reports on current outbreaks and their prevention. Interestingly enough, although most of the epidemics covered in *BMJ* were ones occurring in Cuba and the United States, *JAMA* itself never reported on these outbreaks. Its attention was focused solely on scientific developments. The American readership of *JAMA*, of course, would have ready access to other sources of information on domestic outbreaks of yellow fever. Nevertheless, the difference is striking. As in the case of malaria, the *BMJ* lacked the caution typical of *JAMA*. In February of 1900, the *British Medical Journal* published an authoritative article supporting Sanarelli’s theory for transmission of yellow fever: “there can be no doubt that bacillus icteroides is the causal agent of yellow fever.”¹⁴

The *Journal* continued to support Sanarelli’s theory until February of the next year, when the *BMJ* ran an article explaining that it now supported the mosquito transmission theory. It now praised Dr. Carlos Finlay for, “securing the acceptance for the theory,” and for standing up to, “much opposition and ridicule.”¹⁵ The paper never mentioned its own earlier opposition. Thus, the *British Medical Journal* was less cautious than its American counterpart: with malaria, this meant it reported the validity of the mosquito transmission theory first; with yellow fever, this tendency for rapid acceptance resulted in the *British Medical Journal* supporting for some time an incorrect causal theory. Once the transition was made, the *Journal* revealed a steady, but not an overpowering interest in the topic. Malaria continued to hold far more attention than yellow fever. There was, though, no doubt concerning the recognition, in both professional journals, that an epidemiological revolution had occurred.

Potentially both the *London Times* and the *New York Times*, well-respected newspapers with extensive readership, could have been important tools in the public dissemination, or reinforcement, of the new certainties in the epidemiology of disease. Surely, such transformative discoveries were news-

worthy topics deserving the attention of the press? Moreover, newspapers were perhaps the ideal vehicle for the medical community to ensure that the public was kept abreast of current theories in disease prevention. Most households and domestic outbuildings in Britain and the United States, after all, were home to mosquitoes. True, most species were not vectors for either malaria or yellow fever, but in these early years the explosion of interest in insect vectors led many researchers to see the mosquito, overall, as a major threat to human health.¹⁶ As the American monthly, *Good Housekeeping*, informed its largely middle-class female readership in 1902, “it behooves everyone to join in a grand war of extermination against the mosquito.”¹⁷ Finally, each paper had the potential to play the role of “middle man” by disseminating medical knowledge to its readership, preferably in a form suitable for lay understanding. The question arises: did either paper play a significant role in any one of these three functions during this initial period of discovery and the creation of scientific certainty, 1898-1904?

In view of the British public’s interest in global politics at the turn of the twentieth century, and in light of the threat that malaria posed to the building of the empire, one might assume that the “war on malaria,” as the struggle taking place in tropical climates was referred to, would be an important and frequent topic in the *London Times*. This struggle was at the forefront of official attention in the final years of the nineteenth century, following the influential colonial dispatch by Sir Joseph Chamberlain in May 1898 and the establishment of the schools of tropical medicine in London and Liverpool in the following year.¹⁸ However, the dissemination of knowledge to the reading public in regards to the revolutionary scientific findings was in truth sporadic, incomplete and so devoid of context that it could have been of little interest, or little help, to the reading public. There was, indeed, interest in medical reporting within the pages of the *London Times*. However, this was focused upon actual medical events, not coverage of medical discoveries. In particular, there was no direct link, whatsoever, between reporting in the medical press and related coverage in the daily press.

For example, on 18 December 1897, Surgeon-Major Ronald Ross published the first article in the *British Medical Journal* outlining his discovery that malaria cysts were to be found in the stomach walls

of anopheles.¹⁹ The announcement of this breakthrough discovery by Ross was the first of many which caught the attention of the medical press but failed to make their way into the *London Times*. Instead, attention was devoted to occasions of plague in India and new legislation regarding enforced small pox vaccination.²⁰ This shows that press coverage of actual events, even an outbreak of the plague in Jiddah, Palestine, where only three people died, was more newsworthy than major scientific discoveries.

As stated above, by September of 1898 British researchers firmly believed that mosquitoes did transmit malaria.²¹ However, no mention of this occurred within the pages of the *London Times* until a year later, when on 27 September 1899, the paper published an important letter written by Surgeon-Major Ronald Ross to one Mr. Alfred L. Jones regarding the role of mosquitoes in spreading malaria within the tropical colonies of the Empire. This letter, which was the first time the reading public of the *London Times* could have learned of the mosquito theory, or its proof, via this medium, was focused upon Ross’s plan for the extermination of mosquitoes using kerosene. It also provides valuable insight into the medical community’s perceptions of “the common man.” Ross believed that the solution to the “mosquito problem,” was to supply bands of “natives” with kerosene and have them attack areas heavily infested with mosquitoes under the supervision of a British officer.²² That is, this would be top-down, state-supported action. Ross explained that informing the public of recent medical breakthroughs was worthless because the public could not possibly understand the “complicated medical data.” He wrote, “you will understand of course that it will take some time for the public to get the mosquito theory into their heads.”²³

This letter was published in the *London Times* with no editorial comment or introduction. The irony that the British public was informed of the mosquito-vector within a communication which stated it that they could not possibly understand the doctrine apparently was missed by all parties. It remains uncertain how Ross’ letter to Jones, a leading figure in a Liverpool commercial enterprise with imperial interests, came to be published in the *Times*.

