

Spinning blood into gold:

science, sex work and HIV-2 in Senegal

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Abstract

Through ethnography, this dissertation chronicles how a West African variant of HIV, known as HIV-2, emerged as a knowable entity. It examines how a nation like Senegal, which exists at the margins of capitalism and the periphery of the biomedical knowledge empire, has come to occupy a central place in the trajectory of this “other” form of HIV. The dissertation draws upon scholarship from science studies to unweave the social and historical factors that created an environment in which HIV-2 became an object of scientific knowledge and practice. It also builds upon contributions from medical anthropologists whose work has elucidated the multiple ways that scientific facts, and the practices that produce them, accrue different meanings for the myriad actors engaged in their construction. The extension of bioscience into low-income settings has created new networks of scientific extraction, and with them, new configurations of power. By tracing the trajectory of Senegal’s HIV-2 research apparatus, the dissertation demonstrates how global inequalities shape the avenues of scientific possibility in low-income nations such as Senegal.

Specifically, the dissertation examines how a group of female sex workers in Senegal have been transformed from a population of bodies-to-be-managed into a cohort of enormous scientific value. It traces the series of enrollment practices that have allowed the Senegalese state and local HIV researchers to gain access to their biological profiles for more than three decades. The social behavior, and more importantly, the blood of these women have been systematically analyzed and banked, creating a reserve of biological data that Senegal’s researchers have referred to as “a gold mine.” While home to such powerful scientific raw materials, in the absence of any meaningful internal research funding, Senegal’s HIV-2 research program is exposed to the shifting priorities of international funders. The thesis takes HIV-2 seriously at a biological level, while also employing the virus as a useful lens for articulating the relationships between emerging forms of global power and the formulation of scientific truth.

Résumé

Cette thèse examine d'un point de vue ethnographique comment le VIH-2 (une variante ouest-africaine du VIH) est devenu un objet de savoir. Elle décrit comment le Sénégal a pu, en dépit de sa position marginale dans les systèmes capitalistes et biomédicaux, occuper une place centrale dans la trajectoire de cette « autre » forme de VIH. Cette thèse s'appuie sur les travaux des sociologues de la science pour examiner les facteurs sociaux et historiques qui ont contribué à la création d'un environnement dans lequel le VIH-2 est devenu un objet scientifique. Elle se base aussi sur des études en anthropologie médicale qui décrivent les multiples façons que les faits scientifiques, ainsi que les pratiques qui les produisent, développent de significations différentes pour les divers acteurs qui contribuent à leur production. L'épanouissement de la bioscience dans des milieux défavorisés a créé de nouveaux réseaux d'extraction scientifique, et en conséquence, de nouvelles configurations de pouvoir. En traçant les mécanismes de recherche sur le VIH-2 au Sénégal, cette thèse démontre le rôle des inégalités mondiales dans la formation des possibilités scientifiques dans des pays à faibles moyens comme le Sénégal.

Plus précisément, cette thèse explique comment une population de « corps-à-gérer » (des « travailleuses du sexe » au Sénégal) est devenue cohorte de grande valeur scientifique. Elle trace les pratiques d'inscription qui ont permis à l'État sénégalais et aux chercheurs locaux sur le VIH d'avoir accès à leurs profils biologiques pendant plus de trois décennies. Les comportements et le sang de ces femmes ont été systématiquement analysés et enregistrés, créant une banque de données biologiques considérée comme une « mine d'or » par les chercheurs sénégalais. Malgré la possession de matières premières scientifiques aussi puissantes, l'absence de financements nationaux pour la recherche fait en sorte que la recherche sénégalaise sur le VIH-2 est assujettie aux instabilités des priorités de bailleurs internationaux. Tout en considérant les dimensions biologiques du VIH-2, cette thèse se sert du virus comme outil pour analyser les relations entre des formes émergentes de pouvoir mondial et la formulation de la vérité scientifique.

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Introduction: HIV-2 in Senegal and the Making of a Model Epidemic

Introducing the Problem

This dissertation is an examination of the discovery of HIV-2, the world's other HIV virus. This West African variant of HIV is less prevalent and less aggressive than the more well-known HIV-1, and it is poised to play a central role in the development of HIV vaccine research. The dissertation explores how research subjects came to be enrolled in the HIV-2 research apparatus, demonstrating how the fusion of local practices with transnational networks served to make the local virological phenomenon of HIV-2 both a biologically knowable and socially potent force. What follows examines how the small nation of Senegal came to play a central role in the geography of HIV-2 research, demonstrating that the discovery of HIV-2 is at once a discrete event that occurred in the mid-1980s, and a process that extends back to the politics and policies established when Senegal was the seat of France's colonial West African holdings (*l'Afrique Occidentale Française*¹). HIV-2 is both a virus to be taken seriously on a biological level, and a useful lens for articulating the various types of relations and "assemblages" conjugated through global interactions in an unequal world (Ong and Collier 2005). Nestled within a nexus of the social practices that define contemporary life in Senegal and the scientific practices that define contemporary global science, HIV-2 brings to light the extreme uncertainty that shapes the possibilities of science in Africa, and the distribution of the HIV epidemic itself.

¹ French West Africa (Afrique Occidentale Française) represented France's eight West African Colonies. The federation was founded in 1895 and lasted until 1958. The original capital of the AOF was in the northern Senegalese town of Saint-Louis. The capital was moved to Dakar in 1902.

Situating the virus: Senegal's Model Epidemic

Bearing two-thirds of the world's HIV infections, Africa has come to be almost synonymous with the global HIV epidemic. Current figures estimate that some seven countries in southern Africa have adult infection rates higher than 15%. In the face of such high figures, the small West African nation of Senegal stands out as an exception. For more than two decades, Senegal has been able to maintain an adult HIV prevalence rate around just 1% (UNAIDS 2008). Senegal's low and stable HIV prevalence has earned the country praise from various international organizations, and the World Health Organization has highlighted Senegal's HIV response as one of its "Success Stories in Developing Countries," explaining: "The West African country of Senegal is one of the few countries in sub-Saharan Africa to have succeeded in containing the spread of HIV from the outset"(WHO N.D.). Internationally, it has been recognized as a model for HIV prevention, and has been cited as a proactive nation that has managed to keep its rates of infection among one of the lowest in sub-Saharan Africa (Meda, Ndoye et al. 1999; UNAIDS 1999; UNAIDS 2001)². In addition to the favor garnered by maintaining a low prevalence, Senegal received further attention by establishing one of the first government-run HIV treatment programs in Africa, eventually providing antiretroviral therapy (ART) free of charge to those living with AIDS in Senegal (Desclaux 2002; Desclaux, Ciss et al. 2003; Etard, Laniece et al. 2007).

² Many African nations are home to generalized epidemics, where high rates of infection occur in the general population, primarily through heterosexual contact. In contrast, Senegal has a concentrated epidemic, which means that the general population maintains a low prevalence, but certain defined sub-populations have higher levels of infection. One such vulnerable group is Senegal's population of female sex workers who have consistently maintained high levels of infection. The current overall infection rate for Senegal's female sex workers is 19.8% (CNLS 2008).

In a region where countries are often invoked for high rates of poverty, disease or conflict, making headlines for HIV success is quite a boon. Proof of Senegal's success is offered numerically in the form of infection rates which are produced each year by the nation's HIV Sentinel Surveillance Program. Senegal began its Sentinel Surveillance system in 1986 to create a cartography of HIV that would increase its capacity to monitor the HIV epidemic over time and throughout the country. While many other African nations established surveillance systems around this period, Senegal is one of the only countries to have continually performed reliable surveillance year after year. For practitioners, these studies provide the bedrock for planning HIV-related interventions. They help the government to plan interventions and measure program efficacy. They allow regional health bureaus to track the number of infections in their service, and budget their resources accordingly. For Senegal's politicians, the numbers emerging from surveillance studies provide important political fodder for their reputation as effective leaders.

As HIV has become synonymous with political will, infection rates have migrated from the offices of health planners to the podiums of presidential speeches. As the head of Senegal's surveillance group explained, "Our [politicians] say, yes, Senegal, we have a great system of HIV prevention because our prevalence is low...They use it as a way of asking for funding at an international level. They use it everywhere." She also intimated that for years, detractors leveled critiques of Senegal's low infection rate: "Everyone said that in Senegal we are hiding the results." These results, and the political clout that they carried, needed to be defended. For HIV rates were not only a source of pride for those involved in the HIV fight on the ground, but also they provided at the national level tangible proof of one's efficacy as a leader. On the international scale, they provided quantifiable proof of the vague yet highly prized values of efficacy and trust which can serve to funnel significant aid dollars into the country. These are serious matters for a country like Senegal that depends highly on outside aid. In short, maintaining the status of a model country has important political and economic consequences. For more than two decades the country has

measured HIV prevalence through the standard sentinel surveillance method, which tested pregnant women attending antenatal clinics. In order to definitely prove their low HIV status, in 2006 Senegal decided to undertake a resource-heavy Demographic and Health Survey (DHS), which studied both women and men from across the country. The results showed an adult HIV prevalence of 0.7% -- proof positive the country had contained the epidemic (Ndiaye 2005)³.

Another facet of Senegal's unique position in the realm of HIV in Africa is the remarkable continuity of those in charge of HIV research and care. In Senegal, as in many neighboring countries, government ministers barely warm their seat before a new person is shuffled in to take their place. Doling out such positions is a highly political affair, and Senegal is far from immune to the

³ Senegal has long been a "model" country by Western standards. During the colonial era, Senegal was home to France's citizenship experiment. After the French Revolution and the abolition of slavery, the colonial government put formal assimilationist policies in place, transferring educational and political opportunities to the colony in an effort to boost the image of *la paix française* (the French peace). In a clear break from prior policy, the new assimilation doctrine provided French colonies with representation in the General Assembly in Paris. In practice, this was impossible to implement on a large scale, so the policy was only applied in the four communes of Senegal – Saint-Louis, Gorée, Dakar and Rufisque. The Senegalese were divided into two distinct categories: the politically legitimate *habitants*, and the disenfranchised *sujets*. The French rationalized this contradiction by reframing the right to vote as a privilege for the 'civilized' (Conklin 1997). According to this doctrine, rural Africans were capable of receiving civilization, and thus could become *habitants* if they moved to the city, converted to Christianity or Islam, established themselves in trade, and adopted the lifestyle of Senegal's urban elite. The Four Commune citizenship experiment promoted Senegal as a model colony, and France as a model colonial power. In the post-colonial world, Senegal has largely maintained its status as the *doyen* of France's African colonies. In contrast to decolonization in British Africa, decolonization in the AOF served to consolidate France's relationship with the former colonies which it viewed as key allies. The close ties fostered during the colonial period, combined with significant development aid, fostered French control of the currency, and a strong influence on its language policy through its role in education. These ties, combined with interdependent business and political relationships, solidified Senegal's "special relationship" with France (Chafer 2003). As the realm of international aid has expanded in the region, and France's overseas development budget has declined, Senegal has courted other aid partners as well, notably the United States and the UK. Of course, there has been significant precedence for Senegal's role as an exception in the region. In the early days of colonialism, Senegal was home to France's citizenship experiment. Today, as the region's bastion of stability and democracy, Senegal has become a poster child for international development (Gellar 1995). As part of the USAID's millennium grant campaign, the agency described Senegal as "one of the most stable countries in an unstable region," lauding it as "a model of religious and ethnic tolerance" and a "top performer" (USAID 2006). Embodying the old models of a successful democracy and an accountable aid recipient, Senegal can now add to its list being a "model" Islamic country in an era when the West is deeply suspicious of Islamic fundamentalism.

clientelism that often drives such quick turnover. While ministers of health may change, the leadership of Senegal's National Council for the Fight against AIDS (*Conseil National de Lutte contre le SIDA* or CNLS) has been remarkably stable. Within Africa, Uganda was the first nation to set up a national program, but its leadership quickly deteriorated. Senegal's national program, meanwhile, has remained strong and consistent. Recently it was invoked by the World Bank as a model in the development of their "organizational template," a set of best practices intended to help nations retool their national AIDS control programs⁴. Indeed, the whole apparatus of HIV research and care in Senegal has demonstrated remarkable coherence over the years. From the beginning, the roles that each individual and organization would play in HIV prevention, care and research were clearly delineated. Over time, the individuals responsible for promoting the HIV response have trained successive generations whose members have respected the delineation of roles that were formed organically some two decades ago. This stands in contrast to many African nations where prevention and treatment were instituted much later, and stop-gap measures were put in place by multiple actors in an effort to close the chasm of HIV-related needs. In many places across the continent, the presence of multiple actors bred an uncoordinated response that led to both overlaps and gaps in care.

The harmonized response in Senegal is frequently attributed to early political will. The standard version of the story, which gets repeated at donor meetings and in policy papers, is that Senegal recognized the importance of political will early on, and immediately sought to integrate politicians into the HIV leadership. Indeed, at the time that the HIV was identified in Senegal in the mid-1980s, then-President Abdou Diouf acted swiftly to implement prevention programs that served to curb the spread of the virus. These included the promotion of condoms, the implementation of counseling and testing, and the integration of HIV education in the schools. President Diouf has received

⁴ The muscle behind the seemingly innocuous set of recommendations is the underlying message that nations seeking HIV funding had to comply to the Bank's vision of an ideal national program (Putzel 2005).

multiple awards and recognitions for his political engagement with HIV, including sitting on the board of the Harvard AIDS Institute. The Senegalese state certainly engaged in the fight against HIV long before many of its neighbors, but the back-story to this reveals that Senegal's HIV researchers played a significant role in fostering the political will and early concerted action that would make Senegal a model HIV country. Senegal's HIV engagement was the result of a simple proposal put forth in the hopes that an immediate and concerted effort could help stem the ravages of AIDS witnessed in other countries. It was also an attempt to take control of the enormous scientific and political potential value that HIV research presented. At its most basic level, Senegal's AIDS efforts were the brainchild of three individuals who today are synonymous with HIV in Senegal: Prof. Souleymane Mboup, Dr. Ibrahima Ndoeye, and Prof. Awa Marie Coll-Seck.

Senegal has had a rich history of medical and academic research, but this was largely conducted by the French. When Mboup, Ndoeye and Coll-Seck gathered to set out a plan for addressing HIV, it was the mid- 1980s, a full two decades after Senegal's independence. Yet these three were part of only the second generation of Senegalese to pursue academic and research careers. They understood the important role that research could play in the development of their country, and they knew well the challenges that their mentors had faced in their fight to secure the first research posts for Africans in Senegal. Prof. Coll-Seck was an infectious disease specialist, and would manage the care of HIV patients. Dr. Ibrahima Ndoeye was a physician, and he would take on the administration and political demands of HIV programming. Prof. Mboup was a research scientist, and he would develop the *Laboratoire de Bactériologie et Virologie*, the hub of HIV research in Senegal. According to one of Mboup's closest colleagues, the establishment of Senegal's national program was closely linked with the pressures and opportunities so keenly felt by this burgeoning group of professionals. "When we saw that HIV started to take on some importance, we had to create a National AIDS Control Program," his colleague recalled. "Souleymane Mboup and [Ndoeye and Coll-Seck] got together, and they realized that they had to protect research on HIV in Senegal. We didn't want the French to take it over. They are

very fast, and if they grabbed hold of it, we [Senegalese] wouldn't have anything left because they wouldn't have included anyone else in it. So we fought, we created a Committee for the Fight against AIDS. They went to see President Abdou Diouf, and they created [a mandate] that said that no research on AIDS in Senegal could be performed without approval from the committee. They closed the door." Senegal's swift engagement with HIV was as much an effort to create a united front to combat the spread of AIDS, as it was about staking a claim on the virus. From very early on, Senegal's HIV leadership recognized that the virus was both a threat to public health and a valuable research commodity.

Mboup and his colleagues understood the inverse relationship between HIV and development, asserting that an advanced HIV epidemic could stymie economic growth. The country was already weakened by crushing drought in the 1970s, and an epidemic could spell disaster for the country's delicate economic position. The group also viewed research as a vital step in development as a whole, and they were able to convince the president that HIV could play a role in bolstering the nation's research activities. This view contrasted with how the majority of African nations viewed HIV at the time. For most leaders, AIDS was not perceived as an opportunity for research, but as a plague that administrations sought to distance themselves from at any cost. Senegal's colonial legacy as the capital of French West Africa meant that Dakar had a strong history of scientific research, but at the time other nations were in a much better position economically to pounce on this new research subject. For example, Abidjan, the economic capital of Côte d'Ivoire, was a bustling metropolis with business and research infrastructure that could have helped the nation capitalize on the distant rumblings of this new wave of research. "From very early on, Senegal adopted the position that AIDS exists, and you have to fight it," Mboup's colleague continued to explain, "It was not the same for Côte d'Ivoire. There, the government...[and President] Houphouët Boigny did not want to say that HIV existed, that there was AIDS, because of all of the tourists and such." By viewing HIV less as a public relations threat and more as an invaluable research resource, Senegal's scientific and political leaders were able to take early action against the

epidemic, and take ownership of HIV as a local scientific resource. This move has served the country well. It set the course for a united effort that has played an important role in containing HIV infection. It has also put Senegal on the HIV research map. Twenty years after the prescient meeting-of-three, Prof. Souleymane Mboup was honored by the publication *Jeune Afrique* for his scientific accomplishments by being named one of Africa's Men of the Millennium. Behind this model of a man, at the heart of this model epidemic, is a model disease.

HIV-2: A Model Disease

The meeting of Mboup, Ndoye and Coll-Seck was of vital importance because Senegal had just become the site where a new form of HIV was identified. Prof. Mboup had previously undertaken a survey to determine if there was any HIV infection in Senegal, and he and his colleagues recognized that there was something unique about the HIV samples that they had collected. They displayed a new kind of HIV infection that had never been seen before; this infection was the West African variant known today as HIV-2. This virus has become a model for studying how HIV works in the body. As the next chapter describes in detail, individuals living with HIV-2 generally survive for long periods of time, in some cases whole life spans, before exhibiting any symptoms. This stands in remarkable contrast to HIV-1 infected individuals, who develop AIDS within a matter of years if they are not placed on treatment. As a less aggressive virus, HIV-2 is in this sense a model, or ideal type, of HIV infection. Unlocking the mechanisms that keep the virus under control could provide a major step in the development of an HIV vaccine.

In addition to being a model virus in the sense of its desirable 'behavior', HIV-2 is also a model virus in the sense that it can be used as a proxy for studying the dynamics of HIV-1 infection. Monkey models are currently the standard model for studying certain aspects of HIV-1. Such models are particularly important in the post-therapy era, for it is difficult to study the human body's

immune response to HIV infection if a person is undergoing treatment. Since people living with HIV-2 often live for years, even decades, without treatment, scientists can study their immune systems in a “natural” (i.e. treatment-free) state of infection. HIV-2 is the only available *human* model for the study of HIV-1, and is therefore an important tool in the search for a global vaccine.

With the discovery of this new model virus, Senegal’s researchers had ample reason to call for the recognition of the epidemic and a full-bodied political response. The President of Senegal’s *Université Cheikh Anta Diop* has explicitly linked Prof. Mboup’s work on HIV-2 to the country’s successful HIV politics. When I interviewed him about the current state of research in Senegal, he explained, “Senegal’s advancement in AIDS management is due to the quality of [Mboup’s] research. He was able to convince Senegal to adopt such a policy. His example is a conspicuous demonstration of how quality research is truly related to our capacity to manage such problems.” Mboup himself has also explained that the discovery of the virus has allowed him to build Senegal’s image as a leader in HIV-related research and policies. “The discovery of HIV-2 helped us do a lot of things for Senegal,” he explained, “because we found ourselves propelled onto the international stage. Wherever I go, people will talk about Senegal. So we can be an ambassadorial force...it is a powerful tool for attracting funds.” HIV-2 thus emerges as the back-story to Senegal’s visible HIV success, and this dissertation explores the multiple practices that made HIV-2 both a biologically knowable and socially vital force.

Theorizing an epidemic: How to study HIV-2

This dissertation examines how an agent, for all intents and purposes invisible in virtue of its microscopic size, leverages large-scale biological and social changes. It also examines how a nation like Senegal, which exists at the margins of capitalism and at the periphery of the biomedical knowledge empire, has come to occupy a central place in the story of this other form of HIV. A study of HIV-2 elucidates the multiple ways in which the distribution of disease is

socially shaped, and demonstrates the myriad ways that the contours of knowledge -- what we know about HIV-2 -- are socially informed. Science Studies provides an important theoretical framework for teasing out the multiple practices that made HIV-2 a knowable entity, and explaining how the geography of HIV-2 had Senegal at its center.

Science Studies has provided an important correction to the universalist view that promotes science as somehow outside of culture, what Traweek has described as “an extreme culture of objectivity: a culture of no culture” (Traweek 1988: 162). This dissertation explores the host of social and historical factors that shape both the practice and content of science. It does not view the discovery of HIV-2 as a straightforward tale of a researcher who, armed with objectivity, grit and a bit of luck happens upon a new virus. Rather what follows in this dissertation is a gradual unweaving of the web of social and historical factors that created an environment in which HIV-2 could become a knowable scientific entity. The intention is not to simply replace scientific facts with insight about a broader form of social order (Latour 2000), but rather to position scientific knowledge in the realm of the lived-world, so as to demonstrate the co-production of scientific knowledge, biological reality, and the social world.

Science Studies scholarship is particularly useful in the study of HIV-2 because it shows how the scientific process transforms problems from an “experimental uncertainty to knowledge claim, and from knowledge claim to universal fact” (Adams and Pigg 2005: 26). The process through which biological and social worlds and scientific fact are co-constituted was popularized in large measure by scholars associated with the Actor-Network Theory (ANT) approach to science studies (Callon and Latour 1981; Callon 1986; Law and Hasard 1999). Rather than study the institution of science, the ANT approach turned the analytical gaze to the very content of science⁵. Opening this “black

⁵ While ANT scholars developed a particular framework for studying the content of science, it is important to note that Ludwik Fleck’s study of the Wassermann reaction is one of the first accounts to examine the various practices that made up scientific knowledge (Fleck, Merton et al. 1979 [1935]).

box,” ANT scholars pushed the boundaries of constructivism, focusing instead on “*how* knowledge, in a specific case, has actually been constructed” (Cambrosio and Keating 1992: 363). To do so, both nature and society had to be examined according to the same “grid of analysis” (Callon 1986). Rather than accepting the ‘facticity’ of a fact, they explored the myriad practices and actors that were involved in transforming data into immutable facts. The more actors (human and nonhuman) that could be inserted into such processes or networks, the more a knowledge claim could shed its dependent context, and adopt the quality of facticity (Shapin 1985; Latour 1987). For ANT scholars, then, science is not a universal phenomenon but merely a stable one (Latour 1993).

ANT and the principle of extended symmetry provide important correctives to the tendency in some anthropological formulations to adopt uncritical, universalist positions towards the biomedical sciences. For it reveals the myriad ways in which biology and the social environment are co-constituted. However, the ANT approach suffers from a nearly complete erasure of the political and economic forces that shape how we come to know scientific facts. Indeed, ANT’s founding principles preclude any acknowledgement of the structural features of society, such as race, class, and historical experiences of colonialism, which contribute to the very content of science (Hess 1997). This is due in part to the fact that ANT’s principle of extended symmetry does not recognize “human intentionality,” and thus leaves little room for how power differentials shape a network (Pickering 1999). Indeed, the tendency to attribute to material things an “autonomous voice” impedes the important recognition that inequalities are not only present within networks, but serve to differentially shape scientific knowledge (Collins and Yearley 1992). In an attempt to bring inequalities to bear on science studies, scholars have examined the ways in which certain ways of knowing are tied to particular locales and sets of social relations (de Laet and Mol 2000). By incorporating a focus on these “locally negotiated orders,” scholars have been able to acknowledge the scientific ‘work’ of human and nonhuman actors, while addressing how some actors accrue more value than others through various social processes (Casper and Clarke 1998).

Anthropologists engaged in the work of studying science have demonstrated that in its effort to open the “black box” of science, ANT scholars neglected to explore the context in which scientific facts evolved (Lock 2000).

Methodologically, this dissertation incorporates the vital work of Science Studies to interrogate the nature/culture divide, and focuses on the myriad actors involved in making HIV-2 a knowable fact. However, as an ethnography, this dissertation also plays close attention to the individual and group experiences of the people that I have studied. It acknowledges the imbalances of power that exist between actors who make up the HIV-2 research apparatus. Like other anthropological studies, it incorporates the richness of ethnography to demonstrate how scientific facts, and the practices that produce them, often take on different meanings for different people according to the social, political and economic contexts they occupy (Rapp 1988). Specifically, this dissertation acknowledges that the science of HIV-2 is shaped by local experience and practice, as well as global politics. For as the centers of scientific knowledge production shift away from Euro-America, the emerging field of “anthropology of the biosciences” must engage in wholly new forms of investigation that consider the influential dynamics of global inequalities and postcolonial life (Harding 1998; Anderson 2002). This dissertation situates itself among contemporary anthropological work that explores the intersection between emerging forms of global power and the formulation of scientific truth (Biehl and al 2001; Nguyen 2005; Pigg 2005; Hyde 2007).

Recent work on the anthropology of clinical trials and global pharmaceutical development has traced the relationship between global inequities and scientific knowledge, exploring how the increasing need for clinical data opens new spaces where science and the global organization of biocapital overlap (Petryna 2006; Whitmarsh 2008; Petryna 2009). Building on Foucault’s concept of biopolitics - or the incorporation of life into the realm of political calculation - anthropologists have demonstrated that what is at stake in contemporary biomedical research is not merely a differential valuation of bodies and life, but

the transformation of that hierarchy into a surfeit of vitality, a biovalue that gives way to new hybrids of life, technology, economics and knowledge (Waldby 2000; Franklin and Lock 2003; Rose and Novas 2005; Helmreich 2008). The intensification of the management of health and vitality has created an increasing demand for scientific knowledge, and the global organization of biocapital is shaping local and global therapeutic economies (Nguyen 2005; Rose 2008). As the calculation of bodies and body parts becomes untethered from the power of the nation state, biocapital has adopted an increasingly global character (Sunder-Rajan 2006).

As this brief review of the literature indicates, much of the “black box” work of science studies has focused on the development of scientific facts in Euro-American laboratories. Anthropologists have made significant strides in contextualizing this work within an increasingly globalized world. The recent move to expand science studies to low-income settings has produced important insights about how the extension of bioscience into low-income regions has served to create new networks of scientific extraction, and with them, new configurations of power. However, by focusing on the global extension of pharmaceutical and corporate-driven research, these studies tend to reproduce a centripetal assumption about the nature of scientific discovery: while scientific networks are dispersed across the globe, they remain tied to a Euro-American core. The scientific work of local researchers in low-income nations remains largely invisible, like unopened black boxes. This dissertation seeks to widen this purview by recognizing that nations such as Senegal need not be relegated to nodes within global networks of Euro-American based science. They may also be centers of knowledge production themselves. This dynamic is explored in this dissertation which interrogates the unopened black box of HIV-2. The chapters that follow acknowledge the myriad ways that transnational networks shape how Senegal’s researchers came to make HIV-2 a biologically knowable and socially relevant force. It pays particular attention to the enrollment practices that made the virus knowable within a population of Senegal’s female sex workers, and demonstrates how the ebb and flow of scientific and humanitarian priorities have

shaped the capacity of Senegal's researchers to fully exploit the scientific raw material in their midst. It is therefore a story of scientific survival on the margins – an account of how a highly-trained and well-connected group of researchers have struggled to keep knowledge of HIV-2 moving forward, while striving to build a research program that they view as vital to their country's development. This dissertation is a testament to the efforts that these individuals have made to keep Senegal on the scientific map, and to maintain the central pole of HIV-2 research – like the biological distribution of the virus itself – firmly planted in West Africa.

The current project

This dissertation is rooted in cultural anthropology's tradition of ethnographic fieldwork. The choice to perform fieldwork at the *Laboratoire de Bactériologie et Virologie* (LBV) stemmed from a collegial relationship that I have developed with members of the laboratory over more than ten years. In 1999, I spent a year in Dakar researching the social aspects of antiretroviral therapy (ART), and during that year I built relationships with the staff at *Laboratoire de Bactériologie et Virologie* (LBV), and also at their partnering institution, the *Institut d'Hygiène Sociale* clinic. Conversations over the years, whether at conferences or during short subsequent research trips, allowed me to establish a research plan for examining the contributions of Senegal's HIV researchers. While the foundation for this research was established over the past decade, the data for this dissertation was gathered during a year and half of fieldwork in Senegal from 2006 to 2007. Fieldwork was largely based at the LBV, and the project began as a general ethnography of the laboratory. Over time, it became clear that the lab's work on HIV-2 lay at the scientific and political heart of Senegal's HIV epidemic, and I began to focus my investigation more narrowly on the virus itself.

I carried out daily observations at the LBV and was fortunate to have participated in nearly all aspects of life in the laboratory. I observed at the bench

in the lab's various units, attended meetings with research partners and granting agencies, travelled with LBV staff to the rural labs and clinics to gather samples, and even participated in writing proposals for future LBV projects. During those 18 months of fieldwork, I had ample time to engage with friends and colleagues in a casual manner, learning about their work and life histories. In this manner I came to know the host of actors engaged in LBV's work – from the professors and unit directors, to lab techs, secretaries, washer women and gardeners. In addition to this daily observation, I performed formal, taped interviews with members of the LBV staff. I also formally interviewed the LBV's research partners from Europe and North America during their periodic visits to the lab. The experiences of these multiple informants cannot be adequately represented here, but their stories furnish the backdrop against which the story of HIV-2 unfolds. Various public figures appear in this text, including prominent researchers and program heads. The public nature of their work makes them easy to identify, so with their permission I have included their actual names in this text. All remaining individuals appearing in the dissertation are referred to by pseudonyms in order to protect their anonymity.

When HIV-2 emerged as a research focus, I expanded my research site to include the sexually-transmitted infections (STI) clinic at the *Institut d'Hygiène Sociale*, a public clinic where Dakar's female sex workers (FSWs) report for registration and clinical follow-up. In addition to observations at the clinic, I interviewed twenty FSWs on an individual basis and participated in their group discussion sections. I also performed taped interviews with the clinicians and social workers who care for the women. To provide the historical context for the work at the clinic, I interviewed individuals who had worked as physicians at the STI clinic during the early years of the HIV-2 work. The final component of my fieldwork involved travelling to The Gambia and Guinea-Bissau to meet with researchers from the British-run Medical Research Council (MRC). The first trip was to Fajara, in The Gambia to learn more about the MRC's clinical HIV cohort; the second was to Caio, Guinea-Bissau to better understand the MRC's community HIV cohort. In both The Gambia and Guinea-Bissau, I was able to

interview a selection of the scientists, clinicians, and administrators involved in the MRC's HIV-2 research. These short research trips were not intended to produce deep ethnographic data, but rather were designed to provide a context for the HIV-2 research being carried out in Senegal. This regional contextualization furnished important information about the divergent experiences of a public African laboratory versus a private European-backed laboratory operating in Africa.

Structure of the argument

The dissertation adopts a genealogical approach to the study of HIV-2. It therefore alternates between contemporary ethnographic portrayals of HIV-2 research and historically-oriented chapters that explore the specific social and political shifts that undergird contemporary practice. The purpose of the historical chapters is not to provide a complete history of a given event, or even to search for the “origin” of contemporary practices. Rather, these chapters seek to uncover relevant practices, policies and events of the past that linger in the form of the hidden assumptions that shape contemporary scientific work.

The dissertation opens with an overview of the scientific literature on HIV-2. This summary provides the reader with an orientation to the basic biological aspects of HIV-2, a foundation that will ground the social analyses that follow. The chapter examines the biological origins of the HIV-2 virus, and describes its mechanism of infection. By examining the geographical distribution of the virus, the chapter demonstrates how the microbiological traits of HIV-2 coupled with specific geopolitical events and local social practices to create a uniquely West African epidemic. Finally, the chapter explores how the virological and immunological aspects of the virus make it uniquely suited for the study of a globally-relevant HIV-1 vaccine.

Chapter 2 chronicles how the rise of germ theory, specifically its corollary of commensurable bodies, made bacteriological research possible in Senegal. It begins with an examination of colonial miasmatic theory, and explores how

disease during the early colonial period was located within the ‘otherness’ of the West African landscape, and the foreign-ness of the African body. It traces how the rise of germ theory, and particularly the appearance of Pasteurian science reframed the bodies of Africans as biologically commensurable with those of Europeans. This equalizing power of germ theory permitted Europeans to extend their networks of research across the colonial world. For France, the endemic diseases of West Africa were transformed from barriers to political expansion into powerful scientific raw materials of enormous value. Like the trains that drew raw materials from the colonial interior to the port of Dakar, the scientific infrastructure established by the colonial administration was not designed to foster local scientific practice, but to enrich the scientific capital of metropolitan researchers. As the capital of the AOF, Senegal is home to the majority of the scientific infrastructure instituted by the French during the colonial period. However, the politics of colonial research left the independent country without a meaningful, state-controlled apparatus for promoting local scientific research, forcing the country to build its research program on the unstable foundation of foreign funding.

Chapter 3 explores how this legacy determined the particular opportunities and limitations of HIV-2 research in Senegal. This chapter tells the story of how Senegal came to play a central role in the geography of HIV-2 by “striking gold” and discovering the presence of a new virus among the country’s sex worker population. These sex workers were a renewable mine of biological data that over the span of more than two decades provided Dakar’s *Laboratoire de Bactériologie et Virologie* (LBV) with blood samples and clinical information that enabled the lab to solidify its role as a central player in the global network of HIV researchers. This chapter also demonstrates how the transnational flow of resources -- both technological, financial and knowledge-based -- have shifted over time and reshaped the path of HIV-2 related opportunities for the LBV researchers. Specifically, the chapter explores how the fusion of humanitarian logic and scientific funding has shifted the nodes of HIV opportunities on the continent. Research funds have migrated to regions of higher prevalence, leaving

Senegal bereft of any possibility of meaningfully investing in future HIV-2 research.

While Chapter 3 elucidated the central role that Senegal's female sex workers (FSWs) played in HIV-2 research, Chapter 4 examines how Senegal's FSWs came to be enrolled in Senegal's HIV-2 research apparatus. This latter chapter explores the genealogy of prostitute registration, examining how the dividing practices of registration have produced particular forms of knowledge. At present, little is known about the regulation of prostitution in colonial Senegal, so this chapter turns its gaze to the regulation of prostitution in France. The system of *réglementation* established in metropolitan France guided the prostitution control measures that were eventually established in Senegal. By exploring the moral heft that accompanied the French system under regulation theorist Parent-Duchatelet, this chapter elucidates how hidden assumptions from this regime of regulation persist in Senegal's contemporary program of sex worker registration.

Chapter 5 returns to contemporary Senegal to examine the policies and practices of sex worker registration. This ethnographic chapter is based on the sexually transmitted infections clinic at Dakar's *Institut d'Hygiène Sociale* (IHS). The IHS is the primary site for the registration of Dakar's female sex workers. It is the heart of Senegal's apparatus of FSW surveillance – where women come to receive care and provide blood which is then transported to the LBV to be analyzed and archived. The chapter introduces the host of actors whose daily efforts make the IHS the fulcrum of FSW enrollment. The chapter begins with a description of Senegal's registration policies and then turns to an ethnographic account of how these regulations translate into the daily practices of maintaining a research cohort. The scientific value of their blood has turned this group of FSWs from a dangerous population in need of state regulation into a cohort in need of management and protection. The final section explores how the social workers and physicians, bolstered with international research funds, provide daily care for the individual women in the cohort. Finally, an examination of the reciprocal ties

between the IHS staff and the LBV researchers reveals that the clinic's providers are engaged in the daily promotion of FSW health as well as the daily protection of the cohort's samples for LBV use.

The relationship between the IHS staff and the sex workers is further elaborated in Chapter 6. This chapter turns to the experiences of the subjects of research: Dakar's registered FSWs. The focus of this chapter is the narratives of four sex workers registered at the IHS. Their stories attest to the powerful role that social and economic inequalities play in the generation of biological samples for HIV-2 research. Sex work is a last resort for many women whose social and economic networks have dissolved. Registration allows women to work legally and avoid the fines and prison sentences associated with practicing sex work without proof of registration. However, the women's narratives reveal that it is often the social and economic benefits offered by the IHS staff that motivate them to attend the clinic. For these unanticipated relationships afford women the opportunity to rebuild their fractured social networks and gain access to resources from local NGOs to help them meet their needs and those of the families that they support. Of course, women must weigh these benefits against concerns that official registration might hold unforeseen consequences for themselves and their children. In many cases, these fears and other structural challenges prevent women from registering, and fuel the rising number of women who practice sex work clandestinely. However, the comprehensive care provided by the IHS serves to keep hosts of women registered and attending the IHS clinic on a monthly basis. This keeps the clinic rooms full at the IHS, and the blood archives fully stocked at the LBV.

Chapter 7 places the question of enrollment and HIV-2 research within a larger regional context by examining the HIV-2 research that is being carried out by the Medical Research Council's (MRC) unit in Fajara, The Gambia. This chapter reveals the asymmetrical patterns of HIV-2's geography, and the laboratories' divergent capacities to enroll and sustain HIV-2 cohorts. It opens with a comparison between the laboratory facilities at the LBV, a public African

laboratory, and those available on the MRC campus, a private European lab operating in Africa. It then examines the two HIV cohorts that the MRC has built: a clinical cohort based at the Fajara campus and a community cohort based in the village of Caio, Guinea-Bissau. These cohorts reveal that the MRC's capacity to enroll and sustain large numbers of HIV-2 patients is due to their system of reliable core funding, which has allowed the unit to establish clinics and provide quality health-care in areas that are largely devoid of health care infrastructure. These massive investments have provided the MRC with unprecedented access to HIV-2 samples by transforming whole communities into enrollable research subjects. This chapter demonstrates how the MRC's financial independence from overseas project funds has spared its HIV-2 research from the fate meted out to the LBV. As a public laboratory entirely dependent upon outside aid, the LBV had to cease its HIV-2 work when funders followed the funding priorities to another corner of the globe. Meanwhile, the MRC's reliable core funding has allowed it to build cohorts from entire villages, and build laboratories in some of the most remote zones of West Africa. While HIV-2 research may have started in the lab of the LBV and the STI clinics of Senegal, the MRC now holds the mantle of the future of HIV-2 research.

Chapter One: HIV-2: A Scientific Overview

Situating HIV-2

There are an estimated 33 million people living with HIV world-wide, and the overwhelming majority of these infections are HIV-1 (UNAIDS 2008). While it is widely known that nearly two-thirds of all HIV infections are centered in sub-Saharan Africa, few realize that one to two million of these infections are due to a second HIV virus known as HIV-2 (UNAIDS 2006; de Silva, Cotten et al. 2008). This “other” HIV virus was identified a few short years after the description of HIV-1, the predominant form of HIV infection that is responsible for the global AIDS pandemic. The first indications of HIV-1 related AIDS infection were reported in the United States among homosexual men, and later in intravenous drug using populations and hemophiliacs. Wasting and severe opportunistic infections similar to those seen in these populations were later observed in non-human primates, and a simian virus akin to HIV-1 was identified as simian immunodeficiency virus, or SIV (Henrickson, Maul et al. 1983; Kanki, McLane et al. 1985). In an unusual turn that is fully explored in Chapter 3, SIV was shown to cross-react with *human* serum that was drawn from healthy female sex workers in Senegal. This represented the first description of West Africa’s unusual HIV variant (Barin, M'Boup et al. 1985). A year later, the virus that we know today as HIV-2 was isolated in patients from the former Portugese colonies of Guinea-Bissau and Cape Verde (Clavel, Guetard et al. 1986).

At the time that HIV-2 was discovered in West Africa, the region had a limited number of AIDS cases, particularly in comparison to Central or Eastern Africa where HIV-1 was prevalent and AIDS was widespread. HIV-1, so common in the rest of Africa, was relatively rare at the time in Western Africa. Indeed, findings from Senegal’s original serosurvey of female sex workers in 1985 indicated that HIV-1 was nonexistent (Barin, M'Boup et al. 1985). In the first blushes of the HIV-2 discovery scientists wondered whether this new virus

would lead to AIDS, a concern that was soon confirmed when the virus was isolated in West Africans living with AIDS (Clavel, Mansinho et al. 1987). It was clear that HIV-2 had the same disease-causing potential as HIV-1 (Guyader, Emerman et al. 1987). Soon, researchers determined that HIV-2 could be passed along the same transmission routes as HIV-1, that is through sexual contact, blood-borne transmission, and to a limited extent vertical (mother-to-child) transmission (Markovitz 1993). The link between HIV-2 and AIDS had been solidified, but the virus still puzzled researchers because the majority of individuals infected with the virus did not have any symptoms. Regions in East and Central Africa that exhibited equivalent rates of HIV-1 infection were experiencing a deluge of AIDS cases, while West Africa's HIV-2 showed little signs of being linked to an AIDS epidemic. This suggested that both the pathogenic effects and the natural history of the two viruses were different (Romieu, Marlink et al. 1990). In other words, while both viruses were capable of causing disease, physical decline was much slower in those infected with HIV-2.

As individuals living with HIV-2 were observed over time in Senegal, The Gambia and Guinea-Bissau, it became clear that the clinical features of HIV-2 related AIDS were similar to those of HIV-1. However, the rate of AIDS-free survival was much longer in HIV-2 infected individuals than among those infected with HIV-1 (Marlink 1994; Poulsen, Aaby et al. 1997). Indeed, mortality rates for people infected with HIV-2 were just twice that of the general population, compared to anywhere from ten to twenty times for HIV-1 (Jaffar, Grant et al. 2004). These improved survival rates were due to the fact that individuals infected with HIV-2 were able to sustain healthier immune systems for longer periods of time than those living with HIV-1. Once a patient's immune system became compromised, however, HIV-2 began to produce clinical

symptoms that generally mirrored those associated with HIV-1, and HIV would begin its signature rapid decline⁶ (Schim van der Loeff, Jaffar et al. 2002).

The importance of HIV-2

Today, one of the main challenges facing HIV vaccine development is the question of how the human body protects itself from HIV infection. Researchers have been trying to learn more about the body's protective immunity by studying a small group of people who are infected with HIV, but are able to survive for long periods of time without experiencing disease and decline. These people are known as 'long-term nonprogressors,' or LTNPs. To understand more about LTNPs and why they are key to potential vaccine work, it is important to understand how HIV infection works, and where it came from.

When the HIV-1 virus enters the body it replicates inside CD4+T cells, which play a crucial role in the body's ability to fight off infection. HIV replicates and then goes on to infect other T cells. This leads to a deterioration of the T cells that are normally available to help the body fight off infection. The body is constantly sending out T cells (called 'immune activation'), and yet the virus continues to replicate. Ultimately this leads to immune suppression and death. This process varies from person to person, but the median time from infection to death in the absence of antiretroviral therapy is 11 years (Rowland-Jones and Whittle 2007). While the overwhelming majority of HIV-1 infections follow this progression, a small number of people have been able to maintain normal CD4 +T cells, and therefore have been able to survive symptom-free for a long period of time. These LTNPs stand to play a vital role in understanding the mechanisms behind delayed disease progression, but unfortunately there are very few instances of long-term non progression among those infected with HIV-1.

⁶ One notable exception is that Kaposi's sarcoma (a form of cancer that was an AIDS-defining illness in the early period of the epidemic) was observed ten times more frequently in individuals infected with HIV-1 than those with HIV-2 (Ariyoshi and al 1998).

In contrast, HIV-2 produces a high number of LTNPs. While HIV-1 has rapidly spread across the globe, HIV-2 infections have largely remained concentrated in West Africa, where the virus was believed to have originally emerged. Some cases of HIV-2 have been detected overseas, largely in the former colonial powers of Portugal and France. The few cases of HIV-2 infection found outside of these regions can be linked back to West African contacts (Kanki and De Cock 1994). Indeed, the first cases of HIV-2 reported in Europe were identified in Portugal among Portuguese veterans who had served in Guinea-Bissau during the war for independence (Ancell 1987; Bryceson, Tomkins et al. 1988). Compared to HIV-1, the HIV-2 virus is much less virulent, and those infected with HIV-2 generally live for decades (and in many cases an average lifespan), experiencing nary a symptom. HIV-2 regularly produces LTNPs, and if scientists can unlock the mechanism that allows these individuals to achieve viral control, it could represent a major step forward in the development of an HIV vaccine.

