Waging War on Mosquitoes: Scientific Research and the Formation of Mosquito Brigades in French West Africa, 1899–1920

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ABSTRACT

While the majority of colonial public health officials in Africa intermittently used measures for mosquito containment, the government of French West Africa made the creation of what were called mosquito brigades into a vital element of urban sanitary policy. The project seemed to offer a chance to curb the impact of mosquito-borne disease on the colonial economy. Yet, despite the full support of sanitary policy on the federal, colonial, and local levels, the government found that conducting a “War on Mosquitoes” was far more difficult than they originally envisioned. The colonial government’s mosquito brigades were understaffed and often ran into resistance from both the African and European populations. Above all, the government’s urban mosquito control programs failed because their goal of controlling the breeding of mosquitoes lay beyond the limited capabilities of the both local government and the Federation’s health and sanitation services. This paper will examine the origins and fate of the French West African mosquito brigades and provide a context for analyzing their atypical place among colonial efforts at malaria prevention.

KEYWORDS: malaria, French West Africa, mosquito brigades, urban sanitation, Dakar

The inherent localism of health policy in the late nineteenth and early twentieth century allowed for a variety of responses to contemporary scientific research on malaria. Some public health officials of the time initially rejected the new mosquito theory for the transmission of malaria, while others embraced it as a basis for intervention. Among the latter group, officials in French West Africa distinguished themselves by the vigor of their “War on Mosquitoes.” With programs already implemented to oversee the drainage of local wetlands, advocates of mosquito control in Dakar turned attention to suspected breeding grounds that might persist within the built environment, near concentrated and susceptible populations. Here, officials deployed

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a system of what became known as mosquito brigades, organized groups that fanned out for a door-to-door effort to eliminate open water and encourage personal measures to protect against bites.

Each brigade consisted of a small team including sanitary guards and laborers along with a police officer to ensure that citizens would follow recommended measures. By the 1920s, the mosquito brigade had become a staple of sanitary policy in French West Africa, and remained an important feature of urban policy until the adoption of DDT and chloroquine after the Second World War. Local governments and occupying forces from Cuba and Panama to Africa had moved similarly in the early century to incorporate mosquito brigades, but these measures were typically limited and temporary, confirming James Webb's assertion that among colonial governments in general "mosquito control efforts were episodic and reactionary."¹ The mosquito brigades of French West Africa stand as the best instance of a sustained attempt to control malaria through locally organized and close-range efforts to control mosquitoes. This paper will examine the origins and fate of the French West African mosquito brigades and provide a context for analyzing their atypical place among colonial efforts at malaria prevention.

The vast majority of governments that used mosquito brigades did not see them as a long-term solution. By the end of the first decade of the twentieth century, most colonial governments in Africa had rejected mosquito brigades, either outright or after a brief trial. However, this assessment is not true for urban French Africa. By the 1920s, the mosquito brigade had become a staple of urban sanitation policy. The use of the mosquito brigade formed the basis of the Ministry of Colony's official policy toward public health in Africa. This was true not only in French West Africa; the government of French Equatorial Africa was granted similar rights.² What separated French West Africa from French Equatorial Africa was how ingrained the mosquito brigade would become in urban sanitation policy. Much of this had to do with the structure of the French West African government and its development into a multistate federation.

French West Africa's colonial government took shape in the piecemeal expansion of the French presence in West Africa after 1850, leading to the official creation of the Federation of French West Africa in 1895. By the 1850s, French policy toward the region had shifted and the colonial government looked to expand their influence beyond coastal entrepôts that had characterized the French presence in the region for the previous two centuries. Although these policies had little significant effect until the 1870s,³ a series of military conquests and the slow extension of France's sphere of influence from coastal forts into the interior of West Africa soon allowed the French to expand their colonial holdings into Mauritania, southwards in

1 James L. A. Webb, *The Long Struggle against Malaria in Tropical Africa* (Cambridge: Cambridge University Press, 2014), 35–36.

2 Deborah Neill, *Networks in Tropical Medicine: Internationalism, Colonialism, and the Rise of a Medical Specialty, 1890–1930* (Stanford: Stanford University Press, 2012), 80.

3 Margaret O. Maclane, "Commercial Rivalries and French Policy on the Senegal River, 1831–1858," *Afr. Econ. Hist.*, 1986, 15, 39.

Guinea, Ivory Coast, and Dahomey (Benin) and eastward into French Soudan (Mali) and the military-controlled territory of Niger.⁴

The expansion of Senegal into French West Africa created a three-tiered system of government: the federal level (represented by the governor-general in Dakar), the colonial (represented by the lieutenant-governor in each colony's capital), and the local (either in the form of the circle commander or the mayors of the various West African municipalities). While the military-controlled territories lacked the infrastructure to institute the mosquito brigades, the highly developed local institutions of urban Senegal were able to institute them as an integral part of their urban sanitation measures.

This was in part due to the political development of urban Senegal over the previous century. The first two centuries of the French presence in West Africa was limited to coastal cities. By the early nineteenth century, the communes of Goreé and Saint-Louis-du-Sénégal were home to a vibrant and politically active Creole community which dominated urban politics and commerce. This community lost some of its dominance over local commerce, but from the 1870s, until the First World War, Creole politicians used their family connections and ties to the local business communities to win seats in the local assemblies in Dakar, Saint-Louis-du-Sénégal, Goreé, and Rufisque.⁵ Creole politicians were primarily concerned with protecting the business interests of both French and local elites. This was in part because both groups believed that the government's policies toward controlling yellow fever were interfering with their business interests.⁶ The concerns of the local business interests in coastal French West Africa would be the driving force behind the development of the federation's urban sanitation policy.

The discovery in 1901 that the *Aedes aegypti* mosquito was the vector for yellow fever caused the colonial government to view mosquito control as an economic necessity. The politics of malaria were deeply tied to a belief that malaria was a barrier to France's colonial mission in West Africa and the economic development of the colonies—referred to universally by contemporary colonial officials and French academics as the *mise en valeur*.

Due to this view of malaria as a barrier to economic and political development, it is not surprising that the government of French West Africa adopted "the new discoveries" of the plasmodium parasite and the mosquito vector of malaria with surprising rapidity and with the zeal of a convert. Michael Worboys argues that the adoption of the malaria parasite theory and the mosquito transmission theory by the British colonial medical service from 1897 was based on 'new political interests in the health of Europeans in the tropics following the partition of Africa and the emergence of a policy of "constructive imperialism",' but it can be argued that these politics varied

4 Patrick Manning, *Francophone Sub-Saharan Africa, 1880–1985* (Cambridge: Cambridge University Press, 1988), 63.

5 Hilary Jones, *The Métis of Senegal: Urban Life and Politics in French West Africa* (Bloomington: University of Indiana Press, 2013), 139.

6 Kalala Ngalamulume, "Keeping the City Totally Clean: Yellow Fever and the Politics of Prevention in Colonial Saint-Louis-du-Sénégal," *J. Afr. Hist.*, 2002, 45(2), 200.

from colony to colony, and even more importantly between imperial powers.⁷ Jean-Paul Bado has argued that the politics of health in French Africa policy was developed by taking into account economic interests, the politics of assimilationism, and the experience of biomedicine in the region.⁸

Mark Harrison argues that among doctors in British India, Laveran's discovery was "greeted with widespread skepticism, and in some cases great hostility."⁹ This reaction was mainly because linking the plasmodium parasite to malaria could potentially hurt the reputation of the men who had positioned themselves as experts because his theory could "undermine the theoretical basis of existing preventative measures."¹⁰ Ronald Ross experienced a similar problem with his expedition to Sierra Leone. While Ross was able to successfully introduce mosquito brigades in Sierra Leone in 1899, they were quickly abandoned once they ceased being directly supervised by the Liverpool School of Tropical Medicine. Ross blamed much of the resistance from the colonial government on the Medical Officer of Health, W. T. Prout.¹¹ Raymond E. Dumett has argued that Prout was not the only one to blame for the failure of the development of mosquito brigades in Freetown, but that there was a conservatism characteristic of the local government's sanitation policy as a whole that was not receptive to what they considered to be a radical policy.¹²

Due to urban sanitation policy being under the domain of the federal, colonial, and municipal governments simultaneously, this unified front is quite remarkable. This consensus was neither due to a highly structured state system nor due to the medical establishment in French West Africa being more enlightened than their British counterparts in India and Sierra Leone, but because it was believed that it was in the government's interest to be receptive to the "new discoveries" regarding the etiology of malaria.