Perhaps it was Ross’ intention that his letter would, indeed, assist the public to comprehend the

mosquito-vector. However, if so, it was a peculiar method for the first transmission of a major medical advance in an influential English-language newspaper. It was but the first of many oddities in the publication history of the mosquito-vector disease in the pages of the *London Times*. Sporadic reporting continued to characterize the paper's relationship with malaria. Articles involving malaria appeared as "fillers" for the paper. There was both a total lack of context and a total lack of continuance. For example, on 7 October 1902, an article reported the formation of a "mosquito brigade" to pour oil over marshes. This article did not tell why researchers were employing such methods, nor was there subsequent reporting in the coming months to tell the readership of the brigade's success. The title of the article, "Malaria at Ismailia," provided the only geographic, or textual, information.²⁴ This article told its audience next to nothing about malaria and left it up to the reader to draw an underdeveloped connection between using oil, the elimination of mosquitoes and the conquest of malaria. This type of reporting, with adequate contextual information, would be sensible if it was assumed that the readership of 1902 was already well aware of the relationship between malaria and mosquitoes, and the value of petroleum in eradication (referenced previously only in Ross's letter of 1899). It is, of course, possible that the *Times*' readership did possess this level of understanding. It is most certain, however, that it did not acquire that knowledge from the *Times*.

More often than not, when the *London Times* did publish on malaria it was with reference to the British malaria commissions. Ross's letter to Alfred Jones appeared as the first in a series of those articles. The malaria expeditions were established by the Liverpool School of Tropical Diseases and it had goals of verifying the mosquito-vector and finding ways of preventing the transmission of malaria.²⁵ In one significant report, the British public was notified that the commission in Nigeria had confirmed the mosquito-vector theory.²⁶ However, the remaining coverage was of little or no use to the reading public. An article appearing on 20 July 1901 serves as a perfect example of the lack of context provided by the *Times*. On this date the readership learnt that Ross was about to embark for Sierra Leone, but not why he was going there, or what research he hoped to further.²⁷ These topics had not been broached. Because of sporadic and

incomplete reporting, the reading public would never have been able to grasp the purpose or the work of the malaria commission. It is apparent that although the paper did carry articles dealing with the malaria commission, these articles fell short of the newsworthiness that Ross had himself predicted, for the work. In June 1899 Ross had told *The Lancet*: "the results of the expedition if successful, will be of incalculable value, both scientifically and commercially, and its progress will be watched not only in the British Isles but on the continent."²⁸ Ross was pushing to have this research in "notoriously unhealthy" locals recognized as "Imperial work," with financial support from the public purse.²⁹ One can readily conceive of a series of cables dispatched home, which the editors of the *Times* either ignored or truncated so severely as to strip the "story" of a coherent narrative. Be that as it may, the *London Times* reporting on the malaria commission confirms that the paper's interest in malaria, such as it was, was in actual events taking place, and not the discussion of scientific techniques or theories. It seems clear that in the absence of a major epidemic, the paper had little interest in malaria measures. Coverage was ephemeral. There was no attempt to provide the reader with relevant background information that could have made these "filler" articles comprehensible and useful to the public.

In total, malaria reached the pages of the *London Times* on twenty-six occasions between January 1898 and December 1904. In contrast, during this six-year period there were only five articles focused addressing yellow fever. These latter articles were also episodic and incomplete. However, there was one article, which informed the public of the scientific connection between mosquitoes and yellow fever in a clear and reasonably complete fashion. An article appearing on 14 March 1901 reveals the episodic and incomplete nature of yellow fever reporting. This article, consisting of five lines, focused on romanticizing the efforts of "brave and fearless" American researchers who risked their lives trying to find a cure for yellow fever. The article made no reference to the theories these researchers were attempting to prove, how the research was being undertaken (with mosquitoes), or where the research was conducted. Indeed, this obtuse reference to the American medical research in Cuba failed to mention by name the fearless scientists who it was eulogizing. This article pos-

sesses the same “filter” qualities as did the coverage of malaria: a brief article placed in the paper without context incapable of achieving the stated purpose (in this case, appreciation for heroic endeavors).

In 1900, Walter Reed had confirmed the theory that mosquitoes transmitted yellow fever. By January of 1901, *JAMA*, and in February *BMJ*, published articles supporting the demonstration that mosquitoes did spread yellow fever. Only one month after the *British Medical Journal* confirmed the mosquito transmission theory with a detailed and complicated article, the *London Times* also reported positively the validity of the mosquito transmission theory.³⁰ What is striking about this entry was that this article, unlike those on malaria, was detailed, did provide adequate background information to the reader, and that it beat the *New York Times* by over a year in achieving a public announcement. The article provided an excellent explanation of earlier beliefs and of the new research, which conclusively established the mosquito as a vector in the spread of yellow fever:

the experimenters believe themselves to have established, beyond question, not only that the disease can be communicated from the sick to the healthy by mosquitoes, but also that the soiled clothes and bedding, hitherto so greatly dreaded, may be dismissed from consideration as harmless.³¹

This article was substantial. It was used by the paper to report accurately on the event of the discovery of the contagion of yellow fever. It stands out as the one piece of solid reporting of mosquito-vector disease within the *Times* during this period.

The American public, via the *New York Times*, experienced a different form of medical reporting than did the readers across the Atlantic who subscribed to the *London Times*. However, unlike the British press, whose interest in medical events included many areas around the globe, especially areas within the Empire, the American public was not informed of plague outbreaks in India or Jiddah. Instead, focus was placed solely upon the regional issue of yellow fever in the United States and adjacent shores. The American public was informed that mosquitoes could be the cause of malaria one month before the British public. An article titled “The Mosquito Bite Case,” although located well back on page twenty-two in the 20 August 1899 edition, proposed that there existed a strong

possibility that malaria was transmitted via mosquitoes.³² However, it was not until 1901 that readers of the *New York Times* were told of the medical community’s acceptance of the validity of the mosquito transmission hypothesis.