The origins of HIV-1 and HIV-2

Both HIV-1 and HIV-2 have been shown to originate from two separate non-human primates infected with simian immunodeficiency virus or SIV (Gao, Yue et al. 1992). The link between HIV and SIV is determined by the viruses' phylogenetic relatedness, a term which describes how closely their genes are linked in an evolutionary sense. This is often visualized by a tree, where a single ancestor (in this case, a viral ancestor) mutates, and develops into a different virus or sub-type of virus. These changes are shown as different branches, and can ideally be traced back to a single ancestor virus. The HIV phylogenetic tree demonstrates that HIV-1 is closely related to SIVcpz, a kind of simian virus found in chimpanzees. HIV-2, on the other hand, is phylogenetically related to SIV from a different primate that occupies a different geographical zone: the sooty mangabey (SIVsm). Interestingly, chimpanzees and sooty mangabeys occupy separate geographical regions of Africa, and yet HIV-1 and HIV-2 entered the human population at roughly the same time (Sharp, Robertson et al. 1995; Chen, Luckay et al. 1997). Estimates about when HIV-1 made a zoonotic jump into

humans are imprecise, but generally point to some time in the last century (Gao, Bailes et al. 1999). More precise knowledge has been gathered about the origins of HIV-2.

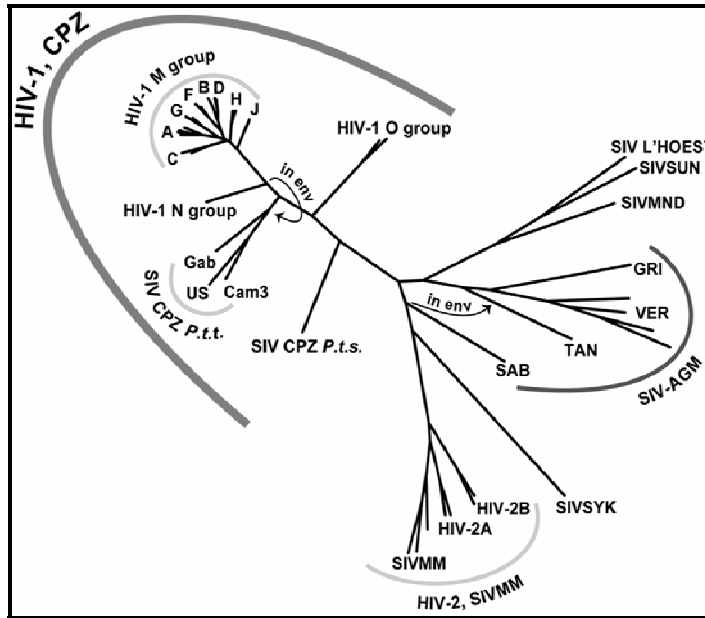


Figure 1: HIV Phylogenetic Tree. Source: Theoretical Biology and Biophysics Group, Los Alamos National Laboratory

HIV-2 likely crossed the species barrier about 30 years after HIV-1, and this cross-over likely occurred in Guinea Bissau around the year 1940 (give or take 16 years). While numerous theories exist about the mechanism that encouraged the zoonotic jump for HIV-1, it is likely that HIV-2 entered humans as a result of the West African bushmeat trade (Apetrei, Metzger et al. 2005). This jump likely occurred around 1940, but the virus only began to spread rapidly through the population years later, approaching epidemic growth between 1955 and 1970 (Lemey, Pybus et al. 2003). While HIV-1 infections on the continent disproportionately infect younger segments of the population, HIV-2 is generally present in older generations. Indeed, contemporary studies of HIV-2 in Guinea Bissau, which are concentrated in the capital of Bissau and the small

Northwestern village of Caio (both centers for international research projects), demonstrate that HIV-2 is more prevalent among individuals who were born before 1962. This proposed period of rapid transmission coincides with Guinea Bissau's protracted war for independence, which ranged from 1963-1974.

The rapid rise of HIV-2 in Guinea Bissau can be attributed to a host of changes engendered by the war. The war also provides a likely explanation for why Guinea Bissau has a high concentration of HIV-2 compared to its neighbors, which enjoyed relative peace throughout much of the 1960s⁷. In fact, having been a young adult during the years of the independence war is a major risk factor for HIV-2 in Guinea Bissau (Schim van der Loeff 2003). During the long years of Guinea-Bissau's fight for independence, the Portuguese colonial army was stationed in the small country. Their presence, as well as the social disruptions engendered by the fighting, created social and economic shifts that produced practices conducive to the spread of HIV-2. The large colonial army presence and deepening poverty of residents served to foster prostitution. Most notably, the increasing presence of colonial soldiers brought the intensification of medical care, making blood transfusions⁸ more widely available. Cohort studies have demonstrated that both army service and the reception of blood transfusions during this period have been linked with a higher risk of HIV-2 infection (Poulsen 2000). In addition to the exchange of blood products, the reuse of syringes, particularly in mass injection campaigns, likely played a crucial role in the spread of HIV-2 in the region (Marx, Alcabes et al. 2001). For example, Guinea-Bissau

⁷ Mansson and authors have demonstrated that HIV-1 prevalence more than doubled in Guinea Bissau during the country's civil war from 1997 to 1999 (Mansson, Alves et al. 2007). Further, they have demonstrated that this spike was temporary, and infections stabilized following the cessation of conflict (Mansson, Biague et al. 2009). See Spiegel et al. and Mills et al. for reviews of the broader relationship between HIV and armed conflict in contemporary sub-Saharan Africa (Mills, Singh et al. 2006; Spiegel, Bennedsen et al. 2007).

⁸ HIV-2 is believed to have entered the blood system of Guinea Bissau by 1966. Indeed, Mota-Miranda and authors have documented the infection of a Portuguese woman who was exposed to HIV-2 by a blood transfusion that she received in Guinea Bissau while her husband was stationed there for military duties (Mota-Miranda, Gomes et al. 1995). Schneider and Drucker have performed a comprehensive review of blood transfusion practices in colonial sub-Saharan Africa. Their analysis points to a vital overlap between the emergence of the first HIV strains in the region and the rapid proliferation of transfusion services (Schneider and Drucker 2006).

was home to high levels of trypanosomiasis (sleeping sickness) which peaked in 1952. The colonial government set up a mass chemoprophylaxis campaign to combat the infection, providing intramuscular injections of pentamidine twice a year to almost two-thirds of the population from 1965 until independence in 1974. These injections, combined with the availability of injective streptomycin for tuberculosis, likely added to the prenatral spread of HIV-2 during this period.

A likely scenario for the spread of HIV-2 in Guinea Bissau is that the virus first entered humans through individuals who had hunted or prepared bushmeat from sooty mangabeys. Once present in the human population, the widespread use of needles and syringes would have quickly and effectively propagated the virus through the population (Pepin, Plamondon et al. 2006). As both the colonial medical presence and massive displacement of people tapered after the war, infection would have kept pace through postcolonial vaccination efforts. Guinea Bissau was in the throgs of war throughout the 1960s, a time when neighboring countries made significant advances in infrastructure development. By the time the fledgling country emerged from the war in 1974 it lagged far behind other nations in the region. Seeking to make up for the immense amount of time lost to the protracted conflict, mass vaccination campaigns were rolled out in an effort to rapidly rebuild the public's health. This created another opportunity for effective HIV-2 transmission⁹. As intensive medical interventions lessened, the epidemic was left to propagate through commercial sex (fostered by high levels of STIs) and contaminated blood¹⁰ products (Schim van der Loeff 2003).

It is the commercial sex link that likely introduced HIV-2 to Senegal. Early epidemiological studies of HIV-2 in Senegal revealed a distinct north-south gradient of HIV infection in the country. The southern region of the Casamance, which bordered Guinea Bissau, was the most heavily infected. The southern city of Ziguinchor was particularly affected, and female sex workers (FSWs) followed

⁹ Personal communication with Sarah Rowland Jones, attributed to Peter Aaby.

¹⁰ Bissau's blood bank only began screening blood donors for HIV-2 and HIV-1 in 1987 (Poulsen, Aaby et al. 1993).

at Ziguinchor's STI clinic exhibited HIV-2 infection rates as high as 38% (Kanki 1992). As one moved northward, however, HIV-2 infections began to taper off and reports of HIV-2 from the northern city of Saint-Louis came in at just 1.5%¹¹. Epidemiologically, the trail of HIV-2 infections in Senegal led south to Guinea-Bissau.



Figure 2: From CIA World Factbook

By 1990, some 40% of the women followed at Ziguinchor's clinic were from Guinea Bissau, and over 80% of them were Manjako women who migrated to Ziguinchor from the a village in the Northwest region of Guinea Bissau known as Caio (Buckner 1999: 390). Anthropologist Margaret Buckner's work in the village of Caio reveals how local social dynamics and economic imperatives impelled village women to travel to southern Senegal to earn money as female sex workers. Buckner found that most of the Caio women working in Ziguinchor entered the trade because of a marriage-related problem. In Caio, a father often selects a husband for his daughter when she is very young. The agreement is

¹¹ These figures come from a presentation given by LBV staff to visiting researchers on June 26, 2007.

sealed between the families with an offering of palm wine, and for several years the betrothed works in the ricefields of his father-in-law as a kind of bride wealth-in-kind. When a promised daughter reaches the age of 18 or 19 she marries her betrothed and moves to his house. There are, of course, some cases when a girl may not wish to marry the husband to whom she has been promised. In such a case, she is able to reimburse the man monetarily for his bride service, thereby freeing herself to marry another man. Similarly, if a woman wishes to divorce her husband she can pay down her bride price and be released from the marriage. While in neighboring Manjako communities bride price has either fallen out of favor or the reimbursement has fallen to families, in Caio the girl herself remains responsible for payment if she does not fulfill her marriage contract. According to Buckner, this phenomenon, combined with Caio's matrilineal form of succession and inheritance, makes prostitution a viable option for Caio women seeking to earn money. As she explains, "This system of succession and inheritance ensures that the children of prostitutes are neither socially nor economically disadvantaged, and that women, including prostitutes, maintain their importance in decision-making and family functions" (Buckner 1999: 400). Of course, economic imperatives often underly a woman's choice to enter the sex trade. This choice is circumscribed by important historical and political factors that have shaped the avenues of opportunity for people living in Caio. During the independence war, Caio suffered from a lack of manpower which led to a deterioration of the dikes that protect the village's rice fields. Emigration worsened this labor shortage, and over time the number of arable rice paddies available for farming continued to drop (Buckner 1999). With less rice available to feed families, and few opportunities for earning cash in the area, women increasingly had to turn to wage labor in neighboring towns and villages. Prostitution in Ziguinchor arose as a viable opportunity for earning a living within relative proximity to Caio.

The decline of HIV-2

By the 1980s, HIV-2 was the predominant form of HIV in West Africa. The first serosurvey performed in Senegal in 1985 indicated that HIV-1 was virtually nonexistent among FSWs, those at highest risk for HIV infection (Barin, M'Boup et al. 1985). While early HIV infections were exclusively due to HIV-2, over the years the number of HIV-2 infections in Senegal has steadily declined. By the early 1990s, physicians at one of Dakar's main teaching hospitals observed that HIV-2 infections in their patients were consistently dropping (Sow 1994). By the turn of the century, HIV-2 had become increasingly rare. In Dakar's cohort of FSWs, HIV-2 prevalence dropped from 8% to 4% between 1985 and 2004, a 50% decrease over the span of twenty years (Hamel, Sankale et al. 2007). Indeed, HIV-2 appeared to be declining throughout West Africa, even in the highly endemic area of Guinea Bissau. In 1987 HIV-1 was virtually non-existent in Guinea Bissau, and the HIV-2 prevalence was between 8 to 10%, with as many as 20% of adults over the age of forty infected with the virus (Poulsen, Aaby et al. 1993; Wilkins, Ricard et al. 1993). By 2006, the HIV-2 prevalence had decreased to about 4.4% among adults, with the exception of older women who continue to present steadily high levels of HIV-2 infection (Aaby 1996; de Silva, Cotten et al. 2008). In both Senegal and Guinea-Bissau HIV-2 infections have declined by half. While HIV-2 persists as an independent infection among older adults, in general it seems to be a "disappearing" epidemic (da Silva, Oliveira et al. 2008). Unfortunately, the spectre of HIV-1 has emerged across West Africa, and its rates are on the rise. Senegal's overall rate of HIV in the adult population has remained remarkably consistent over time, stabilizing at around 1%. However, the constitution of those infections has drastically changed, and across the country the number of HIV-1 infections have surpassed the number of HIV-2 infections. Among Dakar's cohort of FSWs, HIV-1 prevalence has increased over the past twenty years from 0 to 13% (Hamel, Sankale et al. 2007; LBV 2008).

The competitive displacement of HIV-2 in the long term was not unexpected, and is due in large measure to HIV-2's ineffective transmission relative to HIV-1 (Anderson and May 1996). HIV-2 is spread by the same routes as HIV-1. High rates of HIV-2 among people with STIs, and the high infection rates among female sex workers, as well as individual case studies have proven that the virus is transmitted through sexual contact (Kanki, M'Boup et al. 1987; Lauritzen, Molbak et al. 1988; Hamel, Sankale et al. 2007). Studies from Guinea-Bissau and Côte d'Ivoire confirmed that HIV-2 can be transmitted through contaminated blood and blood products, as well as exposure to contaminated needles (Ouattara, Gody et al. 1988; Poulsen 1989). Finally, the isolation of HIV-2 from infants born to infected mothers confirmed that vertical transmission is another possible transmission route for the virus (Matheron 1988; Cavaco-Silva, Taveira et al. 1998). While the transmission routes for HIV-2 and HIV-1 are virtually identical, the transmissibility rate is vastly lower for HIV-2 than for HIV-1. For example, whereas breast-feeding mothers (who are not on antiretroviral therapy) have a 4% chance of passing HIV-2 to their infants, in the same population the likelihood of vertical transmission with HIV-1 climbs to 24.4% (O'Donovan, Ariyoshi et al. 2000). The low rate of vertical transmission in HIV-2 means that there is not a significant pediatric epidemic of HIV-2 in West Africa. It also means that it is more difficult for HIV-2 to propagate itself in a population. In addition to reduced vertical transmissibility, HIV-2 is also more difficult to pass through sexual contact than HIV-1. In general, the risk of HIV transmission through sexual contact is linked to the amount of HIV present in genital secretions (Clemetson, Moss et al. 1993). The amount of virus in cervico-vaginal secretions is up to five times higher in HIV-1 infected women than in those infected with HIV-2 (Ghys, Fransen et al. 1997; Samb and al. 1997; Sankale, Mboup et al. 1998). Similarly, the shedding of HIV in semen is much lower for HIV-2 than for HIV-1 (Gottlieb, Hawes et al. 2006). The lower amount of shedding is correlated to the lower plasma viral load present in HIV-2 infected individuals (De Cock, Adjorlolo et al. 1993; Schim van der Loeff and Aaby 1999). In other words, with HIV-2 infections there is less virus circulating in the

body, and therefore it is less likely to find its way into genital secretions, making it more difficult to transmit.

HIV-2 is a much less 'successful' virus than HIV-1 in terms of vertical transmission and sexual transmission. However, it is very effective at being transmitted through blood, blood products and direct contact with infected needles and syringes. The HIV-2 virus was able to reach epidemic proportions in West Africa through the widespread use of transfusions and injectible medicine that occurred during the time of Guinea-Bissau's war for independence described above. While HIV-2 is comparatively less effective at sexual transmission when compared to HIV-1, it nonetheless is transmissible through sexual contact. Following initial spread of HIV-2 through medical interventions, the virus continued to replicate through sexual contact, particularly in sex work, as frequent exposure increases the risk of infection. This form of replication was just effective enough to keep the virus present in the population, but was not effective enough to create an epidemic of the proportions seen in East and Central Africa's HIV-1 epidemic. The combination of the routine screening of blood supplies for HIV, the proliferation of safe medical injection practices, and the overall replacement of injectible antibiotics with pills has cut off the more effective transmission routes for HIV-2. Having to rely primarily on the less effective sexual transmission route, HIV-2 levels have dropped in West Africa, and have been replaced by the more virulent HIV-1.

Is HIV-2 good for a vaccine?

The relative ineffectiveness of HIV-2 transmission, coupled with a long latency period between infection and disease (typically 10 years or more), make HIV-2 a promising model for vaccine development (Marlink 1994; Whittle, Morris et al. 1994). While HIV-1 tends to cause disease in the human body within a short span of time, many people living with HIV-2 can live for years, and in many cases an entire lifetime, without experiencing any symptoms. HIV-2 infection does not progress slowly in all cases, but the majority of HIV-2

infections demonstrate this mild outcome (de Silva, Cotten et al. 2008). An important route to vaccine development is studying long-term nonprogressors (LTNPs), that is, people who are infected with HIV but who do not experience progressive immunodeficiency normally associated with HIV infection, nor the diseases that result from weakened immune systems. One of the defining clinical factors of a LTNP is that they have normal CD4+ T cell numbers. This means that they are infected with the virus, yet maintain healthy immune systems. Researchers are primarily interested in understanding the infection dynamics of the more widespread HIV-1 virus, but there are very few LTNPs living with HIV-1. In contrast, most HIV-2 infected individuals act as LTNPs, living with the infection for years but not developing disease. Fortunately, HIV-2 has much in common with HIV-1 and can act as a human model for studying HIV-1 infections. HIV-1 and HIV-2 developed from different primate infections, at different times, on different parts of the continent, but they share much of the same genetic make-up. In fact, they share 30-60% of gene structure and sequence, and the viruses infect human CD4+T cells in much the same fashion (Rowland-Jones and Whittle 2007). This genetic similarity, combined with an identical path of infection, makes HIV-2 LTNPs ideal models for understanding how HIV-1 infection works, and hopefully developing an HIV vaccine.

Early HIV-2 studies focused on the possible protective effects of HIV-2. As researchers sought to understand the natural history of HIV-2 (the course of disease from the time of infection to eventual recovery or death), there was hope that the new virus might protect against HIV-1. Early research coming out of Dakar's FSW cohort indicated that individuals infected with HIV-2 had a significantly lower incidence of HIV-1 than uninfected FSWs in the same cohort. This led researchers to suggest that HIV-2 might protect against HIV-1 infection (Travers, Mboup et al. 1995). These results created a significant amount of controversy among scholars studying HIV-2, as other studies indicated that individuals infected with HIV-2 had higher risks of HIV-1 infection¹² (Schim van

¹² Dual infection with HIV-1 and HIV-2 is relatively common.

der Loeff, Aaby et al. 2001). In light of such competing epidemiological evidence, researchers turned to molecular research, and demonstrated that HIV-2 appears to inhibit the replication of HIV-1 at a molecular level (Arya and Gallo 1996; Dern, Rubsamen-Waigmann et al. 2001) While this relationship is not fully understood, unraveling the link between HIV-2 infection and HIV-1 infection may eventually help elucidate the chain of events that lead to disease.

One of the questions that originally generated significant interest was how the virus replicated in people infected with HIV-2. Initially, researchers focused on studying the viral dynamics of HIV-2 in the hopes that understanding more about the structure and function of the virus would reveal why HIV-2 is less virulent. By studying the virus itself, scientists hoped that they could isolate and characterize the epitope, or part of the virus that is recognized by the human immune system. They then hoped to use this epitope to develop a vaccine. The study of viral dynamics in HIV-1 has provided the main thrust for vaccine research thus far. Unfortunately one of the most promising HIV-1 vaccines (the Merck phase II STEP vaccine) was stopped following an analysis that demonstrated no efficacy in the prevention HIV infection. Many researchers have used this failure as a call to return to the drawing board and adopt new, novel strategies for vaccine development.

One of the more promising avenues for vaccine research shifts the focus away from the virus, in favor of exploring the other half of the infection dynamic: the body's response to infection. HIV-2 LTNPs are very important in this new vein of research because they provide a model for studying how the body copes with HIV infection. Specifically, researchers are interested in how HIV activates the body's immune system. This research is predicated on the idea that disease progression may be stopped not just by halting the replication of the virus, but by arresting the continuous activation of the body's own immune response¹³. At first glance this seems contradictory, for the immune response is the body's mechanism for fighting off disease. Normally, when the human body senses a

¹³ Personal communication with Assane Jaye, October 2007.

virus it seeks to destroy that virus by activating the immune system, sending out the body's CD4+T cells, and eventually suppressing the virus. In HIV-1 infection, the immune system is constantly activated, which draws heavily on the CD4+T cells. Over time, the body cannot produce enough new T cells to keep pace with the T cells lost through HIV-induced apoptosis (programmed cell death). Without enough T cells, the immune system is weakened and the body is susceptible to disease and eventual death. Researchers hypothesize that HIV-2 patients may actually fare better than HIV-1 patients because they display less, or perhaps better controlled immune activation, which means that the body can preserve its CD4+ T cells and continue to fight off infection (Michel, Balde et al. 2000; Machuca, Ding et al. 2004; Leligdowicz, Yindom et al. 2007). By working with HIV-2 infected LTNPs, researchers are able to study the mechanisms that shape immune activation, and hopefully learn more about its relationship to delayed disease progression in humans.

Treatment of HIV-2

HIV-2 is a particularly rich resource for vaccine research because there are so many HIV-2 infected long-term non-progressors. Unfortunately, there are also a significant number of HIV-2 infected individuals who do “progress” – that is, drop their CD4 counts – and develop diseases of immunodeficiency. These individuals require treatment with antiretroviral therapy (ART), but selecting an appropriate treatment regimen can be complicated. ART agents have been developed for use in HIV-1 infection¹⁴, and no drugs have been specifically developed for HIV-2 infection. As a result, those working with HIV-2 infected populations have largely had to rely on standards developed for the treatment of HIV-2. This lack of HIV-2 specific treatment regimens is likely due to the fact that HIV-2 patients generally live in resource-poor settings, and many of the

¹⁴ HIV-1 is itself comprised of several different subtypes. Crane's work in Uganda and the US examines how the geography of HIV subtypes overlays global political and economic inequalities, resulting in the marginalization of African subtypes through the uneven development of scientific tools to study and treat HIV (Crane 2007).

countries with HIV-2 epidemics have only begun to access ART. Furthermore, controlled drug trials require large populations, and most HIV-2 cohorts are relatively small (de Silva, Cotten et al. 2008). Treatment options for those infected with HIV-2 are significantly reduced, as HIV-2 is naturally resistant to two of the primary classes of drugs: non-nucleoside reverse transcriptase inhibitors (NNRTIs) and fusion inhibitors (Witvrouw, Pannecouque et al. 2004). It appears that HIV-2 is also less susceptible to various protease inhibitors, and has demonstrated overall weak responses to some of the more standard combination therapies that are effective for the treatment of HIV-1 infections (Matheron, Damond et al. 2006; Rodes, Sheldon et al. 2006). Cohort studies attest to these difficulties as the treatment of HIV-2 patients with ART has largely yielded poor results (Mullins, Eisen et al. 2004; Matheron, Damond et al. 2006; Ndour, Batista et al. 2006).

Recently, researchers and caregivers have come together to call for large multicenter collaborative studies and trials that would help establish which antiretroviral regimens are most effective for the treatment of people living with HIV-2. Developments in Europe to establish an international consortium of HIV-2 cohorts are indicative of the collaborative spirit and dedication of the small group of researchers and providers working to develop a more tailored and effective treatment for HIV-2 (Gottlieb, Eholie et al. 2008). Researchers have been promoting HIV-2 infected LTNPs as rare human models for the study of HIV virology and immunology. It is heartening to see that after twenty years of research on individuals living with HIV-2 in the hope of developing an HIV-1 vaccine, the research world is now calling for the improved care of those living with the world's other HIV virus.

Chapter Two: The commensurable body and the rise of scientific research in Senegal

This chapter situates contemporary research on HIV-2 within the broader historical context of biomedicine and laboratory research in Senegal. Specifically, it explores how miasmatic theory and germ theory sculpted the political and disease landscape in Africa, making contemporary laboratory research possible at institutions such as Mboup's *Laboratoire de Bactériologie et Virologie*. It traces how germ theory, and particularly the Pasteurian agenda, served to transform the world into a natural laboratory (Nguyen n.d.). The particularities of that agenda made bacteriological research possible, and in fact bestowed Senegal with the lion's share of French West Africa's elite scientific institutions. Unfortunately the colonial scientific trajectory developed private French infrastructure at the expense of a public model. Upon independence, the Senegalese state was left with a highly trained elite, and no meaningful state-run funding system to support them. Bankrupt of any national funding streams, Senegal's scientists have had to turn to outside project funding, which has fed insecurity and circumscribed the nation's scientific possibilities.

Pathologizing Africa(ns)

Early discourse linking colonialism with disease on the African continent was overwhelmingly marked by a triumphalist approach that praised the work that Europeans had done to bring civilization and its corollary, health, to the African people¹⁵. This 'heroic' approach to medicine was dependent upon establishing a picture of Africa where the African environment, and the bodies inhabiting that world, was rife with disease and danger. By linking Africans with disease,

¹⁵ See Scott 1968 for an example of triumphant literature. He portrays, for instance, the institution of colonial communication infrastructure as the key to unlocking epidemic disease in Ghana (Scott 1968).

colonial discourse on western medicine pathologized the African body, and promoted medicine as the victor over African disease and European colonists as the vanquishers.

The European portrayal of Africa as a place of disease and danger has been fostered in writings as early as Herodotus and Pliny, whose portrayals of Africans describe mythical figures who bore few traits that could be described as intelligibly human (Cohen 1980). These mythologies were certainly altered when physical contact between Europeans and Africans became more frequent, but the earlier falsehoods influenced the narratives of Europeans who traveled to Africa, and they shaped how these travel narratives were taken up among the European publics. This contentious mix of myth and history solidified notions of inequality between Africans and Europeans long before the first stirrings of colonial contact (Cohen 1980: 291; Butchart 1998).

In a corollary to early perceptions of the African body, European constructions of the African environment were similarly fraught with peril. With the demise of the slave trade, Europeans sought an alternate form of commerce. Colonial powers refocused their economic efforts on the continent, seeking to extend their political reach inland in the hopes of uncovering new sources of raw materials that could be exported onto the world market¹⁶. This shift was driven primarily by the search for capital gain, but it was also fed by the desire to extend Europe's knowledge of previously 'uncharted' territories of the African interior¹⁷. Epidemiological evidence demonstrates that during this period of colonial expansion, Europeans experienced particularly high death rates from endemic diseases (mainly malaria), a phenomenon that was referred to as "relocation cost." West Africa, and the region of Senegambia in particular, was considered by

¹⁶ Abbé Prévost, a "French Anglophile" wrote in 1746, that Europeans' knowledge of Africa "is limited nearly to the coast and some of the rivers such as the Senegal and the Gambia. We know the interior sites so little that we cannot with certitude speak of their location, their extensions and limits...Africa is nearly unknown as compared to Asia and America, although it hardly is inferior in the variety and value of its products" (Cohen 2003: 63).

¹⁷ See Comaroff and Comaroff 1991 for a discussion of how this drive to discover the African interior is akin to a drive to discover the human body (Comaroff 1991).

colonial powers to be the unhealthiest place on Earth (Patterson and Hartwig 1978: 4; Curtin 1987; Curtin 1989: 143). The Naval physician James Lind described the coast of West Africa as “clothed with a pleasant and perpetual verdure; but altogether uncultivated, excepting a few spots, which are generally surrounded with forests or thickets of trees, impenetrable to refreshing breezes, and fit only for the resort of wild beasts” (Lind in Bewell 1999: 27). It was at once appealing and diseased; a threatening environment that served to decimate French troops stationed in the area in the hopes of expanding colonial control of the Senegal River zone¹⁸. By medicalizing the geography of the African continent, Europeans were able to generate a discourse that restructured colonial spaces as diseased and in need of intervention.

Europeans relied heavily upon race as a way to explain the differential death rates experienced by Europeans and Africans in the continent’s interior (Curtin 1989). Colonial powers noted that while Europeans rapidly succumbed to endemic fevers, Africans appeared to be weathering local fevers without effect. The different reactions that Africans and Europeans displayed towards the presumably dangerous African environment were naturalized within colonial discourse and interpreted through anatomical frameworks which resulted in colonial portrayals of Africans as “disease-resistant demon[s]”¹⁹ (Curtin 1964: 360-2; Anderson 1992:508). The link between Africans and the animal world first purported through myths and travel narratives would later solidify into the nineteenth century doctrine of scientific racism. Anatomist Georges Cuvier’s work is emblematic of the period’s propensity for constructing, biologizing and ranking difference. For example, Cuvier developed scales that linked the facial profiles of Africans to those of apes, and further suggested that these physiological similarities reflected a sort of moral and intellectual kinship

¹⁸ For example, French troops stationed in the Upper Senegal River area lost the vast majority of their troops not to colonial resistance, but to disease, and by the 1820s they were losing two-fifths of their ranks every year in Upper Senegal (Cohen 1983: 23).

¹⁹ See Kiple 1987 for a discussion of race and differential disease burdens in the African diaspora (Kiple 1987).

between the two groups (Comaroff 1993: 309-310). The work of colonialism involved in part the widespread categorization (animate versus inanimate, man versus beast) and mapping out a hierarchical “chain of being,” where the African was slotted as “the lowest limits of the human species” (Comaroff 1992: 217).

In addition to a new system of human classification, the colonial endeavor also gave rise to new discourses about the classification of the environment. European medical thought of the 19th century was dominated by miasmatic frameworks that viewed disease as the result of interaction with the atmosphere and climate. Miasmatic theory was in fact quite old, drawing upon Hippocrates’ 5th century B.C. treatise “Airs, waters and places,” where he described the “nosography of fevers,” explicitly linking health to climate and the environment. The attribution of disease to environmental factors marked a break from prior etiologies linking disease with moral transgression (Hannaway 1993). Under this paradigm, disease was the result of an imbalance among the four humors: blood, yellow bile, black bile, and phlegm. Health was linked to the balance of these humors, all of which were linked to the various elements, solidifying the relationship between the health of the body and its environment.

By mid 1800s, members of Paris’ medical faculty were drawing heavily from Hippocratic notions of health and disease in order to promote the health of the Europeans in the colonies, viewing his work as a “bridge” between their metropolitan medical training and the new worlds encountered by the colonialists overseas. Within the context of imperialist expansion, French army physicians “resurrected” the work of Hippocrates, and as Osborne asserts, divorced the theory of its historical context, making it available as “an instrument of French colonialism and imperialism” (Osborne 1996: 94). According to miasmatic theory, which stipulated that miasma emanating from decaying matter and other detritus was the source of disease, Africa was particularly dangerous. The continent’s hot climate and abundant fauna made rotting vegetation a ubiquitous threat, and the region’s humid, stagnant air only served to trap the noxious emanations stemming from the abundant plant matter. Colonial administrations

designed a host of interventions to combat the negative effects of African ‘miasma’. In some cases administrations ordered ships to remain a few miles offshore. In zones without a good place to anchor offshore, taking periodic trips to sea was seen as a way of “clearing out the miasma of shore duty” (Curtin 1998: 60). As the colonial presence pushed inland, however, they had to find an alternative way to maintain European health.

For miasmists who viewed disease through the lens of perceptual space, one way to impose order on the dangerous African environment was to map it. While medical cartography had been in use since the 1790s, by the 1820s medico-topographical surveys had become a central part of preserving the health of colonists, and pursuing the colonial endeavor (Arnold 1993). The colonies were redefined in terms of “healthy” and “unhealthy” places. Once dangerous places were identified, the colonists set about instituting sanitation programs that included draining marshlands and avoiding agricultural cultivation at times when the soil was particularly prone to the release of harmful emanations (Bewell 1999). These interventions were made possible by the mapping of soils and the recording of temperature and rainfall. These elements were key factors in determining which places were healthiest for white settlement. Higher altitudes, for example, were generally considered superior for whites because they were more temperate, and heat was something that miasmists associated with rotting matter, and thus disease. Another popular option for colonial settlements was to build homes on stilts in an effort to keep them as far away as possible from decaying matter that emanated from soils. In Senegal, for example, the *Cap Manuel* zone of Dakar was viewed by medical geographers as a desirable spot for medical institutions. Even as late as 1907, the Committee of Public Works noted that the altitude and orientation of the area in relation to the sea was ideal for building the new *Hopital Indigène* (which would later become Hopital Dantec), which would serve the native populations of the AOF. The site was selected because of its high altitude and its relationship to the prevailing winds, which were viewed as ideal for carrying the “emanations” from the hospital out to sea (ANS 1907). Medical topography revealed Europeans’ faith in their ability not

only to identify dangerous environments, but to adjust their behavior accordingly, adopting everything from their architecture to their regimen of diet, sleep and exercise to mitigate the effects of a harsh climate. This flexible physiology, framed as the “cosmopolitanism of the European race”, was seen as a mark of European rationality and proof of their fitness as rulers of empire (Osborne 1996: 89). These interventions were framed as benevolent interventions, and promoted as a scientific rationalization for the colonial endeavor (Bewell 1999).

The study of geographical environments was also intimately linked with studies about racial constitutions, and was often grouped under the study of “acclimatization.” Anderson asserts that “framing disease, framing ‘environment,’ and framing ‘race’ all were the same maneuver – with political and social consequences perhaps as profound as any military deployment” (Anderson 1996: 63). During this early period of colonial interaction some Europeans believed that if they were able to adapt to their surroundings they could survive the fevers that were killing them in such high numbers. Numerous theories were put forth about how to best achieve this learned immunity, including notions of acclimatization where Europeans would prepare for travel to the interior by slowly adapting to conditions on the coast (Anderson 1996; Harrison 1996-77). Believing in the “physiological immunities of race,” the French were particularly keen on viewing race as a determinant of disease susceptibility. Certain French colonial advisors advocated for intermarriage between Europeans and local populations in order to produce a hardier, more resistant race that could withstand the dangerous African landscape (Arnold 1993; Moulin 1996)²⁰. By the 1850s, however, colonial medical theory moved away from the notion of acclimatization, focusing heavily on the inevitable physical and mental degradation that hot climates posed for Europeans. Medical teachings no longer focused on acclimatization, but on the differences between European and African bodies – differences which were read through a hierarchical lens.

²⁰ This practice stopped when women and families began to settle with their husbands at their colonial posts (Stoler 1989).

Colonial medical topography was used to demonstrate the “superior attributes” of Europeans, a result of their “wholesome” northern climate, and the “degeneracy” of colonial subjects which was the result of their hot climate (Harrison 1996: 91).

In many cases, colonial authorities went so far as to assert that their colonial subjects were the source of “noxious odors,” an argument that led them to established colonial camps and homes that were a significant distance (often upwind) from native settlements (Curtin 1992)²¹. This pre-germ theory notion of contagion is closely related to miasmatic approaches to disease. Sick bodies were similar to decaying matter in the sense that their bodily excretions produced disease-causing miasma in much the same way as soils or swamps. Thus long before microorganisms were identified, the contagious nature of disease was well accepted. And long before fears originated about bacteriological infection, colonial powers had identified segregation as an important tool in the protection of European health. Quarantine and isolation had been in practice for centuries before the consolidation of germ theory. When germ theory emerged, microbes fit rather neatly into the longstanding contagionist program, providing momentum for the contagionist policies such as isolation and segregation (Barnes 2006). In addition to protecting European safety, the practice of claiming access to the most privileged climate zones, such as Dakar’s *plateau* where cool breezes and dramatic views abound, was an assertion of the colonial administration’s power over their African subjects. As Curtin explains, “Avoidance of disease was not the only motive for moving administrators to higher places. It also satisfied the need to segregate the governors from the governed...” (Curtin 1992: 236).

²¹ See Spitzer 1968 for an interesting account of how these notions about the dangers of Africa’s natural and human environments were problematized in Sierra Leone, a nation that was at once home to high disease rates and an educated African and Creole population (Spitzer 1968).

The Rise of Germ Theory

Germ theory as we understand it today did not universally supplant notions of miasma and contagion. The notion that microorganisms lay at the heart of human disease was one that gained ground in fits and starts, both incorporating and eclipsing long-held beliefs about the dangers of noxious emanations. In nineteenth-century Republican France, contagion featured prominently in political discourse. The Republican state was bound to the provision of liberty and equality for all of its citizens, and germ theory was emblematic of the kind of scientific rationality that could guide the Republic's commitment to social reform.

Germ theory emerged at a time when Republican France was also struggling with how to bind a nation together in the absence of a Catholic system of hierarchy. A new "religion of science" proved particularly useful in efforts to promote national unity (Pelis 1997). It was invoked to justify the government's duty to provide for the social and physical well-being of citizens, and importantly, contagion was cited as the foundation for "objectifying" the social ties that drew the French people together as a republic. As Aisenberg explains, "Contagion manifested human interdependence as an integral part of the experience of individual liberty" (Aisenberg 1999: 3). While there is an identifiable continuum between notions of contagion before and after the rise of germ theory, French political and scientific elite played a major role in constructing a boundary that obscured this likeness, preferring to highlight Pasteur's discoveries as a decisive shift²².

By 1880, Louis Pasteur had gained wide recognition for his work on fermentation, advancing scientific knowledge about the makings of beer and wine, but he had only recently begun to explore how microorganisms could shape

²²Shapin's work on the scientific revolution demonstrates how the seventeenth-century was witness to a similar collective will for a new, decisive moment in science. As he explains, "Nothing so marked out the 'new science' of the seventeenth century as its proponents' claims that it *was* new" (Shapin 1996: 65). He continues, "Historical change is not like that, and most 'revolutions' effect less sweeping changes than they advertise or than are advertised for them" (*ibid*: 67).

disease. That year, Paris was plagued by a generalized stench that blanketed the city. Pasteur was called in to address the problem, and eventually concluded that the odors emanating from the city's underbelly were not in and of themselves noxious agents that were capable of causing disease. These odors, rather, were vehicles for the spread of microorganisms that were the true disease causing agents. As Barnes explains, "In effect, the centuries-old doctrine of miasmatism seemed to have gained validation from the new science of germs" (Barnes 2006: 1). While the miasmatic framework of disease held ground until the 1870s, just twenty years later medical geography and its maps would give way to bacteriological research and its microscope, the link between germs and disease having been made explicit.

One of the key moments in the development of bacteriology was Pasteur's experimentation in the 1860s on questions of spontaneous generation, which demonstrated the presence of microbes in the air. In keeping with miasmatic notions of geographic difference, however, Pasteur was quick to note that some airs had more microbes than others. Indeed, much of the European research on disease in the mid-1860s focused on understanding whether disease agents were living or not. It was only after 1880 that there was a general consensus that these disease agents were bacteria. Of course, debate still raged about the actions of bacteria, and the body's reactions to them. A host of theories arose to explain these unknowns; indeed, the nineteenth century was host to multiple germ theories of disease. As bacteriology in Senegal was primarily shaped by ideas about germs and bacteria as they emerged in France, this section focuses primarily on the contributions of Pasteur which featured prominently in French bacteriological thought²³.

It was not until the 1880s that germ theory would be distinguished from miasmatic theory, and more generally propagated as the future of preventative and

²³ See Worboys for a practice-centered account of the transition to germ theory in Britain (including the contributions of Koch), and the rise of British bacteriological research and its integration in public health (Worboys 2000).

curative medicine. An important moment in this trajectory took place in 1881, when Pasteur devised a public demonstration of his anthrax vaccine at Pouilly-Le-Fort, southeast of Paris. Witnessed by journalists, scientists and politicians, Pasteur vaccinated 25 sheep with an attenuated strain of the anthrax bacillus, leaving another 25 unvaccinated. When all of the sheep were later exposed to a virulent strain of anthrax, all of the vaccinated sheep survived, while most of the unvaccinated sheep died. This spectacle served to publicize germ theory and solidify the importance of developing attenuated vaccines. The rapid spread of Pasteur's ideas about microorganisms was deeply embedded in the socio-political nexus of late nineteenth-century France. As Latour succinctly explains: "The social movement into which Pasteur inserted himself is a large part of the efficacy attributed to Pasteur's demonstrations" (Latour 1988: 28).

Interestingly, some of Pasteur's detractors criticized him for the very thing that would become a central hallmark of germ theory. The German physician Koch insisted that despite Pasteur's visible spectacle of vaccination, questions about commensurability still stood. Again, Latour: "We cannot, Koch claims, generalize from one animal to another, nor from animal to man, nor from one disease to another, nor from the vaccination of a few individuals to that of all individuals" (Latour 1988: 30). The generalizability of Pasteur's findings, the notion that microorganisms will act the same way across all individuals, was not self-evident. The proof that Pasteur furnished for his generalizable theory of germs stood on weak scientific legs, yet it was pulled forward by the rising tide of the hygienist movement, which saw Pasteur's work as essential to extending the networks of sanitation. Germ theory provided the hygienist movement with the ability to visualize²⁴ and thus identify and measure disease agents, which could be wielded as a powerfully persuasive tool in their campaign for massive public investments in sanitation. The hygienists did not have to abandon their program in the face of microbes; rather, microbes provided the unifying agent that strung

²⁴ For a feminist/science studies approach to the role of vision and visibility in scientific research, see Haraway (Haraway 1988).

their theory together and made it reasonable to implement. Pasteur and his germs provided a more ordered way of approaching disease by explaining it, not through the diffuse notions of spontaneous morbidity, but through precisely identifiable microorganisms. The Pasteurians, then, did not so much invent a new theory of sanitation, as much as provide the “fulcrum” which provided for a more cohesive, coherent, and exportable theory of disease (Latour 1988). Pasteur’s theory of germs, with its central tenet that a germ and its corresponding vaccine will act uniformly from one individual to the next, was as much the product of this social movement and the nineteenth-century politics of health, as it was the product of his laboratory work. Of course, Pasteur himself framed his work in the laboratory as the beginning of a new era in disease, where contagion was not ruled by spontaneity, but by the microbes that he was able to cultivate in his laboratory. In other words, it was not the constitution of the individual body that engendered disease, but rather microbes that were responsible for morbidity. Furthermore, these microbes could only be made known within the confines of the laboratory.

By the 1890s, bacterial accounts of disease were emerging from the laboratories, and microbiology was solidifying as a “complete, definitive science” (Latour 1985: 54). Unlike miasmatic approaches that focused on geography and local ecology, germ theory unhinged disease from geography and local ecology (Lyons 1992). As bacteriology became stabilized, it would reshape the geography of disease research, linking diseases to the laboratory. While diseases still existed ‘out there’ in the environment, the work of the bacteriologist was to isolate the disease and bring it into a laboratory where devoid of other constraints, the scientist could make the microbe visible, rendering it identifiable, reproducible, and manipulable. Provided that proper laboratory conditions were satisfied, bacteriological research was free to move about the world. Whereas disease used to be articulated through particular bodies, Pasteur’s germ theory focused on the notion of “morbid exteriority,” where disease was the result of microscopic agents rather than a trait of an individual body. Hygiene was no longer a question of interrogating risky bodies, but rather “obfuscating layers of social life so as to

reveal microbial transmission as the cause of disease” (Aisenberg 1999: 90)²⁵. Biological individuality was subsumed by microbial action, and the human body was reduced to a neutral factor: a standardized, commensurable unit. If certain preconditions were met, the entire apparatus that made bacteriological research possible could travel and extend its influence to even more bodies.

Germ theory and the West African colonial context

The rise of germ theory roughly coincided with the “scramble for Africa,” the competition from the 1880s onward for European powers to establish African colonies in an effort to extend their market viability. Microbiology’s mastery over parasites fed the colonizing hubris of the European states. French bacteriologist Albert Calmette wrote, “Is it unlikely that Africa would have aroused so much greed if the peoples of Europe who now share it had not been counting on their victory over malaria” (Calmette 1905: 417 in Latour 1988). Bacteriological advances were an important “tool of empire” for European colonial powers, for advances in disease prevention and control promoted European health in the colonies, fueling expansion into Africa’s interior (Headrick 1981)²⁶. Perhaps more important for the colonial endeavor, however, were the rhetorical advances offered by this new medicine.

One of the basic tenets of the colonial mission was to bring European civilization to the African continent. Medical advances lent credence to the imperial assertion that imperialism was a humanitarian endeavor that sought to

²⁵ Aisenberg also discusses how Pasteur’s theory of morbid exteriority was challenged by other prominent French scientists who advocated for a more social approach to hygiene (Aisenberg 1999).

²⁶ The tool of empire approach has its limits, however. Imperial expansion across West Africa was largely supported not by shielding European health through medical advances, but by replacing French soldiers with African ones who could penetrate the more “dangerous” climates of the interior. Senegalese, and other subjects of the AOF, played important roles in conquering the malarial interior and expanding France’s colonial stronghold (Cohen 1983). Germ theory, applied through the emerging discipline of tropical medicine, certainly shaped imperial practice in the colonies, but the consolidation of military power was also a prerequisite to the effective implementation of colonial medicine (Addae 1996; Harrison 1996).

bring European progress and civilization. The European desire to transform African society in their own vision was “registered” through European claims about the civilizing potential of medicine. Germ theory’s assertion that all bodies are commensurable, and thus capable of being protected or cured made medicine an even more powerful “ideology of empire” (Arnold 1988; Arnold 1993). The ideological turn equating medicine with civilization and development was not aimed at Africans, but rather intended for European audiences in the metropole. The practicalities of the imperial endeavor were often highly contested on European soil, and medicine was invoked as a way to alleviate concerns about colonial exploitation by demonstrating to home audiences that the march of empire was a beneficent, and thus legitimate, endeavor (MacLeod 1983; Ernst 1997). In short, it was compensation for colonialism.