Public health officials in French West Africa embraced the mosquito theory because it did not undermine either the colonial or municipal government's antimalaria programs. Officials at all levels of government in French West Africa and its predecessor, Senegal and its Dependencies, were already undertaking marsh drainage and public works projects in the decades prior Ross's 1897 discovery of the mosquito vector for malaria.¹³ These projects would maintain their position as one of the principal arms of French West Africa's sanitation policy after 1897. In 1904, the powers of the colonial government to control disease were vastly increased with the Decree

7 Michael Worboys, "Germs, Malaria, and the Invention of Mansonian Tropical Medicine," in *Warm Climates and Western Medicine: The Emergence of Tropical Medicine, 1500–1900*, ed. David Arnold (Amsterdam: Clio Medica, 1996), 194.

8 Jean-Paul Bado, *Médecine Coloniale et Grande Endémies en Afrique 1900–1960, Lèpre, Trypanosome Humaine et Onchocercose* (Paris: Karthala, 1996), 7–8.

9 Mark Harrison, *Public Health in British India: Anglo-Indian Preventative Medicine, 1859–1914* (Cambridge: Cambridge University Press, 1994), 57.

10 Mark Harrison, 57.

11 Edwin Nye and Mary Gibson, *Ronald Ross: Malariologist and Polymath: A Biography* (New York: St. Martin's Press, 1997), 99.

12 Raymond E. Dummett, "The Campaign against Malaria and the Expansion of the Scientific Medical and Sanitary Services in British West Africa, 1898–1910," *Afr. Hist. Stud.*, 1968, 1, 177.

13 Raymond Dummett, 158.

for the Protection of Public Health. This law, granted the colonial government, was given the power to enter homes, destroy homes that were deemed unsanitary, and institute any public health and sanitation measures deemed suitable for the prevention of epidemic diseases.¹⁴

For medical officials in French West Africa, mosquito eradication became an attractive option, because it offered a method in which mosquito-borne diseases could be controlled, while also not completely overturning previously held beliefs on malaria control. What would drive the French West African government's attempt at forming a unified front against malaria was in part due to an embrace of Ronald Ross's theory of the transmission of malaria by the medical and research establishment of French West Africa. Above all, the acceptance of the mosquito theory of malaria transmission gave the colonial government hope that they could truly transform the Federation's capital, Dakar, from being one of most unhealthy ports in the empire into a model city.

LOCAL ADOPTION OF THE NEW DISCOVERIES

Late nineteenth-century scientific and medical research linked physicians and scientists with the colonial state in an epistemic community.¹⁵ This community allowed for malaria research to form as a truly international discipline. Colonial officials and those working in the tropics paid close attention to malaria control programs instituted by their international counterparts from Italy (Giovanni Grassi), the United States (Col. William Gorgas), the UK (Ronald Ross, Patrick Manson, and the Liverpool School of Tropical Medicine), and Germany (Robert Koch). While each of these individuals would influence French West Africa's malaria policy in some way, the government of French West Africa was mainly influenced by the development of mosquito brigades in Sierra Leone by Ronald Ross and the Liverpool School of Tropical Medicine.

The three major, late nineteenth-century discoveries concerning the etiology and treatment of malaria (that malaria was caused by the plasmodium parasite, that anophelines mosquitoes transmitted malaria to both birds and humans, and that quinine could kill malaria parasites in red blood cells) formed the basis of three schools of thought on how to control malaria.¹⁶ Giovanni Grassi and Angelo Celli would experiment with conceptions of malaria control through development and mechanical solutions to malaria (primarily screening), before coming to the conclusion that quinization was the best solution.¹⁷ Robert Koch would argue that the best solution was quinization, but his secondary discovery that malaria parasites were prevalent in both children and adults would drive the argument in favor of segregation.¹⁸ And Ronald Ross

14 Gouvernement de l'Afrique Occidentale Française, *Annuaire de l'Afrique Occidentale Française: Année 1910* (Paris: Imprimerie de la Gouvernement de l'Afrique Occidentale Française, 1910), 503.

15 For a good description of medical and scientific research as an epistemic community, see Deborah Neill, *Networks in Tropical Medicine*.

16 James Webb, Jr., *Humanities Burden: A Global History of Malaria* (Cambridge: Cambridge University Press, 2009), 128–29.

17 Frank Snowden, *The Conquest of Malaria: Italy 1900–62* (New Haven: Yale University Press, 2006), 46–51.

18 James Webb, Jr., *Humanities Burden*, 128.

would become one of the more vocal advocates for mosquito eradication as the best method for controlling the disease; all three scientists involved in this debate were driven by personal rivalries, ambition, and national pride. This caused the conclusions to the limited studies conducted to be packed with outsized claims of triumphant successes.¹⁹

Outside of the zealous advocacy of mosquito brigades from Ross, most were aware of the success of William Gorgas' "sanitary squads" in the Panama Canal Zone.²⁰ Malaria control specialists who had worked with Gorgas in Panama were recruited by the government of German East Africa to implement a malaria and yellow fever control program.²¹ Gorgas's mosquito eradication campaign offered a new approach to public sanitation campaigns that would underline all efforts to control mosquito-borne diseases in West Africa, these new sanitation brigades would be less concerned with controlling general filth as they were with combating mosquito breeding sites.²² The use of a team of laborers to diminish potential breeding sites for mosquitoes coupled with a team of inspectors, who issued fines to home owners found with larvae on their premises, would also become the model utilized in West Africa.²³

Where the mosquito brigades in West Africa would differentiate themselves from those used in Cuba would become evident after Cuban independence. While the use of mosquito brigades would be an important feature of urban sanitation policy in French West Africa until the adoption of DDT and chloroquine after the Second World War, mosquito brigades were abandoned by the Cuban government in 1903.²⁴ The independent Cuban government also had differed from West African governments in their view of the role of mosquito brigades in combating malaria. West African mosquito brigades always viewed malaria and yellow fever as a twin threat, while Cuban medical officials were far more eager to control yellow fever than malaria. This is in part because in Cuba, yellow fever was an urban disease and malaria was a rural one and in West Africa, malaria was just as much of a threat to urban communities as yellow fever.²⁵ Beyond regional differences in the etiology of mosquito-borne diseases, it is evident that personality and preference also drove differentiation in local policies.

The United States would adopt mosquito control measures not only in the campaign of Walter Reed in Cuba and William Gorgas in Panama, but also in domestic campaigns would be local in nature and would utilize oiling as their primary means of mosquito control. Leland Howard of the USDA credited the formation of a citizen-led antimosquito movement in New Jersey to a single speech. Alvah Doty

19 James Webb, Jr. *Humanities Burden*, 129.

20 Gordon Harrison, *Mosquitoes, Malaria, and Man: A History of Hostilities since 1880* (London: John Murray, 1978), 161.

21 Amina Issa, "Malaria and Public Measures in Colonial Urban Zanzibar, 1900–1956," *Hygiea Internationalis*, 2011, 10(2), 36.

22 Mariola Espinosa, *Epidemic Invasions: Yellow Fever and the Limits of Cuban Independence, 1878–1930* (Chicago: University of Chicago Press, 2009), 63–64.

