LUND UNIVERSITY
School of Economics and Management

Masters in Economic History

The Health Disparities in Africa: Impact of Colonial Institutions on Indigenous Mortality from the 20th Century

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ABSTRACT

Colonial institutions, a *Miracle* or a *Mirage*? Using an exogenous variation in institutions among countries colonized by Europeans, this thesis investigates: 1) the effectiveness of colonial institutions after Independence in two distinct British colonies; the Gold Coast Colony and the Kenya Colony, and 2) whether the persistence of these institutions contributed to the current day health disparities between the colonies. The thesis collates a newly constructed cross-sectional data to show that, the channels of development that the European settlers transferred to their colonies also contributed to developmental disparities between the colonies. The study primarily utilizes an Ordinary Least Square (OLS) Model for the analysis. The findings exhibit that, higher incidence of malaria and bad geographical conditions determined the share of Europeans in the colony which translates to the share of developments likely to be transferred to the colony. In effect, in colonies where European colonizers settled, the impact of colonial institutions still persists in their current developmental affairs as indigenous mortality rates reduced significantly.

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1 Introduction

"If we are to achieve revolutionary *Socialism*, then we must avoid any suggestion that will imply that there is any separation between the *Socialist* world and a *'Third World'*."

— *Osagyefo* Dr. Kwame Nkrumah, Revolutionary Path.

1.1 Background

In recent years, most studies focused on explaining the disparities in economies has gradually shifted from the market economy to understanding the mechanism that exists in the social and political economy with institutions at the forefront. The arguments posit that "institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interactions" (North, 1990, p.3). In effect, economies which have active institutions implement reforms that facilitate factor accumulation and adoption of efficient innovation needed for development (North and Thomas, 1973; Jones, 1981; North, 1991). However, several constraints accompany the onus of measuring institutions. As there is no exact metric assigned to effective institutions.

Interestingly, Acemoglu et al. (2001) have proposed the need for an exogenous variation in institutions by using a theory of institutional differences among countries colonized by Europeans to estimate the impact of institutions on economies. The theory establishes that European colonial settlement was based on the survival rates of certain prevalent diseases in Africa (predominantly Malaria and yellow fever). Thus, in colonies where the European settlers survived, they settled and established distinct and enduring institutions. However, Acemoglu et al. (2001) also indicate that although Europeans transferred their European institutions in their colonies which persisted after independence, they also incorporated policies that abjected the natives of their colonies. Termed inclusive and extractive institutions.[1] Schematically, the theory follows the pattern;