Medicine was understood to reflect the quality of the colony’s administration, and a high rate of disease was viewed as an indicator of poor colonial management. Disease outbreaks could tarnish the reputation of an entire colonial administration. Colonial medical enterprises emerged as showpieces that demonstrated the tangible manifestation of a successful civilizing mission²⁷. Of course, the shift to germ theory was by no means immediate or complete, for colonial powers frequently accepted or rejected it to suit local political demands. Furthermore, as demonstrated above, the turn of the century was witness to multiple competing germ theories. The manipulation of notions of disease and health outcomes in the colonies was intricately connected to a host of political, economic and social shifts that shaped the colonial project (Turshen 1984). As Warwick Anderson explained, “I suspect that one could find a germ theory to

²⁷ Silla describes the Institute for Leprosy in Bamako as one such site that was promoted by the colonial administration as proof of the colony’s success. The Institute was an important site for prominent visitors, including the Governor General of the AOF during his visit from Dakar. The Institute, like many colonial institutions, provided tangible evidence of Africa’s natural state of misery, and contrasted it with the progress brought about through the graces of the colonial civilizing mission. Yet the pomp of such places was often hollow, for without proper funding, such institutions did little to promote the health of Africa, persisting simply as impotent facades (Silla 1998).

justify almost any practice of colonial hygiene, even those that predated the theory” (Anderson 1998: 526).

In Senegal, the expansion of medical infrastructure went hand-in-hand with a new political approach to colonial rule. Senegal’s coast had long been home to French military rule, but it was only after the Berlin Conference of 1885 that the French began a concerted program to expand their control over the interior. Within the span of ten years, France appointed a Governor General of the AOF in an effort to centralize administrative power in the region. In a move that would shape Senegal’s position in the region and the world, the Governor General was to be stationed in Dakar. This consolidation of power went hand in hand with a new strategy of leadership known as the *mise en valeur* approach. Promoted by Governor General Ernest Roume, the *mise en valeur* doctrine shifted the imperial focus away from the scramble for more territory, towards a deeper exploitation of the lands and people already under her rule. The *mise en valeur* movement was guided by a philosophy that favored a new long-term role for the French state in West Africa that would maximize the economic returns on existing colonies (Conklin 1997).

The *mise en valeur* strategy is in many ways an early incarnation of what we refer to today as a “developmental approach.” It focused on themes common to overseas development today: mainly, infrastructure and public health²⁸. Of course, the goal of this work was not to develop the self-sufficiency of native peoples, but rather to establish a more coherent approach that allowed for the easy movement of people and things (i.e., wealth) across the colonies, and eventually back to metropolitan France. In practice, it was primarily a shift from “unlimited exploitation” to one where exploitation was explicitly linked with “rationality,

²⁸ The two prongs of the civilizing project often created unintended consequences. For example, the railways and improved road system across the AOF served as an important vector for new diseases, and played a central role in the spread of STIs across the region. See Ferguson for a contemporary demonstration of how intentional development plans in Lesotho interact with structural inequalities and daily practices to produce unintended outcomes. Of particular importance is Ferguson’s discussion of how these unintended effects are reinterpreted within development discourse, resulting in a depoliticization effect that he refers to as “the anti-politics machine” (Ferguson 1994).

progress and conservation” (Osborne in Conklin 1997: 41). However, this shift in policy had important implications for the distribution of political power and resources across the region. The *mise en valeur* strategy favored the federation of French West Africa, and under the political leadership of Governor General Roume, the “imperial seat” of the federation would be set in Dakar (Conklin 1997: 45). It was with the consolidation of power within the region that Dakar was elevated to the status of administrative capital of the AOF²⁹.

Dakar would go on to receive the lion’s share of infrastructural, educational, political and medical benefits. The AOF was dependent upon trade, and as the circulation of goods and people was centralized in Dakar, so too were the risks for yellow fever and malaria. At the time, Dakar was considered to be the most insalubrious city in all of AOF. To fully realize the economic potential of the colonies, health risks -- both real and perceived -- had to be reigned in. In an effort to control disease across the AOF, the administration established the *Assistance médicale indigene* (AMI), a program that sought to provide medical care and health education for rural Africans³⁰. The program represented the first opportunity for Africans in the AOF to receive formal training in biomedicine in Dakar. It trained an African corps of *aides-médecins indigenes* who were intended to act as agents of the colonial civilizing mission³¹. The administration

²⁹ The development of Dakar was by no means assured, as the cape of Dakar had long been derided as having abysmal potential for agricultural development, and rights to the area were hotly contested among the Lébou, the ethnic group claiming original ownership of the land. While Dakar sits at the extreme Western point of France’s African holdings, there was little question that Dakar would be the seat of the new colonial administration. The dominant concern of the day was trade, and trade was governed by access to the sea. While Bamako may have been the most central point from which to govern France’s West African territories, the tides favored Dakar with its deep, accessible, and easily protected port. As the Governor General explained in 1902, Dakar would become “the port by which all passengers coming from or heading to West Africa must pass” (Seck 1970: 296). It would become both a military and commercial port, and the city would become the central point from which colonial communication, commerce and political activity would emanate.

³⁰ Despite the mission to decentralize health care, in practice AMI clinics were largely confined to urban areas and those central to the peanut industry (Echenberg 2002).

³¹ Quoting from a report to of the Governor General, Ngalamulume explains that for the colonial administration the *aides-médecins* were explicitly to “help their chiefs to fight against the practices of marabouts and witchdoctors, to spread their influence and to propagate the civilizing ideas that we are trying very hard to spread throughout Africa” (Ngalamulume 1997: 1210).

hoped that their ‘grassroots’ work, paired with public performances of miracle-like surgeries performed by French doctors, would convince vast swathes of the African population to accept their hygiene measures as proof of the benefits of French rule. By 1906, the administration was training Africans as *médecins auxiliaires*, and by 1918, the Dakar Medical School was founded.

The Pasteur Institute and the colonial world

Just as Senegal emerged as an important center for medical training and infrastructure, Senegal was also emerging as an important pole in scientific research in Africa. While the adoption of germ theory in the colonies was spotty on the ground, the biologist, particularly the Pasteurian, was often hailed as the *moteur* behind France’s ability to consolidate power over the African interior³². Pasteur’s interest in *la pathologie exotique* began in 1881 when he was alerted to the arrival of a ship with a yellow fever patient aboard. He wrote, “God wishes me to catch a glimpse of these particular microscopic entities! Afterwards, it would be grand to make a vaccine from this agent of disease and death” (Mercier 1981: 441, my translation). The Pasteurian curiosity in tropical diseases and its dedication to what Pelis has called a “mission of universal bacteriological extension” led to a productive, if informal, relationship between the work of Pasteurians and the French colonial project (Pelis 1997: 583).

The first *Institut Pasteur* was inaugurated in Paris by Louis Pasteur in 1888. While the *Institut* is now widely considered as part of the French *patrimoine*, it is a private, nonprofit foundation. This unique status made it possible for the Institute to collect state and private support, while maintaining its own autonomy. Furthermore, it exempts Pasteurians active in the Institute from having to teach or treat, allowing them simply to research (Pelis 1997). Moulin notes that the scientific ideology that drove the proliferation of Pasteur Institutes

³² Interestingly, Pelis notes that both the French colonial administration and the Pasteur Institute utilized the humanitarianist term “*mission*” to refer to their program of overseas expansion (Pelis 1997).

was at once nationalist in nature, and indicative of the new global tenor that science had begun to adopt. The Institutes were defined primarily by their allegiance to Pasteurian methods, which was essentially a set of universal laws. Pasteur's agenda was not limited to a particular disease or geographical area, and thus was easily allied with a global agenda (Moulin 1992).

Indeed, the Pasteurian agenda proved to be remarkably flexible. While Pasteur's theory and practice was solidified within the laboratory, and focused primarily on the reproduction and attenuation of microorganisms, disease in Africa was distinctly different in two important ways. First, disease in Africa was not simply a matter of culturing microorganisms, but rather understanding the vectors that allowed for the propagation of those microorganisms. Pasteurian science in Africa had to encompass a new set of disease agents that included mosquitoes, fleas, and flies. Second, these new vectors required an entirely new approach that focused on the life cycle of the parasite, and as a result, required massive, population-level interventions. Many of the tropical diseases that the institutes wrestled with were curbed not by inoculation, but through massive social change, such as the construction of new hygienic houses (Latour 1988). In this way, Pasteurian medicine came to be defined by *both* laboratory-based research that focused on growing microbes in mediums, and a field-based interventions that focused on studying and controlling animal and insect vectors (Moulin 1996).

The flexibility of the Pasteurian approach was due in part to the fact that Pasteur's agenda had never been limited to a particular disease or geographical area. This allowed the *Instituts* to adapt to local disease environments, while conferring them a tenor of universalism. This combination made the *Instituts* mobile, and the African continent was particularly suited to Pasteurian interventions. By definition, germ theory required a vast amount of epidemiological and microbiological knowledge, and the collection of this data required the cooperation of significant swathes of the population. The coercive requirements of the Pasteurian program were therefore easier to apply in the

colonies, where an infrastructure was already in place for the implementation of more draconian measures. Myron Echenberg notes that the Pasteur Institute and its directors were “the leading custodians of Western biomedicine” within the AOF. Since medical care was a keystone in the rationalization of the French colonial endeavor, the work of the Pasteur Institute was deeply tied not only to scientific knowledge claims, but to political legitimacy (Echenberg 2002: 197). In practice, the first wave of overseas Pasteurians did not fully understand the extent to which their research was intimately bound with the colonial program. For Pasteurians, their authority did not stem from political control, but rather from their ability to produce value-free scientific data through the objective lens of germ theory (Moulin 1996). However, just as the rise of the germ theory was linked with political and social conditions in the metropole, the administrative forces that shaped life in the colonies facilitated the proliferation of Pasteurian practice. The colonial apparatus could enforce the participation of African subjects in various campaigns, such as smallpox vaccination, with relative ease, because the majority of colonial subjects were not afforded the individual rights that protected citizens in metropolitan France.

One way to ensure a measure of continuity within the universalizing Pasteurian program was to place a premium on standardized training. The most well-known of these trainings was the *Grand Cours*, a microbiology course first offered in 1889 at Paris’ Pasteur Institute. As a private enterprise, the Institute could not provide State diplomas, but an *élève du cours* diploma from the Institute was the highest mark of expertise in microbiology. By 1903, the Pasteur Institute signed an agreement with the French Army health services to allow ten Army physicians and pharmacists each year to attend the *Grand Cours*, and two of them would be given posts either within the Paris Institute, or one of its Outre-Mer (overseas) affiliates. Many expatriate Pasteurians went on to teach specialized courses at the colonial medical universities, including the Dakar Medical School (Opinel 2008). The Pasteurian tradition operated in an almost prophetic way, with Pasteurian scientists locating themselves within a particular historical lineage. Whether operating out of Paris, Dakar or Bangui, their Pasteurian

credentials were proven by tracing their education and connections back to Pasteur himself, or one of his close colleagues. This “claim of transmission” conferred legitimacy to the individual scientist and to his Institute, fondly referred to as the “Maison mère” (Chambon 1976). Frenchmen and foreigners alike would pass through the home Institute in Paris for training, then return to their countries maintaining a link to their French colleagues while establishing a vast network of Pasteurians across the globe.

Of course, there was an implicit hierarchy within this network of institutes. The Director of the Paris Pasteur Institute lay at the heart of the Pasteurian web that stretched across the world. He was, in Pelis’ words, the “prime mover” of the Pasteur Institutes, establishing both the program and “tone” of the Institute’s work (Pelis 1997: 588). Part of the Pasteurian bargain, then, was an implicit acceptance that the Paris Institute would coordinate all activities within the network. This hierarchy was maintained by focusing all “pure research” in Paris, and allowing all of the peripheral Institutes to work on more applied research. Thus, at the heart of the Pasteurian globalism was the assumption that the Institutes existed in order to promote the scientific power of France. Paradoxically, the establishment of Pasteur Institutes in zones outside colonial French rule, and the perpetuation of the network of institutes beyond the fall of colonial rule, indicates their relative independence from the colonial endeavor (Moulin 1992). For while the Pasteurian expansion was facilitated by colonial patterns of rule, the Pasteur Institute operated independently from the Colonial Health Service. The Pasteur Institute was a private institution, and as such, its primary goal was not to promote the health of colonial subjects, but to produce research that could benefit its researchers, and by extension, France.

The commensurability ushered in by germ theory made bacteriological research in Africa possible. Methods were standardized, and both pathogens and bodies could be expected to act in uniform ways across the globe. If one discovered the pathogen that caused yellow fever in Dakar, it could fuel vaccination campaigns from Bangui to Bombay. However, as is the case with

many tropical diseases, vectors re-introduced a certain measure of locality to bacteriological research. While some microorganisms could be cultured and studied in Europe, other diseases simply required study in the field. In other words, the study of tropical diseases re-introduced ‘the local’ into bacteriological research. For example, in an effort to jumpstart his waning success, famed microbiologist Robert Koch sought to study trypanosomiasis, which had no known treatment. At the time, organic arsenical Atoxyl was considered useful in the treatment of trypanosoma, despite its very harsh side effects. Prevailing wisdom was that trypanosomiasis could not be studied in animal models, so in order to study the disease and its treatment Koch had to travel to German East Africa for his work. Over numerous campaigns Koch tested large swathes of the population for the disease, performing painful punctures of the cervical glands at the back of the neck. He relied on colonial police forces to recruit patients for these grueling procedures. Together with medical staff, they scoured for people infected with trypanosomiasis, and forced patients into “coassembly” where they were observed, treated and isolated (Eckart 2002). Less draconian measures for recruitment were also suggested, including a provision that any family presenting a patient to the clinic could receive a waiver that exempt them from paying taxes to the colonial government (*ibid*). This example demonstrates the scientific possibility that Africa held for making and re-making the careers of metropolitan scientists. It also reveals how taxation and other coercive aspects of colonial organization made African subjects knowable, traceable, and thus enrollable as subjects of medical research. Yet it was not colonial power alone that facilitated the transformation of African populations into a sort of living laboratory. By making all bodies the same in the face of pathogenic microorganisms, germ theory provided European scientists with the potential to apply their laboratory science to all corners and all peoples of the world. This was greatly facilitated by colonial power for subjugated Africans had no outlet for collective resistance to these new scientific and public health incursions (Nguyen n.d.)³³.

³³ Of course the colonial record does offer examples of how some Africans were able to resist

The Pasteur Institute of Dakar

The seeds of Dakar's Pasteur Institute were first sown by Émile Marchoux, a French physician and biologist. In 1896, after finishing his training at the Pasteur Institute in Paris, Marchoux was commissioned to report to Senegal where he would establish a small laboratory. This simple laboratory was the first microbiology laboratory in Africa³⁴. By 1913 the small laboratory was transferred to Dakar, and it was only in 1924 that a *convention* (or memorandum of understanding) was signed between the Governor General of the AOF and the Maison de Pasteur to make Dakar's laboratory the Pasteur Institute of West Africa. This agreement made the laboratory part of the official network of institutes, which were by definition independent research institutions. Despite this independent status, Dakar's Pasteur Institute, like others across the continent, was intimately tied to the colonial structure. During its early years as a recognized Institute, the laboratory focused more on applied research, and its scientists rarely ventured out into the field. While the laboratory focused on diseases of the tropics, for all intents and purposes it was a French institution operating in West Africa. In its early years, it offered virtually no training to Senegalese, and by 1945 had trained only one local scientist, the son of famed Deputy Blaise Diagne (Echenberg 2002: 194).

The laboratory was inducted as the Pasteur Institute of West Africa, and its first director was Marcel Léger. Léger was widely published, but under his leadership the Institute produced little work of value to the colonial economy. However, Léger's legacy is indicative of the strong ideological relationship

colonial medical control and experimentation on an individual level. See Echenberg 2002 and M'Bokolo 1982 for more information on how individual Senegalese resisted the administration's anti-plague measures that they viewed as dangerous to their health and compromising to their personal and political lives (M'bokolo 1982; Echenberg 2002).

³⁴ It appears that by the turn of the century the small laboratory was the epicenter of bacteriological (specifically vaccine-related) research for the AOF. For example, by the turn of the century, Saint-Louis' bacteriological laboratory was in communication with the Lieutenant Governor of Guinee concerning the delivery of vaccines (ANS 1905).

between the overseas Pasteur Institutes and the colonial endeavor. Léger held a number of controversial, and in some cases incorrect hypotheses about how to contend with the most significant public health threat facing Dakar during his tenure: the bubonic plague. Notable among these hypotheses is the notion that the plague could be transmitted through healthy human carriers. The Institute's failure to rescind such hypotheses could be attributed in part to their failure to carry out field research, or their reluctance to engage with other institutes also struggling with the plague. It is clear that Léger's work, however misguided, was not questioned for fear of setting off larger political repercussions. As Echenberg explains: "The PID [Pasteur Institute of Dakar] and its directors were the leading custodians of Western biomedicine, a body of knowledge upon which French claims to power and control, in part, rested. For powerful researchers like Marcel Léger to admit error risked calling into question part of the foundation of colonial rule (Echenberg 2002: 197)."

Three years after independence the Institute was renamed the *Institut Pasteur de Dakar*. While the Institute had always been private, it was nonetheless intimately linked to the colonial enterprise. With the emergence of Senegal's newfound independence, the Institute needed some restructuring. To understand more about contemporary research at Dakar's *Institut Pasteur*, I spoke with Prof. Alioune Dieye, Deputy Director of the Dakar Pasteur Institute. Dieye explained that following independence, the Pasteur Institute in Paris (the "mother house") signed an agreement with the government of Senegal that established a new orientation for the Institute. Every research program carried out at Dakar's Pasteur Institute had to be approved by the Senegalese government. As Dieye explains, each year the Institute's administration meets with the Ministry of Health to review the year's activities and proposed projects. The primary orientation of the Institute, which Dieye defines as a commitment to studying local diseases, has remained constant over the years. Amid the host of endemic diseases present in Senegal, the Pasteur Institute has long devoted itself to the study of malaria and arboviruses, particularly yellow fever. In fact, in 1927,

Dakar's Institute was one of the first to isolate the yellow fever virus, and today it is one of the few suppliers of the vaccine in the world. This focus on local diseases, particularly those affecting public health, is what Dieye refers to as the "*esprit Pastorienne*" (Pasteurian spirit).

Like many others before him, Dieye locates himself within the Pasteurian family. "I am a product of the Pasteur Institute," he proudly announced. He began his studies at the Institute, and worked his way up through the ranks, eventually becoming Senegal's first Professor of Immunology. At the time that he started, Dieye's rise could not have been more improbable. Back then there were no Senegalese researchers at the Pasteur Institute. "As recently as 1985/86," Dieye recalled, "there wasn't a single Senegalese researcher. All of the researchers that were there were French... There were technical personnel that were Senegalese...the workforce, etc. But as for researchers, we were the first. Senegal had decided back then that it was time for the Pasteur Institute to take Senegalese researchers." As more Senegalese researchers passed through the ranks, they began to take leadership roles in the Institute, and as Dieye explains, "we began to weigh in on the decisions, to weigh in on the activities." The French scientific personnel gradually left, and today the laboratory heads are almost all Senegalese.



Figure 3: Oil on canvas, commissioned by Prof. Mboup

While Dakar's Pasteur Institute is run by Senegalese, Dieye is careful to emphasize its private nature, clearly stating that it is neither French nor Senegalese. Just as it acted as an invisible wing of the colonial state, the institution now acts as an invisible support to the Senegalese state. Senegal's Minister of Health sets up a health research program every five years. "We participate in the development of this program," Dieye explains. The Pasteur Institute shapes its research agenda in part according to the priorities laid out by the Minister of Health. For example, if there is an outbreak of disease somewhere in the country, the Ministry will alert the Pasteur Institute. "We will go out into the field," Dieye explains, "and then we do the diagnostics here, and we give all of the information to the Minister, who then goes on television and explains to people that we found this." In these public addresses, the Pasteur Institute is never mentioned. As a result, explains Dieye, "The population has never heard of the Pasteur Institute." He continues, "Even intellectuals, professors, they might know about the lab where you come for tests... they come to get their blood taken, they know that. But they don't know that we are behind the surveillance, that we go into the field... because we don't work that way. We don't work for visibility. We are content to be the experts for the Minister of Health." So while the Pasteur Institut is an independent entity, it continues to operate in concert with the state administration. No longer supporting a colonial *mise en valeur* strategy,

today's Pasteur Institute works behind the scenes to provide the very data and statistics that allow the Senegalese state to fulfill its obligation to provide for the public's health. Under the rubric of an advisory position the state is able to claim the knowledge of outbreaks, epidemics, and other threats to the public health that was produced by this independent body. "Well, that's how it is," says Dieye of the Institute's invisibility, "it's normal."

Contemporary scientific research in Senegal

The contemporary position of the Institut Pasteur demonstrates how the rise of germ theory, and particularly its corollary of commensurable bodies, made bacteriological research in Senegal possible. While Africans were still politically and socially subjects of colonial rule, germ theory reframed their bodies as biologically commensurable with all other bodies. Disease was no longer located in the 'otherness' of the African landscape or the foreign-ness of the African body, but localized in microbes whose actions on the human body were uniform. Armed with the equalizing power of germ theory, Europeans were able to extend their networks of research to new sets of bodies in the colonial world. Scientific careers were made and the colonial agenda was bolstered by the powerful ally of medical innovation. In much the same way that the colonial harvesting of raw materials developed European economies at the expense of African peasants³⁵, so too did the colonial approach to bacteriological research enrich the scientific capital of European researchers at the expense of African science. Like rubber or gum Arabic that could be transformed into manufactured goods and European capital, the endemic diseases that once hindered colonial expansion were transformed through germ theory into microbial agents that were powerful *scientific* raw materials. Harvested in the tropics, they could be transformed in

³⁵ See Rodney for a demonstration of how colonial relationships contributed to capitalist development in Europe, creating a unique relationship of structural dependence and "underdevelopment" (Rodney 1972).

the walls of the laboratory into a form of knowledge that enhanced the renown of both the individual European scientist and the colonial power. Colonial science did not build independent scientific infrastructure to benefit Africans, so while independent Senegal could eventually boast a remarkable colonial scientific legacy, the practices and politics of colonial research left the independent nation bereft of any meaningful, state-controlled apparatus for sustaining scientific research. This resulted in a highly trained scientific elite whose work and livelihood is entirely dependent upon outside funding.

Prof. Salif Sow is the head of the Department of Infectious Diseases at Hôpital Fann, Senegal's teaching hospital. He is a part of the small realm of elite researchers in Senegal, a world that has consistently been described to me as "familial." Sow explains that the lack of state infrastructure remains at the heart of the challenges that face Senegal's researchers. "Alone we could never do it," Sow explained. "Take the University, there is no budget for research. Take the government, there is no budget for research. All of the research that we have done here, whether with Mboup or in our clinic, it is always in collaboration with international partners... ANRS, the NIH in the US, or the Belgian or German governments. So it is this international openness that has allowed us to have the means to do research. If we didn't have this openness to the international world, I don't think that Senegal would ever have the money to do research."

Like Sow, Prof. Dieye at the Pasteur Institute considers a nationally-run research funding agency as paramount to the nation's development. "There can be no development without research," he explains. "The most developed nations are the ones that invest the most in research, it's clear. The Northern countries that are the most developed are the ones who put the most into research. The southern countries, the last ones, they are the ones that put the least into research. If you compare the US, Europe, Japan, it is Japan who puts most of its money into research, and it is Japan that is the most developed. It's no secret. Development is something that must be built. A solid foundation. You don't move forward just by talking about it." Sow illustrates a similar point. He explains that while

Senegal has the highest ranking University in the region, “we are missing structures that promote and train high-level researchers.” Students with an ardent interest in research often leave to receive training in foreign countries. For Sow, this system creates the problem of how to motivate highly trained individuals to return home. He explains, “We have to provide them with good research conditions that meet international standards, so that they can blossom in their research. I think that today our main challenge is to create a structure that promotes researchers here in Senegal, in terms of laboratory science, even sociology and anthropology... [Otherwise] after training abroad in good conditions, they will hesitate to come back.” Dieye hopes that some day Senegal will have national political leadership that will recognize that research is an important national goal. Sow has similar hopes, and suggests that public-private partnerships might be a similar way to achieve the goal of building a national funding agency for research.

Without infrastructure or funds for scientific research, the work of monitoring and studying disease, indeed the work of research as a whole, becomes entirely dependent upon outside funding in the form of projects. Unfortunately project-oriented funding from overseas partners is the only way that Senegal’s researchers are able to keep themselves afloat. For Dieye and many others, the lack of state-controlled research monies threatens to undermine the high level of research work being performed in the country. The state has a Ministry of Research, but the Ministry has no funds to disburse to the nation’s researchers, thus the small group of elite researchers in Senegal must depend upon project funding from overseas. For Dieye, this dependence is untenable. “You can’t be interested in a research question just because there is [money] in it, because one day it won’t be there anymore, and everything will all fall apart...This new generation of researchers need salaried research posts. There are no salaried positions available to them. Everyone gravitates towards HIV research, but there aren’t any long-term positions available, so they just get thrown into projects. This doesn’t stabilize our human resources.” The story of

HIV-2 that unfolds in the next chapter provides a case in point, illustrating how a complete dependence on project-oriented funding circumscribes scientific possibility in Senegal.

Chapter Three: Uncovering the “other” HIV virus

This chapter describes how Senegal came to play a central role in the geography of HIV-2. It begins with the unusual story of how HIV-2 was discovered, and how its initial description led to a fruitful collaboration between a small, one-room laboratory in Dakar, and some of the most prestigious laboratories in Europe and the United States. It explores the multiple practices that went into developing HIV-2 as a knowable entity, tracing one of the first international collaborations on HIV in Africa from its heyday to its eventual collapse.

The story of HIV-2 lays bare the scientific process whereby a problem is transformed into a knowledge claim, and further into a fact (Adams and Pigg 2005). This chapter pays particular attention to the experiences of my Senegalese informants, and thus situates the discovery of HIV-2 and its properties within actors’ experiences of social relations and practices. These experiences are examined within the context of broader networks of global politics, thus elucidating the multiple ways in which global inequalities differentially shape scientific knowledge. Underlying this connection between social world and scientific fact is a distinctive shift that has taken place in the realm of HIV research. While for years the HIV epidemic tore through populations unhindered, the enormity of the HIV epidemic has today spawned the intervention of extremely powerful multilateral institutions and philanthropic organizations, each with very specific priorities. The entry of these ‘humanitarian giants’ into the realm of HIV research has produced new capital flows, and new global forms of governmentality (Nguyen 2005; Sunder-Rajan 2006). The story of HIV-2 demonstrates how these new priorities that shape the flow of scientific investment have trumped the traditional forms of social relations that once held scientific networks together.

Stumbling upon a new virus

Professor Mboup knows how to weave a good story. As I settle in at the long table in his office, ready with my questions about the history of the lab, he begins: “One morning, very early – around this time now- I was working away at my lab when I received a phone call from France. The Americans wanted me to come to Harvard.” Of course, the story really begins before that fateful day, when the Professor joined the service at the *Laboratoire de Bactériologie et Virologie* (LBV) at Dakar’s *Hôpital Arisitde Le Dantec*. The Dantec Hospital was originally opened in 1914 as the *Hôpital Central Indigène*, and was the first hospital structure in French West Africa to meet the health needs of the local African population. While not “central” geographically speaking, it represented the centralization of native health care across all of the colonies (Badiane 2004: 19). In 1960, when Senegal became an independent nation, the hospital was transferred from the French colonial authorities to the Senegalese authorities, eventually becoming a university teaching hospital associated with Dakar’s *Université Cheikh Anta Diop*. Founded a century ago to provide care for the native population, Dantec hasn’t strayed far from its mission to care for those who have few medical options. As the head of the hospital described, “In terms of patient care, of course, we are the last resort for people in need.”³⁶ The hospital is

³⁶ The *medecin chef*, or head of the hospital, at Dantec explained the hospital’s current financial constraints and traced them to the problem of cost-recovery. The state sponsors health care for its civil servants, but the hospital must often wait up to three years to be reimbursed for such services. “If you are not paid for three years, that means that you do not have enough money to cover the costs of running the hospital,” he explains. “Me, I have to pay the salaries of my employees, that is my first priority. I prefer to pay the salaries of my employees before I pay my suppliers, the people we purchase our materials from. As a result, if we don’t have enough to pay for the material, everything gets put on hold because I can’t pay off what I owe, and we can’t order anything new from them.” While this problem has been continuing on for quite some time, it has recently spiraled out of control. President Abdoulaye Wade, as part of his re-election campaign in 2007, said that all Senegalese people over the age of sixty will be able to receive free medical care. In 2005, there was an estimated 650,000 people in Senegal over the age of sixty.

set up in a pavilion fashion, and the outdoor campus is dotted with row after row of cement buildings that house the hospital's 24 departments. Some are built in a simple, if stoic, contemporary style. Others sport verandas that harken back to colonial days, and today provide a resting place for the families and friends accompanying the sick. While the sun bakes much of the campus, there are a few old trees that dot the campus, and provide strategic spots where families can congregate. At the far end of the hospital is the *Laboratoire de Bactériologie et Virologie* (LBV).

“You can imagine the number that are over sixty now!” exclaimed the *medecin chef*. When compounded with the years that it takes for the government to reimburse the hospital, such political pronouncements spell disaster. “It diminishes the quality of service, the quality of care. I have problems just keeping up with the basic management of the hospital. I can’t pay for bleach – can’t keep the basics in stock... This seriously impacts our efficiency.” When materials aren’t in stock, the hospital has to improvise, or more often, delay treatment. A patient who could be treated in 5 to 7 days with proper materials, instead remains hospitalized, untreated for anywhere from 15 days to a month. The beds fill up, and fewer people are able to receive care. With fewer beds, patients are simply turned away. The *medecin chef* explains that these days, an ambulance will come to pick up someone in need of urgent care, and the driver ends up taking a tour of Dakar looking for a hospital with an open bed. With no beds available, they spend hours going from one health center to the next, only to have the person die in the ambulance. “Politically, their vision is too short-sighted,” the *medecin chef* explains. “They are working on short-term goals. They have to start looking further ahead. This new free treatment that they are offering... what will be the long-term impacts? They just come in and declare it without [consulting] with us, actually seeing if it is feasible.” Impassioned and clear, the *medecin chef* delivered his diagnosis: “That will kill the hospital.”



Figure 4: Scene from Dantec Hospital, 2007

Today, the LBV is an official Reference Laboratory for the World Health Organization, a UNAIDS Collaborating Center, and host of the African AIDS Research Network. The laboratory is comprised of four units: bacteriology, immunology, virology/serology, and molecular biology, which are connected by mosaic paths lined with well-tended gardens. The laboratory makes an impressive visual impact on the visitor, as its newer buildings and quiet courtyards stand in sharp contrast to the older hospital structures and the swells of people waiting for care by the hospital's entry gate. Almost thirty ago, upon completing the rigorous program at Senegal's military medical school, Mboup was assigned to the Dantec laboratory as an intern. At the time, the laboratory consisted of a one-room bacteriological unit, and research was generally restricted to performing routine clinical tests for the hospital's patients. Dantec was Mboup's very first post, and he would remain there for his whole career. "Bacteriology," the Professor reminisced, "when I started here, it was just a tiny room... it was the smallest department in the whole hospital."

In this modest laboratory environment, Mboup met his "spiritual guide," Professor François Denis, the head of bacteriology at the University. Denis was a Frenchman, who ultimately took the young Mboup under his wing, leading him towards the pursuit that would ultimately become his life's work. As an intern,

Mboup was an eager and self-motivated worker. His immediate boss at Dantec was hardly ever around, occasionally dropping by the small laboratory for “five minutes at a time,” then leaving. Mboup began to pick up the slack, taking on work in the lab that was generally reserved for someone with more credentials. With the help of just one technician, together they performed the work that today is managed by an entire team. They took care of the patients that were sent to them, drew their blood, performed the analyses, and provided the results that were supposed to be distributed by his superior. “At the beginning [my boss] just came in to sign the results [of my tests]. But, bit by bit he stopped coming in altogether, and nobody seemed to notice. He was only interested in the private sector. Basically he put himself wherever he could make money. He picked up work in a private clinic, and brought the clinic samples here to be tested... At night I would do the tests for him there at the hospital, and he got the money for it.” After a certain period of time, Mboup explained that his boss stopped coming altogether. “At one point,” Mboup explained, “he came to Dantec and the guards stopped him at the door because nobody recognized him any longer, and the personnel working at the lab couldn’t vouch for him because they didn’t know who he was. ‘I am your boss’ he explained to them, but they said, ‘The only boss we know is the one that we see.’”

As Mboup’s superior became increasingly irrelevant within the department, the young and eager Mboup caught the eye of Prof. Denis. Denis soon proposed for him the new position of “*maître assistant*” in bacteriology. It was the late 1970s, and at the time all of the departmental heads, or *chefs de service*, at the University of Dakar were French. Mboup was a member of the first generation of Senegalese to receive the position of *maître assistant*. With this new position in hand, Mboup would finish up his work at Dantec and travel across town to the University where he would start his *travaux pratique* (lab work). Under Denis’ supervision he learned how to teach, write papers, and perform the work of an academic researcher. “In teaching, it is very important to have someone who takes you under their wing,” Mboup explained. “Those without [mentors] lose a lot of time... he showed me the way.” With Denis’ help,

Professor Mboup received tenure when he was just 33 years old, one of the youngest of his generation. Mboup guards Denis in his memory as a man of great humanity who embraced a zealous work ethic. “I always tried to emulate him, in the best sense. He is really my model.” The tenured position afforded Mboup the freedom to develop his own career. “When you are tenured, you are at the summit, and it is much easier for you to develop your own initiatives,” he explained. While many prefer the more secure route of the teaching life, Mboup began to pull away from the University and focus his efforts on research at Dantec. Of course, Mboup was among the early generations of Senegalese tenured professors. He has since gone on to train many researchers who received tenure under his tutelage. While this is still a grueling process, the Professor provides the newly tenured professors with money to purchase supplies, and to cover their work and travel. He even provides them with cars to get back and forth to the lab and the University. Mboup himself had not been so lucky. He had to struggle to build the lab and his career under his own steam. Much of this can be attributed to an early project on Hepatitis B.

Around the time that Mboup began his work at Dantec, Senegal was home to a large study headed by the University of Tours in France, which examined the relationship between hepatitis B and primary liver cancer. Denis recruited Mboup for the project because he knew that the young researcher was a member of the military and active in STI research. The Senegalese Army was used as the cohort for the study because they were the only population in Dakar which was registered with the state, and thus could be tracked over long periods of time. This research was part of a large study that examined the relationship between hepatitis B and primary liver cancer. As a part of his work on the hepatitis B project, Mboup travelled across Senegal, following the cohort, performing hepatitis tests, and using ultrasound to track liver health. For a burgeoning young researcher, this project was ripe with opportunities. In addition to gaining field experience, Mboup learned how to manage a project that was backed by numerous research partners, and began to establish his international network of colleagues. One such colleague was Francis Barrin. In the early 1980s, the

Senegalese medical service was supported by French VSN volunteers (*Volontaire du Service National*), members of the French military who were permitted to fulfill their military service obligations as overseas volunteers. Francis Barrin was one of the VSNs stationed in Senegal and working on the hepatitis B project. Before the hepatitis project, Mboup had begun to work on STI research. Dr. Ibra Ndoye, head of the STI service, had first approached the young Mboup about beginning work on STIs in Dakar. Ndoye is trained as a gynecologist, and had been transferred to the STI service at the *Institut d'Hygiène Sociale* (IHS) in the late 1970s. Ndoye is the head of Senegal's National Council on the Fight Against AIDS and a prominent figure in the realm of Senegal's HIV politics. He has his finger on the pulse of the latest HIV trends and funding streams, and thus is able to wield significant political power and personal networks. In 1976, however, Ndoye was a simple gynecologist who had been assigned to reform the STI service. While this was not a sought-after position at the time, being transferred to this lamentable post proved fortuitous as it placed him at the center of Senegal's emerging HIV epidemic.

Part of Ndoye's brilliance is his capacity to spot an opportunity and seize it. The STI program in place at the *Institut d'Hygiène Sociale* was largely undeveloped when he arrived in 1976. The state provided the aid of a social worker, but little else. As this social worker recalled, "When I got there, there was no office, no place to work, nothing." The pair encountered some formidable political challenges when they arrived at the IHS. The STI control efforts originally put in place during the colonial period were largely under the control of the French *assistants techniques* still working in Senegal. As the social worker explained, "When Ndoye came they thought that Ndoye was going to take their place." Feeling threatened by the arrival of these newcomers, the social worker remembers: "[They] didn't even want us to sit down. We stayed like that for eight months. We would just come and go." Her husband grew concerned about the legitimacy of his wife's new position. "You leave, you come back," he said, "You don't even have an office. I am going to see Ndoye and ask him, 'My wife, what is she doing, she doesn't work, but she comes here every time.'" Ndoye was

determined that things would work out. “Be patient,” he implored her, “it will come.”

At the time that Ndoye was establishing his practice at the STI clinic, the international family planning movement was undergoing a series of shifts that would provide Ndoye with the opportunity to begin studying the population of sex workers in his care. The birth control pill was poised to revolutionize the family planning agenda, but so much was unknown about the potential effects of this new form of contraception. What were the long term physical side effects? And in the short term, what would this mean for STI prevention? USAID was poised to institute new family planning programs in Senegal, but important questions remained about the relationship between new trends in family planning and STI control. Ndoye understood the potential of this new funding stream, and in his role as the head of STI control, he was ready to become a significant player. At the time, Ndoye did not have access to a laboratory, so he approached Mboup, whom he knew from his days training in gynecology at Dantec. He proposed a partnership. Mboup enthusiastically accepted and began to test the samples from the sex workers at Ndoye’s IHS clinic. A new era of research was born. As Mboup explained, “Thanks to family planning, we had a lot of funds from USAID, material that we used to do our first STI studies...and we could buy materials for the lab... I used all of the funds to develop the laboratory and to renovate. Our lab, which was so tiny, started to get progressively bigger and bigger, and we were able to bring material to the hospital. Since that time, I’ve almost never had to request materials from the hospital. I have always brought in [resources] for that, and that is what helped me to make a name for myself.”

In addition to routine hospital work and staying on top of the samples from the IHS, Mboup was for all intents and purposes managing the military component of the Hepatitis B project. There was an international meeting about Hepatitis B in Senegal, and two American researchers, Max Essex and Robert Gallow, came to report their research findings. “I saw their presentation,” Mboup recalled, “but it was Denis who proposed that since I was working on STIs, it

would be interesting for me to do a study on AIDS. I had access to the prostitutes and all of that.” So, Mboup began to investigate AIDS in Senegal with the help of Francis Barrin, the French VSN volunteer who had been working in Senegal on the Hepatitis project. Barrin had since left Senegal, and performed some postdoctoral training at Harvard University in the laboratory of Max Essex. It was the early 1980s, and scientists were still piecing together the structure of HIV and the pathogenesis of AIDS. Essex’s lab was at the cutting edge – performing not only ELISA (enzyme-linked immunosorbent assay) tests, but the Western Blot, a diagnostic test that today is utterly routine, but in the early 80s was almost unheard of. When Mboup decided to begin his first study of the prostitutes to see if there was any presence of HIV in the population, he enlisted Barrin’s help.

Denis had suggested to Mboup that he launch a quick study to see if there was any HIV (known then in America as HTLV-III) present in the country. Research on HIV was rapidly progressing in France and the United States, but there was precious little data coming out of Africa. There were hypotheses that AIDS originally came from Africa, and early studies indicated that prostitutes living in East Africa (Kreiss, Koech et al. 1986; Quinn, Mann et al. 1986) had extremely high rates of HIV infection, but there had been little documentation on the virus in West Africa. While Mboup traces the suggestion back to Denis, Mboup’s colleagues recall the drive with which the young researcher pursued the study of HIV. One of his colleagues, hired in 1987 to provide clinical care to the sex workers, is now an extremely successful researcher and businessmen. Recounting the early days, he explained to me with a smile, “Mboup, you know him... one day he gets the [idea]... in 1985 he got up and said, there is a disease that seems to be transmitted sexually and it has been discovered in the North. We haven’t described it in our country, but we have to see if there is a reservoir of the virus here.”

Of course, Mboup’s drive was matched by a tremendous resource that lay right at the feet of the young professor. Mboup’s colleague continued: “So by chance... Senegal is one of the rare countries where prostitution is regulated by

law. It is something that was voted on by the National Assembly... Back then our representatives were ahead of the people at that time, so they voted for it. Prostitution was tolerated, but had to follow the health plan. Women who wanted to prostitute themselves had to come register at health centers. In Dakar there was the IHS, you also had Mbour, Ziguichor, Saint Louis, Thies³⁷. They were given a booklet, and every month at the beginning, or every 15 days they had to come and have a medical exam. If they had a venereal disease they were stopped, you took their card, provided them with treatment, and when they came back and you verified that everything was okay, you gave them their card, and that was it. It was a population that was already a target [of health interventions], so it was very easy... There was a reservoir, and that is how we started.” Quite simply, Mboup had access to the prostitutes enrolled at IHS and other STI centers across the country. It seemed like a natural place to start³⁸. Barrin, the VSN who had worked with Mboup on the hepatitis project, had returned to his post at the University of Tours. With his help, they tested some of the first samples.

The lab at Dantec was equipped to do some ELISA tests to determine whether HIV was present in the samples. The ELISA test is designed to measure the antibody for the entire virus. If the result is positive, the Western Blot, a much more specific test that provides an image of antibodies at each viral protein, is used as a confirmation test. To perform the Western Blot, the sample is put through a gel matrix that is electrically charged. In the presence of an electric current, proteins migrate through the gel according to their surface charge and their size, resulting in visual “bands” that can be read and interpreted. The placement of these bands lets a scientist determine whether HIV is present or not. Mboup and his colleagues had performed basic ELISA tests on their blood samples, and a few of these samples tested positive for HIV. Unfortunately,

³⁷ These are larger towns and cities where STI clinics regularly followed registered female sex workers.

³⁸ Of course, Mboup was careful to follow the links with cancer and blood transfusions that were emerging in the north by testing patients undergoing cancer treatment, and sickle-cell patients receiving transfusions at Dakar’s *Centre de transfusion sanguine*.

Dantec did not have the means to perform the Western Blot tests to confirm the presence of HIV. Mboup sent the samples to Barrin. When Barrin tested the Senegal samples, they failed to produce a band at GP41. GP41 is a protein in the viral envelope of the HIV, and it plays an important role in helping the virus fuse to the host cell³⁹. All other samples that he had tested, whether from the United States or from other regions of Africa, had predictably produced a band at this site. In the words of one of Mboup's scientific colleagues, they had uncovered "a bizarre profile that resembled HIV-1 without being HIV-1." Baffled, Barrin called in the help of his colleagues at Harvard Medical School who he knew from his internship days. The samples were given to a young researchers who would prove to be one of Mboup's closest colleagues and friends: Phyllis Kanki.

When Barrin passed along the samples, he marked them with an "S." Kanki, seeing the "S," thought that it stood for "simian," and tested the sample as though it was taken from the African green monkey. The group regularly tested simian viruses⁴⁰, and Kanki tested the Senegalese sample thinking it was a simian sample. Her results showed the presence of proteins that normally would exist in simian serums, and she casually confirmed with Barrin the presence of the simian virus. Barrin could not believe his ears. What sample had she tested? Then the mistake became clear. The "S" that had marked the samples was not shorthand for "simian," as Kanki had assumed, but for "Senegal." These samples were from humans. Mboup explains, "That is when we said, hold on, there is a virus that is awfully close to the simian virus, but is still a human virus, and it is different from HIV-1. So, maybe there is a second AIDS virus. That's when [Phyllis] asked, where did you get these sera?" When Barrin explained that Mboup had procured the samples, Kanki insisted that he bring Mboup to her lab right away, with some more samples from those same people. They had to isolate the virus. "That's

³⁹ See p. 1389 in Barin et al. for a more complete description of the reactivity of the serum samples (Barin, M'Boup et al. 1985).