23 Marc McLeod, "We Cubans Are Obligated Like Cats to Have a Clean Face': Malaria, Race, and Quarantine in Neocolonial Cuba, 1898–1940," *The Americas*, 2010, 67, 66.

24 Mariola Espinosa, 86.

25 *Ibid.*, 67.

enticed New Yorkers to embark on an antimosquito crusade by offering a bounty for each mosquito caught.²⁶ Similar small-scale mosquito control programs would be undertaken by A. N. Berkley in Upstate New York and Dr. J. M. Bartlett in Georgia.²⁷

This approach should not be construed as the United States having a singular anti-malaria policy. Many southern boards of health could not mimic the success of the Gorgas campaigns in Panama, due to the campaign's high cost and labor-intensive attempts to control the disease.²⁸ Similarly, in American overseas possessions, few would utilize mosquito eradication as a method to malaria control. In The Philippines, public health officials would at first proscribe segregation as the primary method for controlling malaria until shifting course in urban areas after 1912.²⁹

Colonial Medical Officials would debate the merits of mosquito brigades in multiple corners of the British Empire. Sir Andrew Balfour enthusiastically incorporated the mosquito brigade in the sanitation work undertaken by the Wellcome Laboratories in Khartoum as well as mosquito brigades be used for public works in Zanzibar, the Federated Malay States, and the infamous failed attempt at mosquito control at Mina Mir in present-day Pakistan.³⁰ Conversely, in the Madras Presidency in India, twelve district boards and thirty-nine municipal councils decided against instituting mosquito brigades because of resistance from medical officials and a belief that the brigades would not have even been cost-effective enough to experiment with their use.³¹

The Madras Presidency was not alone in the decision to pursue a malaria control policy that did not use, or at least rely heavily on, mosquito control. In the Gold Coast, the Korle Lagoon in Accra was cited as a primary mosquito breeding site for mosquitoes in the city. Therefore, it was deemed that the best method to control the disease was to institute a European "reserve" located roughly a half mile from the lagoon.³²

In Northern Nigeria, the government attempted to control the disease through public works projects, but they primarily attempted to do this through the creation of a *cordon sanitaire* to separate the European and African communities.³³ This approach would be advocated by two doctors from the Liverpool of Tropical Medicine, S. R. Christophers and J. W. W. Stephens, who viewed the two alternatives to

26 Gordon Patterson, *The Mosquito Crusades: A History of the American Anti-Mosquito Movement from the Reed Commission to the First Earth Day* (New Brunswick: Rutgers University Press, 2009), 12–17.

27 Ibid., 17.

28 Margaret Humphreys, *Malaria: Poverty, Race, and Public Health in the United States* (Baltimore: Johns Hopkins University Press, 2001), 69–70.

29 Warwick Anderson, *Colonial Pathologies: American Tropical Medicine, Race, and Hygiene in the Philippines* (Durham: Duke University Press, 2006), 212.

30 Henrika Kuklick, "Sanitary Khartoum: Building a Colonial City, 1899–1912," *Histories of Anthropology Annual*, 2008, 4, 212; Amina Issa, "Malaria and Public Health Measures in Colonial Urban Zanzibar, 1900–1956," *Hygiea Internationalis*, 2011, 10, 37 and 42; Gordon Harrison, *Mosquitoes, Malaria, and Man*, 135–37; V. R. Muraleedharan and D. Veerarahavan, "Anti-Malaria Policy in the Madras Presidency: An Overview of the Early Decades of the Twentieth Century," *Med. Hist.*, 1992, 36, 295; Jonathan Roberts, "Korle and the Mosquito: History and Memories of the Anti-Malaria Campaign in Accra, 1942–5," *J. Afr. Hist.*, 2010, 51, 348; Robert Stock, "Environmental Sanitation in Nigeria: Colonial and Contemporary," *Rev. Afr. Polit. Econ.*, 1988, 42, 23.

31 V. R. Muraleedharan and D. Veerarahavan, 295.

32 Jonathan Roberts, 343–65.

33 Raymond Dummett, 187.

segregation—quininization as advocated by Robert Koch and mosquito eradication as advocated by Ross—were impractical and not cost-effective.³⁴ William MacGregor would undertake an eclectic model of malaria control in Lagos, Nigeria, through the use of quininization, the screening of European homes, and mosquito control. However, in 1907, his successors would implement a policy of segregation.³⁵

Outside of French West Africa, the lone government to attempt to use the mosquito brigades as a permanent aspect of urban sanitation policy was The Gambia. The reports from Liverpool School of Tropical Medicine expeditions by J. Everett Dutton in 1901 and Rubert Boyce, Arthur Evans, and H. Herbert Clark 1904 led to the Board of Health for the city of Bathurst adopting mosquito brigades as a permanent aspect of the city's sanitation campaign.³⁶ The decision to adopt the mosquito brigade in Bathurst was born out of necessity. Bathurst's development was too ad hoc to realistically implement segregation policy and quininization would not present itself as a realistic option until the 1930s; therefore, the mosquito brigade was adopted as the only viable option.³⁷

With multiple theories at their disposal, public health officials attempted to implement policies that fit local conditions, the capabilities of the health services, and the attitudes and policy goals of the colonial government. French West Africa's decision to adopt mosquito brigades and to initially eschew formal segregation was based not only on the personal preference of public health officials within French West Africa but also due to the structure of nineteenth-century French medical research and the powers of the colonial government. More importantly, compared with the other governments discussed in this section, sanitation policy, while tailored to local conditions, still existed within a highly regimented bureaucracy, which placed limitations on how far a local government could veer from overarching policy directives.

FRENCH MEDICINE AND THE ADOPTION OF THE MOSQUITO BRIGADE IN FRENCH WEST AFRICA

Michael Worboys has suggested that for most of the nineteenth-century "doctors practiced (ordinary) medicine in the tropics, not a distinct type of tropical medicine."³⁸ For the French, the separate field of tropical medicine did not exist in the 1880s and would not form a distinct discipline for another twenty-five years. The practice of medicine and medical research in the tropics was heavily indebted to the Pasteurian School. The Pasteurian School followed a model "consistent with the scientific agenda of the Third Republic" by focusing on local diseases.³⁹

Medical geography and the study of local variations had a place in French medical research since the eighteenth century. Studies conducted during the eighteenth and

34 Phillip Curtin, "Medical Knowledge and Urban Planning in Tropical Africa," *Am. Hist. Rev.*, 1985, 90, 598–99.

35 Philip Curtin, "Medical Knowledge and Urban Planning in Tropical Africa," 603.

36 PRS CSO 2/77 The Opinion and Suggestions of the board of Health on Professor Boyce's Report.

37 For a more complete description of malaria policy in The Gambia Colony and Protectorate, see Christian Strother, "Malaria Policy and Public Health in French West Africa, 1890–1940" (Thesis for the Degree of Doctorate of Philosophy, University of Cambridge, 2013), 202–33.

38 Michael Worboys, "Germs, Malaria, and the Invention of Mansonian Tropical Medicine: From 'Diseases of the Tropics' to 'Tropical Disease,'" 182–83.

nineteenth centuries—usually treatises on a specific disease, tropical diseases, or hygiene—were undertaken by both professional doctors working in the tropics and by doctors working for faculties of medicine at French universities. These two groups often had ties to a medical tradition that was deeply concerned with local disease, French naval medicine.

Naval physicians first and foremost French medical practitioners in the tropics practiced a style of medicine that Michael Osborne refers to as a “hybrid niche” in which medical practitioners studied in metropolitan universities, but diverged in approach from metropolitan physicians.⁴⁰ Military doctors had the most access to patients that contracted tropical diseases; this was vital resource to a discipline that was still heavily dependent on case studies. Despite the growing interests in studying the diseases of the tropics, for most of the nineteenth century, there was no such thing as a broad discipline of tropical medicine in France.