In contrast, American medical opinion, as represented by the coverage of this issue in *JAMA*, had arrived at this conclusion no later than 4 February 1899.³³ The reason for this slow reportage of the certainty of the mosquito theory is unknown, but it does, once again, reveal the lack of any direct connection between reportage in the medical press and in the daily press. Given that most articles regarding malaria were located in the back of the *New York Times* and those of yellow fever graced the first and second pages, it appears that the latter deadly disease was simply more newsworthy.

However, this was the extent of coverage of malaria. An endemic disease, which produced no life-threatening American outbreaks, was not newsworthy. Thus, there really was no need to report on malaria expeditions in Africa or new techniques employed to reduce the spread of malaria. Over the span of seven years there were only three articles published in the *New York Times* pertaining to developments within the scientific community, in regards to malaria. It is of interest, therefore, that the *New York Times* provided accurate, albeit sparse, and remarkably prompt coverage of the mosquito-vector for malaria, and did so in the complete absence of any newsworthy concern for malaria as a public health threat.

The *New York Times*' coverage of yellow fever was more substantial. This coverage did include scientific developments; however, most reporting was on yellow fever events. These events focused upon outbreaks, usually in New Orleans or Cuba, the corresponding quarantines and on the number of deaths and measures undertaken to ensure public safety. In respect to science, the public was able to read about debates within the medical community on the cause of yellow fever. On 8 July 1899, an article, which sparked the “yellow fever debates,” outlined the claims made by Sanarelli that he has discovered the germ of yellow fever and has prevented and cured the disease in human beings.³⁴ A few weeks later, another article stated that many within the medical community doubted that the specific bacillus of yellow fever has been identified.³⁵ This was just the beginning of Sanarelli’s and the American medical community’s claims that

would fill the pages of the *New York Times* with a lively scientific debate.

On 11 August 1899, the paper published a long article explaining that Sanarelli believed his American critics were incorrect and that he would issue a more detailed paper outlining his theory on the cause yellow fever. Eight days later, on 19 August 1899, the public was able to read in the *New York Times* Sanarelli's original defense of his work. This article, with commentary, seem to win over the editors of the paper who now supported Sanarelli's argument and went on to express that based on research concluded by Sanarelli there is a "reasonable possibility" of the production of an anti-serum more potent than the one currently employed.³⁶

As these entries illustrate, the American lay public was privileged to key debates within the medical community, in a way that readers of the *London Times* never were. This approach, of course, was not without its dangers. As scientific opinion moved away from Sanarelli, the *New York Times* abruptly reversed its editorial policy. From September 1899 through September 1902, it exercised total silence, until suddenly announcing that the whole of the American medical community had abandoned Sanarelli's theory and were in "firm belief" that mosquitoes were the sole factor in the transmission of yellow fever.³⁷ This reporting was late for a paper which had previously tried to cover new developments, in some instances doing so even before the medical press. It is reasonable to assume that this tardy reporting on the mosquito vector resulted from the paper having learned a lesson when it supported Sanarelli's incorrect theory.

The *New York Times* in its coverage of yellow fever, therefore, abruptly altered its approach to medical reporting from risky to very conservative. The precipitous action of 1899, therefore, provided adequate exploration for a tardy reporting of the mosquito-vector. How, though, is the interest in the sciences of yellow fever itself to be understood? It may be that the public's interest in yellow fever, as seen by the very extensive coverage of outbreaks, accounted for the paper's serious interest in covering the scientific debate. However, as we have seen, there was accurate, although brief, coverage of the malarial vector in the total absence of newsworthy stories on the health consequences of that disease. It can only be concluded that the *New York Times* was more interested than the *London Times* in reporting medical discoveries. It was the aftermath of the

Sanarelli affair which created a restricted and uncharacteristic coverage of the mosquito-vector in yellow fever.

Two distinct patterns emerge from an overview of the evidence. Both papers covered newsworthy events in the occurrence of malaria and yellow fever, with a wider geographic coverage in the *London Times*. However, the approaches to scientific advances were wholly dissimilar. The British paper had a confused and sporadic coverage; indeed, its finest piece of reporting involved the American discovery for yellow fever. However, that one article was truly unique. In contrast, readers of the *New York Times* enjoyed an accurate and timely, albeit brief, coverage of malaria and extensive, authoritative, debate on yellow fever. What is certain, is that in neither paper was there any direct connection between the specialist medical press and the daily newspaper. Instead, most certainly for yellow fever in America, and at least in part for malaria in Britain, the news came to the press directly from the medical researchers. It remains unclear, however, whether the dramatically different coverage of medical discoveries in the two papers arose out of differing editorial policies, or from a different relationship with medical science.

The reporting in the *London Times* in regard to advancements in the understanding of tropical disease research demonstrated common attitudes held at the turn of the century by those within the medical community and the general public. To judge from the press, the British state and public wanted malaria to be dealt with so that the colonies under British control that were "desolated by malaria" could be furthered developed by Europeans in quest of enhanced production and profits.³⁸ A characteristic contextualization of mosquito-vector research in the medical press follows:

This country, with its vast and ever-growing imperial interests has the best reason to be grateful to Dr. Manson, Major Ronald Ross, and the other scientific workers who have spent themselves in the endeavor to track to its lair the insignificant looking enemy which, more formidable by far than the legendary dragons, guards the golden apple of our colonial Hesperides, dealing death to those who seek to gather them.³⁹

American authorities followed suit, with ringing statements such as, "the sanitarian, and not the soldier, or statesman, is most likely to solve the

problem of the expansion of civilization and colonial expansion.”⁴⁰ The *Times* made the articles on yellow fever and malaria of interest to its readership by focusing on the dangers and bravery involved in tropical disease research. It characterized researchers such as Ronald Ross and the unnamed American researchers as brave souls struggling to find cures for important mysterious diseases. Articles which dramatized malaria and yellow fever research appeared much more frequently than articles that described the actual developments made by these “brave souls.” Other articles on native populations and the mosquito-vector exposed the racist attitudes common to the British public and the medical community in an era when social Darwinism influenced medical and philosophical circles.