⁴⁰ Kanki had published a paper in the journal *Science* identifying a retrovirus similar to HIV-1 that was identified in sick macaque monkeys at the New England Regional Primate Research Center (Kanki, Homma et al. 1985).

when Francis called me,” Mboup recalled, “saying that he wanted me to come, and to find those subjects again.”

The prospect was thrilling, but how to get more samples? Almost single-handedly Mboup tracked down the women who corresponded with the samples that he had sent to Boston, and he had took more of their blood for testing. The catch was that he had to draw their blood the same day that he was going to board the plane to the United States. He also needed a visa. With no other options, he traced the samples not only to IHS, but to other centers around the Dakar region – Thiaroye, Pikine, Rufisque, and all the way down to the coastal town of Mbour. Having no other choice, he jumped in his car and travelled to try to find the women and draw their blood. Remarkably, he found the women, drew their blood, and packed all of the samples into a box. “I took all of the samples, I think perhaps a dozen of them,” he explained, “then I put them all in a present package.” The package tied up with a bow, he boarded the plane to Boston.

Stepping off the plane at Logan Airport, the professor had to go through U.S. customs before he could make it to any laboratory. Armed with only a few stale words from English lessons in his schooldays, he just had to make it past customs with the samples intact. “I met the customs agents and they asked me, “What is in that box?” “It is true that I had a gift with me,” explained Mboup, so he replied, “It is a gift.” “Fortunately they didn’t know that I was transporting blood samples. Of course, back then there weren’t the same rules. And finally I arrived at what they called Boston.” He went straight to the lab, gave the samples to Max Essex and Phyllis Kanki, and got sick. Exhaustion finally took its toll, and he was hospitalized for almost a week. “I was given anti-inflammatory medication, and I ended up staying there for three weeks. I think that is one of the longest trips to the United States that I have ever taken.”

The samples were tested straight away. “We put them in a culture, and afterwards we started to talk about partnerships. Back then there were two things that we talked about with Max and everyone. It was the others who interpreted for us, because I didn’t know any English. They explained that...we have to

continue to do this as collaboration. They asked what I needed, and I gave them a list of all of the materials that I needed to work, and then a small budget. They said... 'We will give you all of that and more, and you can bring it all with you when you leave.' 'It wasn't much', they said, but I had never seen so many materials in my life." Mboup returned to Dakar weighed down with lab materials. As this was his first major project, the Harvard partners decided to enlist help from a Frenchman living in Dakar named Dominique Ricard. Ricard had experience working in Senegal, so the group asked him to help Mboup with project.

Materials in hand, Mboup arrived back at his Dantec lab. "When I came back, the lab was so small." Motioning to the room that is now his office, he explains, "There were just these small rooms here, we were maybe 2 or 3 people. I had a technician, and someone who did the washing. That was it." The tiny lab was now filled to the brim with equipment, and they waited. "And then finally... Phyllis did the cultures, and sure enough she isolated a virus that we called HTLV-4... people called it the second AIDS virus."

This was a very unusual way of discovering a new virus. Usually the description of a new virus begins with the identification of a cluster of clinical symptoms. This generally leads to a set of epidemiological surveys, and only then do laboratory studies begin searching for a disease agent. In this case, the standard protocol for describing a virus was turned on its head, for HIV-2 began with the serological laboratory description of the virus, rather than beginning with an identified cluster of disease (Marlink 1996). The group presented their findings in Brussels in November of 1985. The first publication came quickly, an article that appeared in the *Lancet* in 1985 that described the cross-reactivity between this new West African virus and the simian immunodeficiency virus (then referred to as STLV-III) (Barin, M'Boup et al. 1985). The article demonstrated that the samples from Senegalese people reacted better with the simian STLV-III than with known HIV strands (known then as HTLV-III) originating from the United States and Burundi, where AIDS had been reported.

The article hinted at the unusual trajectory of uncovering this virus, stating clearly that Senegalese people infected with this new virus were apparently healthy. The authors spelled out the significance of this finding quite clearly: “The existence and study of such virus variants potentially with differential pathogenicity may provide important information for the development of an AIDS virus vaccine”(Barin, M'Bouop et al. 1985: 1387). This article provided serological evidence for the presence of a new virus, and it strongly hinted at new research possibilities.

As one of Mbouop's colleagues explained, “Professor Mbouop found something like that – tac! He did not have to do a transversal study. He drew some blood, and he discovered it. From there, though, you had to know what was going on with this virus.” With the virus discovered, the group then had to set about searching for disease clustering. The two most pressing questions for the group of researchers were: 1) Is this HTLV-IV virus new, and is it present just in Senegal, and 2) Is it as dangerous as the first virus, i.e., does it lead to AIDS? To respond to the first question, Mbouop embarked on a tour of Africa to draw samples from other high risk populations in an effort to determine whether this new virus was present in other populations. The answer to the second question lay in establishing a cohort that could be followed over time in order to trace the natural history of the virus. In other words, by following a group over time, one could determine how the virus affected people in the long-run.

Mbouop is a professional packrat. Even before he was aware that something big was afoot, he carefully stuffed his correspondence, records, and personal notes into cardboard files. Today, the long wooden cabinets that line his office are home to boxes upon boxes of a lifetime of scientific accumulation that, as an ensemble, traces the trajectory of a scientific discovery. An archaeological dig through the paper files offers typewritten and hand-scribbled glances at the questions that occupied a younger Mbouop, and the paths that he and his colleagues charted in an attempt to understand this new virus. Files bulging with statistics (country, name, age, ethnicity, date of blood test, etc.) tell of his travels

to test for HIV throughout the sub-region from Guinea Bissau to Côte d'Ivoire, and eventually all the way to Cameroun and Gabon. "That's how I really started to make contacts with people in the sub-region," Mboup explains. It also served to spread awareness of the disease across West Africa. "AIDS didn't interest that many people back then, so when I went, I held conferences. I drew the blood myself... but I was also supervising a fair number of students in the countries where I went, especially in the Central African countries. I sent students from here to go there and do theses on AIDS. That is how we managed to get so many samples."

Of course, sampling in those countries wasn't quite so straightforward. There weren't any pre-existing cohorts of sex workers as in Senegal, and most countries, when asked about prostitution, simply replied that it didn't exist. There were, however, people who presented themselves at clinic with STIs. Most countries also tracked pregnant women, so while sampling was a bit more haphazard, Mboup and his colleagues managed to track down samples from more than 4,000 individuals between 1985 and 1987. This data landed Mboup and his colleagues a publication in *Science*, and it offered an answer to their first question. This new HTLV-IV virus was not limited to Senegal, but could be found throughout West Africa, specifically among healthy, sexually active adults (Kanki, M'Boup et al. 1987). These trips also served to bolster awareness of HIV, at a time when the virus was hardly recognized in West Africa. In some cases, Mboup and his students were among the first people to talk about AIDS, and they went so far as to help some countries establish their own national programs.

To respond to the second question of whether this second HIV virus was as dangerous as HIV-1, the group had to describe the natural history of this newly identified virus. The phrase "natural history" refers to the progression of disease within the human body from infection to either recovery or death. The natural history of a virus is vital to understanding its epidemiological impact. At the time that the group first described this new HIV-2 virus, the natural history of HIV-1 was a frightfully rapid path from infection to death. To determine how this new

virus would act in the human body, the group began the natural history project that traced the effects of HIV-2 over time. The natural history project was the focus of the Inter-University Convention, a triangular scientific collaboration between laboratories in France, Senegal, and the United States.

The Inter-University Convention

The walls of Professor Mboup's office are heavy with plaques and photographs from significant moments in his career. Tucked in between prizes from the world's top scientific and multinational institutions, and photographs of him with presidents and other figures, is a collage that shows a young Mboup flanked by his colleagues from Harvard, and the Universities of Tours and Limoges. The photo hangs next to a poster of HTLV-III, and looking at the two together, it is easy to read enthusiasm into the bright young faces staring out from the photographs. This photograph captures a moment in the heyday of the Inter-University Convention on Viral Research, a partnership that institutionalized Mboup's quickly growing network of connections. The group officially became partners in 1985 when they signed on to the Convention, with the intention of solidifying the scientific potential of each member institution. Mboup's mentor, Francois Denis, brought Limoges to the table. As Mboup explained, "I wanted to be very honest with [Denis], because he was the one who really educated me." Mboup's collaborative work with Francis Barrin from his days with the hepatitis project added Tours to the group, and his newly minted collaboration with Phyllis Kanki, Rick Marlink, and Max Essex provided a link with Harvard.

Mboup was the coordinator of the Inter-University Convention, providing a kind of neutral centerpiece for the group's collaborative efforts. Establishing an international collaborative AIDS research group was almost unheard of, given the intense competition that defined the burgeoning field from its earliest date. He explains, "What we had was very unique. Back then there were a lot of things happening between different researchers, especially between the Americans and the French. There was a lot of competition about who discovered [AIDS]." For

members of the Convention, the urgency of the epidemic demanded a new kind of partnership. “We understood very quickly that it is through working with several partners, each with their own expertise, that each country can achieve important results. Each person working in their own isolated corner will never get there.”

The Montagnier-Gallo debate had reached epic proportions by the time the small group of colleagues solidified their research collaboration. For a full three years, the U.S. and France were embroiled in diplomatic negotiations at the highest level to determine whether Luc Montagnier of the Pasteur Institute in Paris or Anthony Gallo of the National Cancer Institute in Washington, D.C. could lay claim to discovering HIV. The stakes were high, as both sides fought not only for scientific recognition, but for a multi-million dollar patent. Tensions between the French and Americans were at the breaking point, and yet Mboup, in his calm and steady way, managed to unite in a common endeavor the same scientists whose colleagues were waging a scientific and political war against one another. Drawing upon the strong interpersonal relationships that he had built in his previous hepatitis work, he deftly tiptoed around the tensions, and convinced each individual that an institutional collaboration where all research results were shared was not only mutually beneficial, but the only way to make real progress in the epidemic.

“Back then, there were a lot of tensions”, Mboup acknowledges. “But we managed to build a successful [program], and put all of that behind us. For a long time, this Convention served as a model for a lot of countries. We need expertise, we need the developed countries. And yet, we also need the developing countries.” There were also tensions between actors on the ground in Senegal. Dantec’s laboratories were small and unsophisticated at the time. Dakar’s Pasteur Institute, which was located right next to the Dantec Hospital, seemed uniquely suited for working on HIV in Senegal. The institution had been around for almost a century, and boasted the nation’s best laboratory infrastructure. Furthermore, the strain that was used by both Gallo and Montagnier in the identification of HIV had come from the Pasteur Institutes in Paris, providing an important institutional

link. Dr. Alioune Dieye, Deputy Director of Dakar's Pasteur Institute, explained how the institute had originally intended to capitalize on HIV research in Senegal. "Back then," he explained, "The director here was someone who worked a lot on arboviruses. We didn't want to bother the Dantec team, though back then they weren't really a team... [Mboup] started all by himself, he had his research partners abroad, and he began it like that. He became interested in it, and he started things up. Here, we didn't want to get in the way of the development of his team. Even if there were certain approaches where we could have worked together. There was a time when we wanted to work together, but the idea came from Paris. The Paris teams wanted to have a collaboration between the Dakar Pasteur Institute and the Institute in Paris. But this collaboration never really worked. There were a few attempts, but nothing that really [came together]. Whose fault it is, I don't know, but we never really got the collaboration running." So while Dakar's Pasteur Institute played an early role in diagnosing HIV-2 and testing blood reserves from the Blood Transfusion Center, Dantec's Inter-University Convention proved more enduring. "So, little by little Pasteur withdrew from AIDS," Dieye explained, and "Souleymane [Mboup] became the leader."

Under Mboup's leadership, the Convention functioned extremely well for a number of years, collaborating on research, and meeting yearly at the Convention's colloquium. The Convention's colloquium was the first regional meeting on HIV in West Africa. In addition to reporting on the research that the four groups were carrying out, researchers were invited from across the region to discuss everything from early prevention campaigns to blood safety techniques. The relationship continued for many years, but as Mboup explains, "Bit by bit, it really became Harvard that had the money to continue on with training, so the relationship became more Harvard-Dakar, and less Tours and Limoges. But, of course, [our French colleagues] played a very, very important role. Historically, the partnership demonstrated that even where there are a lot of tensions, we were able to build a program."

The solid nature of the Harvard-Senegal relationship was palpable to those working in the field. Dr. Wane, a physician following one of the FSW cohorts in the south explained that the Harvard scientists had always taken on a more hands-on approach to the research collaboration than the groups from Tours and Limoges. “Phyllis,” he explained, “when she came, she was more interested in what we were doing. She made the rounds, came [to the clinic], she looked. She worked with us, she worked with the biologists, with the statisticians, with everyone... And it is also true that they were putting more money into it. So at some point the French...perhaps they felt that they weren’t putting money into it, they preferred to draw back a bit. They were more interested in the biological aspects than Harvard... when [Harvard] visited... they came here to the center, discussed, worked with us. So especially with them, we had relationships that were really friendly, and even now we have a relationship that is very tight.”

The ties between Harvard and Dakar teams were even woven into families. “Oh, there were a lot of marriages in the lab,” explained one of the physicians who follows the group of FSWs. Mboup was particularly proud of this point. As a man who places a great deal of emphasis on the importance of family, he beamed every time he spoke about the number of marriages that had taken root within the walls of Dantec. To be sure, many Senegalese had met one another at Dantec, but so too, had the Boston group. I remember rumors flying through the lab during my first year at Dantec, when a Ph.D. student from Harvard who had come to work on PCR in Dakar became involved with one of the laboratory’s promising lab techs. The two are now happily married and settled in the States, and the picture of their little girl graces the desks of their friends and colleagues in Dakar. These personal ties are of great importance to Mboup, and I remember his recalling with great fondness that he was among the few guests to be invited to the wedding of a Harvard colleague. “That is the longevity, in fact of the lab,” Dr. Wane continued. Referring to both marriages and life-long friendships fostered with colleagues in Boston, he explained, “Those who worked with us, we keep up very good relationships with them.”

The Natural History of HIV-2

Through a series of rather extraordinary circumstances, the group was able to quickly identify the presence of HIV-2. The scientific challenge that lay before them was to understand the implications of this newly identified virus. To understand how HIV-2 affected the body over time, the group devised a longitudinal study that would measure the health of people infected with HIV-2. This research project was known as the Natural History of HIV-2 project, and it became the crux of both the Inter-University Convention, and eventually the Harvard-Dakar partnership. Documenting the natural history of HIV-2 was the first step in understanding the effects of the virus on the human body, which would provide the foundation for eventual prevention and treatment. Senegal's female sex workers provided an ideal study population for exploring the natural history of this new virus. "There was a reservoir," explained one of the first physicians to work with the FSW group, "that is how we started; it is a population that was at hand."

When the blood samples were collected from the FSWs they were forwarded to Prof. Mboup's *Laboratoire de Bactériologie et Virologie*. At first, the lab didn't have the material or the training on the proper techniques for testing the samples that were funneling in from the STI clinics. Dr. Ndir, one of the members of the LBV in the early days of the Convention explained that research funding was simply not a priority for the Senegalese state by the mid 1980s. "Here, laboratories benefit very little from support... It was not a priority for the Minister to furnish laboratories with the essential tools for [research on] public health." He continued, "If the [LBV] developed, it was not with money that he got from the government or the hospital, it is because of the leadership of Prof. Mboup." Indeed, before Mboup arrived, the laboratory was functioning essentially as a department of the hospital. Its primary aim was to provide diagnostic services for the patients at Dantec hospital. With Prof. Mboup's first

foray into HIV testing, the laboratory took its first steps towards becoming the WHO-appointed reference laboratory that it is today.

In the early days the group would gather the samples from the FSWs, and then bring them to Boston for testing. Dr. Thioye, the first physician to follow the FSW cohort for the Convention, described the harried pace that this sample delivery created. “We would have a flight reservation for Boston on Wednesday at 1pm. We would have to take blood from the women between 9 and 10am, put the blood in storage pockets, then leave for Boston. We would arrive there at about 7pm, and then head directly to the laboratory and start working on the blood. We worked on it on Thursday, Friday, and then I would take the plane home on Saturday. I can’t tell you how many times I did that.”

The system permitted the group to achieve the results that they were looking for, and the team members who traveled to Boston were able to learn the techniques that the Harvard group was using. Of course this practice didn’t seem tenable in the long term, as it was extremely expensive, and the rhythm of work was tiring for Thioye and the other members of the team who made the trans-Atlantic commute. The group therefore set its sights on equipping the Dakar lab with the means to perform the tests in-house at the LBV. Thioye recalled: “We started to do the technology transfer slowly. Over the course of about two years almost all of the techniques that we did over there we could do here. And we did them better than in Boston. We did them better than the people in Boston because we were used to it. We were very manual, and we did the best work.”

Senegal has long been home to the academic elite of West Africa. As the capital of French West Africa, Dakar was home to the *Ecole de Médecine de l’Afrique Occidentale Française* (The Medical School of French West Africa), established in 1918, and headed by Aristide Le Dantec. The school was designed to train African *médecins auxiliaires* who could operate out of medical posts in the rural areas, thereby providing aid to the European physician practicing throughout the AOF. In 1960, the school was officially inaugurated as the *Ecole nationale de médecine et pharmacie*, at a time when there were only six medical

schools across the continent. As Professor Mboup explained, “I was among the first generations of Senegalese to do studies in pharmacy...even in our promotion year, I think that there were six Senegalese. At the time it was the one university for all of West Africa – really all of Francophone Africa. And everyone came – there were even French, but people came from all over.” While Dakar’s Medical and Pharmacy School was the hub of higher education in the region, the curriculum had to focus on the fundamentals of biomedical and laboratory science because there simply were not the means to procure the latest technologies for training students. With no state or independent funding for laboratory research, Mboup and his colleagues had to develop their research skills in their small, one-room laboratory with only a few basic supplies.

Interestingly, these rudimentary conditions in which the LBV staff worked proved particularly useful once funds from the Convention arrived. In the absence of the newest technologies, Mboup and the assistants working with him had honed their manual laboratory techniques. With years of experience in these basic manipulations, the group excelled when it came time to learn the more technologically advanced techniques. For example, when the group wanted to monitor immunity in HIV-2, there was not an automatized technique for measuring CD4 and CD8 cells. “So, we used a manual technique,” Thioye explained. “It was difficult, but we set it up very quickly.” By working without the aid of the newest technologies, and in some cases even ‘older’ technologies such as regular supplies of electricity, Mboup’s lab developed into a highly-skilled group of researchers. Their manual acuity was supported by their work ethic. Mboup was extremely driven, and he set a high standard of excellence for his small laboratory, making the members of LBV even more highly desirable research partners. As Thioye explained, “Souleymane...he taught me rigor. He never tired. We were always there [at the lab], and we worked so closely. I would always say, if he isn’t leaving, then I’m not leaving either.” The young researchers would often work through the night to treat a set of samples. “Because you know with blood, you can’t put it off,” Thioye explained. “We did good

work, and that is why we have so many indelible memories with the people that we worked with: the real base.”

While a few techniques, such as PCR, were still performed in Boston towards the very end of the partnership, over the years the LBV acquired much of the technology and expertise to perform almost any laboratory test. Furthermore, Mboup and his colleagues were not simply implementing the ideas that Harvard had laid out; they were determining the very trajectory of the group’s research projects. Reflecting on the LBV-Harvard collaboration Thioye concluded, “It was a very good cooperation. Since then, I have seen a number of American groups in Cote d’Ivoire and Zaire – and they were the ones who did everything.... They came into the lab. They came with their American team, and they did the work. Here [in Dakar], that was not the case – we are the ones who did the work. This is fundamentally different, and it is very true. It was really the spirit of the thing, I don’t know if it is Mboup who wanted that, if he imposed the idea. I think that it’s him because that is his way of doing things. He doesn’t like things being done for him; he wants to always be the one doing them himself... Maybe it was the Boston people who had the same idea, because they put their confidence in us, and we helped gain that confidence because we were workers.”



Figure 5: Virology Unit, LBV

The Harvard collaboration did not simply involve sending materials to Dakar, it also involved bringing LBV staff to the Harvard School of Public Health for year-long training sessions. Members of the LBV laboratory were matched up with biologists and lab techs in the Harvard labs that were at the same level as those in Dakar, thereby creating a built-in system of mentoring and supervision. They learned new techniques, often completing work towards advanced degrees. Upon their return to Dakar, they often brought knowledge of a new technique, and the materials to implement it in Dakar. Even members of the LBV who spent most of their time in Dakar were not treated merely as data gatherers; they actively participated in the entire research process. As Thioye explained, “You go over there, they close you up for 15 days, and then you do your analyses, then you interpret your results,.. and then you write it up.” Training in the context of the Harvard-Dakar collaboration did not mean merely providing the LBV folks with the minimal training to extract and process data. Training involved a complete approach to research, including data analysis and article writing. The former LBV researchers who worked with Harvard highlighted the importance of learning how to write up their research. This was highlighted as LBV’s strength, as compared to other African laboratories. While other African labs are doing interesting work, much of that work goes on unseen because they do not publish their findings. “It is the publications that we did,” reflected one of the former LBV researchers, “that got people interested in this virus; without the publication you would never be able to have had that kind of funding.”

Certainly the materials and training that LBV received from Harvard were immensely important in helping the laboratory develop as an independent, cutting-edge research facility. However, it is not merely the centrifuges and other grand pieces of imported equipment that made HIV-2 a knowable entity. The unseen, low-tech work done by members of the LBV staff in the earliest days of the Convention also played an absolutely vital role in making the samples from the FSWs useable for scientific research. One of the first women to become a member of the group was Dr. Fatou Diop, who arrived at the laboratory in 1985, on the heels of the discovery of HIV-2.

When Dr. Diop began her work at LBV, she would receive blood samples from the FSWs at IHS. In the early days, the blood was drawn from the FSWs by a nurse's assistant, who would deliver the samples each day to Dr. Diop. He would arrange the serum, and number each tube. But Dr. Diop noticed that the same number was being attributed to different people. She knew that no matter how diligent her testing of the serums, without an accurate way of linking a serum to an individual FSW, she would never get quality data. "For example, you can't have Hannah and Fatou having the same number," she explained. "It falsifies the results. So I had to take all of the results one by one, to connect up each person to the sample. Every time I did that I saw that there was, for example, one person whose blood had been taken several times, but who had multiple numbers, or several people who had the same number." Dr. Diop had decided to do her thesis on the FSW cohort under the guidance of Prof. Mboup, but before she could do any work in the lab, she had to get the files in order. "I recoded every single file," Dr. Diop reminisced, "and today, truly Hannah, I am telling you, if we were able to do a single study on the prostitutes it is thanks to this system."

Dr. Diop turned to the records that IHS kept on each of the women, manually comparing the numbers on their Social and Health files with the lab records for every sample. She had to make sure that every sample corresponded to a single number, and that one number corresponded to a single woman. Otherwise, it would be impossible to accurately calculate the true prevalence of HIV in the population. Dr. Diop started an entirely new system of numeration, beginning with P1, through Px (P standing for prostitute). "Hannah," she explained to me, "[say] you have your blood drawn in January, February, and March... each of these samples must have the same number." Whether taken in January, February or March, every tube that would correspond to me would have to be marked with my individual P number. This traceability was vital, because the point of Natural History of HIV-2 project was to follow individual women in order to document when they seroconverted, and follow the physical effects of their infection over time.

There was an immense number of samples coming in each month from the cohort, and in Dr. Diop's words, the work of linking every sample to an individual woman was "colossal." Indeed, it took her two years to completely clean the FSW data set. "That is how I codified all of the blood samples from the clinics," Dr. Diop explained. "That is how we were able to start all of the studies that we did on the prostitutes, first the natural history study, then the clinic aspects of HIV-2... and eventually today the CIPRA project. All of that is based on this system." This contribution remains largely invisible today, but Dr. Diop knows what it meant for her project, for her laboratory, and for the understanding of HIV-2 as a whole. "Now, it's clear. I can sleep at night, because there is a coding system in the computer, in the freezer – today everything is linked. If I want a [particular] sample... I can go and find it straight away in its place in the freezer."



Figure 6: Sample storage in laboratory freezers at LBV

Dr. Diop was extremely dedicated to cleaning the data set, but it was unclear why the former identification system had become so unreliable. Why were several people being attributed the same identification number? "While I was working on re-ordering [the samples], I started to understand that the social

workers were actually taking anybody and putting them into the system,” Dr. Diop explained. It seemed that the social workers were using the system to get their friends tested for HIV. If a social worker had a friend who wanted to know her HIV status, the friend would be invited to come to the clinic to have her blood drawn. The social worker would then affix a random number originally attributed to one of the cohort sex workers to the friend’s sample tube. While this practice completely undermined the integrity of the identification system, and the team’s ability to track seroconversion in the cohort, it was quite understandable within the context of Senegal’s health seeking practices.

A colleague who is an infectious disease physician at one of Dakar’s public hospitals explained: “It isn’t even a matter of having money anymore. You can be rich now and still not get care. The only way for you to get the care you need is to know someone.” She was describing the informal economy that runs throughout all of Senegal’s health care structures. In this economy, seeking health care is not a straightforward fee for service affair. With no meaningful state provision of health care, and no insurance to speak of, the only resource that most people in Senegal can turn to in times of need are the members of their social network. Health structures are understaffed and underequipped, making quality, timely service an almost impossible task in the public health system. The one exception to this rule is if you know someone in that service. As employees at Dantec hospital, the staff at the LBV was regularly solicited for help by family, friends, and community members in need of services⁴¹. In some cases, an old

⁴¹ The most personally moving example of this kind of social network support is what transpired around the illness of my friend and LBV colleague, Babacar. Babacar was one of LBV’s brightest young stars. In addition to his work at the lab, he was also running the laboratory at the hospital in Touba, the spiritual center for the Mouride brotherhood. Babacar had just returned from a short stay in the United States where he had undergone intensive GRE preparation, in the hopes of pursuing his PhD in the U.S. Babacar was an extremely hard worker, and he had everything going for him – a wonderful career, a brand new wife, and the support of some of Senegal’s leading scientists and religious leaders. Suddenly, on his trip back home to visit his new wife, his *sept place* (a small *taxi brousse* used for inter-city travel) crashed as the driver attempted to dodge a young girl who had dashed out into the middle of the road. Babacar was hospitalized with severe head trauma. Within a few hours it became clear that Babacar’s condition far exceeded the capacity of what the Senegalese medical system could offer. His only chance was to be evacuated to France by medical air transport. The family was faced with the impossible task of coming up with tens of thousands of dollars in a matter of days, before it was too late. At the lab, we

friend of the family may simply be looking for some money to help pay for medication. But in most cases, the people knocking on office doors at the LBV are sick and in need of immediate care. Whether a lab tech, a biologist, or an administrator, the LBV staff member would drop everything to go find the physician in charge of service where their brother, uncle, or neighbor needed care. Prof. Mboup's waiting room was regularly filled with people requesting his help and intercession. In some cases the supplicants were close family members, but in many cases, they were people who had simply heard about his kindness, and thought that asking the reputed Professor for help was worth an attempt⁴². These people never walked out of his office empty-handed. Refusing help was simply not an option, so those with fewer resources often avoided their offices and took to hiding up in the laboratories in the morning, when these familial and friend requests were at their peak. LBV employees earn decent salaries, but if they honored every request that came their way they would scarcely be able to place food on their own tables.

With no state-supported care, and no insurance provision, informal social networks are the most efficient, and often the only venues for meeting one's health needs in Senegal. It seemed only natural, then, that if one could offer a free HIV test to a friend or family member in need, one would sneak them into the system. Upon figuring out that this informal network was botching up the FSW sampling, Dr. Diop immediately went to the physician in charge of the cohort. The physician then explained to the social workers that the testing system that

organized a meeting, and made a list of every person that we could contact to offer help. Through the dedication of his colleagues and friends, both at the LBV and in Touba, the family was able to raise enough money to evacuate Babacar. When I returned to Senegal a year after his evacuation, I could see for my own eyes that Babacar was home, and flourishing. He was still working on developing some of his finer motor movements, but he was alive and thriving.

⁴² Considered to be a member of the LBV, I quickly learned that I, too, was responsible for facilitating care for my local social network. I was often surprised by how far this network of responsibility stretched. For example, when I returned to Dakar in 2008 after almost a year away, I ran into one of the cab drivers that had occasionally dropped me off at home if I worked late. He looked at me and exclaimed with a smile, "Hannah, you're back!," then immediately told me about his close friend's battle with meningitis a few months back. He explained that he sought care for him at two public hospitals, but despite his requests, was turned away. Remembering that I worked at Dantec, he lamented, "If only you had been here."

they had established at IHS was no longer simply a diagnostic system. He helped them understand the importance of maintaining the integrity of the identification system, and explained that if they had any friends who needed to know their serological status, they could refer them to the Dantec for an HIV test. “But for the prostitutes,” Dr. Diop emphasized, “they had to follow the system.”

IHS: The heart of the Natural History Project

While the project followed registered sex workers across the country, the heart of the project lay at the IHS. The Natural History of HIV-2 was the result of a mutually beneficial synergy between the Senegalese state and the Convention researchers. The state provided the legal and institutional support that brought women into the clinic, and the Convention bolstered the material capacity of the state-run STI clinics. Whereas the clinics were once run by social workers and nurse practitioners, the three Convention sites of Dakar’s IHS, Kaolack and Ziguinchor were supplied with study physicians, who could provide more complete examinations for the FSWs. The offices, patient rooms, and examinations tables have long been in place at the clinic. Yet the injection of funds into the place transformed operations at IHS. “Before Harvard,” one of the physicians explained to me, “there was an STI service, but it wasn’t really functioning. It is with Harvard that we were really able to put in place the means to build a cohort, and to follow it. Before, it was an empty shell. The shell was there, but all that it contains now, it was really in partnership with Harvard that we were able to build it.” With state regulation and the four walls of the clinic firmly in place, the Convention began to send supplies. They provided tubes, covers, everything that was needed for providing a full-scale biological follow-up for the FSWs consulting at the clinic. “With Harvard,” one of the IHS physicians explained, “we would [receive] medications every three months or so... they would send us medications regularly... vitamins, medications that the FSWs needed, antibiotics... We had that available with us at the Polyclinic, and each time it was necessary, we gave them out. So it was free [to the women]. That let us secure the loyalty, and maintain a good relationship with the FSWs, which

allows us to follow them like we were supposed to.” He concluded, “It was not easy, but I know that we provided good care to them, and that is what helped us write an enormous number of papers.”

From the several thousand strong cohort of FSWs⁴³, the project carved a small sub-cohort to study the how HIV-2 developed in the body over time. Practically, this meant that when a woman at IHS was diagnosed as seropositive⁴⁴, she was placed into the sub-cohort. At the time of diagnosis, she was matched with two other seronegative women, who would also become part of the sub-cohort. Her seronegative “matches” were selected based on age (plus or minus 2 years), nationality, and the number of years that she had been registered (plus or minus 3 years). So, for each seropositive woman identified, two “comparable” seronegative women were identified at random and all three were included in the clinical sub-cohort. Twice a year, a list of the members of the clinical cohort was generated so that the IHS staff could know which women were officially enrolled in the sub-cohort (Kanki 1992).

While all of the women registered at IHS received the same level clinical care, members of the sub-cohort were subject to more intensive study. Their blood was drawn twice a year for serological evaluation (to determine exposure to HIV), and they were administered more comprehensive questionnaires that included their clinical and sexual health history. Members of the sub-cohort also provided blood on a yearly basis so the researchers could study their immunological profile, that is, measure their complete blood count and T-cell counts. During these biannual visits, members of the sub-cohort also received a complete physical examination which was supplemented with the information from their regular visits with the nurse practitioner every month (Kanki 1992). These visits were different from the clinical examinations that women who were not members of the sub-cohort received. For non-members, the physician simply

⁴³ According to the automatic record system, the team at IHS has performed over 21,000 consultations for over 3,000 patients.

⁴⁴ It is important to remember that at this time, almost all HIV infections in Senegal were HIV-2.

noted any clinical manifestations in the notebook that is part of a woman's file. One of the IHS physicians explained the rationale: "That way, afterwards, if she becomes a member of the sub-cohort, we can go back into her booklet and have all of her background, all of the clinical signs that she presented before she became a member of the sub-cohort."

The other distinction that was made between the two groups concerned the question of follow-up. In order to trace the evolution of the virus in the women's bodies over time, researchers needed regular samples from the sub-cohort. Harvard provided the IHS staff with funds to travel into the field and track down any woman in the sub-cohort who did not show up at the clinic sites for a 12 month period (i.e., lost to follow-up). Annually, each woman who was not seen during that year would be visited at home by a social worker who would administer the "lost to follow-up" data form, which included a clinical consultation at the woman's home or at the clinic, a follow-up visit outside the clinic to gather information about her health status and reasons for not returning to the clinic. If any woman wished to discontinue participation, she was removed from the study, as were women who had permanently left Senegal, or who had died (Kanki 1992).

The elder social worker, who constantly has her senses tuned to structural challenges facing FSWs, explained to me that these trips to the field were one of the most exciting aspects of her job. "I loved it," she explained, "Because it meant that we were providing them with good care. Sometimes, if you go to the woman's house to track her down and she isn't there, we would work with the leaders in the prostitute community to find her. I found that so interesting... why? Because when you go to their homes, that lets you discover so much about them." By following these women to their houses, she was able to gain a broader understanding of the challenges facing the women that she worked with. For project protocol, these follow-up visits were a vital part of keeping tabs on research subjects, and providing a steady flow of blood samples.

Of course, providing quality care to all registered FSWs, and keeping regular medical records on every woman presenting at the clinic, made good sense from a research perspective. As one of the long-standing physicians at the clinic explained, “It’s true that the sub-cohort, for us, merited particular attention. But... that doesn’t mean that we excluded the others. No. They [received] the same treatment, the same approach that you have with the people in the sub-cohort you must have for those that are outside of the [sub] cohort. Because every one of the women who comes in here could one day be enrolled in the [cohort]. So, the medical care that we provide to all of them must be the same. When they are followed for a year, two years, three years, all of the background that we gather on them during this time, if they are [eventually] placed in the cohort, that will be important. That is why it is important to follow all of them, including those who are not a part of the sub-cohort. Because if you wait until they are a member of the sub-cohort to really follow them, you will have lost all of the time that they have already spent coming in here.”

The sub-cohort provided a good deal of information about HIV-2, and as the researchers began to learn more about the natural history of the virus, a specific point in the trajectory of infection began to take on a new importance. The researchers became more and more interested in “primary infection,” in other words they wanted to learn more about the virological activity that occurred at the moment when people were first infected with HIV. In order to explore primary infection, the researchers had to cast a broader epidemiological net and begin to study profiles of all of the FSWs, not simply those in the sub-cohort. So, the idea of the sub-cohort gradually subsided. The team at IHS stopped the matching process and refocused on the profiles of each of the registered FSWs. “We already knew about those in the sub-cohort,” a physician explained, “Those who were... really newly infected, we had to look for them in the big cohort.”

The other STI clinics

The STI clinic at IHS was in many ways the hub of cohort activity, and it was the earliest cohort of FSWs that the Convention began to follow (ca. 1985). Two years later, the project began to focus on other cohorts of FSWs and test them for HIV. By 1987, the group was systematically testing FSWs enrolled at STI clinics in the eastern crossroads town of Kaolack and the southern town of Ziguinchor, the capitol of Senegal lush Casamance region. The group implemented a multi-site project in order to evaluate HIV-2 infection across groups with variable demographic and behavioral patterns (Kanki 1992).

Kaolack lies 120 miles Southeast of Dakar along the Saloum River. Today, the town is known for its hot, dusty climate, and its mosquitoes. During the colonial period, it was most known for its peanuts. Once a crossroads for the vibrant colonial peanut trade, Kaolack remains a transportation hub, lying at the junction of the nation's few main roads. With few local resources, and an abundance of truckers who pass through the town's dusty streets, Kaolack is home to an active sex work trade. Kaolack's STI clinic could provide important information about HIV in Senegal because it was the meeting point of people (and thus viruses) from across Senegal's diverse regions. When research funds dried up, so too did many of the clinic's services, but in the days of the Convention the clinic staff included a physician, three nurses, one social worker, and a laboratory technician. Examinations occurred in much the same way as they did at the IHS, with the one exception that blood samples taken from Kaolack FSWs had to be sent to Dakar for testing, and then forwarded on to Harvard for confirmation. This meant that women in Kaolack often had to wait months for their results⁴⁵.

⁴⁵See Renaud 1997 for an accessible portrait of FSWs in Kaolack. While much of the work focuses on the relationships of solidarity woven among the town's FSWs, and ways in which these relationships help women enforce safe sex practices with their clients, some information can nonetheless be gleaned about the women's relationships with the STI clinic in Kaolack. It is clear that the STI clinic emerged as the sole outlet where women could access medical care and health information. Interestingly, while a similar kind of dependence endeared many women in Dakar to IHS, this dependence often interfered with the provision of proper care in Kaolack. For example,

The Kaolack site had a relatively high percentage of HIV-2 infections, and therefore provided important samples for the researchers in Dakar and Boston. However, the southern site of Ziguinchor would play a vital role in reconstructing the natural history of HIV-2 and its geographical pathway into Senegal.

The Ziguinchor cohort represented the reservoir of HIV-2 infection in Senegal. Through his early work on hepatitis B, Prof. Mboup had worked with a VSN volunteer named Dominique Ricard. Ricard, like other VSN's on the project, had travelled to Senegal to fulfill his military service by working overseas. Coincidentally, when Ricard left Senegal, he travelled to Boston to do some training in epidemiology. When Mboup travelled to Boston, his Harvard colleagues suggested that Ricard return to Senegal again to help Mboup implement the new project on the ground. Ricard already knew Senegal, and at the time Mboup was working alone, faced with the significant task of testing at-risk populations throughout Senegal and West Africa to determine the geographical distribution of HIV-2. Ricard stayed with Mboup for quite some time, and as Mboup recalls, he was particularly interested in the FSWs of Ziguinchor. "Because," the Professor explained, "These prostitutes... had a very high rate of HIV-2. So [Ricard] was there at the right time."

Ricard was originally sent down to Ziguinchor because he had a dispute with one of the other Frenchmen in the research group, and it was decided that he should go to Ziguinchor and follow the prostitutes there. Geographically speaking, this was akin to exile, for Ziguinchor is the capital of the Casamance, Senegal's southern region which is cut off from the rest of the country by The Gambia, a tiny nation sandwiched within Senegal's borders⁴⁶. Historically, upper Senegal has benefited from the lion's share of economic, educational and physical

Renaud explains that clinic staff were often unwilling to provide FSWs with additional free condoms, believing that the women would re-sell them for a profit (Renaud 1997).

⁴⁶ The boundary makes for an almost laughable effect when drawn on a map, but it was the result of serious political debate during the colonial "scramble for Africa," when French and British colonial forces were fighting for control of West Africa's navigable rivers. The tiny nation of The Gambia, which follows the meanderings Gambia River, is not even 50 km wide at its greatest width.

infrastructure.⁴⁷ Largely left out of Senegal's political and economic life, members of the Diola ethnicity of the Casamance founded a rebel movement, the *Mouvement des Forces Démocratique de la Casamance* (The Movement of Democratic Forces in the Casamance, or MFDC)⁴⁸. In 1982, just a few years prior to the identification of HIV-2, the MFDC organized a protest which was to become the first clash between the rebels and the national government. By the 1990s, the MFDC was officially calling for independence, and the more radical branches of the movement were engaged in guerilla action against the government. Apart from the region's lovely tropical fauna, and the city's delightfully slow pace, an exile to Ziguinchor could have been personally rather unpleasant. Scientifically, however, it was a boon.

The prospective study of HIV in the area that the group had carried out demonstrated that the infections among Ziguinchor's FSW population were almost exclusively of the HIV-2 variety. Following the FSW community, Ricard and his colleagues in Ziguinchor noted that most of the women coming to the STI clinic who were testing positive for HIV-2 were from a particular region in Guinea Bissau known as Caio. Tensions between Ricard and the other Frenchman eventually boiled over, and Ricard's relations with other members of

⁴⁷ This geographic divide still has not been overcome. The hassles of border-crossing, gutted roads and a broken down ferry system (combined with the threat of rebel attacks on road passengers) make overland travel from Dakar to Ziguinchor an uncomfortable, if not a downright risky, option. In the 1990s, Senegal instituted ferry travel between the two cities as an alternative to overland travel. In one of the country's most tragic events of recent times, in September 2002, the passenger ferry, Le Joola, that connected Casamance to the capital sank. Ferry workers were poorly paid, and poorly regulated, and they regularly accepted bribes in exchange for letting on more passengers or goods. On the day the Joola sank, the ferry was carrying more than twice the number of passengers it had been designed to handle. Under such extreme weight, the overloaded ferry could not handle the swells that it encountered off the coast of the Gambia. It heeled over to starboard and sank within three minutes. Over 1,800 people died, and more than 1,000 bodies are still trapped in the sunken vessel. Ferry service has since resumed, as has air service, but both options remain too costly for the majority of *Casamançais*.

⁴⁸ The MFDC movement was solidified by Diola migrants working in France. They established a cultural association in Paris, and published a magazine in the Diola language that focused on the promotion of Diola literacy. The MFDC movement, which claims to valorize "traditional" Diola customs (emphasizing connection to the land and the sacredness of the forests), was in fact the brainchild of Western-educated elite (Gellar 2005). By focusing on a valorization of the Diola language and culture, the MFDC cuts out other ethnic groups in the Casamance, a richly diverse zone where Mandinka and Portuguese Creole are also the *lingua franca* for many people.

the team soured. Ricard decided to leave the project. Interestingly, he met a British researcher in The Gambia by the name of Wilkins who was working for Britain's Medical Research Council (MRC). Ricard mentioned to Wilkins the link between Bissau and the Ziguinchor FSWs, and Wilkins set about getting a grant from the MRC board to do a serosurvey of the Caio region. As Chapter 7 will demonstrate, the serological data produced by the Harvard-Dakar team had made this link between HIV-2 and the Caio region possible, and the MRC, with its abundant research funds, was able to fully exploit this connection by setting up a research cohort in Guinea Bissau that would provide fruitful research for years to come. In the end, Ricard worked with the MRC group on the Caio project for about three or four years, and then moved on, falling completely out of touch with the MRC team.

While the main thrust of the Convention's HIV-2 work was following Senegal's FSW population, the group also engaged in research on the simian form of the virus. In addition to following women at the clinic, Mboup's team also went out to capture monkeys in order to procure blood samples. Dr. Wane had worked with Mboup's team for just one year in Dakar when he was asked by Mboup to replace Ricard in Ziguinchor. Wane established himself in 1987 as the primary physician following Ziguinchor's FSW cohort. "Besides following the women, in Ziguinchor we did what you would call, capturing monkeys," Wane explained to me. "There was this question of trying to determine if there was a link between HIV in man and SIV in monkeys." The group in Ziguinchor was responsible for capturing and testing the monkeys in an effort to isolate SIV samples that could be used for research on HIV-2. "We did it out near Diouloulou," which is an area north of Ziguinchor, in the near the border of The Gambia. "We had someone who went out and captured the monkeys, and he kept them, then at a certain moment, once a month, or once every 15 days, we would do blood tests... we would bring the monkeys to Ziguinchor." The Casamance region was a known habitat for the sooty mangaby monkey, which is a carrier of SIVsm. As a carrier of this virus, the sooty mangaby is thought to be a possible animal reservoir for the ancestor of the HIV-2 virus (Biasco 2006). It is believed

that human exposure to SIVsm was plentiful, as sooty mangabeys were used across West Africa as pets, or killed for food, and thus had multiple opportunities for passing the virus either through blood, tissue or saliva from infected animals (Marx 1991).

At the clinic, Wane and his colleagues focused on following the women in much the same way that they would be followed in Dakar. Registered FSWs reported to the clinic every 15 days for an examination. As Wane recalled, “We were at the center every day. We consulted the women following the outlined study [requirements], but we also looked after any other problems. There was a social center for them, a laboratory, physicians, everything. We also did home visits sometimes. There was also condom distribution, and prevention, both primary and secondary.” Similar to IHS, the main draw for women to register and report to the clinic was to receive the benefits of health care, education and treatment. As Dr. Wane explained “Every time they had a problem, they knew that they can come here and get an appointment for free, without paying anything. All of the tests were free too, the pelvic exam, the blood tests, it was all free. Back then medications were free too, and condoms. Also, when a family member was sick, a woman could bring them in for a consultation.”