This niche was reflected in a style of medical practice that was born within the micro-environment of the ship, where practitioners needed to pay close attention to local conditions and initially lacked medical degrees.⁴¹ This required naval physicians to have “an intimate knowledge of place” in order to best serve the medical needs of the ship’s crew.⁴² By the late nineteenth century, French naval physicians were studying in the medical faculties of France, but naval medicine was still a distinct discipline. During this era, theses produced in Bordeaux, Paris, and Montpellier by naval physicians, and articles in the professional journal *Archives du Médecine Navale et Coloniale*, reflect a discipline built on medical geography and local experience.⁴³

The late nineteenth century marked an era in which the European colonization of the African continent and the rapid expansion of medical knowledge dove-tailed. Helen Tilley argues that it was scientific researchers who drove projects integral to colonial state building.⁴⁴ No research would be more integral to the development of the colonial state in French West Africa than that into tropical disease. Scientists and doctors working within the metropole, doctors in the French military, and researchers working directly for the colonial state actively engaged in the global debate on the etiology and the prevention of tropical disease. The strategy formulated a new approach to treating tropical disease. This approach is exemplified in the work of Charles Grall, whose 1908 work *Hygiène coloniale appliquée* which laid the groundwork for sanitation and medical policy in Indochina by stressing that the role of the health service in the colonies was to combat

39 Anne-Marie Moulin, “Tropical without the Tropics: The Turning Point of Pastorian Medicine in North Africa,” in *Warm Climates and Western Medicine: The Emergence of Tropical Medicine, 1500–1900*, ed. David Arnold (Amsterdam, 1996), 167.

40 Michael Osborne, *The Emergence of Tropical Medicine in France* (Chicago: University of Chicago Press, 2014), 48.

41 Michael Osborne, 47–48.

42 Michael Osborne, 47.

43 The Faculty of Medicine at the Université du Montpellier I holds an extensive collection of medical theses from this era.

44 Helen Tilley, *Africa as a Living Laboratory: Empire, Development and the Problem of Scientific Knowledge, 1870–1950* (Chicago: University of Chicago Press, 2011), 13.

simultaneously endemic and epidemic disease.⁴⁵ There was constant room to adapt to local conditions for colonial health officials, but the overall approach of colonial medicine was to focus on combating endemic and epidemic disease. This focus meant that the French West African government was compelled to do more than protect the European population, and had real incentive to maintain mosquito brigades long after other colonial governments cast them aside for cheaper alternatives.

In order to successfully carry out this mandate, French West Africa was transformed into (to use Helen Tilley's description) a "laboratory" in which the new theories on how malaria was spread and how it could be contained were tested. For the colonial state, this was not simply a matter of sponsoring scientific inquiry within its borders, but was a matter in which they took a keen interest for the sake of the safety and the security of the Federation. In order to protect the Federation, the Governor-General was willing to endorse radical changes to sanitation policy and the leadership of the Health Service at the Federal level began to advocate for broad-based mosquito control policies.

THE DEVELOPMENT OF FRENCH WEST AFRICAN SANITATION POLICY

Beginning under Governor-General E. Roume in 1902 and continuing throughout the colonial period, the Federal government began to develop policies focused on eradicating mosquito-borne diseases. These policies were based on the belief that malaria could be controlled by attacking both the parasite and the vector simultaneously.⁴⁶ While the support for undertaking a new approach to combating malaria was firmly entrenched by 1902, the Health Service did not have a coherent strategy for combatting malaria until 1904. This because of an initial focus on the treatment of Europeans and Africans associated with the colonial state, but also because while the government was sympathetic to the "new discoveries," it initially lacked the capability to adapt their policies to focus on urban mosquito control. Despite the government lacking the capability to implement mosquito control policies, throughout this period, the colonial and federal government voiced their support of developing policy that embraced the mosquito theory.

The 1903 *Assembled Annual Report* for French Soudan proclaimed that it would be the doctors of the Health Service who would turn Laveran's discovery into policy:

Henceforth, the knowledge discovered by Dr Laveran and modern science permits us to know the causes of the propagation of malaria. Thus, our duty is to fight it by decreasing the radius of its means of infection and to limit the creation of new foyers and to eliminate old ones.⁴⁷

45 Laurence Monnaie-Rousselot, *Médecine et Colonisation: L'Aventure Indochinoise, 1860–1939* (Paris: CNRS Editions, 1999), 67–68.

46 Two early proponents of this approach were the brothers Edmond and Etienne Sergent of the *Institut Pasteur* in Algiers who conducted a series of surveys in Algeria from 1902–5 to measure the impact of malaria in the region and to devise a means to control the disease.

47 Archives Nationales du Sénégal, Dakar, Senegal (ANS) (Fonds Ancien) 2G 3/8 Sénégal-Niger, *Rapport Annuel d'Ensemble*, 1903, 2–3. Accessed via Microfilm at ANOM (*Archives Nationale d'Outre-Mer*) ANOM MI 14MIOM/1627.

The “new discoveries,” as they were referred to by the colonial government, became shorthand for sanitation and public works programs and mosquito control. Governor-General E. Roume lamented that the Inspector-General could argue that “malaria was considered an inevitable disease that the European had to undergo upon emigration to this distant part of the country . . .” He went on to state that:

authorities, adopting this fatalism, did nothing or almost nothing to fight this; because they were ignorant of the causes [of malaria]; contemporary science supplies us henceforth with the weapons which we were [once] deprived.⁴⁸

The 1904 *Annual Medical Report* for French West Africa placed the combating of the Federation’s insalubrious reputation through the sanitation as the “primary goal of his [Governor-General Roume’s] agenda.”⁴⁹ Combatting this reputation would not only involve implementing proactive public sanitation policies, but also an attempt to create a more nuanced image of French West Africa’s disease environment.

The government’s zeal for mosquito control was heavily influenced by the 1901 discovery of the mosquito as the primary vector of yellow fever. The medical officers of the Health Service were eager to apply the “new discoveries” in an attempt to make the Federation more profitable and reduce the risk of a yellow fever and their call for mosquito control would find powerful allies within both the metropolitan and federal government.

The merging of malaria and yellow fever control into a twin campaign was in part a directive that was coming from the Ministry of Colonies. A July 15, 1903 internal memo from the First Bureau of the Ministry of Colonies, discussing sanitary measures for Grande Bassam in the wake of a yellow fever epidemic, claimed that: “the most important sanitation work occurs in the yards of [the residents of the colonies’] homes.”⁵⁰ This statement formed the basis of urban sanitation policy in French West Africa. In a paper delivered in the 1905 Conference for the Military Circle of Saint-Louis du Sénégal, Dr. P. Gouzien argued that it would be within the homes of the residents of Saint-Louis that the municipal Hygiene Service would have to conduct the fight against yellow fever because they would have the largest impact by attacking mosquitoes where they bred:

We know, in effect, where we must search for the larvae, where this perfect insect hides. Its [eggs] are deposited in water of all nature, situated in the interior of

48 Archives Nationales d’Outre-Mer, Aix-en-Provence, France (ANOM) FM 1AFFPOL/3236 Governor-General Roume’s Speech is reprinted on pages 10–16 of *Gouvernement General de l’Afrique Occidentale Française: Inspection des Services Sanitaires Civils, Comité Supérieur d’Hygiène et de Salubrité Publiques (Décret du 14 Avril 1904) et Session du 17 au 21 Juin 1904* (Paris, 1904), 12–13.

[48] ANS (Fonds Ancien) 2G 4/22 A.O.F. Inspection des Services Sanitaires Civils, *Rapport Médical Annuel 1904*, 4–5. Accessed via Microfilm at ANOM ANOM MI 14MIOM/1635.