Endemic malarial infection in native populations was identified as the reason for the inability of the British to prevent widespread malaria, or even enable colonial administrators to reduce the transmission to Europeans. There was a focus on how to control and utilize the native populations so that they could be an effective tool in the elimination of the mosquitoes found to transmit malaria. An article appearing in the *London Times* on 14 December 1900 suggested that the best way to combat malaria was to segregate Europeans completely from natives.⁴¹ Interestingly, this idea first appeared in the *BMJ* only in 1904 and 1905, when researchers began to question why the initial anti-mosquito methods had not achieved greater success within the trial sites.⁴² The *London Times* expressed the opinion that native populations would never take the initiative to rid their own communities of malaria and that it was the British task as a more enlightened society to assume control of eradication by the way of large-scale drainage and other top-down measures.⁴³

Ross, as we have seen, was one voice within the medical community who disparaged all lay involvement in the grand plan. The British public, he believed, could not readily comprehend the mosquito transmission theory, and native populations were fundamentally incapable of effective public health education: “it is quite unreasonable to suppose that the mass of the populace in barbarian countries would, even perhaps for centuries, accept the discovery that malaria was borne in mosquitoes.”⁴⁴

The coverage of yellow fever in *The New York Times* was telling in regard to the American

public’s fear of yellow fever. As the feature story in the 31 May 1899 issue attested, even a single death by yellow fever in distant Louisiana was enough to make the front pages of the newspaper. This article, which dominated the page, went on to inform the public that this particular outbreak of yellow fever in New Orleans was earlier in the season than in previous years and, thus, the situation, according to the paper, was gravely serious.⁴⁵ The next day, also on the front page, the *New York Times*, in a move which would characterize its yellow fever reporting at the turn of the century, changed its opinion of the seriousness of the situation and assured the public that there was no cause for concern.⁴⁶ This back and forth, with the paper one day warning the public of the seriousness of an outbreak, and the next day offering reassurance that there was nothing to fear, happened time and time again, often played out on the front page.

One way the *New York Times* reassured its readership of public health safety was to point out that the South, where in the past the authorities were allegedly averse to informing the public about yellow fever outbreaks, had become much better at warning the national authorities of the possibility of an outbreak.⁴⁷ The reassurance of public safety dominated yellow fever reporting. In articles of precise detail, the readership was informed that the troops coming back from Cuba in 1899 had their baggage and camp equipment thoroughly disinfected and were subjected to a detention of five days to ensure they posed no threat to the public’s safety. The *New York Times* also closely followed cases where yellow fever serum was employed to save people from the disease. However, this reporting was slanted, as cases that were deemed to be successful were emphasized by the paper whereas unsuccessful cases, if reported at all, were buried further back in the paper. When an outbreak occurred and quarantine was declared, the paper very quickly assured the public of its safety. On 1 August 1899, a yellow fever quarantine was declared for Hampton, Virginia, and the paper assured the public by stating, in characteristic form “Doctors were working day and night to perfect the quarantine.”⁴⁸ The paper often featured articles announcing how devastating yellow fever was to a local community suffering from an outbreak.

In Hampton readers were told that the quarantine brought business to a complete standstill and that three hundred visitors had checked out

early from local hotels in an effort to flee the area.⁴⁹ Three days later, a human-interest story portrayed the plight of a mother and a child who had broke the quarantine for fear that the poor child would contract the disease. What is interesting about this story is that the public, instead of being outraged that the quarantine could be so easily subverted and that this women risked everyone's health, was captivated by the description of a women willing to do anything to ensure the safety of her child.

Though the reporting in the *New York Times* was often accurate, frequently the paper highlighted stories where the appeal was largely sensational. The paper could also rely upon the fear of yellow fever to make information on the causation of yellow fever an interesting story. On the other hand, no such fear of malaria existed—it was endemic, not epidemic, and not a sensational killer in the United States. Given that the paper was preoccupied with American events and that malaria did not have the newsworthy pull that the fear of yellow fever had created, it is comprehensible why it was the causation of yellow fever, and not malaria, which was most important to the *New York Times*.

The question arises as to where these two newspapers obtained their information on the medical discoveries. Not a single instance has been found where a report in the daily papers originated in either *BMJ* or *JAMA*. Knowledge transfer, therefore, was not linear. The reporting in the papers was at times in advance of what appeared in leading medical journals, and at times lagged far behind. Although sources of information were rarely divulged to the reading public, it is obvious they were received by the papers directly or indirectly from a medical authority. If the paper did receive important information from medical authorities, why was the reporting on important discoveries so sporadic? Either the contacts between medical researchers, or public health experts, and the press were irregular, or the editors of the two newspapers had on hand material which they chose not to use. Both explanations appear likely. The severely truncated, virtually meaningless, reports on the British malaria commission in the *London Times*, and the long hiatus on the causation of yellow fever for the *New York Times* between September 1899 and September 1902, both, for different reasons, suggest that the papers had in their possession information which they chose not to print. On the other hand, the presence or absence of links between newspapers and

the medical experts were also likely consequential, and worthy of study.