The end of the partnership

The research on HIV-2 that was carried out between Harvard and Dakar was an extremely fruitful collaboration that lasted for sixteen years. During that time the group produced numerous publications, and it solidified the careers of both the Harvard- and Dakar-based researchers. By following the cohort of sex workers over time, the partnership was able to produce a myriad of information about the nature of HIV-2, describing the unique virological and epidemiological characteristics of this more tame HIV type (Kanki and De Cock 1994; Marlink 1994). By examining the clinical presentation and natural history of HIV-infection, the group was able to describe the unique effects of HIV-2 on the body, quelling fears about an imminent second HIV epidemic, and opening up new

possibilities for vaccine research at the virological level. The group followed the disease as it slowly marched from the south of the country to the north, and documented its slowed growth and eventual decline, as it was overtaken by the more virulent form, HIV-1 (Sow 1994). As a result of their early work, scientists have been able to trace the history of the disease and speculate about its origins (Kanki, Hopper et al. 1987). The group made a few inroads into the immunologic distinctions in HIV-2 infection, trying to understand the virus's long clinical latency period, and its relatively low rate of transmission. Through comparative research, and by examining the relationship between HIV-1 and HIV-2 (Popper, Sarr et al. 1999), the research led to a better understanding of the evolution and the pathogenesis of both forms of HIV (Marlink 1996).

The partnership allowed Mboup to expand his individual competencies, and those of his colleagues, creating a level of expertise and renown that earned LBV the title of a WHO-recognized reference laboratory. Material support from the partnership allowed Mboup to expand the capacities of the laboratory, developing LBV from a one-room laboratory to a virtual campus within the Dantec hospital. A small bacteriology lab when the project began, the LBV is now home to a bacteriology, virology, immunology, and molecular biology unit. Numerous LBV researchers had the opportunity to train at Harvard, returning to Senegal to become professors, researchers, and the heads of local NGOs. A number of Dakar's scientists elected to stay at Harvard, and have since become Senior Research Scientists at the Harvard School of Public Health.



Figure 7: View of *Laboratoire de Bactériologie et Virologie*, 2007

While the effects of the partnership on Dakar’s researchers and resources are evident, it is also important to recognize the profound ways that the partnership shaped the Harvard researchers. As one of the LBV scientists who interned at Harvard explained, “I think that if you look at the publications of Phyllis and others who are there, it rests essentially on HIV-2. Back then there were very few publications on HIV-2... and it was really a favorable moment to work on that, and to publish things that were really interesting.” The work, he explained, was dependent upon going out into the field, and producing high quality samples that then could yield good results. Without the LBV’s dedication to producing quality samples from the FSWs, the cutting edge of scientific analysis would never have been possible. “There was a good monitoring of the subjects...the lab, it’s work that you do within four walls, but you really have to leave the lab and go out into the field,” he explained, “and that was really made

possible by the partnership.” The identification of HIV-2, and the subsequent studies on the clinical presentation and natural history of HIV-2 infection, solidified a place for the young Harvard researchers at the University, and in the international HIV community⁴⁹.

While the years of collaboration were fruitful for both sides, after sixteen years, Phyllis Kanki began to draw back a bit from HIV-2 work. As Prof. Mboup explained, “To do clinical studies on a grand scale in Senegal is simply not a priority. We lose out. We have a lot of expertise, but there are not a lot of [HIV] cases, so people prefer to go to other countries where there are a lot of cases.” Mboup remembered when Phyllis sat down with him to explained her current challenges in sustaining their HIV-2 partnership. He explained to me, “Financing [agencies] like PEPFAR⁵⁰, Phyllis said, they want a big number. When you say that you are treating people in Senegal, that doesn’t interest them. Where is the cohort of 1,000 people? They need thousands and thousands. It is because they are now putting thousands, millions of dollars into this....Even if we do great work, the fact is that there are few numbers, with a cohort of HIV-2 and all of that, people are no longer interested.” Despite their status as a reference lab; despite their myriad of publications in the top scientific journals; despite Mboup’s pleasant demeanor, trusted reputation and dogged efforts, Senegal is simply not the place in which to invest. HIV has become about big money, and big funders want big results, fast. By doing everything right, and keeping the HIV population at bay, Senegal’s researchers have become systematically cut out of the competition for high-level, sustained research funds.

⁴⁹ There was a brief period of difficulty for the Harvard team when it was discovered that the sample that they had originally isolated was contaminated. As Mboup explained, “This cost [the head of the Harvard team] very dearly; Harvard was not very happy to get all of that publicity.” In the end, the issue blew over, and most members of the Harvard team have all gone on to achieve full professorships at the University.

⁵⁰ The President’s Emergency Plan for AIDS Relief (PEPFAR) is an aid program founded in 2003 by the United States to support HIV research and intervention. The program was renewed in 2008, and it will commit \$48 billion over five years to fight HIV, tuberculosis and malaria.

Mboup has surely sensed this for some time. His friend and colleague Rick Marlink, once so involved in the Dakar group, was the first to build partnerships elsewhere in Africa. While Marlink included the LBV in another project⁵¹, and selected one of the physicians from the IHS cohort to act as project director for his next project, shifting the focus to Botswana permitted him to perform more extensive, readily-funded HIV research. Shortly thereafter Phyllis Kanki shifted her work to another country as well: Nigeria. “These countries have a much higher prevalence, and can get a lot more funding,” Mboup explained to me. “Moreover, these are Anglophone countries, and the links with the USA are there – Senegal does not represent much in terms of investments. The other countries hold American interests. There are diamonds, there is petrol. If we had that, people would be more inclined to take an interest in Senegal.”

The renown that Kanki had forged through the partnership played an important role in her capacity to shift her sights towards Nigeria. In 2000, Kanki received a \$25 million grant from the Bill and Melinda Gates Foundation to establish the AIDS Prevention Initiative in Nigeria (APIN). This project is specifically billed as building on the success of the Harvard-Dakar partnership: “Researchers are developing collaborative HIV prevention programs as the Harvard School of Public Health has done successfully for two decades in Senegal, where infection rates have remained stable at below two percent” (APIN 2009). Mboup and the LBV have played an integral role in transferring skills to the Nigerian partners, hosting APIN workshops on STI management and HIV testing and surveillance. In 2004, Kanki received funding from PEPFAR to further her work in Nigeria, and expand it to the hard-hit areas of Botswana and Tanzania.

This shift led to significant changes for the FSW cohort at the IHS. The group no longer had the steady flow of medications that they had grown accustomed to during the partnership. This compromised the kind of care that the physicians could offer the FSWs, and the providers at IHS had to rely on other

⁵¹ For example, the Enhanced Care Initiative, among others.

incentives to keep the women coming in on a regular basis. “The women knew that they could come and see us any time, and we could treat them for free,” Dr. Ngom explained. “Then that started to disappear. We continue our work, because we have known these women for such a long time. Now, they have become almost like our friends at this point, and we still follow them. But the possibility of providing medical care for them, well, it was much more effective, more efficient, when we could provide them with medications....It does not stop us from doing our work, but it was a plus that we used to have.”

Because of the fickle nature of project funding, Dr. Ngom explained, he has to make sure that every day the focus of his work is not the project, but his patients. “When you come just for a project, you put in your time to complete the project, and then you leave. But when you leave, the population does not leave with you.” The women being followed at IHS need the same care that they have always required, regardless of whether their blood samples are effectively being used for research. This is particularly true for the IHS cohort, because by law they must report every month to the clinic in order to legally practice sex work. “They will still come in for consultations,” Dr. Ngom notes, “so there must always be a physician there to take care of them.” When Harvard pulled out its funding for the Natural History project, the group at IHS still had to provide the same level of care to the FSW population. However, project funds had always paid for the salaries of the clinic physicians, and they played a vital role in FSW care. The social workers and midwives whose salaries were assured by the state could not fill the gap alone. Furthermore, the physicians were the representatives of Dantec at IHS. Harvard had moved on, but the bank of samples was still intact, and Prof. Mboup believed that it was important not only to maintain the care of the FSW population, but to keep samples coming in on a regular basis. These samples were the foundation upon which he had built the laboratory, and upon which Senegal had built its reputation as a leader in HIV research and care. “Our backbone is truly the cohort,” Mboup explained. “But when this backbone breaks... we’re having a lot of difficulties these days.” Somehow he had to find a way to keep the physicians paid, and the blood samples flowing.

The Harvard collaboration had been in large measure the life blood of the LBV. Over time, Mboup and his colleagues had diversified, establishing links with partners in France and Belgium. In addition to scientific collaborations, Mboup also sought funding from multinational agencies. For in the decades since they began the Harvard partnership, HIV research in Africa had become an important aim of international humanitarian funds. Agencies ranging from various UN offices, to the French ANRS, to USAID and the Gates Foundation provided monies for HIV research under the rubric of humanitarian aid and support. As Harvard began to pull away from LBV, Mboup began to seek for other funding to keep operations up and running. For the most part, this involved cobbling together small bits of money from a host of organizations. This was a challenging task for the small financial administration staff who had to keep on top of the diverse reporting requirements of each agency. These small sums were also barely enough to keep the now expansive lab afloat. In an attempt to fill the gap that was created by the absence of the lab's keystone project with Harvard, the lab applied for funding from the National Institutes of Health (NIH) under the rubric of a new multi-centered project known as CIPRA (Comprehensive International Program of Research on AIDS).

As one of the beneficiary countries of CIPRA, Senegal was provided with the funds to set up a clinical trial for a novel set of antiretroviral medications. The primary goal of this safety and efficiency trial was to develop good clinical practices (GCP) guidelines, with a strong emphasis on quality control and assurance. The molecules themselves had been tested elsewhere, so the focus of the project is not as much on the results of the trial, but rather on the development of laboratory capacity, specifically demonstrating that the LBV is compliant with the GCP standards set by the NIH. Dr. Wane, one of the physicians following the cohort, explained the various changes that CIPRA had brought to the cohort. "It's a new way of doing things," he explained to me. "It's much more objective, more pragmatic; we follow the norms and international criteria for standardization, in other words, American [norms]." While the clinical encounter remains essentially the same, the way that the IHS physicians work administratively has changed.

Again, Dr. Wane: “Before, it’s almost as though we were working blindly... it was rather informal. Now, there is a traceability, everything is written, the protocol defines everything that must be done, who does it, when it is done, and according to which criteria. So everything is normalized.”

By conforming to CIPRA specifications, LBV and its partners (including the clinic at IHS) are able to demonstrate compliance with NIH standards. In the long term, Mboup and his colleagues hope that this will open up new avenues for long-term funding, specifically new opportunities for clinical trial research. As much as CIPRA is about establishing new norms, it is also about providing treatment for the cohort of female sex workers. Dr. Thioye, the former IHS physician who now owns a successful private laboratory, explained that even as Harvard pulled out, Mboup and his colleagues still believed in the importance of following the cohort.

“It started to get a bit difficult, because there wasn’t any more money. We had to find something, because there was a lot of potential. So we thought, okay, how about treatment? Our dream since the beginning was to have the women that we have followed get treatment.” He continued: “Treatment is available, they should be able to take advantage of it.” While Senegal was offering ARV treatment through its national program, ISAARV, many of the FSWs followed at IHS were not enrolled. A few had begun treatment, but many were not eligible according to the more strict ISAARV enrollment requirements. With the CIPRA projects, eligible women in the cohort are enrolled, and put on ARV therapy for the duration of the CIPRA project. Once the project is over, the women will be immediately rolled over into the ISAARV program, and their treatment will be assured by the government. With the end of the CIPRA project monies looming near, Mboup remains concerned about how to keep the cohort intact. The priorities for funding are based on the volume of the HIV problem at hand. “You saw yourself with the CIPRA project,” the professor explained to me, “of the 33 people, we are having a hard time finding patients, whereas in other countries that

number would be recruited in a day.” “So,” he muses, thinking about the cohort, “We developed it. We put money into it. But it is our handicap right now.”

The FSW cohort at IHS remains one of the oldest and most comprehensive biological libraries in HIV research. With a record of social behavior, clinical manifestations, and serology that stretches back almost twenty-five years, the LBV, and Senegal as a nation, have in their midst what one LBV colleague referred to as a “gold mine.” Sitting in the freezers and files at LBV is the serological story of thousands of women, with the exact dates of their seroconversion. But to keep a mine from collapsing requires a lot of work. Just keeping the freezers that preserve these samples running requires an immense amount of money. Other samples from Mboup’s initial serosurveys across West Africa, which were gathered around the same time that the lab started drawing samples from the cohort, had to be dumped. They were simply too expensive to maintain. “They threw everything out last year, and I had to close my eyes,” Dr. Diop said. “We worked too hard on those serums there. They threw everything out, except for the serums from the prostitutes. They are [all] there, starting with the very first serum that we drew, right on up to the present day.” The FSW samples are safe for now. Without funds, however, the group can do little more than maintain the cohort and continue cataloguing the women’s serum in the hopes of one day securing funds, and beginning the work anew.

Chapter Four: The genealogy of sex work regulation: colonial roots of bioavailability

This chapter explores the genealogy of Senegal's policies on prostitution and the control of sexually transmitted infections. It also demonstrates the historical links between Senegal's current registration policy and the control (*réglementation*) of prostitution in nineteenth-century Paris. The French system of *réglementation* was based upon the division of prostitutes from the rest of society, and this chapter examines how the marginalization of prostitutes helped to transform them into objects of scientific knowledge. The second half of the chapter focuses on the control of sexually transmitted infections in colonial Senegal. Colonial practices of STI control were heavily steeped in the French *réglementariste* program and its accompanying moral freight, as well as powerful imaginaries about oversexed Africans. The regulation system adopted by Senegal after independence similarly focused on the isolation and biological surveillance of prostitutes. The chapter concludes with an examination of how the particular facets of Senegal's registration program served to make prostitutes "bioavailable" (Cohen 2005) as resources in the production of scientific knowledge, most notably knowledge about HIV-2.

Early STI control and the roots of registration in France

Syphilis and its ravages had been recognized in metropolitan France since around the 16th century. At the time, prostitutes were not directly associated with the disease, but they eventually became targeted as primary carriers. Official approaches to prostitution in France had constantly shifted through much of the 16th century, and it wasn't until the rule of Louis XIV that the control of prostitutes became part of a grand-scale, concerted regulatory state effort. Under Louis XIV, prostitutes and others unfortunate to be perceived as a threat to the health of society were forcibly isolated or "enclosed" in state-run institutions. For example, a 1684 royal ordinance stipulated that all Parisian prostitutes had to be

confined to the Salpêtrière hospital in Paris. Known by prostitutes as “the big house,” the Salpêtrière held nearly 8,000 people. The women interned there were forced to undergo a strict regimen of prayers and forced labor.⁵² The Salpêtrière was typical of the institutions founded during the Great Confinement (*grand renfermement*), a movement that swept across much of Europe in the 17th century, and was characterized by the isolation of individuals that were deemed a threat to society. These included vagabonds, the mentally ill, and prostitutes. Like most institutions of the era, the Salpêtrière operated as an entirely new type of space that was at once a prison and a hospital. Promoted by state officials as a way to cope with social disorder, institutions such as the Salpêtrière were devised not as medical establishments per se, but as a space to cordon off deviants from the rest of society. In *Madness and Civilization* Michel Foucault describes the “ethical power of segregation” that emerged in the new space of the hospital-cum-prison (Foucault 1988: 58). The enclosed spaces of Great Confinement emerged as important nodes in the development of scientific inquiry. By dividing deviants from the rest of society, a move which was rationalized by these groups’ supposed unwillingness to comply with society’s values, new forms of human observation were possible. Through the process of enforced labor, interned deviants were to be ethically reformed, and through this process they were simultaneously transformed into objects of scientific study. This enclosure of the disenfranchised allowed for the exercise of novel forms of power and the development of new forms of knowledge.

Within the walls of the hospital, prostitutes had to undergo mandatory treatment. A treatment course lasted for six weeks, followed by two weeks of convalescence. All patients were first bled for a few days, purged, and then subject to prolonged baths. After this preparation they were treated for 28 days with mercury pomade, and were placed on a severe diet. This extremely regulated treatment was carried out in what has been described as slave-like

⁵² In some cases, prostitutes were even deported to populate the colonies - primarily Mississippi, Louisiana and the “islands of America”(Benabou 1987).

conditions, where women were “stacked like a cargo of negroes on an African boat” (Mirabeau 1788 in Benabou 1987: 411). The hospital, with its horrifying image of the treatment of venereal disease, served in the public consciousness to equate promiscuity and danger. The hospital was viewed by the public as a “terrible ulcer” upon a city that was already perceived as teeming with infection (Benabou 1987).

In addition to enforced internment in the unique penal/treatment site of Salpêtrière, the 1684 ordinance also ushered in a new era where prostitution became linked with the police force. The Lieutenant General of Police was saddled with the responsibility of assuring the moral surveillance of the city, and setting the terms for convicted prostitutes (Benabou 1987)⁵³. The ordinance also marked a shift in prostitutes overall position vis-à-vis French society. Prostitutes had always been separate from the rest of society—primarily excluded on moral grounds—and forced to live at the margins of society as *femmes perdues*, or lost women. The 1684 ordinance formalized women’s marginalization and linked it for the first time, albeit informally, with disease control. For much of the 17th and 18th centuries, the isolation of prostitutes was carried out in much the same way as the control of any other vagabond. It was only in the 19th century, under a new system of regulation, that the relationship between prostitution and disease control would be made explicit through public health interventions (Harsin 1985).⁵⁴

In 1778, an ordinance from the police Lieutenant General Lenoir noted that the general punitive measures were proving ineffective at controlling the problem of prostitution. Indeed, pamphlets circulated throughout the city condemning the ineffectiveness of police control measures. In the face of such criticism, Lenoir hinted that it would be more effective to adopt a regulatory approach that would focus police efforts on controlling merely the most public

⁵³ For an in-depth study of the role of the *police des moeurs* in late nineteenth and early twentieth century France, see Berlière (Berlière 1992).

⁵⁴ By the 18th century, however, French medical doctrine had already cast prostitutes as a reservoir for syphilis. Syphilis was understood as a condition that stemmed from a corrosive acid that emerged from the mixture of *different* men’s bodily secretions mixing within a woman’s vagina, making prostitutes particularly susceptible to the disease (Conner 1996).

and flagrant aspects of prostitution. Under such a regulatory system, prostitutes would be permitted to practice in certain regulated locales. Lenoir's program did not have the legal clout to effect any change, but nonetheless it marked a shift in prostitution control. Rather than confine all prostitutes to the hospital, he suggested that prostitution be confined to certain regions of the city, or certain houses where the sex trade could be practiced with impunity. These *maisons de tolérance* were already popping up within the city, in any case. The police had informal agreements with certain madams in the city that they could practice their business without police interference, provided that the madams maintained order in their houses, and supplied the police with key information about the practice of prostitution in Paris.

Prostitution as a matter of public health

By the 19th century the French state began to take on increased responsibility for the health of its citizens, making the control of prostitution and its associated venereal diseases a state matter.⁵⁵ Under this new system, the practice of sex work was redefined as a matter of public health, and thus subject to state regulation. Previously lumped together with other members of Paris' underclass and interned at Salpêtrière, by the early 1800s prostitutes were redefined through a new approach that sought to regulate prostitution through registration. This regulation was by no means straightforward, for debates about the nature of contagious disease were linked to broader political questions such as the limits of individual liberty, and the state's capacity to regulate individuals under the rubric of contagion and the protection of the larger social body (Aisenberg 1999).

⁵⁵ This shift significantly shaped the practices and possibilities of power, as Foucault elaborates in *The History of Sexuality*. As he explains, "Power would no longer be dealing simply with legal subjects over whom the ultimate dominion was death, but with living beings, and the mastery it would be able to exercise over them would have to be applied at the level of life itself; it was taking charge of life, more than the threat of death, that gave power its access even to the body" (Foucault 1990).

Against the backdrop of these redefinitions of state power, a small clinic was opened in 1802 to examine prostitutes for venereal disease. Examinations at the clinic were originally performed on a casual basis but were soon declared mandatory. The regularity of visits was assured by the police who kept a running registry of all of the city's prostitutes. This marked the official beginning of France's prostitute registration system which linked disease control with the tolerance of prostitution. Prostitution was "tolerated" in the sense that it was illegal, but not generally prosecuted. This endowed the authorities with the power to make it illegal at any moment, a threat which masterfully served to keep women registered and attending the clinic. With the fall of the Napoleonic Empire in 1814 and the stationing of troops outside of Paris, public concern about venereal disease intensified, and Paris' prostitutes became the target of this swelling concern. The small clinic for prostitutes, once run rather informally⁵⁶, was reorganized under the Municipal council and furnished with a hefty operating budget. As the recipient of city monies, the clinic now had to produce proof that their work was producing results, which meant that the clinic had to gather regular statistics on Paris' prostitutes.

Registration was widely implemented by 1816, and women wishing to practice prostitution had to register with the *Bureau des Moeurs* (Vice Squad). Women wishing to practice independently were issued a registration card that authorized them to practice. Most were encouraged to practice out of the city's sanctioned brothels known as the *maisons de tolérance* (literally "houses of tolerance"). A woman practicing out of a *maison* registered directly with the establishment's madam. An official file was opened at the police station in the name of each registered woman. The only way for a woman to close her file was to formally apply for a "*radiation*" (de-registration), a process that required her to demonstrate proof of marriage or regular employment. Once registered, women had to report regularly to the clinic for examinations. While the regularity of

⁵⁶ The clinic was staffed by two physicians, and service was paid for by levying a 3-franc fee from the prostitutes themselves. These two physicians allegedly hired two medical students to perform the medical exams, while the elder doctors collected the fees (Harsin 1985).

these exams varied over time, women were generally required to undergo a physical examination on a weekly to monthly basis. If a prostitute was found to be infected with gonorrhea or syphilis (which were indistinguishable and incurable throughout the 19th century), she was sent to St. Lazare hospital for moral rehabilitation and mercurial cauterization therapy.

The registration system was not formal law but simply a *réglementation*, so the police were free to enforce regulation in an arbitrary manner. In practice, registration was frequently forced onto women. With pressure to register as many prostitutes as possible, police were often permitted to force any woman presumed of engaging in the sex trade to register against her will. This led to some instances of major abuse; in one case ten year old girls were arrested for promiscuity and added to the registry (Bullough 1987). The regular arrest and forcible registration of large numbers of women points to the considerable inequalities that marked Parisian society. With the rise of industrial capitalism, large swathes of the French population were left economically bereft and vulnerable to administrative abuses. Furthermore, under the Civil Code, women were similarly deprived of legal rights. With quotas to fill, the forcible registration of vulnerable women was often an act of “simple administrative fiat” (Harsin 1985: xx).

The theory of réglementation: Parent-Duchatelet

Dr. Alexandre-Jean-Baptiste Parent-Duchatelet, the man who would become synonymous with France’s *réglementation* approach, launched his career by studying sewers. As a member of the Paris *Conseil general de salubrité*, he fastidiously studied clogged sewers, refuse dumps, polluted rivers, even dead horses in order to understand the health effects of urban detritus. While his work in the sewers afforded him little fame, this early work championing public health and hygiene provided a solid foundation for the work that would later bring him a fair measure of fame: the regulation of prostitutes in nineteenth century France. Bringing the study of sanitation above ground, Parent-Duchatelet produced an

exceedingly detailed two-volume study of prostitution that was published posthumously, *De la prostitution dans la ville de Paris*. He began his study of prostitutes at the request of a friend who was interested in the question of reforming prostitutes. He made a few inquiries on the subject to help this friend, and soon became consumed by the topic, approaching his research with a vigor that some scholars have attribute to his eventual demise: “He visited the depths, fathomed their mysteries, wrote his book – and died” (Harsin 1985: 97). While today we might envision the subjects of sex work and city sanitation as entirely unrelated, Parent-Duchatelet’s miasmatic, sanitary approach to disease envisioned prostitutes as tantamount to the refuse of society. He explained in *De la Prostitution*: “If I have been able... to penetrate into the sewers, to handle putrid matter...why would I blush to enter a sewer of another type (a sewer more impure, I swear, than all the others) in the hope of doing some good?” (Parent-Duchatelet in Harsin 1985: 108). For Parent-Duchatelet, prostitutes were not individuals but part of a toxic part of the urban environment that had to be identified and controlled.

The regulatory system of prostitution was well established by the time Parent-Duchatelet arrived on the scene, but his analysis would become the accepted theoretical position on prostitution in the 19th century. His work essentially validated the practices developed by early regulationists: the registration of prostitutes, mandatory health examinations, and confinement in hospitals or prisons. At the heart of his theory was the idea that prostitution is a necessary evil. “Prostitutes,” he wrote, “are as inevitable, where men live together in large concentrations, as drains and refuse dumps” (Parent-Duchatelet in Corbin 1990: 4). For Parent-Duchatelet prostitution was even a necessary part of urban life, as it played a protective role in society. The practice was, in his words, “an indispensable excremental phenomenon that protects the social body from disease” (Parent-Duchatelet in Corbin 1990: 4). While prostitution was unavoidable, Parent-Duchatelet believed that it needed to be controlled in order to protect the well-being of the larger social body. The linchpin for the control of prostitution was syphilis.

The threat that prostitution posed for society lay not in its existence *per se*, but in the porous boundaries that separated the isolated prostitute world from society as a whole. Parent-Duchatelet diligently examined numbers from police, hospital and prison archives, and eventually began to interview the women themselves. His research consisted in large measure of counting. He observed the prostitutes closely, and generated statistics about their general characteristics, as well as their levels of venereal infections. He researched the women's files and gathered immense numbers of statistics on everything from weight and eye color, to place of origin and father's occupation; all of which he organized into extremely detailed tables. From this data he concluded that most prostitutes were eventually able to find an alternative way to support themselves, making it possible for them to leave the sex trade. In other words, a prostitute's marginality was temporary. Parent-Duchatelet feared that in slipping back into society these women would pose a serious biological threat to society. In his estimation, prostitutes were a reservoir of syphilis, which he regarded as the most dangerous biological threat to society. In addition to the threat of biological contagion posed by prostitutes, Parent-Duchatelet feared that reformed prostitutes would also introduce to broader society any amoral behaviors that they had picked up during their career as prostitutes (prime among these dreaded behaviors was lesbianism). These fears were the foundation for Parent-Duchatelet's argument in favor of regulation.⁵⁷ In order to protect the health of the larger social body, prostitution had to be both tolerated and regulated, for at any moment, these dangerous bodies could slip through the cracks of their isolationist program. "We have major reasons to watch this population," he implored, "...to seek to diminish its vices and its faults and, in this manner, to attenuate, as much as possible, the evil they

⁵⁷ Parent-Duchatelet's fears about the mobility of prostitutes is in keeping with a broader fear about the mobility of France's underclass as a whole. By the mid-18th century, Paris witnessed an influx of migration from the countryside, and this rapid urbanization bred anxiety about the effects of the increasing social and geographical mobility of the poor that persisted throughout much of the 19th century (Wright 1979).

could do to those with whom they would later find themselves in contact” (Parent-Duchatelet in Harsin 1985: 124).

The bedrock of regulation: marginality

The isolation of prostitutes was central to the regulation system, and this division served to produce new forms of knowledge. For Parent-Duchatelet, prostitutes were necessarily marginalized. They were, in his words, “a people apart.” Parent-Duchatelet viewed prostitutes as the absolute Other, explaining that their habits and tastes differed from French society as much as people “from the nations of another hemisphere” (Parent-Duchatelet in Corbin 1990: 5). Prostitutes had long been socially and economically marginalized in French society. In order to protect the social body from disease and moral degradation, the regulationist project sought to marginalize them administratively as well. The geographic isolation of these women was a key component of *réglementation*.

Above all, Parent-Duchatelet heralded the importance of isolating prostitution to particular *maisons de tolerance*, or *maisons closes*, which complied with a set of defined regulations. The *maisons* were themselves isolated from society, permitted to operate only in areas that were off of main streets, and at a sufficient distance from any schools or public buildings. The police controlled which brothels were accorded *tolérance* status, and the seclusion of the prostitutes within these select *maisons* was enforced by the police as well. The constant threat of imprisonment kept prostitutes registered and isolated in the *maisons*, and was leveraged to ensure their compliance with the order of things in the *maison* and the clinic.

The forcible enclosure of prostitutes ensured their marginalization, indeed their segregation, from broader society. However, their isolation was not merely temporary, as in the case of disease-driven segregation. The isolation of prostitutes under the regulationist system was intended to operate as a new norm that would promote perpetual visibility and control. The enclosed space of the *maison close* was to be invisible from the outside, and ideally limited only to

certain neighborhoods or *quartiers réservés* (reserved neighborhoods). The *maison* was to be separated by two doors, and all windows frosted and barred. On the inside, the *maison close* was to be highly regulated, operating according to a very strict system of hierarchy, where women were compartmentalized according to such characteristics as age and class, facilitating their constant observation. Government inspectors were allowed to enter the *maison* at any time, and the doors to the interior rooms were not permitted to have locks. In addition to the constant threat of an inspection, the individual women were constantly under the surveillance of the madam. The structure of the *maison close* was integral to the overall goal of disciplining and isolating the prostitute, creating a disciplined space apart from society that was analogous to the religious cloister (Corbin 1990). The women were rarely allowed out of the house, with the exception of visits to the clinic. The physicians at the clinic were similarly under the authority of the *Bureau des mœurs*, ensuring that a prostitute's world was entirely ensconced under the caring/observing eye of the moral appendage of the state. By isolating prostitutes in the *maisons*, they became constantly visible, and thus available as objects of knowledge.

While the *maison close* represented the ideal form of separation and surveillance, registration was also permitted for “street walkers” or *filles en carte* (literally “girls with cards”). Women who elected not to join a *maison* could register with the state and be provided with an official identification card that would allow them to practice sex work independently, soliciting clients on certain streets between the hours of sunset and 11pm. These *filles en carte* had to undergo regular health checks, and their cards contained records of their medical visits. These visits were ensured by the police who could ask a woman for her card at any time. The entire system was designed to promote transparency and knowledge - for example, vast filing systems were set up to maintain orderly registration and promote the harvesting of statistics. Each woman had a file of her own at the dispensary, and the various dates of her examinations were recorded so that the vice squad could be alerted when a woman missed her medical visit. Police carried out organized raids at bars and on streets, where

independent prostitutes were known to solicit clients. The rules about where card-carrying women could solicit were generally unclear, thus police action was arbitrary and dependent upon the good will of the policeman (Corbin 1990). Any woman accused of violating regulations was arrested and taken to the dispensary for medical examination. If infected with an STI, she would be sent to the infirmary of Saint-Lazare for treatment⁵⁸. First time ‘offenders’ who were healthy were generally released, and if they agreed, were immediately registered. If a woman refused, she would be returned to the police. Prison sentences varied, and upon incarceration, women were subject to harsh prison conditions and forced labor under the watchful eye of nuns (Corbin 1990).

Exclusion, rationality and scientific knowledge

The system of *réglementation* served not only to control prostitutes’ dangerous bodies, but also to make these bodies ‘knowable’ through the harvesting of statistics about their social worlds, and above all, their biological profiles. The statistics that Parent-Duchatelet mined reinforced the relationship between prostitution and syphilis. As the state began to take increasing responsibility for the public’s health, the association between prostitutes and syphilis gave rise to a new notion of health-based rationality. By the nineteenth-century, the health of the population emerged as a strong measure of political legitimacy. By linking syphilis with prostitution Parent-Duchatelet was able to reframe the social problems that had emerged in nineteenth-century Paris as a result of rapid urbanization and industrialization as moral problems (Aisenberg 2001). The control of prostitution gained traction as a means of protecting the health of the wider social body.

For Parent-Duchatelet, registration was the ideal solution to the problem of prostitution, but it necessitated alienating certain rights that were fundamental

⁵⁸ In the French system, prostitutes were often treated in special departments because medical authorities distinguished between the STIs present in the general public and those present in the prostitute population (Corbin 1990).

to French Republican ideals. Mandatory clinic visits, combined with forced registration and isolation, hardly invoked images of the freedoms secured by the Revolution. This contradiction was circumvented by an appeal to science-backed rationality. According to this logic, the freedoms of citizenship could only be guaranteed to those who could properly make use of them. The tables and statistics that Parent-Duchatelet produced from his observations of prostitutes indicated that these women exhibited high levels of syphilis. These high rates of infection were offered as scientific proof of their inability to engage with the political and social rights afforded to French citizens. Since prostitutes were unable to make rational use of their freedoms, it was the duty of the state to control them, and thus protect society at large (Aisenberg 2001)⁵⁹.

Parent-Duchatelet galvanized the administration's approach to prostitution regulation, highlighting sex work not merely as a social ill, but as a direct threat to public health. This extreme form of regulation was made possible by a shift in the duties of the state to protect the public's health, the association between prostitutes and venereal disease, and the rise of a new form of health-based rationality. Following this argument, *réglementation* is not an intrusion of the state upon individual rights, but rather proof of the state's fulfilment of its contract to protect public health and well-being. Lacking the ability to control themselves, prostitutes had to be entirely controlled by the state through regulation, which incorporated not only the *police des mœurs*, but the physician, linking science and political repression. By invoking syphilis and science,

⁵⁹ A similar rationale was invoked in the distribution of political rights to inhabitants of colonial Senegal. Senegalese living in one of the four designated towns or "communes" were accorded the right to representation in the General Assembly in Paris. This right was denied to rural subjects. The problem of these rural *sujets* was a sensitive one in France, for their status was a glaring rejection of the Republican ideals of citizenship and political rights. The French rationalized this contradiction by reframing the right to vote as a privilege for the 'civilized' (Conklin 1997). Rights could not extend to animist Africans who occupied the interior, because they were not equipped to handle the benefits of civilization. Eventually, as French politicians recognized that extending French citizenship to colonized Africans would result in a risky "blackening" of France (Coquery-Vidrovitch 2001: 285), even these compromised terms would be renegotiated. In 1912, France declared that citizenship would no longer be accorded to all residents, but was something that could only be conferred through naturalization, that is, on an individual basis.

prostitution was circumscribed by the state's responsibility to preserve the health of its citizens.

The end of regulation in France

The regulationism of Parent-Duchatelet would undergo many changes in the twentieth century, with the eventual demise of the registered prostitute. With the development of the first effective test for syphilis, known as the Wassermann test, medical examinations became much more thorough. Samples of blood and vaginal fluid were regularly collected in order to diagnose venereal diseases. The police were gradually removed from the regulation of prostitution, with punishment for missed health exams meted out by the court of summary jurisdiction (Corbin 1990). By 1946, the *maisons closes* were shut down, and existing registers were ordered to be destroyed and replaced by a new sanitary and social national file. This marked a new moment in the centralization of information about prostitutes. Whereas women could previously move in and out of the society of a large city, the centralization of their personal data mean that they could no longer “disappear.” In the absence of brothels, Corbin notes, certain women who were former “inmates of brothels” had an extremely difficult time transitioning to soliciting clients in the streets (Corbin 1990). By 1960, parliament ratified the 1949 UN convention that called for the abandonment of any practices that were discriminatory towards prostitutes, or served to keep women working as prostitutes. The medical and social file was abolished, and in its place, parliament set up a medical and social department to supervise the retraining of France's prostitutes. France's *réglementation* had officially come to an end. Today, organized prostitution is illegal in France, as is any form of public solicitation. At the same time that France was retiring its system of *réglementation*, the newly independent nation of Senegal was just establishing its own system of sex work regulation. This next section explores the historical approaches to controlling prostitution and sexually transmitted infections in Senegal.

The Control of Prostitution and STIs in Senegal

To date, there has been no comprehensive study of the history of prostitution in Senegal, and there are scarcely few archival materials dealing with the subject. Nonetheless, it is clear that the French *reglementariste* system provided the basis for the colonial treatment of prostitution, and would ultimately inform independent Senegal's policy of *tolérance*. Despite a lack of archival data on prostitution, glimpses into the history of sex work in Senegal can be culled from a more general history of how STI control was approached in Senegal and across French West Africa.

Prostitution was not illegal in the colonies, because according to the *Code Pénal*, only public forms of indecency could be prosecuted. Prostitution was therefore regulated in a very local and arbitrary way. Similar to early control efforts in the metropole, the colonial administration's early attempts at controlling venereal disease entailed controlling Senegal's prostitutes much as one would control paupers or prisoners. As John Iliffe explains, medical care in the early colonial settlements of Saint-Louis and Gorée was geared exclusively toward the care of French military and administrative personnel. This began to change after 1848, when the French emancipated Senegal's slaves, and the colony was faced with the challenge of integrating more than 6,000 freed slaves into the colonial economy. While some continued to work for their masters or found jobs in public works, many fell into destitution. Slave owners were particularly reluctant to provide care for young female freed slaves, and with no other way of earning a living, many of these girls turned to prostitution. The administration made a special provision to provide care for this population at the *hospice civil*, where women with venereal disease were treated alongside prisoners and other undesirables (Iliffe 1987).

Similar to the promoters of Paris' *reglementariste* policies, the local colonial administration in Saint-Louis sought to isolate the colony's prostitutes, believing that isolation was the best way to control their trade, and thus, venereal

disease. In 1882 the colonial civil affairs officer alerted the physician in Saint Louis, then the capital of the AOF, that the administration wanted him to begin examining “loose girls” for venereal diseases. Any “girl” who was found to be infected was to remain in the hospital until she recovered. The physician responded to this request, explaining the efforts that he had made and the unique challenges posed by local sex work practices: “Authorized prostitution in Saint-Louis did not include brothels. Girls were not subjected to weekly consultations. Prostitutes registered directly with the police. On my arrival there were ten to twelve of such girls registered...The police list has been given to the hospital staff so that they will report any absences from regular consultations”(Becker 1999: 67). In 1897, the governor general of the AOF echoed similar concerns about the disconnect between local styles of prostitution and the metropolitan style of regulation: “The conditions under which prostitution was occurring in Senegal made preventive measures such as those implemented in European cities impracticable. For it is not in the streets that such actions take place that would have facilitated surveillance by vice squads who could then keep records on those indulging in such an activity. As for controlling prostitution in brothels, it is easier to imagine than to actually establish because those ready to undertake such commerce are yet to be located...The Public Administration can not achieve efficient surveillance unless cases of infected women, and brothels where infection is detected are reported” (*ibid*).

The administration soon discovered that the unique nature of Senegal’s sex trade made formal isolation impossible. Prostitutes in Saint-Louis did not work out of brothels, which meant that a full-scale Parisian-style regulation system was untenable in the burgeoning colony. Another unique feature that confounded colonial efforts to develop a functional vice squad was the local practice of “*prendre mouso*”, which Becker and Collignon explain means “to take a native woman” in the colonial jargon of French Sudan. French military personnel stationed in Senegal were encouraged by military doctors to pursue such sexual relationships with *métis* women, believing that a woman’s services

would prevent servicemen from falling into the trappings of alcoholism and depravity which they associated with “hot climates” (Becker 1999:78).

This unique challenge to a more metropolitan style of regulation stems from the early relationships that were formed between African women and European men in Senegal. In the early days of French colonial occupation, French men working for the Senegal Company (*La Compagnie Française des Indes et la Concession du Senegal*) did not bring their French wives to the Senegambian region. Throughout the seventeenth and eighteenth centuries many of the French men stationed in Senegal took on African mistresses, or *signares*, a term derived from the Portuguese word *senhora*⁶⁰. Such informal sexual relationships between Senegalese women and French men were forbidden under the rules established by the Senegal Company, but over time such regulations were relaxed, and eventually such sexual arrangements were tolerated. The *signare* lived with French men in marriage-like relationships known as a *mariage à la mode du pays*. These were not binding relationships, and while in some cases a French suitor would offer bridewealth to the *signare*'s family, the union dissolved as soon as the man departed for France, freeing the woman to take on a new husband. The *métis* children of the *signares* could claim certain rights and benefits through their fathers, including access to education and privileged entry into the world of local commerce.

The practice of taking on a *signare* wife had economic implications, and these informal marriages became an important tool for French men seeking to solidify trade relationships in the region. Senegalese society was based largely on kinship ties, and marriage with local women provided French men greater access to the kin relations that controlled trade in the region (Jones 2005). Furthermore, the *signares* eased the transition to life in the colony by setting up a domestic space and acting as important linguistic and cultural interpreters. In return, the *signares* enjoyed significant wealth and social position. Of course, not all women

⁶⁰ French men stationed in Senegal did not begin to bring their French wives with them until about 1914 (Johnson 1971: 106).

who flirted with attaining *signaré* status were taken as partners, and Brooks suggests that women often took great risks by associating themselves with newly arrived junior employees of the Senegal Company. If a woman's advances did not result in a marriage, she ran the risk of falling into "casual prostitution" (Brooks 1976). By the late nineteenth century, this *mariage à la mode du pays* had generally subsided as Church teachings and the *Code Civil* introduced a new era of regulating the private lives of French citizens. While formal marriages between the French and *signares* largely subsided, the colonial practice of *prendre mouso* was accepted well into the twentieth century. This practice frustrated local physicians and administrators who believed that it prevented prostitutes from being referred to the colonial health services (Becker 1999).

Without a formal regulation system like the one established in metropolitan France, authorities had to rely on sporadic medical reporting to assess the level of venereal disease in the colony. Data from these reports tended to overestimate the rates of venereal infections in the colony. For example, one study suggested that 90% of Africans admitted to the hospital in Saint-Louis were infected with chronic urethritis, inflammation of the urethra likely due to an STI, and most were infected with syphilis (Becker 1999). These cursory reports were extrapolated by the administration, which fomented a panic about the overwhelming disease burden in the colony. Despite a complete lack of evidence, the administration believed that the African population in Senegal had exceedingly high levels of STIs, which they attributed to perceived sexual excess (Echenberg 2006). Syphilis was of particular concern, and the gross exaggeration of syphilis statistics was only realized in the 1950s when endemic syphilis (treponematoses) was identified in Senegal⁶¹.

⁶¹ A similar (and well-documented) case of diagnostic confusion took place among the Bagandan people of Uganda. Colonial authorities mistakenly attributed fertility problems to what they perceived as an epidemic of syphilis that they estimated to be ravaging eighty percent of the Bagandan population (Lyons 1994). This aroused significant concern in colonial circles because following the racially categorized scientific system of the times, the Baganda were considered to be among the more "advanced" of African groups, and authorities feared that a drop in fertility would impede their development (Summers 1991; Vaughan 1992). These inflated rates of syphilis

As in other colonial regions, concern about venereal disease was frequently couched in moralistic terms, but often motivated by capital and the fear that depopulation would harm the economic viability of the colonial endeavor (Hunt 1991; Levine 1993). By World War I the colonial administration was framing much of its concern about venereal disease in terms of population loss. The administration's obsession with demographic trends was largely due to concerns about maintaining the African labor pool in light of the need for increasing demands for military recruits. For example, the first quasi-demographic survey of Africans in the AOF was undertaken to determine the number of Africans that could be conscripted into colonial military service without creating a labor shortage (Echenberg 1987). Concerns about depleting the "colonial reservoirs" led to more comprehensive medical reporting during the inter-war years. The administration also sought to increase West African labor pools by curbing venereal diseases which could negatively impact fertility and child development. This was facilitated by the establishment of clinics such as the *Institut d'Hygiène Sociale*, which was founded in 1921 and was home to a venereal diseases unit. Syphilis therapies, including such aggressive agents as mercury salts and arsenic, were gradually made available, particularly to physicians who were treating the colony's prostitutes (Becker 1999).

stem from a diagnostic confusion with endemic yaws, and assumptions about African promiscuity held by colonial and missionary health workers (Orley 1980).



Figure 8: Colonial IHS , courtesy of Omar Diack

Registration as a mechanism of bioavailability

Thus far this chapter has examined the historical precedents that led to Senegal's policy of female sex worker registration, and the eventual formation of a FSW cohort at the STI in Dakar's *Institut d'Hygiène Sociale*. Certain key elements of the prostitute registration system initiated in France, and later introduced in Senegal, served to make the blood of sex workers available as raw material for scientific investigation. As demonstrated above, France's system of *reglementation* was highly intrusive, and could hardly be justified in Republican France. This contradiction was side-stepped in large measure by the work of Parent-Duchatelet. He helped legitimize the practice of *réglementation* by demonstrating that Parisian prostitutes had high rates of syphilis. These high rates of infection were held up as proof of prostitutes' threat to society, and their misuse of personal freedom. By redefining prostitutes as outside of the law, the

state was free to intervene with impunity, forcing prostitutes to undergo physical examinations, and live and work under constant surveillance.

By placing registration within a historical context, it becomes clear that the regulation of sex work has long acted as a mechanism for making women's bodies available to the state as new spaces for the production of knowledge. Whether clothed in the rhetoric of syphilis or HIV, such exceptionalism has transformed individual women into a "bioavailable" population (Cohen 2005)⁶². By redefining the political rights of prostitutes, the state was able to transform their bodily products and social histories into statistics that could be used to enact new measures of public health control. For contemporary research scientists in Senegal, the system of registration rendered the blood and social data of FSWs into bioavailable products that could be banked, studied, and eventually transformed into scientific facts.