49 ANS (Fonds Ancien) 2G 4/22 A.O.F. Inspection des Services Sanitaires Civils, *Rapport Médical Annuel 1904*, 4–5. Accessed via Microfilm at ANOM ANOM MI 14MIOM/1635.

50 ANOM SG CIV XI/12 A. Kermorgant, “Mesures Sanitaires à Grande Bassam: Note pour la 1^e Direction-1^e Bureau,” July 15, 1903, 3.

homes, or in its surroundings, where we must attack all at first instance: the slightest collection of water, be it pure, brackish, soiled, even soapy, if it has time to allow the deposits of excess alkaline salts, can serve as receptacle for mosquito larvae.⁵¹

Gouzien warned that *A. aegypti* could even breed in places, such as decanters, flower vases, cisterns, and wash basins.⁵² The Hygiene Service would use sanitation brigades to conduct these searches for larvae, and it would be these brigades that would become the front-line in the government's campaign, the "War on Mosquitoes."

By the time of the passage of the 1904 Decree Relative to the Protection of Public Health (which set the powers of the colonial government during epidemics and laid out the general framework of public sanitation legislation in French West Africa), the mosquito vector had become firmly entrenched in government policy. The year prior to this decree, the colonial government had enlisted Dr. Le Moal to research the mosquito population of Senegal's four communes of Dakar, Saint-Louis, Gorée, and Rufisque and advise the government on the best methods of controlling the mosquito population.⁵³

The 1904 annual report from the Inspectorate of the Civil Health Service declared that "today it is apparent that it has acquired an indisputable fashion, that [malaria rates] parallel the frequency of anopheles mosquitoes."⁵⁴ One example of the pressure that was placed on members of the colonial government to accept the mosquito theory came in the form of a 1905 circular from the administrator of Kayes, French Soudan, to the directors of local services which stressed that the government must form a "unified front" to face an assumed public resistance to the "new discoveries."⁵⁵

This "unified front" was bolstered not only by the adoption of the mosquito theory as an integral part of public health policy. This also led to a renewed interest in medical geography. It would be through medical geography that medical officers and government officials in French West Africa found an easily understood framework to develop policy and to discuss the necessity of mosquito control.

THE MOSQUITO VECTOR AND THE REVIVAL OF MEDICAL GEOGRAPHY

In his 1904 report, *Study on Mosquitoes in French West Africa: [and] their Pathogenic-Prophylactic Role*, Dr. Le Moal argued that while studies of malaria indexes that focused on Europeans led to the belief that the entire region of French West Africa was

51 Dr. P. Gouzien, "L'Hygiène du Casernement et la Prophylaxie en Période Amarile," *Journal Officiel de L'Afrique Occidentale Française*, 1905, 1(41), 445.

52 Dr. P. Gouzien, "L'Hygiène du Casernement et la Prophylaxie en Période Amarile," 445.

53 ANS (Fonds Ancien) 2G 3/19 Inspection des Services Sanitaires Civils, *Rapport Annuel 1903*, 2–3. Accessed via Microfilm at ANOM ANOM MI 14MIOM/1631.

54 ANS 2G 4/22 A.O.F. Inspection des Services Sanitaires Civils, *Rapport Médical Annuel 1904*, 42–43. Accessed via Microfilm at ANOM ANOM MI 14 MIOM/1635.

55 Archives Nationales du Mali, Bamako, Mali (ANM) (Koulouba) H 126 "Circulaire à Messieurs les Administrateurs et Commandants des Cercles," 1905.

insalubrious, tests conducted African children offered a more complex picture of the disease environment:

The evaluation of the endemic index does not demonstrate that a uniform reputation of insalubrity can be made for the whole colony. It is possible that within each colony there are unhealthy regions, but also there are unhealthy towns, within the towns there are unhealthy quarters, and within each quarter there are homes or groups of homes that are particularly insalubrious.⁵⁶

As studies of the breeding habits of mosquitoes began to proliferate during the first decade of the twentieth century, colonial health officials in French West Africa began to draw connections between regions with high malaria indexes and high concentrations of mosquitoes.

When discussing the differences in malaria indexes from one area to another in the city of Dakar, the Principal Medical Officer of Senegal's Health Service, Dr. Rangé, argued that the areas of the city with the highest rates of malaria also coincided with the "principal foyers for the development of anopheles . . ."⁵⁷ Alexandre Kermorgant made a similar connection when he stated that the evolution of malaria is essentially connected to the frequency of the rain, which creates "the appropriate conditions for the development of Anopheles."⁵⁸ In an article in the *Annales d'Hygiène et Médecine Coloniale*, Kermorgant adds that "a puddle near a habitation is more dangerous than a swamp a kilometer away."⁵⁹

Research on the breeding habits of the mosquito also led to a further understanding of the nature of malaria transmission in West Africa. A 1905–6 study of malaria in Senegal conducted by Drs Thiroux and D'Anfreville of the Bacteriological Laboratory was able to explain that the spike in infections during the months of July through November and the localized nature of malaria were due to the behavior of the mosquito. This behavior led to the "foyers for the development of anopheles" to become the "foyers" for the transmission of malaria:

[W]e could not help noticing that culicides do not hibernate, like in temperate regions. We could find anopheles larvae year-round; we observed this in Sor, a suburb of Saint-Louis, which is very malarious, during the months of March and April; to tell the truth, adult insects are very rare during this period and they do not move far from where they were born; their reproduction, without stopping, is relentless.⁶⁰

56 ANS H 18(Fonds Ancien) Dr, Le Moal, *Les Etude sur les Moustiques en Afrique Occidentale Française: Leur Rôle Pathogénique-Prophylactique*, 7. Accessed via Microfilm at ANOM ANOM 14MIOM/1127.

57 ANOM BIB SOM C//1196 Conseil de Gouvernement de l'Afrique Occidentale Française (Dr. Rangé), *Rapports sur la Prophylaxie des Principales Malades Infectieuses Appliquée de la Cote d'Afrique (Variole, Malaria, Peste, et Fièvre Jaune)*, (St. Louis, 1903), 22–24.

58 M. A. Kermorgant, "Maladies Endémique Epidémique et Contagieuse qui on Règne dans les Colonies Française en 1904," *Ann. Hyg. Méd. Coloniale*, 1906, 9(3), 371.

59 M. A. Kermogant, "Prophylaxie du Paludisme," *Ann. Hyg. Méd. Coloniale*, 1906, 9(1), 26.

60 Dr. André Thiroux, "Des Relations de la Fièvre Tropicales avec la Quatre et la Tierce d'après des Observations Prises au Sénégal," *Ann. Inst. Pasteur*, 1906, 20(9), 770.

The tendency for adult mosquitoes to stay close to where they were born would become central to the understanding of the distribution of malaria. While the discovery of the malaria parasite gave health officials a new tool to study malaria among the various population groups of West Africa, it would be the study of the behavior of the mosquito that would determine the etiology of the disease.

The mosquito as a marker of the presence of malaria was not considered absolute during this period. Anophelism without the presence of malaria would vex malariologists until the 1920s, but mosquito population densities were much easier to track and calculate than acquiring large blood samples and splenic indexes taken from children. The study of mosquitoes also allowed French doctors to take into account the peculiar nature of the etiology of malaria in the region.

Colonial doctors and members of the colonial health service began to look at malaria as a disease that did not uniformly affect the West African coast. Malaria was viewed as having a predictable pattern and distribution that could be studied and understood. The link between mosquitoes and malaria allowed colonial officials to create an unofficial map of malaria in the Federation. Studies of the malaria index (the morbidity rate for malaria determined by either testing for enlarged spleens or for the presence of the parasite in blood samples) and mosquito density created boundaries for regions that were malarious and those that were not. Above all, this understanding allowed the colonial medical service to be proactive in malaria policy.