The only medical researcher who had an obvious role to play in the *London Times* was Ross. He contributed several articles. However, in each case these appeared in the papers much later than the actual discoveries in the establishment of the mosquito-vector and each was peculiar in that, as in the case of the published letter to Jones, the information was transmitted to the public in a sideways fashion. It is worthy of notice that Ross did have an interest in promoting his own pre-eminence.⁵⁰ In the medical press Ross's contributions were authoritative and written with great precision. The contributions to the *Times*, on the other hand, appear as after thoughts. It is obvious that Ross did not have much competition in publishing articles in the daily press. It is apparent that Ross's relationship with the press was peculiar. Ross remarked that the public would take a very long time to understand the role of the mosquito in the transmission of malaria. However, believing this, he continued to publish articles in the *London Times* that carried complicated medical information, such as the type of mosquitoes that could be carriers of malaria. It also appears that Manson had forged a better relationship with medical journals, especially the *British Medical Journal*, where Manson still continued to serve as Ross' spokesman. Perhaps Ross forged a relationship of sorts with the *Times* because in this forum he could illustrate to the public what he had accomplished without giving any credit to Manson or others. Or was Ross a shrewd medical reformers of the type identified by John Duffy, who recognized that a major step forward in public health could only be accomplished by having the public understand the benefits and the necessity of further research?⁵¹ However, that purpose would have been best served by purposeful, contextualized, articles capable of lay comprehension. That however, is not what is found. The sole item of that character in the *Times*, was the anonymous yellow fever piece of 14 March 1901.

In principle, at least, both Ronald Ross and Patrick Manson expressed interest in educating the British public to the danger posed at home by the anopheles mosquito. In the early summer of 1900 Ross addressed the members of the Cambridge Pathological Laboratory in the certainty of the mosquito vector in malaria. He concluded with "strong conviction that the country was not

fulfilling the obligations which were incumbent upon it in regard to the destruction of mosquitoes [*sic*]. This he considered to be a matter of extreme importance....”⁵² In the same year Manson embarked upon his famed malaria experiment at London, infecting his son, P. Thurburn Manson, as a means to publicize what “all biologists and medical men” accepted but “it cannot be said that the general public (including these Europeans who in malarial countries might benefit by the practical application of the theory) unreservedly believe in, much less practically apply it.”⁵³ Manson feared that public ignorance would mean:

that a great principle, pregnant with important issues, might remain barren and unutilized. Impressed with this fear, and being anxious to see some profit from a theory which I knew to be true... I cast about for means by which the conversion and the co-operation of the public might be secured. I felt that unless the public believed in the efficiency of the sanitary measures so definitely proved by the mosquito-malaria theory, and, understood the principle on which these measures should be founded, they would not adopt them, nor, what is so necessary to the success if all such measures, co-operate heartily in carrying them out... It remains for the public to apply the lesson taught by the experiments.⁵⁴

We are left to speculate on Manson’s reaction to the London *Times*’ total silence on the dramatic experimental proof. Clearly, the message desired by Ross and Manson was not being disseminated in standard sources of public information. A larger, valuable study would be focused on discovering to what extent, and the means by which the British public of that time did know of Manson’s London experiment upon his son. However, the silence of the *Times* is both important and suggestive.

Meanwhile, what was the role of the British public health professionals in Manson’s grand endeavor? At the annual meeting of the British Sanitary Inspectors’ Association in August 1902, the president, Sir James Crichton Browne, seized upon the history of the discovery of the mosquito-vector in malaria as the theme for the presidential address. As reported in the *Times*, Browne speedily departed from this theme, to devote the great majority of his text to the likelihood that the common house-fly would soon be recognized as surpassing

the mosquito as the enemy of human health.⁵⁵ The readers of the *Times* did find the fly and the mosquito characterized as the agents within “Satan’s invisible world.” However, the fly, at a time when fly-borne disease of the Boer War was a topic of great concern,⁵⁶ took precedence as the next large step in medical discovery. As to the implication of the lessons now known from the malarial mosquito, Brown’s message was clear and unequivocal: the employment of suitably gratified members of the Sanitary Inspectors’ Association, “would at no distant date be approved and promoted by the Colonial Office.” Thus, one-hundred and fifty members in the British public health field were told that a firm knowledge of mosquito-vector disease would soon make them highly employable, abroad, by the Colonial Office. Not a word of the reported speech referenced domestic application of the knowledge. Clearly, the battle was to be fought and won within the Empire. There lay the glory of eradicating a disease which, Manson estimated, killed five million annually in India alone.⁵⁷ There lay the perceived economic opportunity, for nation and practitioner alike.

The *Times*, thus, provided information relevant to the then current developments of ideas on public health issues, but it was a partial, incomplete picture, best understood with the advantage of hindsight. Contemporaries would have had a more difficult time comprehending long-term trends. It is apparent that the *Times* did not believe it to be their responsibility to publish articles on medical discoveries, nor did it feel obligated to make these medical entries more accessible by providing context and accessible information. It appears reasonable to assume, therefore, that the London *Times* was a passive recipient of information.

The circumstances for the *New York Times* are as difficult to unravel. This paper also printed articles containing a high level of detailed medical information especially during the 1899 debate between Sanarelli and unnamed members of the medical community. The views of those within the American medical community were never expressed, nor their theories explained, except that they refused to accept Sanarelli’s theory of transmission. When the paper re-introduced the topic in 1902, only one article revealed any sort of relationship between the paper and medical authority. In September 1902 when the *New York Times* finally assigned its full support for the mosquito-vector, it

did so in, for this paper, an oddly inexact fashion. It based its conclusion on the work of one “Dr. Carter” who, “was in firm belief that mosquitoes is the only way yellow fever is spread.”⁵⁸ Henry R. Carter was a leading yellow fever specialist in the U.S. Marine-Hospital Service, well known and respected within the field, but was not a household name to the readers of the *New York Times*. Did Dr. Carter use his influence to place this article in the paper because by 1902 he believed that the public should be informed of certainty within the medical community of the transmission of yellow fever via the mosquito? It is interesting that after this article appeared in 1902, until the end of this study in 1904, not a single item on mosquito-vector diseases, outbreaks or further medical developments was printed. This pattern suggests that it was medical debate, as in 1899, which was newsworthy. While in 1902 the mosquito-vector in yellow fever was highly newsworthy in *JAMA*, it barely made the pages of the *New York Times*. Moreover, there clearly was no impetus towards public health education. This can be seen from the paper’s style of reporting on scattered yellow fever outbreaks throughout the period of study. In these instances, the sanitarian and quarantine public health measures taken in the affected areas were reported with no effort to educate the public on the importance of the mosquito.⁵⁹