The processes involved in making these products bioavailable are the subject of the next two chapters. They seek to reclaim the narratives and practices that became erased as women's blood and social histories were transformed into samples and clinical data. By exploring daily life at the clinic where Dakar's FSWs are followed, the next chapters elucidate how interpersonal relationships between the FSWs and their clinic providers combine with acute economic need to create a clinic-centered blood economy that keeps food on the tables of Senegal's FSWs, and blood flowing into the labs of Senegal's HIV-2 researchers.

⁶² This term, originally utilized in pharmacology, has been invoked by Lawrence Cohen to refer to the process by which tissues within the human body are made available for extraction and transplantation (Cohen 2005). Cohen's work builds on the insights of Margaret Lock, who has demonstrated that in order to mobilize tissues for transplantation in North America, human bodies had to be redefined as non-living entities. The concept of "brain death" permitted those in the health field to attribute a new "cadaver-like status" to individuals so that their tissues could be made into bioavailable products that could be extracted and exchanged (Lock 2000; Lock 2002). In his examination of organ sales in India, Cohen explains that the motivations of organ sellers are frequently erased from the organ transactions. This erasure serves to remove the seller from what he calls "the relational frame of being a person" (Cohen 2005: 82). An organ can be purchased only when the seller's humanity is erased, and the love and sacrifice that motivated the sale is removed from the equation.

Chapter Five: Life in the Clinic - The politics and practices of enrollment

This chapter examines the daily practices of life in Dakar's *Institut d'Hygiène Sociale*. As the primary site for the registration of Dakar's female sex workers, the IHS lies at the heart of the apparatus of surveillance and care that makes it possible to regularly harvest blood samples for HIV research. The chapter opens with an ethnographic account of how registration takes place. It describes the specific practices that are involved in enrolling these women as both official sex workers, and as members of a research cohort. With the isolation of HIV-2, the sex workers at IHS became not just a group of bodies-to-be-managed (Becker 1999; Stoler 2002; Sanchez 2004) but a cohort of enormous scientific value. The latter part of the chapter focuses on the IHS providers, specifically the social workers and physicians who work with the IHS cohort on a daily basis. It details the networks of engagement and reciprocity that have been built over time between scientific researchers, the IHS providers, and the sex workers in their care. The physicians and social workers at IHS emerge as both guardians of women's health and well-being, and gatekeepers of the valuable social histories and blood samples that are produced on a daily basis within the clinic.

The legalization of prostitution in Senegal

In many ways, HIV-2 as a knowable scientific fact, and the social world of the IHS and Senegal's FSWs were co-constituted. Insofar as the injection of Convention funds allowed the IHS to become, in the words of a clinic physician, "competitive and capable," so too did the reservoir of registered sex workers make the description of HIV-2 possible. Senegal's registered female sex workers represented an extraordinary study population for tracking the effects of HIV-2 in the body. This section explores the kind of HIV-2 research that was performed by Souleymane Mboup and his partners, while highlighting the social and political

forces that converged to create a fertile environment where HIV-2 could become a knowable thing.

In official terms, sex work is “tolerated” in Senegal (Ndoye 1995). In 1962, during its fledgling years as a new nation state, Senegal began to establish a set of laws through the National Penal Code that legally recognized and protected the practice of sex work. In 1969, the Prime Minister with the support of parliament and legislature passed the so-called “law of tolerance,” which permits women over the age of twenty-one to legally engage in sex work if officially registered with the state⁶³. As a part of this new movement, public clinics were established in the main urban centers of Senegal to monitor the rates of sexually transmitted infections. Women wishing to practice sex work legally must register at these clinics, where they open up an official file known as the Social and Health File. Upon registration, they receive a *carnet sanitaire* (health booklet), a small green booklet that serves as proof of registration, and is in essence a license to practice sex work. The booklet bears a woman’s name, photograph and registration number, and contains a running list of her visits to the STI clinic. The 1962 law also established a special section of the police force known as the “*brigade des moeurs*” or the “vice squad” whose mission is to enforce the registration of female sex workers (Tardy N.D.). This vice squad patrols regularly sex workers to verify that the women are in possession of a booklet, and that the booklet is up to date. Any woman who cannot provide proof of registration, or who is in possession of an expired booklet, is taken in by the police, and subject to fines or imprisonment⁶⁴.

⁶³ This is the 1969 *Instruction Ministerielle* that expanded upon earlier laws governing prostitution. It provided a legal definition of prostitution: “Prostitution is the fact of using all or part of one’s sexual capacities with a client.” It must involve three elements: 1) sexual acts 2) payment, and 3) searching for a partner in a public or private place, through the use of recruitment (i.e., words, gestures, by letter or telephone). All three elements must be present for the act to be considered prostitution. Those who do practice prostitution without registering for the *fichier sanitaire et sociale* (health and social file) face up to a month in prison and anywhere from 20,000 to 100,000 CFA fines.”

⁶⁴ Renaud notes that in her work with FSWs in Kaolack, several people told her a rumor about a very different governmental intervention. According to her informants, in 1960 the new Prime Minister, Maimed Dia, decided to deal with the “prostitute problem” by ordering all FSWs to

The Minister of Health and Social Affairs is ultimately responsible for the Social and Health Files for FSWs, and the registration process for Dakar is managed at the *Institut d'Hygiène Sociale* (IHS). In some cases, women report to the IHS of their own accord, seeking to officially register and receive their *carnet sanitaire*. Others are dropped off at the clinic by the police after having been picked up for practicing sex illegally (i.e., without an official booklet)⁶⁵. When a woman arrives at the IHS for the first time, she is immediately met by a social worker who administers a brief intake. During this initial interview a social worker provides the woman with an overview of the registration process, specifically outlining her rights and responsibilities. As the social workers have explained to me, their primary aim in this first session is to try to dissuade women from engaging in sex work. During the interview they inquire about a woman's experience and social connections, trying to determine if she might have another skill that she could draw upon to support herself financially. The social workers typically spend at least an hour or two with a new client, teaching her about STIs and the other risks of sex work, and explaining to her how the clinic works and what is required of her if she elects to register. While most women ultimately insist on registering, some women do turn away at this point, either because they deem the risks of the profession too high or because they prefer to practice clandestinely.

If a woman decides to register, she hands the social worker her National Identity Card or a passport if she is not Senegalese. She must also provide four

gather in front of the public defender's office. Apparently Dia had also spread the word for single men to gather there as well. When the women arrived, they were made to cover their faces, "with veils or bags," and men were permitted to select one of the veiled women as his bride. The minister then ordered the men to give the newly selected brides 100 CFA (roughly 20 cents). A wedding ceremony was conducted there and then for the few thousand new couples (Renaud 1997). There is no written account of this rather remarkable story.

⁶⁵ Homaifar and Wasik offer a quantitative estimate for the IHS references. In their study population of Dakar FSWs, 36.7% of women registered at IHS after being referred to the clinic by a fellow FSW; 45% were brought to the clinic by the police after being caught for soliciting clients without a booklet (Homaifar and Wasik 2005)

passport-size photographs, a requirement which provides steady business for the small photo lab across the street from the clinic. One of the photographs is affixed on the woman's new Health and Social File, the *Fichier sanitaire et social de la Prostitution*. This new file also bears her first and last name, and her new registration number, including the date of her registration. The standard-issue cabinets that line the walls of the main office hold records from as recent as this month, and as far back as 1974. To complete her file and receive her official *carnet sanitaire* each woman must complete a set of documents. The Information Page of the file reads like a standard bureaucratic document, with fields for such personal information as the woman's height, hair color, eyes, and skin color. The Patient Information Form makes note of more sociological information, including a woman's ethnicity, marital status, religion, educational level, etc. This sheet also allows the team to obtain information about a woman's physical health, specifically risk determinants, such as age of first sexual encounter, number of sexual partners per week, and questions related to female excision, scarification and blood transfusions. To complete her registration, a woman must also officially sign the consent form, in which she agrees that she is:

- 1) 21 years or older;
- 2) Registering of her own free will;
- 3) Willing to provide necessary identification for her dossier;
- 4) Willing to perform period syphilis tests, and bacteriological, parasitic and mycosis tests;
- 5) Willing to "submit" to health checks and follow prescribed treatments;
- 6) Willing to participate in educational sessions on STIs and HIV; and
- 7) Willing to inform the center of any change in her personal status or her practice.

The document also acknowledges that women have the right to receive all test results, as well as the right to unregister at any time by written request. While women have always provided consent for enrollment, the informed consent process has evolved over time, in step with the shifts in the ethical terrain of medical research. With the evolution of new “ethical problems,” one of the IHS physicians explained: “We adapted. The problem of informed consent became a new theme and... when it appeared we [incorporated] it into the cohort.”⁶⁶ When all documents are completed, they are filed at the IHS, and a copy is forwarded to the Central Police station. With each visit to the IHS, a woman’s medical history grows. While medical records are kept at the IHS, they are accessible to the police at any time.

The law permits women to “radiate”, or de-register upon request. In order to withdraw from the Health and Social File, a woman must submit a signed request to the Director of IHS. Then she must complete a medical visit, and if clear of all STIs, she is first taken off of the register at IHS, and then at the level of the police. If her examination indicates an STI infection she must undergo treatment, and once treated, will then be removed from the register. After withdrawal, the woman must turn in her *carnet sanitaire*, at which time she receives a certificate of disbarment. A copy of the certificate is kept in her file at IHS, and another is kept with the police. So, while she is no longer a registered sex worker, proof of her prior activity remains on record in perpetuity. If a woman eventually decides to resume the practice of sex work, she must open up a separate registration.

With the dossier complete, the social worker will then provide the woman with her green, pocket-sized *carnet*, with the date of her next examination clearly

⁶⁶ Some members of the Senegalese HIV community have raised concerns about the ethics of the Natural History of HIV-2 project. For example, a historian who is an active member of Dakar’s STI and HIV research community expressed serious concern that adequate consent was not provided in the early years of the project. As a forerunner of Senegal’s recently established review board, he was working hard to set up a local body that would provide a more rigorous review of proposed research projects that would be carried out within Senegal.

marked on its inner pages. Upon receipt of the booklet, women are told by the social workers to immediately take their new cards to one of the office supply stalls in the market and have it laminated. One morning a woman came to the clinic for her regular check-up and presented the social worker with an unlaminated booklet. In Senegal's dusty, hot climate, the once-crisp booklet had warped and faded. Looking at the state of the woman's booklet, the social worker harshly criticized her for not taking the necessary steps to protect the document. "I'm putting a note in your file," she warned the woman, "so that the next time you come in, whoever does the intake will see that if you didn't laminate your card, you won't be allowed to have your appointment." Within the space of the clinic, and by extension within the bars and clubs, the booklet takes on important transactional value. For social workers and physicians at the IHS the booklet is the organizational basis for much of their daily work. A card that was soiled was tantamount to a lack of respect for the order that the social workers attempted to maintain within the clinic.

There are two kinds of examinations performed at the IHS: the simple visit, and the complete visit. The Penal Code of the 1960s stipulates that women had to report to the clinic every two weeks for visits that alternated between the simple and complete visit. According to one of the IHS physicians, over the years this particular stipulation has become "obsolete." With an increase in the number of women attending the clinic and no significant bolstering of the staff, the IHS now gives women appointments every four weeks, which alternate between complete and simple visits. Even with this more relaxed schedule the clinic is still abuzz. During a simple visit, women are given a clinical examination and are only provided with a vaginal swab if needed. During a complete visit, women undergo a full gynecological exam with the IHS nurse practitioners. Women received an annual blood test, which originally included TPHA and RPR for syphilis, as well as tests for Chlamydia antibodies, and gonococcal smears and cultures. With the dawn of the Convention in 1985 the group implemented serological screening for HIV-1 and HIV-2 (Kanki 1992). If, in the course of an exam, a woman is found to have sexually transmitted infection, the vaginal swab

is repeated and her *carnet* is confiscated by the service until she can provide proof of treatment for the STI. The vaginal samples are tested at the small lab at IHS, and the blood samples are brought to Dantec's LBV⁶⁷ for testing and archiving. For these visits, women must report to the clinic early so that results can be forwarded to the laboratory in time to be tested that day. Results are provided within 48 hours, and if the results show that a woman is free of STIs she can recuperate her card, which is marked with a date for her next clinic visit. If she tests positively for an STI (gonorrhea, syphilis, etc.), she must provide proof of treatment before she can recuperate her booklet. Interestingly, while the presence of an STI is cause for withholding a woman's *carnet*, a positive HIV test is not grounds for confiscating a woman's booklet. The rationale guiding this decision is that, regardless of the presence of HIV, some woman may still have to rely on sex work to survive. By allowing FSWs living with HIV to maintain their booklets, the system ensures that these women can maintain regular access to medical care, free condoms, and health education sessions that will ultimately reduce the likelihood of transmission.

Daily life at the IHS clinic

The *Institut d'Hygiène Sociale* was created in 1950, and by 1976 it was home to Dakar's STI clinic. Officially, the clinic is charged with the treatment and prevention of sexually transmitted infections. In practice, the clinic's primary job is to provide care for Dakar's female sex worker population. The clinic is surrounded by a high wall, insulating it from the hustle of Avenue Blaise Diagne, one of the city's main arterial avenues. *Commerçants* (street vendors) jam the sidewalks outside of the clinic, and their stalls overflow with anything from bright pyramids of oranges to tables piled high with plastic flip-flops. There is generally a steady flow of people in and out of the IHS, though the place has a calmer, more

⁶⁷ In the early years of the cooperation, initial tests were performed at the LBV, and the samples were then transferred to the Harvard School of Public Health for confirmation. Eventually, as LBV obtained appropriate materials, all routine testing was performed in Dakar.

administrative feel than other clinics and hospitals in the city that have bustling inpatient and emergency services.

The STI clinic is tucked towards the back of the clinic where it shares a pavilion with the crowded dermatology service. While certain hours of the day may find the tiled benches lining the STI clinic bare, in the early and mid-morning the place is generally abuzz with women waiting for their appointments. The mood often depends on the activities planned for that day. On some mornings the dimly lit hallway that doubles as a waiting room is silent as women quietly sit, staring at their feet while waiting to see their provider. The staff at IHS regularly holds educational meetings for the FSWs, and on these mornings the place erupts with activity. Women of all ages, from newly registered young women to elders who have taken on a leadership role in the community, gather in the narrow hallway. Their loud greetings ricochet off the tiled walls, and the dimly lit hallway takes on a bright and welcoming atmosphere.

When a woman first arrives at the service for her monthly examination, she purchases a ticket from the clinic's *garçon de salle* (orderly) for 500 CFA (roughly 1 US dollar). Between collecting fees and hunting for change (small bills are a perpetual problem, even at the clinic), the *garçon* also helps the social workers with the filing. With ticket in hand, a woman will then wait in the hallway for one of the social workers to call her name. When her name is heard, she checks in with the social worker who takes her *carnet* and hand writes her name in the official register where all of the women's visits are recorded. Once checked in, the social worker or *garçon de salle* fetches the woman's personal folder from the myriad cabinets lining the wall. The oldest cabinets hold records from as far back as the 1970s, and serve as more as an archive. On the other hand, cabinets from the early 1980s are regularly opened, and the decades-old files still make their monthly rounds as veteran women faithfully attend their appointments.

On some days the clinic may also be holding one of their educational sessions, or in clinic parlance, IECs (Information Education and Communication). These are held in a small, curtained-off space just behind the social workers' offices. IEC meetings are generally held by the head social worker or one of the leaders in the FSW community. At any given time, there could be ten to twenty women per session, and the meetings attract both 'regulars' who come to share their experience, and the newly registered who come seeking the advice and guidance of their peers. Given the large number of FSWs followed at the clinic, women are divided into smaller groups, and each group meets at least five times a year. The groups sometimes focus on a designated topic which allows for a more free-form discussion that focuses on the needs and concerns of the women present. At other times, official demonstrations are planned, notably a presentation on how to use male and female condom which are both readily available free of charge at the clinic.

Sometimes the centerpiece of the meeting is an educational video, either of the more classical social marketing bend, or the homegrown "theatre" genre. Senegalese "theatre" is akin to a local Wolof version of the popular Latin American *telenovellas*. They employ straightforward dialogue and exaggerated gestures, and rely on good versus evil scenarios typical of the global genre. Like a modern, televised twist on older morality parables, the subject matter and characters of the Wolof theatre tackle local issues in a way that is simultaneously pedagogical and entertaining. Households across Dakar would come to a screeching halt when the theatre came on the television, and both official and bootleg copies of the most popular series fly off the shelves of the DVD hawkers in downtown's Sandaga market. This genre has become a popular way of tackling important societal issues, and its low budget production means that it can readily be incorporated for public service announcement-type public health campaigns. Some of these are produced specifically for health education, and one of the FSWs that I interviewed proudly explained that she had acted in one of these theatre sketches that dealt with HIV education and prevention. The more mass-produced theatre sketches intended for local television stations were often

met with mixed reviews by the IHS staff. One morning, the social workers were venting about the theatre that aired the night before on local television. The story portrayed the fictional saga of a sex worker whose family discovered her covert profession. Laden with moralist sentiment, the writers also added a dose of realism to the script, making sure that the actress carried her *carnet*. The social workers were aghast. One explained, “I told my husband, ‘I just know we won’t have that many women tomorrow after this one. They will all be traumatized, and won’t come.’”

The clinic has barely changed since my first visit nearly ten years earlier, with the notable exception of new air conditioners in the windowless room where the social workers greet and register the women. The STI clinic also managed to secure a new office for one of the physicians, enabling the two physicians to operate in their own separate offices and examination spaces. “We knew it wasn’t very ethical,” he said, remembering how the two had to see their patients in the same room, “but we just didn’t have the space.” Apart from this significant upgrade, much remains the same: the sterile examination rooms, the curtained-off space where the educational meetings are held, the jumble of file cabinets that line the room where the social workers perform patient intake. Most notable, however, is the unchanging presence of the head social worker, and the two physicians who have been following the population for years.

Social Workers at IHS

There are a number of women who have been actively involved at IHS for years, but the head social worker, Rama, stands out among the crowd. Rama was the first half of the dynamic duo that began the STI service back in 1976, well before HIV even appeared on the public scene. “It was August 6, 1976,” she proudly recounted one hot afternoon in the office of AASED, one of the NGOs that she had founded to support the children of FSWs and other vulnerable children affected by HIV. “Dr. Ndoye was sent to [the service] as a gynecologist, I was sent as the social worker.” While the law governing the registration of

prostitutes had been on the books for more than a decade, there was no coherent approach to their care. “Back then, when we first came, nobody was really taking care of the FSWs... They started being followed three years before I arrived, but it wasn’t a complete visit. The police brought the women in, somebody gave them a quick once-over, and then they left. They weren’t even registered. But in 1976 it all became official.” It wasn’t easy for the pair when they first arrived. “It was empty,” Rama recalled, thinking about how the clinic had changed. While the French Ministry of Cooperation, the Ministry of Health and other multinational organizations such as the World Bank eventually provided money to build the clinic, in the early days they didn’t even have an office. Rama was worried that this new job wasn’t going anywhere, but Dr. Ndoye held fast, and urged her to be patient. Gradually they started making changes to the care provided to the FSWs, and slowly, the women began to register. “The organization of [this place] started when I arrived, because before there weren’t many social workers or midwives, there weren’t enough personnel. When I arrived in ’76 there wasn’t a single file.” Even after she arrived, there simply wasn’t enough money to perform any meaningful follow-up. “You came, you were consulted, and we took your name and address, but the lab wasn’t really sophisticated at all, and we didn’t do any home visits, because there simply wasn’t the money to do it.” That all changed when the Inter-University Convention was established, providing much-needed funds to the small clinic. “It all came together when the money came in... the projects, that motivated people” she explained. The group could hire more staff, and provide more care. For Rama, this meant that she could follow her passion of going out for regular home visits.

In order to maintain the integrity of the Natural History cohort, the staff at IHS had to ensure that the FSWs making up the cohort were consistently followed. To perform a longitudinal study of the effects of HIV-2, the scientists needed blood samples from the same women on a regular basis. Securing regular samples was not always an easy task because most of the women registered with IHS did not have the resources that afforded them a stable life. Almost anything

could prevent them from coming in: a downturn in clients, a sudden illness, or an unexpected but necessary trip back home to care for a family member. It was Rama's job to track down these women if they didn't show up for their regular appointment. "When they no longer come, we as social workers go out to their homes to do an interview to see why they haven't come, and we bring them in for their consultation. Mboup's study had to examine them over time, and they needed to see the blood of prostitutes that were sick and having problems, to see their CD4 counts and such. All of the women did not come back [on their own], but we made it so that 97% of them came back to continue the consultation," she proudly explained⁶⁸.

While some people may have found the tasks of field follow-ups challenging, Rama thrived on them. "I always loved that kind of work," she explained. "It's no problem for me to hop in a *car rapide* (minibus) and leave. Even back when I was just an intern, even before coming here in '76... I would hop in the *car rapides* and the *ndiaga-ndiaye*⁶⁹ and go all the way out to

⁶⁸ Rama explained that in the early days of the discovery of HIV-2, she also played a role in the shoe-leather epidemiological field visits that took Mboup and his team across the country in search of new cases of suspected HIV-2 infections. She recalled one of these early trips: "We used to even go up [north] to Saint Louis. The first woman who had AIDS and eventually died, that happened in a village called []. Mboup came to me and said, 'As this woman has died and we don't know the cause, we have to go and visit the village health center to see what her diagnosis was.' So we went there and the nurse said that she vomited, had diarrhea, and was losing weight...she had oral lesions and was losing her hair. We knew right away that the cause of death was AIDS."

⁶⁹ *Car rapides* and *Ndiaga-Ndiayes* are the most affordable form of public transportation in Dakar, and throughout much of Senegal. The *Car rapides* are brightly painted Renault SG2's that have been gutted and retrofitted with benches to seat upwards of 16 people at a time. Most of these were cast-offs when they hit the streets of Dakar more than thirty years ago. While their brightly painted facades add an undeniable charm to the city streets, their frequent stops are infamous for clogging the city's main traffic arteries, their unregulated emissions are reviled for emanating plumes of exhaust, and their aging pump brakes are widely recognized as a menace to public safety. Unfortunately, for most Dakarois, this is the only type of transportation that they can afford. Indeed, for many in the *banlieu*, the *cars* are the only form of transportation that serves some of the more remote and impoverished neighborhoods. The *Ndiaga Ndiayes*, named after their famed proprietor, are privately owned, 30-seater white minibuses that are a slight step up from the more homegrown *car rapides*. They offer slightly more direct routes from downtown to the periphery.

Guédiawaye⁷⁰.” For Rama, these home visits provided her access to women’s homes lives, which she described as “a universe apart.” Through such visits she gained insight into the women’s lives and the particular challenges that they faced. “Does she live in a room, two rooms, does she live in a shack? Sometimes women will tell you anything. But you arrive at the house and you can really do something for them. You can provide them with nutritional education, you can sit with them, if you see that one of their children is sick, you can help them. There is so much that you can find out from visiting their homes.” Unfortunately, since the partnership has pulled out, the funds simply don’t exist to continue with the home visits. Rama still works intently with the women, and her years of home visits provided her with important social context for the FSWs in general, but she laments the level of individual attention that has been lost since those visits have stopped. Of course, in addition to the funds being pulled, the urgency of retaining the FSWs also pulled away when Harvard dropped the program. Before, she explained, one of the researchers would come to Senegal, and they would sometimes go and see the women directly. “When he came,” she explained, “We would go into the neighborhoods and look for specific women, and sometimes take the blood tests, we did that right there in their homes. Yes. Because sometimes they were too sick to move. They were sick. We had to know their CD4 levels.”

With her years of experience and her strong will, Rama rules the service and the women it provides for, with remarkable ease. She is an unflappable character whose record for upholding the rights of FSWs is widely acknowledged by her colleagues and her patients. Her generally brusque manner has turned some women off, yet the same strong character has also won her respect and loyalty of many others. Every morning the bench outside her office is lined with women seeking her advice or, more often, presenting a problem to her with the hope that she could intervene on their behalf. Over the years, Rama and her

⁷⁰ Guédiawaye is a suburb of Dakar. For more on the challenges of reaching Guédiawaye and other suburbs of Dakar via public transport, see (Sakho 2002).

colleagues have learned about the personal lives and struggles of so many FSWs, and they have diligently fought to get the women in their care access to the resources that they need to be healthy and to provide for their children. One morning while observing at the intake area, one of the social workers was glancing through the registry where the names of the women are recorded when they come in for their visits. Glancing through the names of the folks who had come the day before she said, “Oh! Fama! I can’t believe I missed her. It has been so long since I’ve seen her, and I’ve been thinking about her a lot recently.”

Whether they had worked there for two years or two decades, the social workers knew the names and situations of the individual women that they worked with, and as a team they conferred about how to best help women through the myriad problems that they encountered. In many cases the women needed support through a particularly difficult time, as in the case of one of the FSWs who turned up at the clinic and intimated that her daughter had just committed suicide. Other times, FSWs turn to the social workers as their only allies with enough political power to intercede on their behalf – writing a letter to request the release of a woman wrongly jailed, or showing up in court to defend a woman accused of practicing illegally. In one case, the entire social work staff gathered to address the crisis facing one of the children of a veteran FSW. This woman was a regular at IHS, and the staff was particularly fond of her. She had dutifully put aside the wages that she earned to put all of her children through school. Her daughter was brilliant and studying to become a physician, but due to a recent hospitalization she was unable to sit for one of her exams. Her mother came to the staff at IHS in a panic because neither she nor her daughter was able to convince the administration to allow her to take the examination at a different date. The social workers immediately leapt into action, flipping open their cell phones and calling upon their vast social network until they found someone close enough to the school administration who could intercede on behalf of the young woman.

Clinic veterans had observed and experienced this kind of support from the IHS staff many times over the years. In return, the women became fiercely loyal to the social worker staff and to Rama in particular. This helped operations run smoothly at the clinic, but it provided a particular incentive for researchers working with the FSW population. As Rama explained, the FSWs that she worked with were more than happy to be a part of the study cohort that was set up under the Convention. “The FSWs, they have a lot of confidence in us,” she began. “They are well prepared, there is the informed consent [for enrolling at] the STI center, there is the informed consent for the project. There are the two consents. We don’t do anything without consent.” She continued, “And when we tell them that it is in their best interest, in the interest of the nation itself, it’s not a problem. Because if we do research, it is to find something, to help them. Me, I think that is really what the research is about.”

These loyalties between the FSWs and the staff, and between the staff and researchers, provided the solid foundation for the development of the cohort and a flourishing research project. In Senegal, I was seen as a “member” of Mboup’s laboratory, and thus was integrated into this intricate web of loyalty and reciprocity. When I had first met Rama years ago, I had been introduced to her by Prof. Mboup. When I later proposed my project to her and asked if I could speak with the staff and clients in the clinic, she proudly said, “Hannah, I will get you access to whoever you want.” Indeed, having Rama promoting my project among the FSWs, I had a stream of women willing to share their stories and reflections with me. Of course, helping me was a proxy for helping the Professor. One afternoon she explained to me, “I would do anything for Mboup. In the beginning, when I didn’t have a salary, he believed in the work that I was doing, and he paid me. He paid my salary for a whole year. I am forever grateful to him, so whatever he needs, I am happy to do it.”

The IHS Physicians

The provision of quality medical care certainly plays a vital role in encouraging women to register at the clinics, thereby assuring continuous blood samples for the researchers. Yet the work of the IHS physicians was not merely related to enrollment. The data that they gathered during the clinical visits had direct implications for understanding the natural history of HIV-2. Dr. Ba, a physician who had followed the cohort in the early days of the Convention, recalled the vital importance of their clinical work: “The biologist, he has the material, in other words, the blood samples... but that won’t have any meaning unless you are able to compare them with the actual [physical] state of the person. That is where it gets interesting.” The richness of Senegal’s FSW cohort data set was that in addition to routine blood screening, these women each had abundant files that contained information about their regularly monitored physical and social condition. The physicians who followed the women were provided with technical training on how to compare serological status with the clinical profiles that they were observing. The data that the staff gathered about the FSWs included vast information about their life conditions, including nationality, age, date of cohort entry, years of registration, and number of sexual partners per week, data which was frequently exploited in the Convention’s scientific papers.

For the cohort’s two current physicians, Dr. Ngom and Dr. Wane, this complete and comprehensive care is a priority. Monday through Friday, they are in their small offices, receiving a long line of women who have dutifully reported to their required physical examination. They often arrive early in the morning, around 7am, to begin setting up and seeing patients. They generally wrap up their consultations by 1pm. The two physicians occupy an interesting position at IHS. Following the FSW population at the IHS, a public hospital, the two are carrying out a mandate that is set out by the state in its regulation of prostitution. However, their work is supported by grants and funding secured by Prof. Mboup.

As Dr. Ngom explains, “You know, we’re over there [at IHS], but we are not paid by the Minister of Health... That is a very important thing for you to understand.” He continued, “The work that we do right now, we do it for Senegal, but it is someone else who pays for it. So it’s a little complicated, but that is how it goes. You could go to the Minister, and she could confirm that for you. It is not the Government of Senegal that pays us, it is through projects that we are paid. At first it was Harvard, and now it is CIPRA that has taken over.” Doctors Ngom and Wane have offices at both IHS and LBV, and while they tend to spend more time at IHS these days, when I first met them about ten years ago, they were still faithfully ferrying blood samples every afternoon in the back of Wane’s tiny car from IHS to LBV. As Dr. Ngom explains, “We are really the link between what happens in the clinic, and what happens here in the lab... we are the bridge between the clinic and the laboratory.”

The two physicians look after the full spectrum of the FSWs’ medical needs, providing support and care not only to the women themselves, but to their familial network as well. They regularly provided clinical care for women during regular appointments, but they were also available for consultations any time that a woman fell ill. If a FSW had any concern about her health or general well-being she could drop by the clinic, and Dr. Wane or Dr. Ngom would consult with her. This kind of care was further extended to her familial networks. When a woman’s child was sick, she could immediately bring the child to the clinic for care. If a boyfriend or a husband was ill, they too could be seen for free by Ngom or Wane. The FSWs knew that the physicians and the whole team at IHS were present to support them if they or their families had any difficulties. “They are comfortable with us,” Ngom explained. “It’s not just because we have been there a long time, it is because we have fostered those connections, for any time that they have a health problem, they come to the clinic, or they give us a call. All of the prostitutes have my phone number, my cell phone, and Wane’s number too. So any evenings, any Saturday or Sunday, when they have any health problem on the weekend, they call.”

Indeed, I remember interviewing Dr. Ngom one afternoon in his office at LBV. It was late in the day, and he was at Dantec to go over paperwork in the quiet of his private office. Just as the interview had gotten underway, his cell phone rang. He pulled it out of his pocket, and glancing at the number, politely excused himself to take the call. It was a patient of his on the other end of the line, and as he spoke with her, the high-pitched voice on the other end of the phone gradually fell to a lower, calmer register. He apologized for the interruption and we continued. But a few moments later, he began going over the concerns that his patient had expressed. She was one of the FSWs, and she was on a new medication regimen. She was concerned that the medications she just received at her appointment were different from those that she was supposed to take. He tried to assure her that the generic medications she received were correct, but her concerns were still with him. "I get calls like this all of the time," he explained, "even at night. Most of the women have my cell phone number, and they have Wane's number too. Any time they have a health problem, they call us. They don't hesitate. Those who have money will call us, those who don't have enough will 'beep' us, and we will call them back using our credit... When you leave the clinic, your work isn't over. It has only just begun." A few moments after picking up our conversation, Dr. Ngom apologized to me, and said that he was really concerned that if he didn't meet with his patient, she might stop her treatment. He called her back, bade me goodbye, and then headed back to the clinic to meet her.

In addition to providing regular care to the FSWs and their families, and 'pinch hitting' when any problems arose, the two physicians are also responsible for the blood drawn from the FSWs. Early on in the Natural History project, the group decided that contrary to standard procedures where nurses draw blood, Dr. Wane and Dr. Ngom would be in charge of taking all blood samples from the FSWs. In order to follow the population accurately over time, it was essential that each blood sample be accurately identified with the woman's correct ID number. Dr. Ngom explained that they decided to have the physicians draw and label the blood in order to avoid any errors. "You have the patient," he began, "you know

her, you know her name, you know her number, and when you take a sample, you are sure that it is her [ID] that you put on the tube... but if you have two, three, four patients, and you send them all to a nurse, that person could make a mistake and when that happens... it's catastrophic." So very early on in the project, the group decided that following the medical consultation, the physician would take the blood sample. "The sample stays with you," Ngom explained. "When you come here [to Dantec] at noon, you bring it with you." Arriving at noon at the lab, they then brought the samples to the virology lab for testing. In the early days, before the cohort had become so large, Dr. Wane and Dr. Ngom would finish a full morning of clinic visits, and then they would spend their afternoons at Dantec carefully entering the data that they had gathered from the morning's consultations. They were at once clinicians and data managers, entering all relevant data into the machines, and then making any necessary corrections. Over time, as the number of women consulting at IHS increased, the pace of work was simply untenable. "We were exhausted," Dr. Ngom remembered. Eventually the lab was able to hire some extra personnel to take over the job of data entry and management. This allowed the two to focus more on the clinical aspects of their work, a job that with increased cell phone communication was beginning to become a full time, 7-days-a-week affair. The physicians know that they are the only two people who can provide for the steady stream of sex workers seeking medical care at the IHS. There is not a large clinical staff that can absorb the absence of a doctor for a few days or weeks at a time. "Morally, you can't not go to the [clinic]," Dr. Ngom explained, "you have to be there every morning." The two physicians have taken this to heart, and despite the weariness that occasionally appears across their faces, they haven't taken a vacation in years.

It is not merely the long hours nor the severity of the problems that they encounter that has taken its toll on the two physicians. Being the bridge between the Dantec laboratories and IHS has not been an easy task. Dr. Ngom and Dr. Wane represent the LBV presence within the clinic. One afternoon in his office, Dr. Ngom explained to me the important role that he, Dr. Wane, and their predecessors played as part of the project:

“If Harvard didn’t have representatives at the *Polyclinique*, they would never have been able to make it over there. That’s for sure, because the *Coopération Française* [French Ministry of Cooperation], ANRS[National AIDS Research Agency of France], were so powerful at the [IHS] that they would have done anything to monopolize the cohort as soon as they saw that it was becoming ‘interesting’ to have this cohort, because there were a lot of studies that could be done on the cohort. But they hit a brick wall...because they knew that as long as Wane and me, and before, there was Dr. T., and Dr. S., they knew that there would always be a Harvard presence at the *Institut d’Hygiène Sociale*. So, they couldn’t remove us. It was impossible. They did some projects there, but we kept things in line by making ourselves indispensable. In other words, today, if you work with the female sex workers at the [IHS], if you want to really do good work, you must pass by us. Because we are the ones that the [FSWs] know, we are the ones who see them for their appointments, we see their boyfriends, their husbands, we see their families if necessary. We are the ones who know them. So if you want to come and do a study for two or three months, if you want to do something serious, you can’t do it without contacting us. It is not possible.”

Being the vanguard of Mboup and Harvard’s presence was not an easy task, and it was something that the physicians faced day in and day out. As much as they were viewed as representatives of Harvard, they were nonetheless Senegalese, and this, in addition to the loyalty of the FSWs, conferred them some level of immunity. “We are the ones who are there consulting patients,” Dr. Ngom explained to me. “And we are Senegalese too, like them. They can’t just chase us out of the hospital, it’s not possible. I am sure that if it had been foreigners who had come in and set up shop there, it would have been very easy to say to them, ‘Listen, stop what you are doing because of this or that...’ But Senegalese people like us who are there, who are caring for the Senegalese population, you can’t just say ‘Get out.’” Indeed, these were physicians who were locally trained, who were members of the Senegalese Order of Physicians, and above all, they were offering their services at a public hospital essentially for free. Of course, that doesn’t mean that people didn’t try to stop them from working there. “The people from the European Union, that is to say the French, they did

everything to try to get us out of there... because we represented the Americans, you see? So for them, when they see us over there, it is really the Americans that they see over there, it is Harvard that they see over there. And since there is competition between the French and the Americans, between Harvard and whoever... but with the help of the Professor, we managed to hang on over there at the *Polyclinique*. And today, we are indispensable in the system of following the cohort.”

Concluding remarks

This chapter has explored the various guidelines that regulate the registration of sex workers in Senegal, and it has detailed how these guidelines have established the day-to-day work practices at the *Institut d'Hygiène Sociale*. The experiences of the IHS social workers and physicians demonstrate how the emergence of HIV-2 and the rising scientific importance of the cohort have changed the work of the clinic over time. With the arrival of funds from the Inter-University Convention, social workers such as Rama were able to perform fieldwork visits, extending the surveillance of women to their homes. This ensured a more constant supply of blood samples, and also expanded the range of knowledge about women's social worlds. Funds for HIV-2 research also expanded the capacities of clinical care for the cohort, increasing the provision of medical supplies, and providing further incentives for women to register with the state and to return over the years for continued medical care. This served to expand the number of women enrolled in the registration apparatus, extending the breadth of the state's surveillance of FSWs, and producing a rich archive of social and biological material. Finally, the experiences of the social workers and physicians at IHS have demonstrated how the relationships of care and trust that have been woven between the FSWs, their providers, and the researchers at LBV have played a central role in the distribution of the valuable clinical and biological data garnered from the IHS cohort. The next chapter extends the analysis of this dynamic by exploring the narratives of the female sex workers who are the

objects of the surveillance described here, and the subjects of Senegal's HIV-2 research.

Chapter Six: Regulation and the voices of women getting by

This chapter examines the experiences of the LBV's HIV research subjects: the cohort of female sex workers registered at Dakar's *Institut d'Hygiène Sociale*. The following four narratives are representative of the themes that emerged from observations and interviews at the IHS clinic. Their stories demonstrate that sex work emerges as a viable option for many women seeking to sustain themselves and their families in the face of economic hardship and the dissolution of social networks. They also show that enrollment at the IHS clinic is an important strategy that women employ to mitigate the risks inherent in their work. By situating their experiences within a political-economic framework, it becomes clear that the effectiveness of Senegal's registration system is largely due to the poverty and social vulnerability that narrows the field of opportunities available to women seeking to support their families. In short, women are compelled to register as sex workers in part because of the enduring systemic, social and economic inequalities that mark contemporary life in Senegal. Registration permits women to work legally and avoid the fines and prison sentences associated with practicing sex work *sans carnet*. By fostering relationships with the IHS staff, registration also affords women the opportunity to rebuild their fractured social networks and gain access to the NGOs and other resources that can help them cobble together a reasonable safety net that includes basic nutrition, medical care, and schooling for their children. This unique combination of politics, policies and poverty resulted in a ready-made cohort for the study of HIV-2 in Senegal. To situate the IHS cohort within a broader context of sex work in Senegal, the chapter concludes with an examination of Dakar's widespread phenomenon of clandestine prostitution.

Astou

Astou⁷¹ provided Rama with her national identity card and four photographs more than twenty years ago when she came to register at the IHS in 1987. Astou has been an active member of the sex worker community for the past twenty years, and today is one of the older, more respected women in the cohort. When we sit down to chat in the quiet of Rama's office, she is quick to place herself within an even longer lineage of female sex workers. "You know," she began, "the control [of prostitutes] has been around for a long time. This center has been around for a long time. There are people here who are the children or grandchildren now, going about their business. They are the real old ones. But the truth is that Senegal has always shown respect for health. Research has always been respected."

Twenty years ago Astou found herself unable to provide for her family's needs. Her first husband had died, she divorced her second husband, and she found herself the sole provider for her three children. "My mother didn't have any sons," Astou explained. As the eldest of three daughters, she assumed responsibility for the family well-being, a role that normally would fall on the shoulders of an elder brother. "I had to be both the woman and the man; they were entirely dependent upon me." Astou's family was already bereft of the familial safety net that many Senegalese are able to turn to in times of need. "My mother was Gambian. She came from The Gambia to marry my father... Since she turned her back on her family to come and marry my father, she had nobody to turn to." In addition to supporting her three children, Astou had to support her elderly mother. "That's why I got into this," she explained to me. "I don't enjoy it, I don't like it, but I was forced to do it to have a little something to help support my mother and my family."

⁷¹ The names of the women in this section have been changed to preserve their anonymity.

Each woman that I spoke with had a similar story, adding her experience of poverty and hardship to a growing litany of vulnerability. Many had never gone to school, and when spouses died or bad marriages collapsed, they were left with nothing. While many were born in Senegal, some had crossed borders in the hopes of finding a better life in Dakar, far away from civil strife, drought, or desperate families. As one woman explained, “The women who come here it is because they have no other source of income that they come to get their *carnet sanitaire*. Otherwise, they would never go into prostitution. To watch out for children, to put food on the table, to give them a place to sleep... that is why a woman goes out. In the [absence] of other possibilities, women go out and do it.”

Astou is proud that her income allowed her to feed, clothe, and house her children and her mother. While she is very clear about the sacrifices that this work has entailed, she praises God for having been given the opportunity to provide for her family members. Of course, she is adamant that her path hadn't always been so clear. “Before, I would spend the night in a hotel and arrive at the hospital with powder dripping down my face, lipstick smudged, and my hair all over the place. I came sometimes with my pants all wet, sometimes smelling of urine.” Rama knew her story and her background, and she worked closely with her, exhorting her to be courageous and determined, and to stay on a path that would support her family. Rama was very explicit. She told Astou to stay clear of drugs and alcohol, and warned her to never forget her mother and children whenever money passed through her hands. “Since she gave me my carnet, I have never deviated from these recommendations,” Astou announced to me proudly. Over the years, she directed her earnings towards paying the bills, and importantly, paying her children's school fees. Every one of her children has completed their studies.

For Astou, the education that she received from Rama and the IHS staff extended beyond condom use and STIs. They helped her learn how to stay out of prison and taught her how to manage her practice, so as to avoid any problems

with her clients. The IHS staff also helped Astou her to reinvent herself physically and emotionally. Recalling her disheveled appearance of earlier days, she says, “Now, I take a bath, I wear respectable traditional clothing. Who would be able to guess that I have been in a bar? Nobody.” Through Rama’s help, she has engaged in a process of self-renewal. “Every day I pretend not to understand something,” she admits, “so that they will offer me more advice, which helps me to build my knowledge capital (*capital de connaissances*). That way, tomorrow I will be more equipped to manage my family, to know how to behave around my neighbors, to know how to talk to everyone. I want to demonstrate better behavior than I did before.”

Rama has been the leading figure in Astou’s re-birth within the clinic. “Everyone knows me. They say that I am Rama’s daughter. Really, she is a mother to me. She is my mother.” She explains that for many patients who come to the IHS, the personnel become mother or father figures. “Especially for me,” she notes. “All of the doors are open to me in the hospital. Wherever I go people say, ‘Oh, there is Rama’s daughter.’ That is important. It allows me to meet new people. Some of [those people] I had only ever seen on television. Now, I speak with them, and participate in seminars alongside them.” By entering into a fictional family relationship with Rama, Astou has been able to benefit from Rama’s connections and her status within the Senegal’s HIV community. As part of her familial association with Rama, Astou pledges her unyielding support for the social worker. In a statement of complete devotion, Astou explained to me, “If she wants, I will go all the way to Tamba⁷² with my own money, without asking why.” In return for this blind dedication, Astou is conferred the special status that gains her entry into political meetings where she is the voice of FSWs. She also has access to Rama’s network of NGOs, which provides very practical assistance to women living in vulnerable situations. By registering and establishing a relationship with Rama, Astou found out about AWA, an NGO that

⁷² Tamba, short for Tambacounda, is a city in the far eastern region of Senegal. A trek to Tambacounda is extremely tiring, as it is several days’ journey along broken roads across the hot, dusty savannah. Nobody would undertake this arduous journey without good reason.

Rama and colleagues founded in 1993 to meet the needs of Dakar's female sex workers. Women who are officially registered are eligible to join AWA, and for a membership fee of 1,000 CFA (about 2 USD), they are able to take advantage of all of the benefits of membership. The group's activities include education about HIV and STI prevention, and psycho-social and nutritional support⁷³.

When speaking with the FSWs themselves, it is clear that the most important assistance that the group offers is financial help. Today, without the support of the Convention or Harvard, monies are slim at IHS. Where medications were once provided freely to all registered women, today they have to purchase medications themselves. There has been no corresponding shift in policy, and when women are diagnosed with an STI at the IHS clinic, her *carnet* is still withheld until she can show a social worker that she purchased the medication prescribed to her by the IHS physician. The NGO AWA has emerged to fill this medication gap that was left behind when research partners withdrew funding from the cohort study. When a woman receives a prescription that she cannot afford, she can bring it to AWA and the group will pay for the cost of the medication.