Colonial and local governments throughout French West Africa instituted programs to oil and drain possible breeding grounds. The most impressive program undertaken by a local government was the draining of the hinterlands of Dakar. The Cap Vert peninsula was described by one observer in 1898, as containing a "vast low-lying plain more or less inundated eight months out of the year" to the north-north-west at the Cape of Ouakam. A second large marsh, the marsh six kilometers to the north-east of the city at Hann, was believed to be another major breeding ground of mosquitoes.⁶¹ By the 1920s, these marshes had been mostly cleared, allowing for the expansion of Dakar into Hann and Ouakam, but the drainage system failed to curb the breeding of mosquitoes in the city, because the expansion of the city had created new artificial breeding sights from the mosquitoes. A large portion of the colonial sanitation budget would go into marsh drainage, but for reasons of feasibility and the constraints of local sanitation budgets, meant that attacking some sources of mosquitoes was beyond the means of the local governments.

Besides determining where to focus public works and sanitation projects, the measurement of the density of mosquitoes determined by locality and time of the year allowed colonial health officials to extrapolate the impact of malaria on a particular region from one year to another. The study of the insect's behavior allowed health officials to explain year-to-year variations in the malaria index as being based on changes in the breeding habits of the mosquito. Years where malaria rates were especially high or

61 Quoted in Marcel Leger, "Le Paludisme en Sénégal et en Particulier à Dakar: Ses Causes, Ses Moyens d'y Remédier," *Comptes Rendues des Sciences Communications de l'Académie Sciences Coloniale*, T. IV, 1924–25, 410.

low could be explained by the level of rainfall or by the vigilance of local sanitation ordinances.

By the early twentieth century, malaria had shifted from a disease that was an inevitable part of life for the European in the tropics to a disease that could be contained and—hopefully—avoided. It would be the mosquito theory that would allow the discipline of medical geography to be given a second life. Early studies by entomologists, scientists (studying the disease in both animals and humans), and physicians attached to the military and the colonial state would create an ecological theory of malaria for West Africa. These men had to take into account a region's average temperature and rainfall and theories on malaria and elevation were adjusted to account for the breeding of mosquitoes. The fact that malaria was caused by a parasite and was spread by an insect vector that is sensitive to temperature and rainfall meant that the explanation of the etiology of malaria through the concepts of medical geography was a relatively easy one.

Insalubrious regions were studied for the various environmental and ecological causes of malaria. From these studies, a new method of malaria control would be born; one that viewed controlling stagnant water found in gardens just as vital to public health as the development of the healthcare system. To the men working on malaria policy during this time period, it seemed as if there was a method to control the disease. To combat the disease, the colonial government decided to use their new understanding of the distribution of malaria to attack the disease in the cities.

The introduction of mosquito brigades in the commune of Dakar, Senegal, was neither a unilateral move by the government nor the acceptance of the recommendations of a scientific enquiry by a research institution, but a conscious effort by the government of French West Africa's Health Service and the Dakar's Municipal Hygiene Service to utilize the approach to the etiology of malaria that best fit their means, concerns about the general state of health within the commune, and the ecology of the city to form a policy to combat mosquito-borne diseases.

THE WAR ON MOSQUITOES IN DAKAR

Maurice Neveu-Lemaire concluded his 1901 doctoral thesis in medicine on the malaria parasite and its prophylaxis by musing on the role of mosquito control in the fight against malaria:

The complete destruction of the anopheles species of mosquito would certainly, more or less after a long period of time, cause the disappearance of malaria, but it is an impracticable dream; we will thus have to be content with making a relentless war on these insects.⁶²

62 Maurice Neveu-Lemaire, "Les Hématozoaires du Paludisme : Historique-Connaissances actuelles Application des Découvertes Récentes à la Prophylaxie du Paludisme," Thèse Pour la Doctorat en Médecine, Faculté de Médecine de Paris (Paris, 1901), 121.

In a 1903 report, Dr. Rangé of Senegal's Health Service recommended that the government should post notices on sanitation laws and—through a justice of the peace—issue penalties to those who were not following sanitation ordinances as “the only means of overcoming European and native indifference.”⁶³ To enforce these new measures, Rangé suggested that the sanitary agents of each town create a team including sanitary guards and laborers along with a police officer, who would ensure that the measures were followed. Rangé recommended that the Director of the Health Service for each colony should oversee the teams and the director would report to the Inspectorate of the Civil Health Service for French West Africa.⁶⁴ This effort was officially declared in an introductory report on malaria and yellow fever in French West Africa by Drs Rangé and Le Moal of the Health Service when they proclaimed that “the war on mosquitoes is now declared . . .”⁶⁵ Rangé and Le Moal's war would not be solely combatted through screening and mosquito nets—or even through marsh drainage, which had been the government's primary method of combatting disease—but through the reduction in the sources of stagnant water in both public spaces and within the interior of homes and compounds.⁶⁶

The public face of the “War on Mosquitoes” would often be the mosquito brigades, but there were also attempts to educate the public on the importance of mosquito control. A 1904 poster from the Government of French West Africa declared that:

Fever, out of all the tropical diseases, kills the most victims. It is not only the Europeans that pay this heavy price; natives and métis are not exempt. For a long time, doctors have worried about curing this disease, and the discovery of quinine has saved many lives, but if quinine cures bouts of fever, it can do nothing against the agent that causes this disease. . . . Recently, researchers have demonstrated that mosquitoes, so widespread in the tropics, were the propagators of fever. Until now we had considered them as pests, with irritating bites that cause the skin to itch . . . it is now known that these bites inoculate people with a parasite that after a few days manifests itself into a fever [that is] more or less grave.⁶⁷

The poster laid out a two-fold strategy for controlling mosquito-borne diseases: the first was to encourage the public to avoid being bitten by mosquitoes through the use

63 Dr. Rangé, “Rapport sur la Prophylaxie de la Malaria à Saint-Louis, Dakar, Rufisque, Konakry, Porto-Novo, etc., etc.,” Conseil de Gouvernement de l'Afrique Occidentale Française, *Rapport sur la Prophylaxie des Principales Maladies Infectieuses de la Côte Occidentale d'Afrique (Variole, Malaria, Peste, et Fièvre Jaune)* (Saint-Louis: Imprimer du Gouvernement de l'Afrique Occidentale Française, 1903), 28.

64 Dr. Rangé, “Rapport sur la Prophylaxie de la Malaria à Saint-Louis, Dakar, Rufisque, Konakry, Porto-Novo, etc., etc.,” Conseil de Gouvernement de l'Afrique Occidentale Française, *Rapport sur la Prophylaxie des Principales Maladies Infectieuses de la Côte Occidentale d'Afrique (Variole, Malaria, Peste, et Fièvre Jaune)* (Saint-Louis: Gouvernement de l'Afrique Occidentale Française, 1903), 28.

65 ANOM 1AFFPOL//3236 Dr. Rangé and Dr. Le Moal, *Fièvre Jaune et Paludisme: Hygiène Prophylactique (Rapport Introductif)*, n.d., 18.

66 Dr. Le Moal, 20.

67 ANS H39 (A.O.F. Fonds Ancien) Gouvernement de l'Afrique Occidentale Française, *Guerre aux Moustiques*, (sign) (Saint Louis: Imprimer du Gouvernement de l'Afrique Occidentale Française, 1904).

of screening and the second strategy was to “hunt” mosquitoes and to prevent their breeding.⁶⁸ This campaign to convince the public of the importance of mosquito eradication coincided with an effort by the Health Service to convince the civilian administration of French West Africa of the importance of their war on mosquitoes.