One likely result of the pattern of reportage on yellow fever and malaria in the *New York Times* and in the *London Times* was that the general reading public remained both less knowledgeable on, and more suspicious of, the mosquito vector theory in contagious diseases. For example, the *Lancet* reported in 1905 that sections of the American public, when exposed to public health measures to eradicate mosquitoes, “looked on askance of these measures which seemed [to them] founded on mere theory.”⁶⁰ In the same year, the *British Medical Journal* lamented that sections of the public still did not believe in the relationship between mosquitoes and these two tropical diseases, “from time to time, even to this day, laymen will declare that malaria may be acquired without mosquitoes.”⁶¹ This result should have come as no surprise to medical practitioners, who repeatedly emphasized the difficulty of getting the public to accept the validity of a new medical paradigm.

As stated in *JAMA*, physicians know how difficult it is to persuade the public to adopt

preventative measures in preventable diseases.⁶² How did research scientists and public health officials expect the public to accept, to support, and to adopt these preventative measures? Even Ross, as reported in the *London Times* never tried to inform the public what types of measures they could undertake to protect themselves from the threat of mosquitoes. Although a high percentage of the relevant articles in *JAMA*, *BMJ*, the *New York Times* and the *London Times* focused on the large-scale measures that could be undertaken against the mosquito to reduce the transmission of yellow fever and malaria, not a single one of these medical journals or newspapers produced an article dealing with preventative techniques to be employed in their own countries by the general public. Why?

There are two explanations. First, the two critical battles against the mosquito-vector disease, it is clear, were defined as important, but reasonably distant, struggles: malaria in British India and Africa, and yellow fever in the American South and Cuba. The second explanation showed that within the medical professions top-down measures were seen as the most viable method of reform. Medical professionals on both sides of the Atlantic believed that the eradication and control of the mosquito was to be accomplished through state support and intervention. The well known struggles of public health movements in the late nineteenth century to acquire the involvement and financial resources of the national state established a legacy of focus upon large grand scales for the improvement of health orchestrated by, and centered around, the highest levels of authority. Private householders, or the reading public in general, were not entirely overlooked, but they were certainly not at the center of attention. In America, the first time when the public had to be called into the grand struggle and educated on the mosquito-vector, was the yellow fever epidemic of 1905: at that time, the *Stegomyia* mosquito became front-page news in a number of daily newspapers.⁶³ In Britain, the movement to enlist the general public was delayed until the campaign to eradicate all mosquitoes from the country in the 1920s.⁶⁴

In summary, malaria and yellow fever were, to some degree, newsworthy for both the *London Times* and the *New York Times* in the period 1898 to 1904. The focus was generally placed upon public health crises, or events. The only truly extensive newsworthy story worth reporting was yellow fever

outbreaks, or threatened outbreaks, in America or adjacent American-controlled Cuba, by the *New York Times*. This fits a pattern where those papers reported in substance only on national (or more rarely imperial or international) public health crises. Perhaps that is why the *New York Times* showed extensive interest in the Sanarelli debates of 1899, both because of the importance of the topic in America and because it came fast on the heels of the epidemics of 1897, 1898 and the heightened fears of 1899.⁶⁵ In the absence of a major domestic health crisis, neither yellow fever nor malaria were particularly newsworthy, either in their isolated outbreaks, or in scientific discoveries of causation. Thus, the discovery of methods to prevent or eradicate malaria in the British Empire, or yellow fever in the wider world, was little more newsworthy for the *London Times* than an outbreak of the plague in India. Endemic malaria lacked the sensationalism and public appeal of a yellow fever epidemic for the American and British press. As Ross stated in 1899, malaria killed slowly and lacked the interest of “dramatic” illnesses, such as cholera.⁶⁶

On the other hand, yellow fever was only marginally newsworthy for the *London Times* in this period. Perhaps, this could be attributed to the general absence of contemporary epidemics within the Empire. However, that was not entirely true. There was a series of yellow fever outbreaks in Gambia in 1900 that was never reported in the *London Times*. Indeed, that was notable as the first time in the British Empire when the disease’s connection to the mosquito was advanced.⁶⁷ Here we see an imperial crisis, a link to a newly emergent scientific theory, and a total silence from a major element within the British and international press. Possibly the *London Times* was more insular than hitherto supposed. It seems indisputable, thus, that the absence of a public health crisis in yellow fever, which was deemed to be directly relevant to the readers of the *London Times*, made any announcement beyond the actual event of finding the true causation of the disease to be wholly non-newsworthy.

This paper has shown the lack of connection between the medical press and the daily newspapers. Furthermore, it has shown that important and newsworthy discoveries within the medical community were virtually ignored by the daily press. Knowledge transfer between the medical

press, the *London Times* and the *New York Times* was non-existent. Although the daily papers did publish articles on medical discoveries for tropical diseases, these sporadic articles were weak competitors to stories involving outbreaks of disease. These actual events were deemed newsworthy by the daily newspapers. However, the papers never informed the public of the risk factors or the preventive techniques. The result was a near total absence of informed knowledge. If the readership of the *New York Times* or the *London Times* was relying solely on these sources for their information on malaria and yellow fever, they would not have known much about the nature of the disease, how it was caused, or how take preventative action.