Rama's latest endeavor is a group called the *Appui et Assistance aux Enfants en Situation Difficile* (Aid and Assistance for Vulnerable Children) (AASED), which is designed to help orphans and vulnerable children. Rama founded the organization in order to ensure that the children of the FSWs that she worked with at IHS, and those who had died from AIDS leaving their children behind, would be able to receive an education. The association's mission broadly applies to all children infected and affected by HIV, but the group focuses in large measure on helping the children of women who are registered at IHS. The group runs a small kindergarten in a building across the street from IHS, where they also distribute pediatric medications for children enrolled with AASED. The groups host events throughout the year, such as toy drives for the annual Christmas party,

⁷³ When I asked one woman the role that AWA played in her life, she responded with three words: Rice, Milk, and Lentils.

but the organization's primary goal is the promotion of education. Working with FSWs for so long, Rama knows that one of their primary concerns is paying for their children's schooling. In Senegal, a family must pay to send their children to public school. In addition to school fees, children need school supplies and a school smock in order to attend classes. As a result, many FSWs who struggle simply to feed their families are unable to afford to send their children to school. With funding from the World Bank and HACI (the Hope for African Children Initiative), AASED is able to pay for all school fees and supplies for the children of the FSWs followed at IHS.

Twenty years of active work in the sex trade has taken its toll on Astou. She tires easily now, and isn't able to keep up the practice of sex work like she once could. Fortunately, through her connection with AWA and other NGOs, she is able to receive 30,000 CFA (about 60 dollars) in aid each month, which she uses to pay for her rent, and provide food for her family. Her remaining expenses include electricity and water bills for her family, which she pays for by doing a little bit of trade at the market. With the financial help of NGOs, she has been able to leave active sex work behind. This aid is particularly helpful for older women. As one of Astou's colleagues explained to me, "I'm no longer as active as I used to be. When I was younger, I could hold out until dawn. But now, once 11pm or midnight hits, I go back home. Sometimes a month will go by, and I haven't gone out. So, I just don't have the same resources." In addition to stamina, older women have a more difficult time attracting high-paying clients. Another colleague explained that women as young as thirteen are "going out" in more numbers, resulting in stiff competition for clients. Astou, like many of the older women attending registered at IHS, is still adamant about making her regular appointments at the clinic. For it is Astou's up-to-date *carnet* that affords her the right to regular medical care, a seat at policy meetings, regular visits with her IHS community, and ironically, her membership with the very NGOs that have afforded her the opportunity to retire from active sex work.

Bintou

Bintou's story added to the litany of tragedy that most women at IHS faced in their early lives. She had never attended school, so when her marriage failed, she was left with few choices and a family to feed. Like many of her colleagues, Bintou had been registered with IHS since the early days of the convention. Citing one of the first physicians to follow the cohort, she proudly told me, "I was here back when Dr. T. was here. Now he is in the United States." Indeed, while Bintou had regularly been attending her clinic visits at IHS, Dr. T. had faithfully served the clinic for more than six years, then with his experience gone on to build a career at some of America's finest institutions including Harvard University and the Gates Foundation. As an early member of the FSW cohort, and an active member of HIV prevention campaigns, Bintou considers herself to have played a central role in stemming HIV infection among sex workers. "You know, the HIV virus was very widespread in Senegal once. If we had just stayed with our arms crossed, it would have become a more significant problem. Our determination to fight it, the information given by our physicians on the existence of the disease, and the education to put a stop to it... I think that this research was an excellent thing. It happens that you will hear someone complain about having to have their blood taken, that they take so much blood and that they will say that they are going to sell it... nothing is sold. They take a bit of blood in a vial... So, they take care of us."

For Bintou, these blood tests are the very point of registering with the state. In Senegal, most FSWs operate independently, setting their own hours, and working wherever they choose⁷⁴. A few special bars help to set up clients with particular women, but for the most part women work independently, without the role of a specific intermediary (Ndoye 1995). Bintou solicits clients independently, and therefore travels quite a bit, for personal and professional

⁷⁴ Unregistered FSWs working in the *banlieux* of Dakar often solicit clients on the street. Among registered female sex workers, one survey estimates that 70% of women officially registered with the state solicit clients in bars and clubs (Homaifar and Wasik 2005).

reasons. She often spends a few weeks in the resort town of Mbour, in search of business, and will also occasionally head out to Diourbel or Seikbhotane to visit family. Rather than travel all the way back to Dakar to consult at IHS, when the deadline for her appointment draws near she will sometimes drop in for an appointment at another STI center. Any STI clinic can update her card, but she explains that the other clinics do not provide the same quality of service. At other centers, she explains to me, you could get away with sending someone along in your stead, because they do not provide a full gynecological exam and blood work-up. “I could give you my papers,” she laughed, “and you could get them done for me!”

While the quick and easy visit may be a draw for someone, Bintou values the thorough nature of the visits at IHS. She regularly has to undergo complete gynecological exams and blood work-ups. If an STI is detected, her *carnet* is withheld until she can provide proof of treatment. Another woman outlined how things worked at IHS:

“Let’s say you do a complete visit today... today is Thursday. The carnet will be held until Monday. You have to wait for your results. For some people that doesn’t work, because they will get picked up by the police as soon as they leave. But in Mbour, they do the visit and get their carnet back right away. Same in Pikine. You know, that is not a good thing. That is why all of them women go to Mbour... Here, on the other hand, they hold your carnet for the test, whereas there, they let you go right away with the carnet. They hold your card so you can’t go out.”

These strict regulations certainly deter some, and the staff at IHS has reported that they have lost a certain number of women to other clinics viewed by the FSW community as more lenient. But for Bintou and many of the IHS veterans, strict regulations are proof of the quality of care that they receive at IHS. As one of Bintou’s colleagues explained to me, “There [at the other clinics] they give you the prescription and your card at the same time, so those who are negligent like me will just let the prescriptions, and the disease, pile up.”

For the majority of women that I spoke with, the medical care that they received at IHS was the primary reason for registering with the state. They were well aware of the risks that their work exposed them to, and without any means to pay for their own medical visits, the IHS doctors were their only hope for quality medical care. Women enrolled at IHS were keenly aware that they were always just a few days away from losing their apartment or not being able to put food on the table. Debts piled up easily, and if a woman had to serve a jail sentence for an expired *carnet*, or business was simply bad for a few days, many had to resort to asking for items on credit from the corner shopkeeper to put dinner on the table. Living hand to mouth (and for many women there are a lot of mouths to feed), it was nearly impossible to think about saving any money. Even employed Senegalese with steady incomes saw their paychecks drain away with weddings and baptisms seemingly every week, and the constant financial demands of family members in need. As one woman lamented, “Every cent we earn, we just end up spending. You can wake up in the morning with 30,000 CFA, and by evening have no idea where it went. There are too many problems.” While some women may have the good fortune of soliciting wealthier clients, there are some FSWs in Dakar who report earning as little as 1,500 CFA (3 USD) per day for their services (Homaifar and Wasik 2005).

For these women, the only kind of long-term investment that they could make was in their health. As one of Bintou’s colleagues explained to me, “The blood tests, treatments, and the advice that we receive, that lets us take care of our health... [you have] to know just how much your body can take, because a woman who goes out is not the same as a woman who is just with her husband. For us, our body never rests. This fact, of being taken over and over again, it is what makes us wither away.” For her, the monthly exams, and the blood tests, were a long-term strategy for protecting the only assets that she possessed.

Coumba

Like her colleagues, Coumba came to the profession, and to IHS, following her divorce from her husband. She has been registered with IHS for ten years, and like most women, entered the profession to provide for her children. She was fiercely proud of being able to care for her family, but she was still wary about the various dangers that were inherent in the profession, and the risks that she took on by registering with the state. While women expressed the hope that they would one day find a husband who could lift them out of their current situation, and provide them the opportunity to disbar their registration and start anew, Coumba was a bit more realistic. “You have to be careful,” she explained to me. “Because men, they are bastards. Taking on a lover... that is what will bring catastrophe into your life. In general, women who have partners are the ones who get sick. With a stranger, you propose a condom, if he says okay, great, if not, then each of you go your separate ways. But a lover will never accept a condom. That is why there is so much disease.” She concluded, “Married women, God alone protects them. Because their husbands are not faithful. At night, they take their car and go and find girls in the street. There are all kinds in this country.”

Unable to sustain the hope of marriage as an exit-strategy, and lacking any financial or social resources for finding alternative work, Coumba saw sex work and a *carnet* as her only option. The *carnet* helped her to mitigate some of the dangers inherent in her profession. Beyond the provision of health care, the booklet provided access to some of the more safe places to practice sex work. With bouncers and bartenders, clubs and bars provided some measure of protection from clients who could be violent or try to cheat her out of her pay. Of course, to get into the bars where clients could be found, a woman had to present an up-to-date *carnet* to the police who frequently planted themselves at the door to monitor the women. Without a *carnet*, a woman had to take her chances on the streets. “When you are in the streets anything can happen to you,”

Coumba explained. “A *djinné*⁷⁵ can cause you to develop psychological problems. You could get killed by a hoodlum. You aren’t safe... That is why it is better to have a *carnet*.”

Coumba wasn’t the only women to warn me about the dangers of running into a *djinné* while soliciting clients at night. As one woman explained, “You can meet anyone out there... you are going out with strangers. So, you don’t know if the [person] is a *djinné*, an evil spirit, a bandit...” The *djinné* are Islamic spirits that share the physical world with humans, and have the capacity to induce mental illness. The Dakar School’s⁷⁶ form of ethnopsychiatry presented spirits such as the *djinné* as locally-salient cultural signifiers. According to their work, these spirits were a culturally sanctioned mechanism for exteriorizing an internal problem of conflict. By placing these conflicts within contemporary social and political contexts, members of the Dakar School developed an innovative approach to ethnopsychiatry that explored how illness could be linked with a disruption of the social order that stemmed from widespread social change (Collomb 1966; Zempléni 1969; Ortigues 1984).

⁷⁵ Collomb described the *djinné* as “a neutral spirit, but one that can be dangerous if you meet it and are not equipped with certain protections or precautions. The *djinné* can be an ally; giving strength of knowledge. It can also be an enemy or an aggressor, using its strength or knowledge against an individual or a healer” (Collomb 1975). *Djinné* are frequently associated with mental illness.

⁷⁶ The Dakar school refers to an interdisciplinary team of psychologists, ethnographers and other health providers who worked at the Fann Psychiatric Unit in Dakar, Senegal. The Fann Psychiatric Hospital was originally founded in 1956 as a psychiatric asylum, but was transformed two years later into a social psychiatric facility under the tenure of Henri Collomb. The publication of the journal *Psychopathologie Africaine* extended the influence of the Dakar School throughout the Francophone world of ethnopsychiatry. The Dakar School began their work in 1958, at the cusp of the era of independence in Senegal. Against this backdrop, researchers examined questions relating to emerging selves within the postcolonial Senegalese context. Specifically, Collomb and colleagues were interested in how the individual related to society, and how this relationship would shape the expression of the developing self. To respond to this question, and indeed to perform any measure of psychiatric care, Collomb recognized that the group needed to understand what was then referred to as ‘traditional’ healing practices in Senegal. The clinical practice and scholarly research that emerged from Fann was the product of an intricately woven combination of clinical and ethnographic methods which resulted in richly contextualized accounts of illness that interpreted symptoms through the use of local cultural signifiers.

Djinnés have recently made front page headlines in Dakar as a host of young girls in high schools and colleges across Senegal have fallen prey in the middle of class to these bouts of “hysteria” induced by *djinnés*. These attacks have inspired public debate about how youngsters are being adversely affected by contemporary social change in Dakar. In an effort to explain the recent attacks, one local religious leader stated that the *djinné* are becoming more active because of the new “galloping urbanization and housing frenzy, which has brought humans to occupy zones where previously only the *djinné* lived”(Ndiaye 2008). The *djinné* are important contemporary signifiers for indicating the risk that comes with transgression, with a situation that is out of control. Dakar’s rapid expansion is placing pressure on a city already bursting at the seams. Geographically, there is no room for expansion on the narrow peninsula, and yet people continue to arrive from the countryside and from abroad. The city’s crumbling infrastructure is increasingly crippled under the weight of so many new occupants, all desperate to trade hunger and poverty for the dreams of opportunity in the city. Despite the luster of a few illusory new public projects, the job market in the public and private sector is abysmal. Out of sheer desperation, people are finding themselves resorting to ever-more dangerous ways of scraping together a living. By invoking the specter of the *djinné*, Coumba and her colleagues are employing a readily available cultural signifier to express their fear and reticence about the danger involved in soliciting clients. Like so many of Dakar’s underclass, these women are forced every night into situations that go against their better judgment about what it means to lead a safe and morally upstanding life. The *carnet* emerges as a form of protection from the *djinné*. It allows women to work in ‘known’ places, such as bars and clubs, and it allows them to learn about their trade through educational meetings, and above all, know about their bodies through regular testing.

Dieyneba

Dieyneba, another veteran of IHS who has been attending the clinic for more than twenty years, echoed Bintou's praise for the place. "I enrolled here first," she explained, "and I have never thought of switching to another clinic. Here is always good – maybe it's because they are researchers – but I prefer to come here." Dieyneba is quite clear about the physical risks of sex work, and she views the visits at IHS as indispensable in mitigating those risks. "You can be sick and not even know it. Only a physician can really know it and prescribe a treatment for you that will help you from contaminating someone else." For Dieyneba, the blood tests are what truly keep her coming back. "When they take the blood, they bring it to a laboratory to be examined, to see if there are any diseases... it would be catastrophic if there weren't any blood tests." The *carnet* is the only way that she could access such services and learn whether her work has exposed her to any new diseases. "People are not created the same," she explained to me plainly. "Without the *carnet*, how would I get care? The *carnet* is important. Nobody wants to get into this line of work. We are all dreaming about getting married, or finding an alternative way to get by. But we don't have that, so we prostitute ourselves, and it is better to have a *carnet*."

While many women are outspoken about the benefits of signing up for the card (including medical care for themselves and their children), a set of rumors that have gained credence among women at IHS express an ambivalence toward the system that few spoke of directly. The first set of rumors centers around the general theme that once you sign up for a *carnet* you relinquish your right to leave the country. Few women apply for passports or other state documentation, so when a woman applies for her *carnet* it is frequently the first time that she has provided the state with such intimate details as her official name, address, personal information, and photograph. Women can see the photographs that are affixed to their *carnet* and to their IHS file, but the other photograph disappears from view to be kept on file at the Central Police Office. Even Dieyneba, who

had been a part of the state system of registration for more than twenty years, expressed concern about the potential consequences of registration. She explained, “When you are photographed for your file, people say that you can’t emigrate, or that your children won’t even be able to leave, because they will say, ‘this is the child of a woman who has led a bad life.’” When I asked if she gave any credence to this rumor she said, “Our photos are at the central police station, aren’t they? I just don’t know...” Other rumors focused on how registration could affect the life of one’s children. One rumor that circulated among the woman was that when you signed up for a *carnet* you forfeited your children’s right to emigrate. This is a particularly fearsome prospect, as many families in Senegal are able to get by on overseas remittances that are sent to them by a child who managed to ‘escape’⁷⁷ Senegal and find work abroad. Another rumor adds a slightly different twist: when a woman registers as a sex worker, it is said that her children could be denied access to a formal job.

These rumors are a powerful testament to the insecurity that marks these women’s lives. The unemployment rate in Senegal is just shy of 50% (as of 2007, CIA 2009), and even graduates of the country’s elite institution of higher education are struggling to find any form of formal employment⁷⁸. In such an

⁷⁷ There is a long history of emigration of Senegalese workers overseas. Migration of Senegal’s Murid traders has been widely documented i.e.(Diouf 2000; Babou 2002), as has the effects of remittances on family life in Senegal (Buggenhagen 2001). The most recent twist in Senegal’s history of migration is the increase in illegal immigration to Europe. Over the past few years, young men have been leaving from the shores of Senegal and Mauritania in small boats to brave the open seas of the Atlantic ocean in the hopes of reaching the Canary islands. While many die during the perilous crossing, thousands reach the shores of the Spanish islands as a kind of back-door passage into the EU, 30,000 arriving in 2006 alone (Buschschluter 2009). This has become big business for the human smugglers ferrying these folks to the ports of Los Cristianos, Tenerife and Gran Canaria. It is estimated that one in three of these boats do not survive the perilous 500 mile journey. Under Spain’s immigration laws, migrants can be held for just 40 days, after which time, they may be repatriated, or in some cases, flown to mainland Spain and released without papers. In 2007, the interior ministers of Spain and Senegal signed an agreement to bolster education centers to train Senegalese youth in jobs that were identified as priorities for the Spanish economy. The program was expanded in 2008, and patrols were tightened, leading to a significant drop in illegal immigration. The new \$3.2 million Sea Horse Network of satellite systems established in 2009 will likely close the door on this option of migration, as these high-speed satellites can track even small fishing boats.

⁷⁸ Misty Bastian’s work on witchcraft on Nigerian college campuses illustrates the challenges facing Africa’s educated youth. She explains that educated and unemployed young men are

environment, women who have been cut out of the educational system⁷⁹ and the social networks that control the meager job market stand little chance of finding formal employment. The same educational and social network gap also precludes the possibility of getting by on informal work, such as setting up a stand in the market, or hair braiding. Even these humble jobs require access to start-up money that most women can never obtain, or which, when in their grasp for a moment dissolves quickly into food for their children. In every sense, these women are stuck in sex work. It is little surprise that the *carnet*, the symbol of their profession⁸⁰, becomes the centerpiece in rumors that express anxieties about movement – movement out of the country, or movement out of poverty.

Rumors about children of FSWs being barred from leaving Senegal, or denied formal jobs also provides women with a way to express their distress about the stunted possibilities that they see for themselves and their families. Anthropologists and social historians have demonstrated that gossip is also an important way for those without a formal political voice to express resistance, dissent, or simply uneasiness about their current life situation. Rumors during the colonial period were a way for Africans to express dissatisfaction with the colonial project. They provided a forum for African subjects to express their anxieties about the very real dangers posed by colonial penetration and the forceful introduction of a market capitalist system (White 1993; Burke 1996). For example, vampire accusations in Uganda increased as state medicine began to

increasingly turning to occult practices that she refers to as “postgraduate violence” (Bastian 2001:81). In the absence of the rewards promised by a college education, Nigerian youth turn to one of the few forms of post-bac survival: occult violence. College campuses remain the bastion of independence-era modernity, yet as Bastian explains, the modern figure of the intellectual college man in Nigeria no longer rises in prominence through his degree, but through the occult powers that he has learned to manipulate during his college years.

⁷⁹ According to Homaifar and Wasik, 25% of the Senegalese registered sex workers that they interviewed had no schooling, 25% had only completed an elementary level of education, and 41.7% completed a few years of secondary school (Homaifar and Wasik 2005).

⁸⁰ The *carnet* is both a deeply personal admission of their profession, and an outward demonstration of it to the world. Stuffed in envelopes, and shoved deeply into the bottoms of purses that never leave their side, most women guard their *carnets* carefully out of sight. “When you have a carnet,” one woman explained to me, “it’s like you advertise that you are a sex worker. If [someone sees it] it’s like you can no longer hide your profession.”

introduce powerful new technologies, such as x-rays, that rendered the private interior of the African body increasingly visible to colonial power (White 1995). In situations where outright planned actions such as collective protests were untenable, gossip and rumors became an important mode of expressing embodied distress and dissent (Janzen and Arkininstall 1978; Porter 1985).

For women like Dieyneba, these rumors provide a venue for expressing the ambivalence that marks their everyday lives. Most of the women at IHS have entered the profession in order to provide for their children, and they are fiercely proud of being able to care for their families. Yet, they also feel ashamed of their work, and feel powerless in protecting their family from this stigma. One woman explained that if she didn't register and was caught working more than once, the police would report directly to her parents. "Yes!" she exclaimed, "They ask you questions to know where your parents are. And they will go and inform themselves... they can go to the *chef de quartier*⁸¹ and he will give them the exact address. They bring your parents to the police office, and they inform them there [that you are a prostitute]." The *carnet* protects women from this form of exposure, but by formally registering with the state, a woman opens herself up to a different, more permanent form of risk. As one FSW explained to me, even if you are eventually able to pull yourself out of the profession, there will always be residual evidence of your life as a sex worker. "It leaves behind traces... that's what I've heard. If you have a *parent*⁸² who is a man of the law, he can always find traces in the archives." Through these rumors, women demonstrate the impossible decisions that they are faced with. As women with few resources and significant responsibilities, they must weigh the risks of clandestine sex work against the risks of officially registering. As one woman explained, "We are mothers of families. Whatever we do, it is for our children. If they make us lose

⁸¹ Every neighborhood in Dakar has a *chef de quartier* who is generally a local elder who speaks on behalf of the neighborhood's residents.

⁸² "Parent" in this sense does not refer simply to one's mother or father, but to any elder member of a woman's social network.

our dignity in front of our children, it really isn't worth it. But we can't stand around doing nothing, because we must take care of our kids.”

Clandestine Prostitution

While much of this work has focused on Senegal's FSW population as a focus for research, it is important to note that sex workers have also been the subject of much public health concern as well. Senegal's HIV epidemic is classified as concentrated, in the sense that the country has an overall low HIV rate among the general adult population (0.7%), and higher rates of HIV among specific risk groups (Ndiaye 2005). Key among these risk groups are Senegal's female sex workers. The most recent surveillance data reports that Senegal's registered FSWs have an overall infection rate of 19.8% (CNLS 2008)⁸³. These numbers are significantly higher than the statistics gathered in the late 1980s, when fewer than 10% of registered FSWs were infected with HIV. This overall increase in HIV infections corresponds to a general shift in the type of HIV affecting the population. Whereas FSWs in the mid to late 1980s were infected almost exclusively with HIV-2, today, the majority of FSWs are infected with the more virulent HIV-1 (Kanki and De Cock 1994; Kanki, Travers et al. 1994; van der Loeff, Awasana et al. 2006)⁸⁴. In accordance with this trend, women 50 years of age and older tend to have higher rates of HIV-2 infection, compared to women in their 20s (Wang, Yamataka et al. 2007). In light of the high prevalence rates among these women, female sex workers (Kaptue, Zekeng et al. 1991; Kitabu 1992) and their clients (Espirito Santo and Etheredge 2002; do Espirito Santo and Etheredge 2003) have been identified as “bridge” populations, with the potential to spread infection to the general population.

⁸³ HIV infections differ across geographical areas. For example, registered FSWs in Dakar have an infection rate of 19.4% whereas registered FSWs in Ziguinchor are reporting a 29% infection rate.

⁸⁴ Interestingly, evidence that HIV-1 is more highly infectious than HIV-2 comes from this very population (see, for example the mathematical modeling of transmission rates in Donnelly et al. 1993 (Donnelly 1993)).

The Senegalese state has made significant strides in the more flashy arenas of HIV prevention and care, such as the president's campaigns for free antiretroviral therapy. All the while, the very mundane, but epidemiologically significant sex worker population has been left to operate according to the status quo. Perhaps this is because the FSW cohort had been carved out largely as the responsibility of Mboup and his American colleagues. When these colleagues left to pursue research in other higher-prevalence areas of Africa, the LBV's capacity to sustain their work at the IHS was vastly diminished. Similarly, the state has been unable to sustain any meaningful interventions among one of the most invisible risk population of them all: clandestine sex workers. As we will see in this section, Senegal's health infrastructure was not designed to handle the new challenge of clandestine sex work, and the specter of infection that it poses. While there is interest and recognition among Senegal's HIV professionals that the "clandestine problem" must be addressed, a crumbling health system has let these women slip through the cracks. As Harvard did almost three decades ago, a non-governmental entity (less research-driven and admittedly much less academically august), has stepped in to patch together some semblance of care for Senegal's unregistered, clandestine female sex workers.

While the team at IHS provides registered sex workers with important health and social resources, the majority of sex workers in Senegal practice without registering with the state⁸⁵. In an effort to understand the health risks faced by this population, the Senegalese Ministry of Health conducted a survey in 2000 where they tested over 200 unregistered sex workers for HIV. The report concluded that STIs were high among the group, and that the HIV prevalence among those tested was 14% (Unregistered Night Ladies 2001). These women who fall outside the periphery of the state's registration system had long suffered without access to any special health resources. A few years ago the NGO

⁸⁵ It is estimated that more than 80% of the women who engage in transactional sex are not formally registered with the state.

ENDA⁸⁶ Santé organized an intervention project that targeted young women practicing clandestinely in Dakar's suburbs. Today, this group works with nearly 1,500 women who engage in the sex trade, but for a host of reasons, are not formally registered with the state.

The organization's director, Aziz, sat down with me one afternoon to explain why the group had begun to plan interventions with these women. "It was very important that we started working with this group of sex workers," he explained. "They are a very vulnerable group and the research that has been done with the [IHS] cohort has given us a lot of information, not the least of which is the discovery of HIV-2. But, when the system [that legalizes prostitution] was put in place, it was not for AIDS, it was for STIs. At the time, a FSW could register when she was 21 years old, as that was the legal age. Now, a lot of things have changed, and younger women are becoming more sexually active – we are starting to see girls getting pregnant at 13 years old."

Senegalese law has changed since the 1960s, the time that that the *Code Pénal* which governs prostitution was written. The age of majority in Senegal is now 18 years of age, and Senegal's *Code de la Famille* stipulates that a girl has the right to marry when she reaches the age of 16. "Our customs, our values stipulate that girls often marry before they are 16. Now we have statistics to prove this," he continues. The country had just recently completed its Demographic and Health Survey (DHS). This massive undertaking examined health and demography at the household level. Requested by the Minister of Health, the DHS survey was funded in part by the state, but also in large measure by development partners, including technical support from Macro International, a market research firm that works on behalf of USAID to conduct demographic and health surveys. "If you look at the DHS," Aziz explained, "the part that is dedicated to youth sexuality indicates that the age of first sexual activity is very young."

⁸⁶ ENDA is an acronym for *Environnement et Développement du Tiers-Monde*.

Most of the clandestine sex workers that *ENDA Santé* works with are under the age of 21. Too young to register, these women are absent from the research that is carried out on Senegal's official sex worker population. With great concern Aziz explains, "These women are not registered, so they don't benefit from being studied, and they don't get any information." Places that are intended to provide for FSWs, like the IHS, are only for women who are officially registered. "If 80% of the FSWs are not registered, it means that they do not have systematic access to medical care," he explains. Furthermore, Aziz explains that these women's biological profiles are not well understood, because they are too young to officially register. "There is some very important biomedical information that you could have on these other FSWs, but since you can only follow those who are registered, you miss out on a lot."

Some women who are of age to officially register also elect not to open up a file with the state. For some, the problem is the location of the STI centers. Women have explained to Aziz and his staff that they haven't registered because the location of the STI centers is well known to the general population, and the women worry that they will be spotted heading into the clinic and labeled as a sex worker. Furthermore, IHS is located in the Medina, near the downtown area. Most of the women who work in the sex trade practice in the poorer suburbs, so regular trips to the IHS are extremely difficult for them. When the STI clinic was established most of the activity surrounding the sex trade occurred downtown. But as Dakar has expanded, and the economically vulnerable have been forced ever further away from the downtown core, the epicenter of the sex trade has shifted to the suburbs. For Aziz and others seeking to provide care to sex workers, geographic location is a considerable hurdle. On the one hand, women do not want to be recognized, and would therefore not attend a clinic in their neighborhood. On the other hand, travel to the downtown core is both time-consuming and costly, and is a significant deterrent for women who are already economically marginalized and frequently overburdened by family and work responsibilities. "The suburbs are not prepared to prepared to handle the [care] of FSWs," Aziz admitted.

ENDA Santé's mandate is certainly geared towards public health interventions, but the organization's inclination leans towards the social sciences. Before beginning any medical interventions, *ENDA* sent its social workers and sociologists to begin working with the FSWs to identify the women that they intended to help, and to explain the benefits of registering with *ENDA's* new program. In preparation for their outreach with clandestine sex workers, the group did a lot of qualitative work to understand why the current system of registration was not working for most of Dakar's practicing sex workers. In addition to the significant hurdle of age requirements, a few women indicated that they found the care at IHS disagreeable, citing long wait periods and lack of respect. More often though, Aziz explained to me, women didn't want to go to the STI clinic because it forced them to accept that they were female sex workers, whereas many view their work as a kind of petty trade. Registration was a form of confirmation of their identity as a sex worker.

As an NGO, *ENDA Santé* was clear about its mission. They were not a state organization, and were not interested in controlling and monitoring the FSWs. They simply wanted to provide care to the FSWs whose needs were not addressed by the existing centers. "We couldn't expect women to come to us," Aziz explained, "we had to go to them. So, we decided to put into place mobile clinics... In the evenings, we go to the zones where FSWs are living and working, and we offer them the same care that they would receive at IHS. We give them exactly the same kind of care." The population that *ENDA's* mobile clinic follows is fundamentally different from the women registered at IHS. Whereas the women who are registered at the IHS are older (an average of about 35 years old), the *ENDA Santé* group is much younger, with an average age of about 24 years old. The *ENDA* method is much more appealing to younger women who, by and large, are just starting to work as FSWs. Most of the women who register end up formally registering only do so after about ten years of informal sex work. The *ENDA* model steps in to provide care in the early part of a woman's career as a FSW, providing for a population of women who are rather unsure about sex work. "This is a very sensitive time [for them]," explains Aziz. "The women

herself does not know what to do. She often doesn't self-identify as a FSW, and as a result she doesn't have access to medical care, or information.”

In describing *ENDA*'s program, Aziz emphasizes that the many ways that their outreach program differs from the state's official registration process. He explicitly noted that while their units tested women for HIV and STIs, the blood that they drew was not archived or used for biomedical research in any way. The women are regularly tested for HIV, and if they test positive, they are referred to one of the public hospitals, and if they are put on ARVs, *ENDA* pays for all of the medications that are not already covered by ISAARV, Senegal's national ARV therapy program. While the group cares for one of the state's most at-risk populations, *ENDA*'s work with the clandestine FSWs does not come from the state, but from a host of independent funding agencies⁸⁷.

A carnet calculus

The narratives presented here bring another dimension of the HIV-2 research apparatus into focus by detailing how the scientific “gold mine” of blood samples stored at the LBV was largely built upon the systemic inequalities that mark everyday life in Senegal. They have shown that as social networks dissolve, many women have had to turn to sex work to support themselves and their families. By registering with the IHS and complying with the set of regulations established by the state and enacted in the clinic, women are able to enter into a new web of social relations that provide them with a certain measure of stability. The green *carnet* officially provides assurance against police raids, and as these narratives reveal, that *carnet* also provides them with access to medical care as well as food and educational support for their families. Of course, the rumors that circulate among sex workers demonstrate that registration is by no means a straightforward affair. Many women believe that by opening a file at the clinic

⁸⁷ Most notably, Red Cross Luxembourg has supported *ENDA*'s work with the clandestine FSW population.

and the central police station - by making their status as a sex worker official - they put themselves and their children at risk.

The decision of whether or not to register at the IHS entails a complex calculus, as evidenced in part by the large number of women who elect to practice sex work clandestinely. This decision is akin to what Fairhead and authors have termed the “blood economy,” a concept developed in their study of a West African Vaccine trial. The authors use the notion of a blood economy to describe how individuals living in low-income settings must weigh the benefits (free health care) and risks (fears of blood stealing) involved in enrolling in clinical trials (Fairhead 2006). This work, along with the growing anthropological literature on bioeconomy, demonstrates how poverty in general, and the unequal distribution of medical care in particular, create these vexed calculations⁸⁸. While blood certainly factors into the exchange at the IHS, blood stealing rarely appeared as a concern. In fact, as these narratives indicate, for many women the mandatory provision of blood and vaginal swabs was an indication of the clinic’s professionalism and rigor, and thus part of the health benefits of attending the IHS clinic. Instead, the overwhelming concern for most women is that by registering, their identity as a sex worker could be revealed, an event that they feel would hinder the opportunities available to them and their children.

Finally, these narratives reveal that in addition to health care, the *carnet* allows women to access a vast social network that off-sets many of the insecurities that the sex workers face in their daily lives. They are integrated into a relational network of social workers and physicians who regularly mobilize their social contacts to intercede on behalf of sex workers and their families. Furthermore, registration allows women access to the NGOs that funnel humanitarian aid to Dakar’s sex workers in the form of food donations, prescription reimbursements and school fees. The IHS and the LBV are public

⁸⁸ For more on the political economy of blood sales, see Anagnost 2006. Copeman provides an important review of the role of blood, and specifically blood donation, in the emergence of a new bioeconomy (Copeman 2009). For more on the relationship between inequality and the sale of organs and tissues, see Cohen and Scheper-Hughes (Cohen 2001; Scheper-Hughes 2005).

institutions that operate on little funds, yet they strive to meet the needs of a very impoverished group of women. Their care, and the continuous production of vulnerable women, serves to keep a steady flow of registrations and a steady flow of blood to the laboratory. The next chapter situates the apparatus of HIV-2 research in Senegal within a regional context by exploring how the virus is being studied in The Gambia and Guinea-Bissau. Specifically, it explores how private research institutions have altered the contours of scientific possibility for HIV-2.

Chapter Seven: Contextualizing HIV-2 research in West Africa

This chapter contextualizes Senegal's HIV-2 epidemic within the broader West African epidemic, and provides regional context for the work performed at the LBV by examining the two other HIV-2 cohorts in the region. Both cohorts are managed by the Medical Research Council (MRC), a British research institute based in Fajara, The Gambia. The chapter opens with a comparison between the facilities at the MRC and the LBV, highlighting how the scientific possibilities within an African lab are fundamentally different from those of a European lab operating in Africa. The chapter then focuses on the MRC's clinical cohort in The Gambia and its community cohort in Caio, Guinea-Bissau. These cohorts are evidence of the MRC's capacity to establish reasonably comprehensive systems of health care in contexts that are largely devoid of any health infrastructure. This investment in health care has allowed the MRC's scientists unprecedented access to HIV-2 samples in part by literally transforming an entire community into enrollable, knowable research subjects. Ready access to HIV-2 samples, combined with state-of-the-art laboratory equipment, has placed the MRC at the forefront of investigating the scientific potential of this other HIV virus.

An introduction to MRC Fajara

The origins of the UK's Medical Research Council (MRC) lay in a royal commission that was appointed at the turn of the twentieth century to study tuberculosis. Originally fostered by funds from the National Insurance Act for medical research, the MRC eventually became an independent research organization. The MRC receives funding from the British Parliament, but the council is free to select the kind of research it will support. While founded to improve the health of the British public, the MRC was also interested in establishing itself as a viable entity in tropical medicine. By the 1940s and 1950s the council was able to carve a small space from the grip of the Colonial Office

and establish a field station in the small West African colony of The Gambia. While independent from the government, the MRC laboratories established in the small Gambian coastal town of Fajara were intended to promote the primary colonial export from the region: peanuts. The lab was originally established as a fieldwork site for a working party affiliated with the Human Nutrition Unit in London. The group had set out to study the effects of nutrition on peanut farmers in the area. Within a short period of time the unit realized that it was not nutrition, but malaria and other infectious diseases that were compromising the health of the Gambian farmers. The field station soon became an official unit of the MRC, and for the next thirty years, the majority of the unit's research efforts were focused on the study of malaria. As new scientists arrived over the years, they brought their own diverse experience and expertise, expanding the research focus to incorporate virology and immunology, and developing new research focuses such as measles, and later, HIV.

As a testament to the unit's foundational focus, the MRC's main administration building that now houses the offices of the director and senior and emeritus researchers is guarded by a giant sculpture of the *anopheles gambius* mosquito. The building is the administrative heart of the 300 acre-campus, which houses within its gates world-class laboratories, a 60-bed hospital, and a host of unexpected resources including a library with complete electronic journal access, a garage for the center's fleet of more than 90 4X4s and 300 motorbikes, a soccer pitch, furnished dormitories for visiting scholars and students, and at the periphery, a ring of shaded family homes that house the MRC's senior expatriate employees. It is generally acknowledged that the MRC and LBV laboratories are the two poles of scientific excellence in West Africa, but after working for a year at the public *Laboratoire de Bactériologie et Virologie* (LBV) in Dakar, walking on to the campus of MRC Fajara was like stepping into another world. The dusty paths of Dantec's public hospital were replaced at MRC by shaded groves of old-growth trees, and the hustle of ailing ambulances gave way to the calm whirring of a European scientist passing on his or her bicycle, sometimes accompanied after-hours by their child on a wobbly tricycle. Many MRC researchers live either

on the campus in one of the MRC-owned residences, or in one of the many waterfront apartments available for rent within a few minutes' walk from the MRC. Life on a campus is ideal for the rigorous schedule of basic research. One student summed it up nicely: "We have the clinic right there, and the lab is right there – and [pointing] my house is right there." Jean, an LBV colleague who was visiting the laboratory with me remarked wistfully, "I would love to build something like this in Dakar, then if I am doing my experiments late into the night, I can run home and shower or grab a quick nap, then come back and finish them up. I would be so much more productive that way." He is a serious researcher, who regularly toughs it out in the lab until 4 a.m. to complete an experiment. Like nearly all of his colleagues at LBV, his modest salary means that he has to live in an apartment with his family, far from the lab, because the LBV is situated on the Plateau, at the tip of Cap Manuel, which is one of the wealthiest areas of downtown Dakar. Once reserved for European residents, today the exclusive neighborhood is home to guarded embassy residences and sprawling, bougainvillea-draped, colonial homes⁸⁹. With little hope of affording housing in such an area, most of the lab's employees live at least an hour away from Dantec in the more reasonably priced suburbs⁹⁰.

For a scientist, the differences between the LBV and the MRC laboratories shape the quality of one's life, but also the quality of one's work. As an integrated part of the public hospital, the LBV staff is constantly solicited by family members and friends in need of an insider who can advocate for them, and help them gain access to more prompt and affordable care. Scientists at MRC do

⁸⁹ Over dinner one evening, a visiting researcher from Quebec explained that he often spent his weekend days wandering around the Plateau with his young family, taking in the wide boulevards and storied homes as if it were a "colonial Disneyworld."

⁹⁰ The LBV housekeeping staff, who are the first to arrive and the last to leave each day, live even further from the LBV, in meager rented rooms at the city's periphery. Such *bidonvilles* are poorly served by public transportation, and require multiple transport connections. These women can little afford housekeepers for their own homes, and are thus responsible for cooking dinner and cleaning their home when they return late at night. The LBV staff are keenly aware that any meeting stretching into the late hours means an even later departure for the housekeeping staff. They regularly will slip the women money for their transportation, offer them their second-hand clothing, and often remember them with a bonus during feast times and holidays.

not have to retreat from their offices to dodge family and community members asking for financial help, for their offices are nestled behind doors that are secured by keyless card readers. Touring the MRC labs with my LBV colleague Jean, I observed how he marveled at the layout of the new MRC lab facilities. The new building was constructed with funds from the UK, and the new structure was suggested by British scientists who had visited the facilities and deemed the older lab facilities unsafe. Whereas Dakar's laboratories consist of cramped, individual rooms, the new benches at MRC are housed in a vast, open corridor, affording scientists the safety of unencumbered movement and the opportunity to work with colleagues in other disciplines. "There is such an open atmosphere here that stretches across the fields," one MRC graduate student explained, "and that is very conducive to good research." At either end of MRC's laboratory space are sinks, specifically placed to promote a sterile environment. In contrast, the sinks at the LBV's immunology unit are dry, for the lab is dependent upon city water supply, and there is not enough water pressure to animate their second-story facilities. Taking such a challenge in stride, LBV's scientists improvise, dipping into a plastic tank that is manually filled by a hose each morning. On one occasion, the head of the LBV's Microbiology Unit had to send one of her students from his bench to the market on her dime to pick up a box of pens so that they could label samples. The quality of the scientific research emerging from the LBV is a testament to the Herculean effort of Mboup and his colleagues, who have spent years shouldering not only their research responsibilities, but the often unacknowledged work of maintaining a safe and sterile research environment in the face of significant material scarcity. In contrast, scientists at MRC are fortunate to have a steady stream of basic supplies. They are free to focus on their work and the finer adjustments of the workplace, as evidenced by posters affixed to MRC public bulletin boards, which indicate how to properly adjust a desk chair for optimum back health. One of the doctoral students at MRC proudly explained to me: "The facilities that we have here are second to none. You have the right facilities to be able to do the kind of work that you want to do. There are people from all over the world who would be envious of the situation that we have here."

Both The Gambia and Senegal are considered by the United Nations to be among the world's Least Developed Countries⁹¹, and their people are accustomed to scraping together a living from limited means. The stark contrasts between the LBV and the MRC are not due to significant differences in national wealth or resources; both laboratories operate in very poor countries. The difference is that LBV is a public laboratory in a public teaching hospital, and the MRC is a private laboratory on a private campus. Moreover, while the MRC facilities are on African soil, the institute is essentially an African arm of the British MRC. One of the physicians working at MRC explained, "We sort of joke, I've heard people joke that they live in The Gambia but they work at MRC. They don't live in The Gambia, they live in MRC." There are many Africans on staff these days. In fact, the Fajara unit is now headed by its first African director, Tumani Corrah. When I spoke with Corrah, he lamented that for much of its history, MRC's training initiatives have been aimed at non-African scholars. "If I go to an international conference," he explained, "and address a large group, when I ask how many of them have spent part of their training in The Gambia, about 25% of the people will put up their hands. About 90% of them are from Europe and America." Corrah describes the paucity of African scholars emerging from the MRC as "a failure."

In a similar vein, the MRC Fajara's Director of Research, Dr. Rowland-Jones, referred to the unit as "a bit of an anachronism." "It is still a sort of colonial place," she explained, in the sense that it is a British institute that operates in a former British colony. Despite the increasing presence of African scientists and lab technicians from across the continent, many of the senior scientists and administrators that I spoke with doubted whether the Fajara labs

⁹¹ The two nations share much in common. Nestled inside Senegal's borders, the unusually shaped nation of The Gambia shares similar languages, landscapes, and ethnic groups with its geographically engulfing neighbor. During my stay, I heard many people in The Gambia refer to their Senegalese neighbors as part of the same family, whose futures were separated only by colonial powers. Split between French and British colonies, the same family named would diverge, becoming today's anglicized "Sesay" in The Gambia, and the French "Cissé" in Senegal.

could ever be truly “Africanized” in the sense that the unit could be fully transferred to the Gambian government. Dr. Rowland-Jones noted that unlike other MRC initiatives in Africa, such as the one in Kenya which partners with the Kenyan Medical Research Institute (KEMRI), the Fajara unit largely operates separately from the Gambian government⁹². She explains that there are no government-run research units in The Gambia that could shoulder the research work currently undertaken by the MRC. It remains to be seen whether the government’s new public health laboratory will emerge as a research facility. It was established just three months prior to my visit to the MRC in 2007, as part of the festivities for the “July 22nd Revolution,” a celebration of the President’s rise to power. The Africanization of the Fajara unit is further stymied by the paucity of research training available in The Gambia. The government established the country’s first university in 1999, and with such a short history and few financial resources, it is simply not a research-driven institution. Rowland-Jones explains that for those hoping to pursue a career in research, the MRC is the only tertiary educational facility in the country. While not a degree-granting institution per se, the MRC sponsors its students to pursue graduate programs in the UK, or online while working at the Fajara unit.

Educational opportunities abound for all levels of the MRC staff. For example, housekeepers and other support staff can access literacy lessons through the unit. Other incentives provided to MRC employees include free clinical care at the unit’s clinic. There is a physician at the clinic who is hired solely to provide care to members of the MRC staff and their families. Such educational and health benefits, in addition to generous salaries, make MRC positions highly coveted. Curiously, these benefits have served to reduce the Gambian presence at the Fajara unit. While having made significant strides in hiring African scientists from across the continent for its top posts, the benefits offered by the MRC have

⁹² Some efforts are underway to transfer certain projects to the government. For example, The Gambia’s HIV Sentinel Surveillance work was organized and administered largely by the MRC, using government health centers for testing. As an MRC researcher explained, they have gradually been transferring certain testing sites to the government to handle surveillance activities.

thwarted the unit's ability to recruit qualified Gambian scientists. Rowland-Jones explains that in order to recruit laboratory technicians or other trained staff, the MRC must obtain written permission from the Gambian government. These measures were put in place to prevent the MRC from "poaching" qualified Gambians who have been trained locally, and would seek the well-paid MRC posts over government positions. As a result, while the MRC unit is becoming increasingly 'Africanized,' it is not necessarily becoming a more 'Gambian' institution.