Principal Medical Officer Dr. Le Moal called for the circle commanders in the region surrounding Kayes, Upper Senegal, and Niger to “pursue the evil at its roots.”⁶⁹ To accomplish this, Le Moal laid out a five-step proposal for mosquito control in the city: control of stagnant water through drainage and oil; control of the “passive receptacles” of stagnant water; provision of wire coverings for public sources of water; controlling the mosquito breeding places in public gardens (especially ponds); and the final recommendation was to encourage personal protection by sleeping under nets and the screening of homes.⁷⁰ These recommendations would be fully endorsed by the Governor-General E. Roume and Senegal’s Health Service.

In a letter to the Lieutenant-Governor of Senegal, Roume condensed Le Moal’s recommendations into two categories. The first category of recommendations called on property owners to take direct action to prevent the breeding of mosquitoes such as: the covering of receptacles and the oiling of small bodies of water. Despite the Governor-General’s call for individual responsibility, he was reticent to give the administration the full power to inspect homes. Roume felt that these “special regulations” should be placed in an official act, but that it was “still not up to the administration to intervene in the interior of homes.”⁷¹ The second category of recommendations contained actions that could be taken by local and municipal governments; these were mainly large-scale projects, such as drainage and the maintenance of public water supplies.⁷² Despite the seemingly tepid support of the Governor-General, Dakar’s sanitation brigades were created with the Hygiene Service with the law of January 5, 1905.

The creation of the sanitary brigades was not the first time that local authorities in Dakar had been granted the right to inspect homes. Prior to the creation of the sanitation brigades, the municipal police carried out the inspection since being granted the authority to do so under the local ordinance of June 9, 1903 and the municipal ordinance of November 25, 1903.⁷³ To enforce these new measures, Rangé suggested that the sanitary agents of each town create a team including sanitary guards and laborers

68 ANS H39 (A.O.F. Fonds Ancien) Gouvernement de l’Afrique Occidentale Française, *Guerre aux Moustiques*, (sign).

69 ANS H 18 (A.O.F. Fonds Ancien) Dr. Le Moal, “Instructions rédigé par M. le Médecin-Principale Le Moal pour la destruction des moustiques dans le cercle et territoire de Kayes,” January 13, 1904.

70 ANS H 18 (A.O.F. Fonds Ancien) Dr. Le Moal, “Instructions rédigé par M. le Médecin Principal Le Moal pour la destruction des moustiques dans le cercle et territoire de Kayes,” January 13, 1904.

71 ANS 18 (A.O.F. Fonds Ancien) Le Gouverneur-General de l’Afrique Occidentale Française à Monsieur le Lieutenant-Gouverneur du Sénégal, “Projet Assainissement de Gorée,” April 19, 1904.

72 ANS 18 (A.O.F. Fonds Ancien) Le Gouverneur-General de l’Afrique Occidentale Française à Monsieur le Lieutenant-Gouverneur du Sénégal, “Projet Assainissement de Gorée,” April 19, 1904.

73 ANS (Fonds Ancien A.O.F.) H 22 *L’Hygiène à Dakar de 1899 à 1920*, 49. Accessed via Microfilm at ANOM ANOM 14 MIOM/1129.

along with a police officer, who would ensure that the measures were followed. Rangé recommended that the director of the Health Service for each colony oversee the teams and the director would report the Inspector of Sanitary Services for French West Africa.⁷⁴ The following year, Governor-General Roume wrote to the Lieutenant-Governor of Senegal calling for two mosquito brigades comprising of: two *garde sanitaires*, two workers, and one gendarme each.⁷⁵

The brigades were entrusted with conducting the basic sanitation work within urban Senegal: clearing any abandoned pirogues or objects that could contain stagnant water from public places, and, every eight days, placing kerosene on the surfaces of marshes and small bodies of water in close proximity to human habitation, but they were intended to especially target malaria. Team B in conjunction with Team A would also be responsible for searching private properties. Team A was also given the responsibility of the gardens and the exterior, while Team B searched properties for empty receptacles capable of holding stagnant water and placing screens on any water holding vessels. Both were given the authority to ensure that the owners of the property were in compliance with the new sanitation laws and those found to be in violation of the law were issued a *procès-verbaux*, for which the sanitation commission would then issue a fine or recommend any further action.⁷⁶

The number of teams that would become available for the use of the local government would increase over the following decades—by 1924, the Hygiene Service for Dakar consisted of one doctor, four gendarmes, and “a certain number of prisoners working as laborers”—but their primary task would stay relatively unchanged.⁷⁷ Yet, within a year of its inception, there were questions about the effectiveness of the sanitation brigades. The Medical Officer for the Municipal Hygiene Service for Dakar complained that the local population did not heed the advice of the Service and served as a “permanent danger” to Europeans.⁷⁸ The initial complaints revolved around the general compliance of those whose homes were being inspected, but another had to do with the structure of the brigades themselves.

The initial brigade consisted of one brigadier de gendarme and six guards in 1905. Already by 1906 Dr. Ribot, the Chief Medical Official of the Hygiene Service, was calling for an expansion of the mosquito brigades.⁷⁹ This belief that the mosquito brigades were understaffed was not unfounded. A report of the sanitary surveillance for Dakar for the period of November 28 through December 20, 1912, pointed out

74 Dr. Rangé, “Rapport sur la Prophylaxie de la Malaria à Saint-Louis, Dakar, Rufisque, Konakry, Porto-Novo, etc., etc.,” 28.

75 ANS H 39 (A.O.F. Fonds Ancien) Le Gouverneur-Général de l’Afrique Occidentale Française à Monsieur le Lieutenant-Gouverneur, n.d.

76 ANS H 39 (A.O.F. Fonds Ancien) Le Gouverneur-Général de l’Afrique Occidentale Française à Monsieur le Lieutenant-Gouverneur, ca. 1904.

77 Marcel Leger, “Le Paludisme en Sénégal et en particulier à Dakar: Ses Causes, Ses Moyens d’y Remédier,” *Comptes Rendues des Sciences Communications de l’Académie Sciences Coloniale*, T. IV, 1924–25, 412.

78 ANOM 1AFFPOL//3236 Le Médecine des Services Municipaux d’Hygiène du 2^e Article à Monsieur le Maire de la Ville de Dakar, n.d.

79 ANS (Fonds Ancien A.O.F.) H 22 *Hygiène à Dakar 1890 à 1920*, 49. Accessed via Microfilm at ANOM ANOM MI 14 MIOM/1129.

that during a year of epidemic yellow fever, local police were supplementing the work of the mosquito brigades. The report argued that local police were not a viable substitute for trained sanitation brigades. The task of searching homes should be entrusted to a group that has been trained by the Hygiene Service in “the basic notions of hygiene”; the report went on to claim that these brigades should serve as examples, especially to the Europeans, of how to properly follow the colony’s sanitation laws.⁸⁰

That same year, the Bouet-Roubaud Commission—organized to study the state sanitation policy in Senegal—examined the city and found that the logistical problems went beyond the use of police officers to supplement hygiene workers during the epidemic. In a letter to the Medical Inspector of the Civil Sanitary Service, the commission did note that by dividing Dakar into eighteen sectors, the sanitary brigades were able to inspect the entire city within the span of a week, but that the number of prisoners (eight prisoners were usually overseen by two or three African Sanitary Agents) was insufficient to carry out the task of clearing the city of all the debris that could conceivably become sources of stagnant water. The report believed that this forced the undermanned brigades to search the entire city only every six days, causing waste to build up in the areas between inspections. The commission suggested that prisoners should be assigned to one specific area to be cleaned every morning.⁸¹ The commission stressed the importance of the task of clearing waste because they viewed the destruction of possible containers of stagnant water as “the main objective of the stegomyia brigades.”⁸²

Dakar’s sanitary brigades were viewed to be lacking in the necessary personnel to control the spread of stagnant water in both the public sphere and in private homes. Whether one believed that the lack of personnel in either sphere was more of a concern than the other, it was generally agreed that the brigades were undermanned and overworked. Even with an expanded workforce, reducing the artificial breeding sites for mosquitoes—or even gauging the amount of homes containing such sites—proved to be an impossible task. The 1909 report from the Inspector of Civil Sanitation for French West Africa argued that in order to find the true number of homes containing mosquito larvae during the course of any year, one must multiply the number of *procès-verbaux* by at least twenty.⁸³

The report stated argued that the work of the mosquito brigades hindered by “long formalities.”⁸⁴ Mosquito brigades did not have the right to search the interior of properties, meaning that the majority of stored water for drinking and everyday use by the

80 ANS (Fonds Ancien AOF) H 20 Rapport sur la surveillance sanitaire de la ville de Dakar (Novembre 28–Decembre 20, 1912), 9–10. Accessed via Microfilm at ANOM ANOM MI 14 MIOM/1128.