In 1898 Ronald Ross explained the significance of the mosquito-vector to his medical peers with the comment: “in no department of human activity is it more true that “knowledge is power” than in that of preventative medicine.”⁶⁸ If knowledge was power, what was the price of ignorance? It is important to understand that in the mindset of that age it appears neither the daily press, the medical researchers, nor public health officials, felt it was their responsibility to inform the public, via a common means of mass communication, of transformative approaches to public health. The newspapers were focused on events, whereas researchers placed their attention either on discoveries or the prevention of these diseases. A reasonable conclusion, thus, is that reporting on the discoveries of mosquitoes as the agent of transmission in malaria and yellow fever suffered both from a particular, narrow, understanding of newsworthiness, and a weak connection between the medical community and the daily press.

Endnotes

1 This study arose within an experimental course provided by the Faculty of Humanities, McMaster University. I acknowledge the assistance and guidance provided by Dr. J.D. Alsop.

2 “Etiology of Yellow Fever,” *British Medical Journal* 26 February (1898), i, 550.

3 Patrick Manson M.D., “The Mosquito and the Malaria Parasite,” *British Medical Journal* 28 September (1898), ii, 849.

4 International Reporting,” *British Medical Journal* 24 November (1900), ii, 1249.

- 5 “The Dangers of Insect Bites,” *Journal of the American Medical Association* 4 February (1899), 249.
- 6 *Journal of the American Medical Association* 2 February (1901), 262.
- 7 Sir William MacGregor, “A Discussion on Malaria and its Prevention,” *British Medical Journal* 14 September (1901), ii, 680.
- 8 R.S. Michael M.D., “Malaria,” *Journal of the American Medical Association* 11 June (1898), 553.
- 9 *British Medical Journal* 24 November (1900), 1532.
- 10 Ronald Ross, “The Duty of the State in the Prevention of Malaria,” *British Medical Journal* 14 November (1903), ii, 1290.
- 11 Albert Wolder M.D., “Cultivation of the Estivo-Autumnal Malarial Parasite in the Mosquito,” *Journal of the American Medical Association* 5 January (1901), 562.
- 12 “The Mosquito Theory of Yellow Fever,” *Journal of the American Medical Association* 28 September (1901), 875.
- 13 Articles where yellow fever is the topic broken down by year: 1898 – 6; 1899 – 10; 1900 – 8; 1901 – 7; 1902 – 9; 1903 – 13; 1904 – 2.
- 14 “Etiology of Yellow Fever,” *British Medical Journal* 10 February (1900), 334.
- 15 “Mosquitoes and Yellow Fever,” *British Medical Journal* 16 February (1901), 399.
- 16 “Mosquitoes,” *Journal of the American Medical Association* 12 August (1899), 546.
- 17 *Good Housekeeping*, June 1902, 44, quoted in L. Jacklin, “Communicating Medical Information to the American Public: Domestic Health, Insect Diseases, and the Informed Housewife, 1902-1904” (unpublished paper).
- 18 E.E. Sabben-Clare, D.J. Bradley, and K. Kirkwood, eds., *Health in Tropical Africa during the Colonial Period*, Oxford, 1980, 142. See, for example, “The Identification of Mosquitoes,” *British Medical Journal* 29 September (1900), ii, 942. For the interest of the Colonial Office in yellow fever eradication, see, *The Prevention of Yellow Fever* London: H.M.S.O., 1906.
- 19 Ronald Ross I.M.S. “On some Peculiar Pigmented Cells found in Two Mosquitoes fed on Malarial Blood,” *British Medical Journal* 18 December (1897), ii, 1392.
- 20 In 1898 health reporting was dominated by the topics of which the following are typical articles, “Plague in Bombay” *London Times* 1 April (1898), 6.; “Vaccination” *London Times* 7 October (1899), 7.; “Anthrax Outbreak” *London Times* 11 April (1899), 9.; “Plague Commission Established,” *London Times* 4 November (1899), 4.; “Plague in Jiddah,” *London Times* 26 March (1898), 7.
- 21 Patrick Manson M.D. “The Mosquito and the Malaria Parasite,” *British Medical Journal* 24, September (1898), ii, 849.
- 22 Ronald Ross I.M.S., “The Malaria Mission,” *London Times* 27 September, (1899), 4.
- 23 Ronald Ross cit (24), 4.
- 24 “Malaria at Ismailia,” *London Times* 7 October (1902), 8.
- 25 “School of Tropical Diseases: Inaugural Lecture by Major Ronald Ross, I.M.S., on the possibility of Extirpating Malaria: Expedition to West Africa,” *The Lancet*, 24 June, (1899), 1744; “Special Correspondence,” *British Medical Journal* 24 March (1900), I, 736-7.
- 26 “Malaria expedition to Nigeria,” *London Times* 14 December (1900), 15.
- 27 *London Times* 20 July (1901), 8.
- 28 “School of Tropical Disease,” *The Lancet* 24 June, (1899), 1744.
- 29 “The Study of Malarial Fevers,” *British Medical Journal* 24 March (1900), i, 723.
- 30 *London Times* 14 March (1901), 10.
- 31 *London Times*, cit (32) 10.
- 32 “Mosquito Bite Case,” *New York Times* 20 August (1899), 22.
- 33 “The Danger of Insect Bites,” *Journal of the American Medical Association* 4 February (1899), 249.
- 34 “Serum in Yellow Fever,” *New York Times* 26 July (1899) 2.
- 35 “Fear under Control,” *New York Times* 3 August (1899) 5.
- 36 “To Conquer Yellow Fever,” *New York Times* 19 August (1899), 5.
- 37 “The Spread of Yellow Fever,” *New York Times* 29 September (1902), 5.
- 38 “Malaria and Tuberculosis,” *London Times* 30 January (1900), 12.
- 39 “The Malaria Experiments,” *British Medical Journal* 22 September (1900), ii, 818. See also Ronald Ross, “Malaria and Mosquito,” *The Lancet*