The work of the MRC is almost entirely supported by British funds. The Fajara Unit is primarily funded by a grant from the British MRC which is renewed every five years. The current grant provides for an operating budget of 45 million pounds, and is the major source of funding for the unit's research activities⁹³. The operating grant is not automatically provided to the Fajara unit; the unit must produce a grant application every five years, outlining the proposed research activities. On one occasion the grant proposal was unsuccessful, but unlike more traditional grant applications that leave the applicant without recourse, the MRC granted the Fajara unit provisional funding for two years while the unit restructured its leadership and produced a new, successful proposal. This is notably different from the funding structure of nearly all other laboratories in the region, such as the LBV. As Mboup explains, "Unlike the MRC and others, we have nothing. But we manage to hold on, to do our projects and work with others...which is so different from other big institutes that have the security of core funding...if you compare us to the MRC their budget is a thousand times...larger than ours." The five-year funding grant from MRC provides the Fajara unit with a considerable advantage over most African laboratories that have to chase after disparate, short-term project funding. Certain groups in Fajara have been able to secure project funding, but these project monies did not represent the life blood of the organization's operational budget. With a five-year funding cycle the unit is able to sustain long-term research projects, and it is able to execute

⁹³ One research scientist estimated that 90% of the MRC's budget was supported by MRC funds.

projects that its own scientists deem to be of vital scientific importance, rather than taking on research projects simply because they are a source of funding for the laboratory. This may be changing, as the President's recent inflation of the Gambian Dalasi served to double the operating costs of the Fajara unit overnight. As a result, the institute must look for other sources of funding. Dr. Sarah Rowland-Jones explains that this can put the MRC in a bit of an awkward spot. "We don't want to become a bank of sorts," she explained, where samples are merely farmed in The Gambia and then sent out somewhere else to be analyzed and studied. One of the MRC's scientific resources that would be very appealing to foreign funders is the unit's two HIV cohorts. Rowland-Jones admits that these cohorts could certainly attract partnership funding, but she recognizes the importance of playing a partnership right: "We don't want to give away all of our treasures."

Why study HIV-2

Rowland-Jones was responsible in part for writing the unit's next five-year grant to submit to MRC. She approached the difficult task of selecting which research would be included in the grant by assessing which projects would present the unit with a competitive advantage. "HIV-2 is something that is very interesting, and worth investing in because it is highly unique," she explained. As a small country, The Gambia cannot produce the large numbers of HIV or TB infections that many studies and trials require. This puts them at a significant disadvantage compared to zones in Eastern and Southern Africa, where large numbers of TB and HIV cases attract significant research monies. Whereas the LBV lost its primary funder to this trend, leaving its HIV-2 cohort bereft of any research funding, the MRC's unique history and funding structure helped the institute transform the region's small number of HIV-2 infections from a research liability to a scientific boon.

The MRC is home to two HIV cohorts with significant numbers of HIV-2 infection. The first cohort is a clinical cohort that operates out of the MRC

Fajara's Genito-Urinary Medicine (GUM) Clinic, and the second is a community cohort based in Caio, Guinea Bissau. These cohorts have been in place for almost twenty years, and all samples gathered from the cohorts are catalogued and stored. In planning the next five-year grant, Rowland-Jones must focus on diseases of particular relevance to The Gambia, such as tuberculosis and malaria. However, she and others at the MRC have also made room for HIV-2 as a priority in terms of funding and the recruitment of graduate students. While numerically-speaking, HIV-2 may not be posing a major health threat to the region, scientifically the push to understand the virus is urgent. The defining feature of HIV-2 is its slow progression, a feature which provides researchers with the opportunity to examine *in vivo* how a human can live with a human retrovirus. This unique research opportunity is rapidly disappearing, for as described in chapter one, the rate of HIV-2 infection in the sub-region is rapidly dropping. "We have a good sample collection," she explains, "and we want to be able to work in humans [not animal models]... We don't know how long we are going to be able to look at this population before it is gone." MRC's scientists are in a race to understand the virus, and the body's immune response to it, while they still can.

For researchers seeking to understand the virus itself, HIV-2 presents an opportunity rarely seen in the post-ARV world. In a resource-poor country, by the time a patient presents at a clinic their CD4 counts are often below the threshold of acceptable levels, and they must be put on therapy. HIV-2 patients, on the other hand, tend to keep high CD4 counts, and can go for years without needing therapeutic interventions. Isaiah, one of the MRC's doctoral students, explained that by studying HIV-2, he was able to examine a virus in its "natural state," that is without having been uninfluenced by ARVs. For those studying virology, he explained, "the picture that you get now is generally that of an HIV-1 patient on treatment." This has significant implications for researchers studying the virus because the mutations that they are examining could be the result of human immune challenges, or the result of drug pressure. Working with HIV-2, he concludes, "we know that whatever is happening, a mutation or whatnot... it is the virus responding to natural immune challenges." Since HIV-2 infected

patients progress more slowly, one can examine the virus and its immune response in a “natural” state for a much longer period of time.

HIV-2 also provides a promising venue for understanding the relationship between HIV infection and the body’s immune response. MRC’s HIV research has been primarily immunological, rather than virological, in nature. While most HIV vaccine research has focused on the virus itself, Immunologist Assan Jaye explains that the unusually slow progression of HIV-2 has inspired the MRC to develop a research program that studies the human response to HIV. “What helped us to actually reorient ourselves to the other side,” said Jaye, “is that we have got this other infection that is not affecting the patient. And we want to know why. And so we said, why can’t we look at other aspects, at how the body actually...is coping with [infection]?” Given recent set-backs in a more viral-oriented research (Cohen 2007; Barouch 2008), the MRC approach represents a vital new avenue in vaccine development. According to Karim, one of Jaye’s doctoral students, most HIV vaccine studies examining attenuated infection begin with a simian model. With access to MRC’s HIV-2 cohorts, Karim and his colleagues have the advantage of studying HIV immunology in a human, rather than simian model. “People are basing their work on SIV,” Karim explains, “particularly on work with sooty mangabeys. But HIV-2 is so much more relevant if you want to study immune activation for three major reasons: 1) HIV-2 is 40-60% similar to HIV-1 in terms of nucleotide structure; 2) You are able to work with the same host [i.e. human]; and 3) the mode of transmission is exactly the same, but in terms of infectivity there is a discrepancy.” These three elements make HIV-2 an extremely good model for unlocking the immunological pathways of HIV-1, and paving the way for a broadly-applicable vaccine. While researchers working on viral structure can study preserved samples, Karim’s immunological approach requires working from fresh samples. “Not many people can do this kind of work,” he explains, “because they do not have access to the patient base, and at the same time, the facilities required to perform this kind of work.”

The MRC cannot compete in the realm of clinical trials, for they require thousands and thousands of HIV-positive patients. Yet the MRC has made the most of its strengths by emphasizing immunological studies which can produce remarkable results from a mere handful of samples. MRC's longitudinal studies, bolstered with intensive clinical and field-level follow up, make cutting-edge HIV science possible in a low-prevalence country. The presence of HIV-2, combined with a clinical cohort on MRC's campus and a community cohort in neighboring Guinea Bissau, has revived the possibility that the key to an HIV vaccine may yet emerge from the HIV-2 epidemic.

The GUM Clinical Cohort

The Fajara campus is home to the MRC's medical clinic which houses both a 60-bed inpatient ward and extensive outpatient facilities, including the general medicine or "gate" clinic, and the specialty TB and Genito-Urinary Medicine (GUM) clinics. Clinical services are offered by the MRC as both a form of service to The Gambia, and as a way of feeding the MRC's research projects by funneling clinic patients into MRC research studies. The clinic serves just 250 patients a day, so people begin lining up at the clinic gates as early as 5:30 in the morning to assure that they will be admitted. During malaria season the demand for care is so high that some people even spend the night outside the clinic's gates in order to assure that they will receive treatment. The MRC clinic is very popular because it is one of the few places in The Gambia where patients can be seen by physicians. Those presenting at the public Royal Victoria Teaching Hospital are generally seen by a student or a nurse, and will only be seen by a physician in rare, grave cases. Public hospitals are desperately short of staff and supplies, whereas the MRC clinic has a highly-trained staff and a significant enough budget to offer extremely good clinical care. The availability of costly viral load tests to patients of the GUM clinic is but one obvious barometer of the quality of care available to MRC's patients.

The 250 patients who receive their treatment tickets report directly to a triage nurse. Some are treated and discharged, while others are forwarded to a physician for evaluation. As part of the evaluation, a clinician will determine whether the patient meets criteria for the multiple projects underway at MRC. If criteria are met, the person is contacted to obtain informed consent. Dr Smith, an HIV specialist physician, explains that the GUM clinic operates in much the same way. “We provide a clinical service with the explicit goal of involving patients as subjects in research. And when people sign up for care, they sign up for care and research. Now, specific studies may have an additional informed consent process, but basically the fundamental pact is that we give them medical care for free, meds for free, taxi fares to and from the clinic, and when we draw blood from them (which we periodically do), we have their permission to use whatever unused portion of that is leftover for research purposes. And this is what has driven our immunology research over the last 20 years.”

HIV testing at MRC is based at the GUM clinic, which also houses the MRC’s clinic-based HIV cohort. The GUM clinic’s patients are largely referred from the gate clinic for STI and HIV testing. In some cases patients are referred to the GUM clinic by the private clinics and NGOs, specifically those that are not obligated to refer patients to state health structures. The GUM clinic also receives self-referring individuals requesting VCT (voluntary HIV counseling and testing). The majority of these people request an HIV test as part of a visa application, or as a prerequisite for marriage in many of the small Pentecostal churches whose religious leaders refuse to celebrate a marriage unless the partners get tested for HIV. On a patient’s first day at the clinic, he or she will be offered an HIV test (about 80% of STI patients at the GUM clinic accept to be tested for HIV). Their blood is drawn for a screening test which is performed at the lab across campus, and the patient reports back two weeks later. If the patient’s screening test result is positive, blood will be sent again to the laboratory for a confirmatory test, and the patient will return in another two weeks for the final result. If the final result

is positive, the patient is asked whether they would like to join the Fajara cohort, and they begin an informed consent process. Most people elect to join the cohort. As Dr. Smith explains, “Almost everyone when they hear the deal, that is, we have got a highly-trained staff who will give you free medical care, free drugs and will pay for your taxi fare so you can come and get it all, most people think that is a pretty good deal. So most people actually end up going into the Fajara cohort. And if they choose not to, then we would refer them away. Because we are not really set up to have some people getting medical care but whose blood cannot be archived, and cannot be sampled. That would be awkward for us. So we would refer these people away.”

The clinic has been providing HIV care since 1986, and the clinic cohort was formally established in 1992. Over time, through the provision of STI care, and offering HIV testing, the cohort has grown to about 1,750 people, with roughly 250 individuals who are on ARV therapy. As members of the cohort, patients are bled twice a year, giving 10 or 20 cc’s of blood, which the MRC labs then test for CD4 counts and percents, and CD8 counts and percents. If a patient misses one of these regular examinations, one of MRC’s team of fieldworkers will be dispatched to the field to follow up with the patient. On the basis of these tests, a clinician or fieldworker will determine if a patient fits the criteria for the various research projects taking place at MRC. As Dr. Smith explains, “We get these things, and some other clinically useful information, and then there are cells available from people with defined characteristics – now I am looking for people who have maintained a CD4 count over 500 for 5 years because I want to look at this or that...You look them up out of the database, you go to the freezer, you pull their stored samples, and you are off to the races.”

The GUM clinic sees patients three days a week, and researchers at MRC are immediately alerted by clinicians if one of the patients corresponds to the set of criteria for their study. When an HIV-2 patient presents at the clinic, there is quite a scramble to access the new sample. All patients provided consent to be in the cohort, but the researcher must additionally administer consent to the

identified patient for his or her particular research study. Once a patient has provided additional consent, the blood that is drawn from the patient is transferred to the laboratory for a routine clinical work-up. The remaining sample is stored for research purposes. In addition to the preserved physical samples, the MRC has archived all relevant clinical data gathered since the founding of the cohort. All patient data is stored and maintained by one of the MRC's two data units, making the MRC (along with the LBV) the repository of one of the largest, most complete banks of HIV-2 samples in the world. The MRC's ability to maintain a top-notch clinic in a nation where quality health care is extremely scarce assures a steady flow of potential research subjects. The MRC's second cohort, the Caio community cohort, is an even more remarkable testament to the unit's capacity to utilize its health-care resources to create a large-scale research community. While the Fajara cohort is comprised of health-seeking individuals, the MRC's work in Caio consists literally of making an entire community enrollable, and knowable as research subjects.

The Caio Community Cohort

As mentioned in chapter three, the MRC's work on HIV-2 had its origins in the southern Senegalese town of Ziguinchor. The French physician Dominique Ricard had been transferred from Dakar to work with female sex workers (FSWs) in Ziguinchor as part of the Inter-University Convention project. Ricard noticed that many of the FSWs presenting HIV-2 infections were originally from a particular area in Guinea Bissau known as Caio. In an interview with Dr. Hilton Whittle, emeritus researcher at the MRC, he recalled that his interest in Caio was triggered by a visit from Ricard to Fajara. “[Ricard] said that there was a village across the border, and the FSWs that he was treating were coming up from there to Ziguinchor to work in the dry season,” recalled Whittle. “He suggested that we go down to Caio to see what was happening down there. We got a grant from our board to go down and do a serosurvey to see if there was a lot of HIV2 down there, and indeed there was.” The MRC was the only operation in the region with ready access to funds, and Whittle and his colleague Andrew Wilkins were able to

rapidly secure money from the MRC to travel the roughly 300 km from Fajara to Caio, a journey which today takes anywhere from eight to fifteen hours depending on whether the country's strained ferries are up and running. Together with Ricard, the group from MRC set up a demographic surveillance system in Caio to study HIV-2. They performed a serosurvey of Caio's adult population (over 15 years of age), and found that HIV-2 prevalence in the village was just above 8% -- higher than any other identified population (Wilkins, Ricard et al. 1993).



Figure 9: Caio Village, National AIDS Day Celebration, 2007

Caio is a Manjako village along the Northwestern shore of Guinea Bissau. It is comprised of about twelve smaller communities that are spread out over an 8km dirt track. The village is bordered by small tidal inlets, and the village spills out onto bright green rice fields, which together with fish, cashews, palm oil and palm wine comprise the diet and sole exports of the area. The entire population of Caio is roughly 8,000 people at any given time. In 2007, the UNDP ranked Guinea Bissau as one of the least developed countries on earth, with a Human Development Index score that was third from the bottom (Watkins 2007). The

country was witness to a brutal, drawn-out struggle for independence from Portugal, and more recently, was shaken by a civil war in 1998 that centered on the capital of Bissau. The head of the MRC Caio field site is Stephen who has been working in Caio for more than ten years. Stephen described the lasting scars that the recent war has left on Bissau and its surrounding communities: “It is staggering what’s been left just lying around after the civil war... stockpiles of old bombs, up to 500kg bombs have been found there...Some of it is just in rice fields that people haven’t been able to use since, [even] in Bissau itself... in and around built up areas, residential areas. It is very indiscriminate the way that they just left things.” The brutal war for independence, and the series of coups and counter-coups have left Guinea Bissau bereft of even the most basic infrastructure. Saddled with the dual challenges of poverty and the lack of political continuity, the health system in Guinea Bissau struggles to meet even the most basic needs of its population. Under such constraints small regional health facilities, such as the one in Caio, are unable to staff their clinics with a physician. The facilities at the government-run clinic in Caio are minimal. A patient seeking help at Caio’s clinic could access only the most basic drugs, when there are any in stock. The clinic does not even have a working bathroom, and consulting patients are forced to use a neighbor’s latrine. “They have nothing,” Stephen surmises. “They have nothing.”

The health care options in Caio significantly shifted when the MRC took note of the small village. The 1989 serosurvey revealed high levels of HIV-2 infection in the community, and Whittle and his colleagues saw great research potential in this small coastal community. The MRC set up a community cohort group, and enrolled into the cohort the 200+ individuals who tested positive for HIV, as well as an equal number of negative individuals who would serve as match controls. The MRC regularly monitors the cohort, and in addition, every five to ten years they performed a massive sero-survey on all of Caio. Since 1989, the MRC has carried out three population-wide sero-surveys in Caio, which have examined the HIV-prevalence of the village residents. Infected individuals and their corresponding match controls are invited to enroll as members of the

study cohort. Members of the cohort receive “green cards” that entitle the bearer access to the clinic that the MRC set up near the center of the village. The MRC clinic provides free medication, and importantly, access to a doctor. The promise of clinical care from a physician is strong incentive for those living in a small village in Guinea Bissau, for generally doctors are only available at centers where there is a hospital⁹⁴. This provides important incentive for members of the Caio community to enroll in the serosurvey and perhaps ultimately the cohort.

Follow-up sero-surveys that measure the entire village have been performed every five to ten years, with the most recent survey completed in 2007. With each successive survey, new infected individuals are identified and enrolled in the cohort with a corresponding match control. The current cohort is comprised of roughly 600 individuals. This kind of large-scale community study is predicated on the simple but elusive precondition of knowing who lives in Caio. In other words, to accurately measure levels of HIV-2 in Caio, the MRC needed a census.

The resident expert on counting people in Guinea Bissau is Peter Aaby, a Danish anthropologist-turned-epidemiologist who has been working in the capital of Bissau for more than 30 years. Aaby’s primary interests include childhood disease and mortality, and in the late 1970s he worked to develop a system for population registration in the Bissau suburb of Bandim in order to study nutrition and child health. The same census system that Aaby established for Bissau over thirty years ago is what allows the MRC group to keep track of the number of people in Caio. As Stephen explains, “All of the information that he gathers in Bissau, on children and how many live in a room and whether there are animals living in the house...we use the same information in Caio.” Following Aaby’s model, Stephen and his team of roughly five local fieldworkers gather census data on a daily basis, which allows them to update the Caio census on a yearly basis.

⁹⁴ The MRC provides certain services to all Caio residents, including an ambulance service to transport any ill community member to the nearest hospital. The MRC-employed physician also works at the local government-run clinic.

The Danish model, coupled with funds from MRC, have made Caio a knowable micro-population within a larger, un-counted nation of people. “The government comes to us on occasion,” said Stephen, “[to ask] how many people are living in Caio, because they don’t know. So we tell them.”

This complete census system has allowed the MRC to transform the village of Caio into the cohort of Caio. With the residents of Caio counted, they can be tested, and the number of HIV-2 seropositive cases in the village can be tracked over time. Logistically, a serosurvey involves training local fieldworkers, who go out into the community to gather samples. Testing begins with a village meeting where the fieldworkers explain the study and respond to people’s questions. Trained fieldworkers are then deployed to a particular area in Caio where they are provided with a list of each residents and his or her location, information which was made available through the census work. Fieldworkers track down the people on their list, describe the study, and get consent from those interested in participating. Next, nurses take a small bit of blood from interested participants, and they perform a rapid test for malaria hemoglobin. Treatment is immediately provided for any diseases that are immediately detected. The samples are then stored at the lab facilities in Caio and eventually transported on dry ice made in Caio to Fajara, where the samples are tested for HIV, HTLV and syphilis. The group generally processes 30 samples a day, so a complete serosurvey of Caio has taken anywhere from 9 months to more than a year.

This kind of long-term, community-wide testing is extremely rare in such an impoverished region of the world. As Peter Aaby explained to me one afternoon in his Bissau compound, the kind of science being carried out at Caio is rather revolutionary. Aaby is mild-mannered and unassuming, but has quite the revolutionary streak himself, as evidenced by his commitment to remain working for the people of Bissau throughout the entire duration of the civil war when nearly all other expatriates fled to safety. For Aaby, the kind of research that Whittle and his colleagues were able to set up twenty years ago is rare and vital. “There is so much that can be learned from a long-term cohort, but nobody wants

to set one up,” he explains, “because nobody wants to keep it up...People always want it to be something new. They don’t want to keep up something that has been around for the past ten years, because they assume that it is not good science if you just continue doing the same thing... That is where the MRC’s core funding is a huge advantage. They can actually set up something like that.”

Core funding helped Whittle and colleagues devise the original prospective study decades ago. Together with his staunch support of the site, such long-term funding helped the MRC sustain the Caio work even through civil war when international research projects simply shut their doors. Of course, the work looked very different. Formal census work had stopped; indeed the entire composition of the village shifted as a result of the civil war. Caio was generally out of the line of fire, so people from hard-hit Bissau flocked to the relative safety of the small coastal village. “I think really it was down to Hilton [Whittle] that we managed to keep the place going,” Stephen remembered. “We didn’t do the ‘normal work’...I had fieldworkers who suddenly had 50 or 60 people in their houses, because family came from Bissau. They had to feed all of these people.” Working with the Catholic mission, Stephen brought much needed food supplies down from Fajara. Cobbled together with Aaby’s donations from Denmark, the MRC was able to supply Caio with medication for an entire year while the war raged.

As HIV-2 has become an increasingly important component of MRC’s research program, Caio has become a significant priority for the Fajara unit. In the early days of the study, the group worked out of meager laboratory facilities that they had set up in a converted old shop. In order to exploit the samples taken in Caio, researchers had to transport them across the border into Senegal, then into The Gambia where scientists at the better equipped Fajara laboratories could perform immunoassays. While still marking the same spot, the old “bush laboratory” in Caio has been replaced by a newly equipped laboratory that rivals those one might find in major cities in the region. Rural laboratories are generally unheard of in West Africa, and a rural laboratory of such sophistication is simply

unparalleled. Caio is off the electricity grid, so the laboratory relies on solar power and generators to keep the unit up and running. These alternative energy sources power the split air conditioner that keeps the laboratory itself cool during working hours. The lab boasts two gas-powered refrigerators with -20 freezer sections, a CO2 incubator, a Partech CD4 machine -- indeed enough equipment to allow cell culture, cell cryopreservation, and flow cytometry. Behind the clinic's well-tended garden are three dormitory-style rooms and a washroom with hot and cold water, designed to house visiting researchers. Comfortable accommodations and formidable rural research facilities make the research site an accessible environment in which to live and work. The Caio field station is an island of resources in an extremely poor country.



Figure 10: Scene from Caio Village Lab

The confluence of high quality, on-site facilities and the presence of an established community cohort creates an invaluable research opportunity for MRC. Unlike clinical cohorts, which are primarily comprised of individuals who are sick, Caio's cohort provided scientists with access to a "natural setting." By

performing a serosurvey on an entire community, researchers could identify even asymptomatic individuals infected with HIV-2. This is particularly important in HIV-2, because the majority of people who are infected with the virus simply don't get sick at all. Indeed, researchers working in Caio found that there were many HIV-2 infected individuals living well into their 70s and 80s, and were completely healthy⁹⁵. This provides MRC researchers with the unique opportunity to study the immune response of asymptomatic HIV-2 infected individuals. In a recent MRC-funded study, researchers followed 64 such asymptomatic individuals in Caio in an effort to understand how their body's immune response helped protect them from disease. They found that the immune systems of these individuals, specifically their "T cell" immune cells, responded to a viral protein called "Gag," which helped the body to better control the replication of the virus. Since the Gag protein is present in both HIV-1 and HIV-2, this study has important implications for HIV control beyond West Africa. By demonstrating that the quality, rather than the quantity of immune response plays a major role in the body's ability to fight off infection, this work helps researchers know which part of the immune system to target in vaccine development (Leligdowicz, Yindom et al. 2007).

The Caio work presents scientists with the rare opportunity to participate in a kind of 'adventure science.' Researchers perform serious work that has been published in top-notch scientific journals, but they also emerge from their time in Caio with such hair-raising stories as narrowly escaping gunfire at the Casamance border. In addition to gaining laboratory skills, doctoral students become fluent in skills that help them thrive in rural environments, from how to conserve water to how to finesse their way through police stops. The combination of an enrolled population and an equipped laboratory makes Caio the only space in the region where one can perform quality scientific research and have a kind of village adventure. Whereas the Fajara unit is more of a Western enclave within The

⁹⁵ In the natural environment, nearly 80% of Individuals infected with HIV-2 in Caio could be described as "healthy" both in terms of a complete lack of symptoms, and in terms of regular CD4 counts (Communication with Sarah Rowland-Jones, October 2007).

Gambia, the small Caio lab is intimately linked with the community and presents a more “authentic” experience to the visiting Western researcher.

In their description of the research station, MRC scientists often emphasize the traditional nature of life in Caio, particularly the practices surrounding local animist beliefs. I was enthusiastically told by various members of the MRC about the traditional dances and ceremonies that took place in the village at various times throughout the year. For Stephen, who has been managing the site for more than ten years, a deep appreciation and curiosity about these practices and beliefs keeps him rooted in Caio. After describing the 30 or 40 spirits sites peppered throughout the village, he mused, “I think that is probably what keeps me there.” “There is so much going on there,” he explains, “it is impossible to learn everything and know everything about the place. There is always something.” The first images of Caio that I saw were images from an MRC PowerPoint presentation that I viewed in Fajara. Stephen narrated the show for me: “This guy was becoming a traditional healer; this was the ceremony that he went through; these are boats that go across to the islands; [here are] kids bringing the cows in; [here,] palm wine, it’s the main thing this time of year.” When I travelled to Caio two months later, the same bucolic rural images appeared at every turn. A stroll to the marsh revealed cut-out fishing canoes, and in the distance a young boy rode his cow through the rice fields. A walk through the woods revealed small plots of ancestor shrines, and in the evening we toasted with palm wine. The technological space of the small laboratory emerges in stark relief to these village scenes. The visual dichotomy between lab science and village life found its way into some of the stories that I was told about MRC work in Caio. One of the senior scientists at MRC recounted with great admiration a story about a student of hers who was performing doctoral research in Caio. While working in the Caio lab, the student received an interview request from a prestigious scholarship competition in the UK. The village has only two spots where one can receive cell phone reception; one is located in the busy village center, the second in the middle of the forest near a sacred burial area. With no other quiet option available, the student conducted the high-stakes interview in the

forest, amid the “fetishes” and other bits of material culture related to local animist practices.

In this story and other power-point presentations and publications, images of “fetishes” such as Caio’s ancestral post are invoked as powerful visual signifiers of ‘traditional’ cultural practice. Anthropological accounts of contemporary Manjako life offer a different perspective on these symbols of ‘village tradition’. Eric Gable, who performed ethnographic fieldwork in a nearby village, reveals that the Manjako people have had a long history of labor migration, with male laborers following pre-colonial, colonial and later millennial capital flows. While today many émigrés provide their families with zinc roofs and concrete floors, one of the more popular (and economical) forms of demonstrating their commitment to home is to sponsor traditional ceremonies, notably funerals and the planting of ancestor posts⁹⁶. This “cosmopolitanism-as-tradition” reveals ancestral posts not as relics of arcane religious practice, but as contemporary signifiers that permit the émigré to reinforce homeland ties while celebrating long-distance accomplishments. The suit-wearing, white-faced depictions on the ancestral posts mark a kind of re-invented tradition that offers a path for coping with the contemporary problem of when a family member dies abroad. Indeed, while village inhabitants have been steadily moving away, ancestor shrines are proliferating at home. According to Gable, then, the ‘traditional’ funeral ceremony is neither unchanged artifact nor the straightforward reclamation of émigré life by village tradition. Rather, the funeral ceremony emerges as a celebration of overseas success through local idiom: “a theater of cosmopolitan accomplishments”(Gable 2006: 390).

⁹⁶ Manjako ancestral posts are shrines (*issap*) that represent the souls of ancestors. After a man dies a post is planted in his honor, a gesture which represents his membership in what Buckner refers to as “the collectivity of ancestors” (Buckner 2004).



Figure 11: Manjako Ancestral Posts, Caio, Guinea-Bissau

For Manjako the figure of the ancestral post embodies tensions between individual desire and the pull of the village social body. For MRC scientists, these carvings have a very different meaning. Ancestral posts and other images of ‘traditional’ life in Manjako Caio find their way into stories and representations of Caio in part because they are useful. A contemporary laboratory is, first and foremost, a necessity for exploiting the data from the Caio cohort. However, the visual image of a well-equipped laboratory nestled amid a traditional village is a powerful testament to the co-existence of science and village life. Those at the helm of MRC Fajara recognize the challenges that they face as a European institute in post-colonial Africa. One of the ways that the MRC is able to justify its existence in The Gambia is by producing a body of research that is relevant to the needs of the West African population. In other words, it is not enough for MRC science to be good; it must also be useful. In its most recent Annual Report,

the MRC Fajara unit stated that part of its Mission is: “To develop and strengthen our relationships in The Gambia and the sub-region towards capacity building and partnership in the implementation of internationally competitive research on issues of *immediate local priority*” (MRC 2007: 3) (emphasis mine). The visual image of a laboratory deep within rural West Africa sends a powerful message about the unit’s commitment to support health in some of the most remote areas of the region.

MRC’s mission includes a quasi-humanitarian element insofar as it bases its agenda on local needs; but consideration of local concerns is very carefully situated within a research orientation. The point of MRC’s work is to produce scientific findings that are relevant to the communities where they work, not to provide care to the communities where they work. Stephen explains that while the MRC provides help to Caio’s struggling government clinic, they are wary of providing too much help. “It is very difficult,” he begins, “because on the one hand you sort of think, well we should do something about this.” He continues, “But on the other hand, as soon as you do something to help them out, then the government will pull out and say, ‘Well MRC is taking care of that, we don’t need to bother.’ So it is a very fine balance... Yeah, we can help them out, a lick of paint every so often, some basic equipment and so on... anything major though, it has got to be sustained at the end of the day.”

However, the MRC’s capacity to roll out significant health care facilities in some of the region’s most remote and underserved populations has provided the unit with access to large research populations. For example, MRC is active in sites such as the remote Gambian town of Basse. The region has very little infrastructure, and as one senior researcher explained, is largely forgotten by the government save for occasional visits around election time. From this research station, the MRC carries out its research projects in the region and has brought significant medical infrastructure to the area. “We are really the only ones providing anything resembling specialized health care up in that area,” the researcher explained. She described a recent study performed in the area,

mentioning that the villagers had called for the MRC to return to the village after the completion of the study. “Without the study up there, they didn’t have access to the health care and vaccines that they needed,” she explained. These long-standing relationships with research populations, solidified through the provision of much-needed health care, is what allows the unit to perform its quality research.

In-depth ethnographic studies of MRC’s work in The Gambia have revealed that for study participants, access to MRC-provided health care is often the central factor of the trial experience, and even the perceived purpose of MRC’s presence in The Gambia⁹⁷ (Geissler 2008). Fairhead, Leach and Small’s investigation of an MRC pneumococcal vaccine trial in a Gambian village documents how local women equated study participation with accessing care for their vulnerable infants. Enrolled mothers and children were provided with a registration card, not unlike the “green card” used in Caio to denote members of the cohort. The special stickers affixed to the registration card indicated “being with the MRC,” a status that provided the infant with access to free, quality, convenient health care in exchange for regular bleedings. While some parents were concerned about the blood extraction and worried that quality Gambian blood was being taken from their babies and sold in London, ultimately they equated “joining the MRC” with the provision of clinical care, an important safety net for families with little access to health care (Fairhead 2006: 110, 112)⁹⁸. In a

⁹⁷ The perception of the MRC as a provider of health care is not limited to The Gambia, nor to the project’s target research populations. A mandatory step in preparing for the trip from Fajara to Caio involves stuffing small plastic bags with various over-the-counter pills, from generic fever-reducers to multivitamins. The MRC-branded Land Rovers that ferry researchers and samples between the research sites are regularly stopped by police and border patrolmen who have come to expect their share of medication and condoms dispensed by MRC staff in exchange for being waved through police blocks.

⁹⁸ Historians and anthropologists have used rumors of blood and organ stealing to uncover the obscure and diverse historical narratives of Africans’ colonial experience (White 2000), and have read these (often occult) rumors as idioms for exploring ambivalence and dissent with regard to colonial and neoliberal technologies and practices of medical intervention and commodification (Comaroff and Comaroff 1999; MacGaffey 2000; Molyneux 2005). Geissler and Pool assert that rumors represent a safe space for research subjects, who are often operating from a position of relative vulnerability, to debate the merits of research participation. Tuning in to this *radio*

region where blood accumulation and extraction is linked with health and susceptibility, research participation is not a simple question of understanding trial policies or creating the “modernist research subject”. It is a balanced calculus that connects the body and the economy, where fears about stealing blood cannot be reduced to occult rumors nor untethered idioms, but must be understood as decisions that “refract” the socio-economic divide between researchers and participants (Fairhead 2006: 118-119). Geissler and colleagues found a similar association among villagers participating in an MRC malaria vaccine trial. Villagers involved in the malaria vaccine trial viewed MRC’s engagement at once through a humanitarian lens (MRC as helper), and through a lens of power (Africans are powerless to resist). This ambiguity stems from the disengagement of the state from providing health care for its citizens. “The experience of crisis,” the authors begin, “rather than the mere lack of services, makes medical research in The Gambia highly ambiguous: it is vitally needed, but it never reaches the promise of modern government health care, nor the quality of health services in the wealthy European countries funding MRC research collaborations” (Geissler 2008: 697-8). It is, nonetheless, the only option available to those seeking a health safety net, and the provision of blood samples is viewed as a necessary sacrifice for gaining entry into the trial community and its benefits.

In contrast to the MRC trial sites examined by Geissler, Fairhead, Leach and colleagues, Caio is a long-term community cohort. Members of the community are not asked to participate in a trial, but rather are asked to provide their blood on a semi-regular basis for the purposes of being studied and banked for future research. The combination of flexible core funding, scientific and personal interest on the part of researchers, and the extreme health needs of the target population has resulted in the transformation of an entire village into a serologically knowable population *over the long term*. Whereas the roots of

trottoir of rumors can provide vital information about African communities’ perspectives on medical research (Geissler and Pool 2006).

MRC's involvement in HIV-2 can be traced back to Dantec's early studies of HIV-2, today the MRC has eclipsed the work of its neighboring African laboratory to the north. The capacity to enroll and *sustain* an entire community has placed MRC at the forefront of the race to understand HIV-2 and unlock its considerable vaccine potential before the molecular clock tolls, and the unique virus disappears.

Conclusion: Looking forward - Restructuring the axis of research

This dissertation has elucidated the social, economic and historical practices that produced a population of enrollable subjects in Senegal, and set the stage for the scientific alchemy that permitted local scientists to spin the blood of the nation's sex workers into scientific gold. The dissertation has traced the diverse network of actors, policies and practices that coalesced to make HIV-2 a knowable fact, and it has examined the diverse social effects that HIV-2's facticity has had on the scientists at the *Laboratoire de Bactériologie et Virologie*, the providers at the *Institut d'Hygiène Sociale*, and the women they care for. The practices engendered by this model virus have even contributed to Senegal's role as a model country in Africa's fight against HIV.

One of the threads uniting this dissertation is the various ways that local and global inequalities have paradoxically shaped the trajectory of HIV-2 as a knowable entity. Basically, economic and social vulnerability on an individual scale has emerged as a scientifically productive force in Senegal. These inequalities have driven sex work registration at clinics such as IHS. At the clinic, women are able to rebuild their fractured social networks, and mitigate some of the exceptional challenges brought on by poverty and the specific vulnerabilities related to sex work. The clinic's social workers and physicians readily draw on their wide net of social contacts to advocate for the sex workers in their care, and they pass along resources that help women meet the challenges of educating and feeding their children. Continuity among the IHS staff means that there is a long institutional memory at work in the clinic. Those who have been working there since its earliest days remember how their capacity to care for the FSWs was enhanced with the arrival of overseas funding secured by Prof. Mboup to study the natural history of HIV-2. This has engendered a lasting sentiment of reciprocity, and has served to 'protect' the valuable blood samples and clinical histories of the FSW for use by the LBV and its research partners.

Furthermore, broader inequalities have also shaped the contours of HIV-2 knowledge, and have largely determined Senegal's place within the HIV research realm. International research partnerships have provided the technological and economic capital for the LBV to develop its laboratories, and for the IHS clinic to provide more comprehensive care. The Inter-University Convention was one of the first international HIV collaborations, and it emerged at a time when the epidemic was tearing through the continent, largely unaddressed and unhindered. In the decades since the partnership's founding, the HIV epidemic has become a centerpiece in the realm of international aid. Most recently, the HIV epidemic in Africa has become the focus not only for multilateral aid institutions, but also for large philanthropic organizations such as The Gates Foundation. The funding streams for these organizations have united scientific inquiry with humanitarian concern, and thereby shifted the realm of possibility for science in Africa. As funding priorities are increasingly shaped by humanitarian parameters, the LBV's research partners were lured to other countries with more significant epidemics, and more lucrative opportunities for wide-scale HIV research.

This dissertation has demonstrated that the insecurity experienced by Professor Mboup and his colleagues is largely the result of the particular forces of scientific extraction that were set in motion during the colonial period. While Dakar's position as the capital of French West Africa afforded Senegal unique educational and infrastructural opportunities, these systems were primarily designed for the purposes of extracting Senegal's scientific raw materials for the benefit of metropolitan France. The President of Dakar's *Université Cheikh Anta Diop* explains that this legacy has severely hindered the production of an independent, state-driven research program. "The University of Dakar was created in 1957 by France for the entire sub-region," he explained. "And if they instituted any research, it was expressly for the interest of France." With some 4,000 doctoral students, the University produces a surfeit of highly-trained researchers; however, without any meaningful state-controlled apparatus for

funding research these bright young scientists stand little chance of earning a living in a research-related field. What emerges is a tragic paradox. Senegal is home to both powerful scientific raw materials such as HIV-2, and a readily-available population of trained young scientists, but in the absence of meaningful internal funding for research projects, the nation's scientific and human potential stagnates.

International relationships are the sole outlet available for bridging this gap. The University President summarized the problem facing Senegal's research community: "You won't see a single publication from my Dakar colleagues unless it is with their colleagues from the North, notably France and the United States...This internationalisation allows us to yield results that our work environment could never otherwise allow." Of course, the story of HIV-2 provides a cautionary tale for these relationships. In the absence of any long-term HIV-2 partnerships, the LBV has had to cobble together funding from disparate sources in order to maintain its activities. "I must confess," Mboup said to me one day, "a while back I was rather pessimistic, because all of our financing had come to a halt. There were not a lot of opportunities, people were generally discouraged, and we couldn't see a way forward. The end of each year was so difficult, and we knew that we had to make a leap, and begin to bring in new projects, to develop things on tuberculosis and malaria -- separate from our traditional HIV-2 projects." By casting a wider net and diversifying its focus, the laboratory has been able to establish new projects -- any project -- that could bring in reasonable financial support for the laboratory. Reflecting on how the LBV's dependence on project-oriented funding has pulled their focus away from HIV-2 Mboup explained, "That is the difference between [LBV] and the MRC. They have almost their entire functioning budget assured for them. They can compete for project monies, but [if they don't get them], it will not stop the place from working, because there is an institution behind them that guarantees financing. Our situation is very difficult because we are in a constant state of insecurity. That is very difficult because it means that we can't provide secure positions for our personnel. At best, some people have been able to stay around because their

projects have lasted a long time. But we really are living in a permanent state of insecurity.”

By examining the story of HIV-2 from an ethnographic standpoint, this dissertation has elucidated how contemporary scientific research in Africa is shaped by economic, political and historical events. At certain moments, these experiences and their effects have produced unique opportunities for scientific discovery. This dissertation has explored the myriad enrollment practices that allowed Mboup and his colleagues to describe HIV-2. For more than two decades Mboup worked to stabilize the network of HIV-2 research, building his laboratory and incorporating more individuals and technologies into the HIV-2 matrix. In the absence of any internal funding mechanism, he held the HIV-2 work together by investing in relationships. Indeed, such relationships have become one of his hallmarks, and they have permitted him to hold together a laboratory under significant financial constraints. One of his North American research partners remarked on the enduring legacy of these ties: “Occasionally I have criticized a member of Mboup’s staff,” he explained, “or pushed him to get staff to do something. He is very protective of them, and will always stand up for them. I really respect that. It has inspired a deep loyalty, which has worked extremely well for him.” By promoting and sustaining those around him, and often at his personal expense, Mboup has worked to keep the lab, and Senegal’s HIV-2 networks strong. Floating the salaries for his employees during difficult times, and even turning down recruitment offers from the director of UNAIDS, his decisions stand out in a region where pervasive uncertainties often engender a kind of hegemonic, “I graze therefore I am” mentality of distribution that Bayart has referred to as “politics of the belly” (Bayart 1989: 268). Speaking of these choices, Mboup explains: “Often people reproach me for it, saying, ‘One day you will regret all of this because you have invested an enormous amount here [at LBV]. You will find that you will have nothing for yourself...all of this money -- you have mobilized it for the lab instead of putting into your own account. One day your kids will reproach you, because you will leave this hospital and leave everything, and you will have nothing.’”

Mboup's response is quite simple: "I say, what does that matter? What is essential for me is that I have left something. But what I do not want is to leave something that will collapse after me. That would be the worst thing. A lot of people here, they have a reputation and they work towards creating an emptiness [*faire un vide*] around them so that they are the only ones [with power]. But once they leave, there is nothing. Whereas me, I started to build a team...My philosophy is that in leaving here, I would like to leave an institution that continues to work, because if this institution crumbles when I leave, it is as though I have done absolutely nothing."

Unfortunately, the HIV-2 story has demonstrated that networks of scientific work in Senegal are extremely unstable entities. The work of Mboup and his colleagues, and the historical and social work that made the enrollment of Senegal's sex workers possible, created a network that was strong for a very long time. HIV-2's facticity produced papers in the world's top journals, established ties that stretched across oceans, and helped to build both a laboratory and the reputation of Senegal as a model in the HIV epidemic. However, after two decades, the foundation of the HIV-2 network, as if built on sand, began to shift under the tides of new funding flows. Despite the solidity of the highly-trained and motivated staff and the potent scientific potential of the virus, when overseas funding moved elsewhere Senegal's HIV-2 network began to unravel.

Chapter 7 demonstrated that a different set of social and economic circumstances have allowed the HIV-2 research apparatus to thrive at the MRC laboratories. As a British institution operating in West Africa, the MRC has access to a stable funding structure that has allowed its researchers to enroll entire populations as research subjects, and sustain such population-level studies over time. This has allowed the MRC laboratories to extend the HIV-2 network, developing immunological studies that represent a new frontier of HIV-2 research possibilities. This trajectory of HIV-2 points to the significant challenges facing Africa's public laboratories. Significant funds for HIV research are being

diverted to the continent in an attempt to produce new knowledge forms that may lead to a vaccine. The goal of these funds is to produce new forms of HIV knowledge, but as this dissertation has demonstrated, the unstable nature of these funds may have some unintended consequences on scientific knowledge production in these low-income nations.

Interestingly, Senegal is beginning to take measures to reduce some of the instability that has limited scientific possibilities for its researchers. To bridge the research funding gap, Dakar's *Université Cheikh Anta Diop* has been working to create alternative funding streams to diminish their researchers' dependence on foreign partnerships. The University has begun to restructure its doctoral program to promote inter-disciplinary research collaborations, and it is in the earliest stages of trying to establish a new foundation that will support local researchers through regular funding competitions. The Director of Research at the University explained the importance of creating a new infrastructure to support Senegal's scientists: "The limiting factors are financial and technical resources... we realize this, that is why we want to construct an environment... where they can consecrate their time to research." Meaningful change can only come from restructuring the accepted practices that grew out of the colonial era of extraction, and such a shift would be a significant undertaking for a low-income nations such as Senegal. Yet perhaps this proposition is an indication that the state is moving towards the position advocated by those represented in this dissertation: that the development of a strong research program may ultimately help the nation meet the needs of its population.

In the meantime, Senegal's HIV-2 research apparatus has slowly unravelled. Nonetheless, the social and physical incarnations of Senegal's HIV-2 legacy are pushing forward. Mboup and his lab that HIV-2 built are finding new ways to reinvent their mission and their work. For example, the LBV now has strong programs in the study of malaria and tuberculosis. Mboup explained this shift to me towards the end of my stay: "If you do not adapt, you will disappear." His intention, of course, is for the lab to be around for a long, long time. And it is

his hope that HIV-2 may yet find its way back into the LBV repertoire. While it is a drain on the laboratory resources, he still finds a way each year to keep some funds flowing to the IHS – enough, at least, to keep the blood of sex workers flowing into the lab. “There have been some motions to leave the cohort,” Mboup acknowledged. “Of course, sentimentally-speaking it means a lot to us. But independent of that, there really is scientific value there. It is still a mine, because there isn’t another population that has been followed over time like this one. With all of the possibilities there -- the virus, the immunological interactions, the socio-anthropological implications -- it would be very unfortunate to leave all of this behind. If we leave it, one of these days we will regret it. So for that reason, I am still holding on...even if we are not doing anything with it now, I am convinced that it is a mine, and that we can really make something of it some day.”

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