81 ANS H 20 (A.O.F. Ancien) Le Mission Bouet-Roubaud à Monsieur le Médecin-Inspecteur des Services Sanitaires Civils, ca. 1912.

82 ANS H 20 (A.O.F. Ancien) Le Mission Bouet-Roubaud à Monsieur le Médecin-Inspecteur des Services Sanitaires Civils, ca. 1912.

83 ANS 2G 9/22 Inspection des Services Sanitaires Civils, *Rapport Annuel 1909*, 44 ANOM MI 14 MIOM/1650.

84 ANS 2 G 9/22 Inspection des Services Sanitaires Civils *Rapport Annuel 1909*, 44 ANOM MI 14 MIOM/1650.

African population were off-limits to the brigades.⁸⁵ They also encountered many homes that were abandoned during long periods of the year when the city's European population returned to the metropole. Inspectors were eventually allowed to enter homes, but only after the home owner failed to reply to a notice left by the municipal Hygiene Service.⁸⁶ Despite the criticisms of the Bouet-Roubaud Commission, the government-general of French West Africa stood behind the mosquito brigades as an essential part of urban sanitation policy.

In an April 1909 circular, Governor-General William Ponty would produce the first in a series of annual circulars urging colonial officials to see the importance of the government's mosquito control policy:

Before the start of *hivernage*, I feel the need to repeat the importance for continuing, relentlessly without faltering, the fight to defend the inhabitants of the centers of French West Africa against avoidable diseases, and [maintaining] the front-line against malaria and yellow fever.⁸⁷

Ponty proclaimed that modern scientific understanding had shown the best method to "check the intrusive march of these two diseases."⁸⁸ The Governor-General encouraged local officials to maintain their vigilance in searching homes for stagnant waters and placed the onus on them to maintain the colony's new more salubrious reputation.⁸⁹

In his 1911 circular, Ponty asked the citizens of the Four Communes of Senegal to aid the mosquito brigade and "do their duty and become auxiliaries of the sanitation authorities and hygiene agents."⁹⁰ Ponty hoped to do this by calling upon the citizens and subjects of urban Senegal—African, Creole, and European—to search their homes or compounds for all signs of stagnant water. Ponty argued that this task was vital to the success of the Federation:

We must protect ourselves, we owe it to our countrymen, we owe it our beautiful West African colony, and to protect its salubrious reputation that we have gained in the previous years to facilitate its economic and social boom.⁹¹

Ponty's circulars were an attempt to rally local people and sanitation agents to embrace laws that were extremely unpopular and whose effectiveness was considered questionable, but his emphasis on the protection of the colony went beyond simply

85 Marcel Leger, "Le Paludisme en Sénégal et en particulier à Dakar: Ses Causes, Ses Moyens d'y Remédier," 412.

86 ANS H 20 (Fonds Ancien) Dr. Huot à Service d'Hygiène ca. 1913.

87 William Ponty, "Circulaire au Sujet de la Continuation de la Lutte Entreprise Contre les Maladies Endémiques," *Journal Officiel de l'Afrique Occidentale Françaises*, 1909, 5(225), 211.

88 William Ponty, 211.

89 William Ponty, 211.

90 William Ponty, "Circulaire Relative à l'Application des Règlements de l'Hygiène Pendant l'Hivernage," *Journal Officiel de l'Afrique Occidentale Françaises*, 1911, 7(338), 315.

91 William Ponty, 315.

implored his Circle Commanders to enforce unpopular laws: he was reminding local officials of the importance of their mission. Despite the backing of the Governor-General, the problems laid out in the Bouet-Roubaud Commission's reports persisted.

In a 1913 letter from the General Inspector of the Civil Sanitary Service to the Governor-General of French West Africa, the inspector alluded to something basic to this unease when he argued that the African personnel should have "a great deal of initiative and tact; in effect they are encroaching into the private sphere, their actions are very disagreeable to the local population."⁹² The public's uneasiness with the work of the mosquito brigades would not diminish over the course of the next decade. A 1921 report on sanitation in Dakar argued that favorable conditions for the breeding of mosquitoes during the rainy season in both the European and African quarters were caused by the "negligence of the entire urban population."⁹³ This negligence was viewed as going far beyond a disregard for the importance of the inspection, amounting to outright opposition to the inspection process and interference with the work of the sanitary brigades.⁹⁴ The local government of Dakar quickly discovered that the development of mosquito brigades did not cause an immediate decline in the number of individuals infected with mosquito-borne diseases and had even sprouted its own particular set of problems when it came to conducting inspections.

CONCLUSION

The mosquito theory did not radically change how public health officials viewed malaria, but it was an attractive option to Senegal's municipal hygiene services and the Health Service. After decades of fearing that the colony would never be more than "The White Man's Grave," mosquito control gave government officials a concrete solution to how to control malaria while also preventing future yellow fever epidemics. The decision to institute mosquito brigades in French West Africa was one that was based on an acceptance of the "new discoveries" concerning the etiology of malaria, but it was also based on the specific conditions found in Senegal. The structure of French West Africa's Health Service and the localist approach of French medical research during this period allowed the French West African government the freedom to experiment with new solutions to the perpetual menace caused by mosquito-borne diseases. However, it was that very structure that allowed for the development and implementation of mosquito brigades that would also lead to their failure.

What the French West African government discovered was that developing policy and forming a consensus among colonial officials on the need to institute mosquito control measures was far easier than implementing policies. While government officials at the federal, colonial, and local levels at least passively accepted the new policies, the residents of the communes did not. Governments instituting these new policies found

92 ANS (Fonds Ancien A.O.F.) H 13 Le Médecin Inspecteur des Services Sanitaires Civils à Monsieur le Gouverneur Général de l'Afrique Occidentale Française (Personnel), Organisations d'une Section des Agents Indigènes du Service d'Hygiène du Sénégal, March 5, 1913, 2. Accessed via Microfilm at ANOM ANOM MI 14 MIOM/1126.

93 ANS (Fonds Ancien AOF) H 22 *L'Hygiène à Dakar de 1899 à 1920*, 320.

94 ANS (Fonds Ancien A.O.F.) H 22 *L'Hygiène à Dakar de 1899 à 1920*, 320.

themselves at loggerheads with local communities that neither feared malaria and yellow fever enough to allow for intrusions into the day-to-day lives nor to accept fines for creating conditions for the breeding of an insect that was largely seen as a nuisance. These factors, combined with a shortage of trained personnel to conduct mosquito inspections, eventually led to the perceived failure of the mosquito brigades.

Despite this, the mosquito brigades of French West Africa stand out as one of the few instances in which a colonial government used them as a consistent part of their sanitation policy. Despite the difficulties that the government experienced in implementing vector control policies, it would still hold an important place in government thinking; vector control would even expand into rural regions of Senegal during the 1920s. Efforts to control the mosquito vector would survive into the interwar period as one arm of a multifaceted approach to malaria policy. For the rest of the continent, vector control's return to prominence following the introduction of DDT during the Second World War signaled a departure from the previous policy, but for French West Africa, it seemed like the culmination of a dream held by colonial officials and doctors for nearly half a century.

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