- 27 May (1899), i, 1559; “The Story Out of Malaria,” *British Medical Journal* 17 March (1900), I, 655.
- 40 M.A. Veeder, “Typhoid Fevers from Sources Other than Water Supply,” *The Medical Record* 26 July (1902), 15.
- 41 “Malaria Expedition to Nigeria,” *London Times* 14 December (1900), 15.
- 42 Alexander Crombie, “The Success of Mosquito Destruction Operation,” *British Medical Journal* 17 September (1904), 631.
- 43 “Malaria and Mosquitoes,” *British Medical Journal* 10 February (1900), i, 329.
- 44 “Malaria and its Treatment,” *London Times* 11 November (1903), 5.
- 45 “Yellow Fever in New Orleans,” *New York Times* 31 May (1899), 1.
- 46 “Little Fever in New Orleans,” *New York Times* June 1, (1899), 1.
- 47 “Yellow Fever Precautions,” *New York Times* 6 July (1899), 3. The theme of municipal and state reluctance to report yellow fever is examined in detail in, Margaret Humphreys, *Yellow Fever and the South*, New Brunswick 1992.
- 48 “In Fear of Yellow Fever,” *New York Times* 1 August (1899), 2.
- 49 “In Fear of Yellow Fever,” cit (50), 2.
- 50 Jeanne Guillemin, “Choosing Scientific Patrimony: Sir Ronald Ross, Alphonse Laveran, and the Mosquito – Vector Hypothesis for Malaria,” *Journal of the History of Medicine and Allied Sciences* v 57, 2002, 387; Edwin R. Nye and Mary E. Gibson, *Ronald Ross: Malariologist and Polymath. A Bibliography* Bassingstoke, 1997; Eli Chernin, “Sir Ronald Ross, Malaria, and the Rewards of Research,” *Medical History*, 32 1988, 32, 119-41; Robert S. Desowitz, *The Malaria Capers More Tales of Parasites and People, Research and Reality* New York: Norton, 1991, 174-98; Gordon Harrison, *Mosquitoes Malaria and Man: A History of the Hostilities since 1880* London, 1978, 102-8.
- 51 John Duffy, *The Sanitarians: A History of American Public Health* Chicago, 1990, 199.
- 52 “Special Correspondence: Liverpool,” *British Medical Journal* 9 June (1900), i, 1437.
- 53 Patrick Manson, “Experimental Proff of the Mosquito-Malaria Theory,” *British Medical Journal* 29 September (1900), ii, 949.
- 54 Manson, cit (56), 949-951.
- 55 “Sanitary Inspectors’ Association,” *London Times* 9 August (1902), 11.
- 56 The medical press demonstrated a concern for the fly as a general danger in disease propagation: “The Transmission of Cuban Fever by Insects”, *British Medical Journal* 17 December (1898), ii, 1848; “Flies and Typhoid Infection”, *British Medical Journal* 15 September (1900), ii, 787; “Insects as Carriers of Disease”, *British Medical Journal* 6 October (1900), 1037-8. In contrast, the *London Times* focused upon the probably importance of the fly as a disease vector in the Boer War and in India: “Camp Sanitation”, *Times* 13 November. (1900), 6; “Typhoid in the Army”, *London Times*, 22 August (1901), 8; Typhoid in the Army”, *London Times*, 13 November (1901) 14; “The Report on Sanitary Measures in India”, *London Times*, 1 October (1906), 9.
- 57 The Stomping Out of Malaria,” *British Medical Journal*, 17 March (1900), i, 655.
- 58 “The Spread of Yellow Fever,” *New York Times* 29 September (1902), 5.
- 59 For examples of the lack of concern for educating the public on essential health measures please see: “In Fear of Yellow Fever”, *New York Times* 1 August (1899), 2; “Fear under Control” *New York Times*, 3 August (1899), 5; “To Conquer Yellow Fever”, *New York Times*, August 19 (1899), 5.
- 60 “The Warfare against the Mosquito,” *The Lancet* 19 August (1905), ii, 562.
- 61 “Malaria without Mosquitoes,” *British Medical Journal* 1 July (1905), 36.
- 62 *Journal of the American Medical Association* 9 April (1904), 653.
- 63 J.D. Alsop “The Role of Epidemics in Public Health Education: Yellow Fever in Florida, 1905” (unpublished paper).
- 64 For example, “The Habits of Mosquitoes in England, *The Lancet* 8 April (1922), i, 724; “What is a Mosquito,” *The Lancet* 15 December (1923), ii, 1332.
- 65 Margaret Humphreys, *Yellow Fever and the South*, New York, 1992, 5.
- 66 “Malaria and Mosquitoes: Address by Major Ross I.M.S. *British Medical Journal*, 27 May (1899), I, 1459.

67 L.J. Bruce-Chwatt and J.M. Bruce-Chwatt, “Malaria and Yellow Fever” in Sobben-Chare, et.al. eds., *Health in Tropical Africa*, 56. The news of a concurrent outbreak in the Gold Coast was allegedly suppressed by authorities; if so, reports may not have leaked out L.J. Bruce-Chwatt and J.M. Bruce-Chwatt cit (70) , 57. As recently as 1898, the decline of yellow fever in Jamaica was an important topic for the medical press *British Medical Journal*, (1898), I, 110, 168, ii, 885.

68 “The Etiology of Malaria,” *British Medicine Journal* 12 March (1898), i, 716.