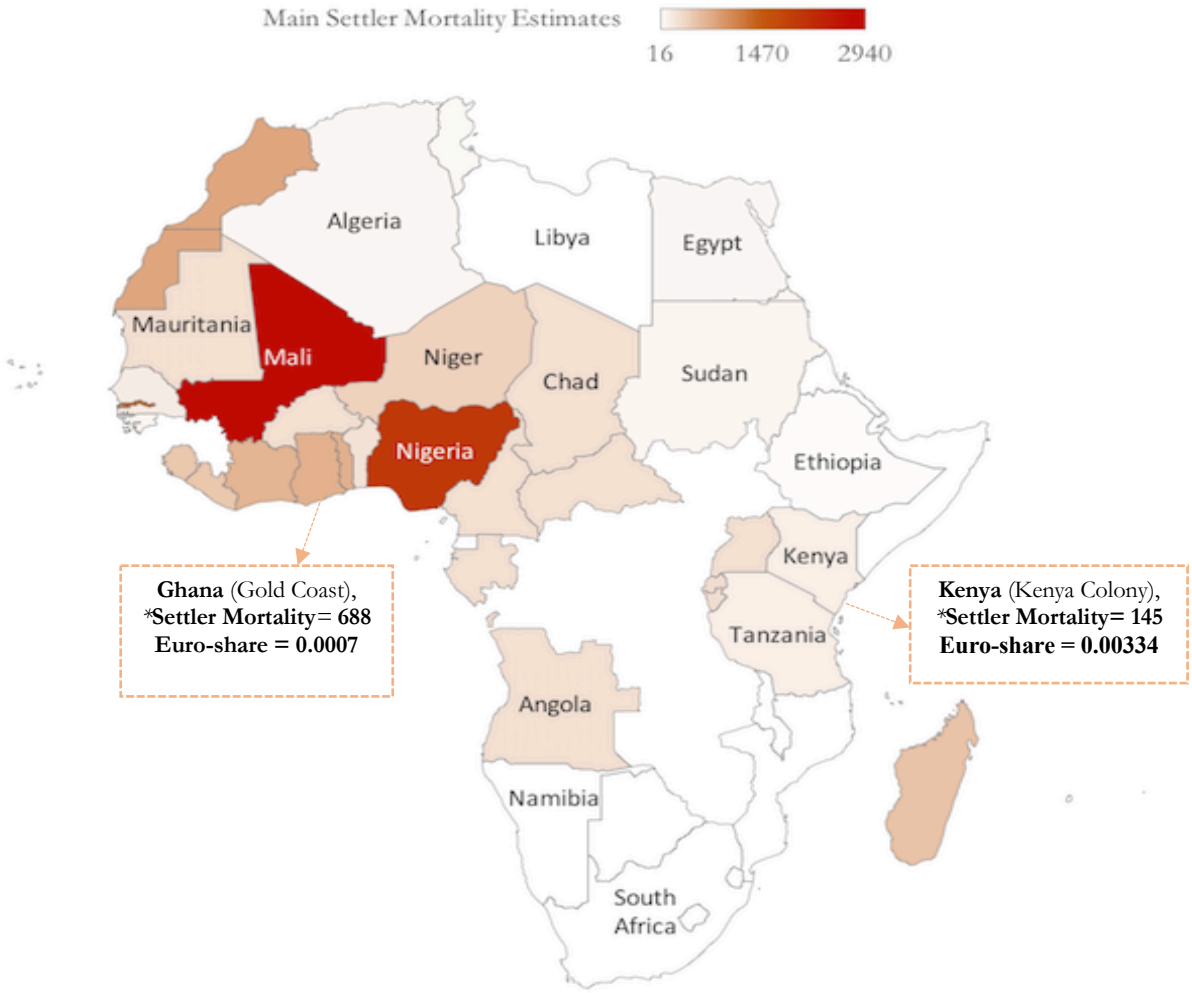
Settler Mortality $\xrightarrow{yields}$ *Settlement* $\xrightarrow{yields}$ *Initial Institutions* $\xrightarrow{yields}$ *Current Institutions* $\xrightarrow{yields}$ *Economic Institutions.*

Using the Mercator Projection system, Figure 1 below also depicts the estimated death of European

[1] Acemoglu et al. (2001): Doyle (1909) and Conrad (1899) elaborates that extractive institutions are institutions that exploits the resources of colonies. Example is the Belgian Colony of Congo which King Leopold III is argued as exploiting extensively. Inclusive institutions recognize property rights, rule of law amongst other positive mechanisms that ensures the progressiveness of colonies.

settlers in Africa from studies of Acemoglu et al. (2001). The data is originally extracted from Curtin (1989) – Death by Migration. Settler mortality determines whether European colonizers settled in a colony or not. Predominantly, the data consider the colonial death of the European soldiers *circa* 1900. The extreme colors depict high and low numbers of European mortalities. From the Figure below, settler mortality was relatively higher in the Gold Coast Colony at an estimated number of 688 deaths, than the Kenya Colony at an estimated number of 145 deaths (see images of colonies in Appendix *A*2). The highest number of deaths is recorded in Mali with about 2,940 European mortality (see Table 2. for detailed estimates of death for each colony). Comparatively, the share of European population was also relatively higher in Kenya than Ghana at a share of 0.00334 and 0.0007 respectively.

Figure 1 - **Estimated European Settler Mortality in Africa (circa 1900)**



Note: Mercator Projection is utilized for locating countries on the map. The omitted country boundaries: Zambia, Zimbabwe, DR Congo and Equatorial Guinea. Total of 17 countries had no European settler mortality (see Table 2 in Appendix for the estimates). *Data source:* **Acemoglu et al. (2001)** and **Easterly and Levine (2009).**

Previous studies on the impact of colonial institutions have rightly focused on these strands of thoughts proposed by Acemoglu, Johnson and Robinson. Most recently, Easterly and Levine (2009) also showed that the colonial origins of development led to the establishment of enhancing institutions in predominantly British colonies. Besides that, Easterly and Levine (2009) also estimated that, in colonies where the prevalence of diseases was low, and mineral (natural) resources, as well as agricultural endowments were available, Europeans transferred their enduring and distinct institutions that are present in contemporary times.

Building on this theory from Acemoglu, Johnson and Robinson (2001), this thesis will contribute to previous research on colonial development, by arguing that, regardless the development transferred by the European settlers, the enduring colonial institutions also brought disparities between the colonies over time. The relevance of this study is to validate that, by the discovery, conquest, and settlement of the European colonizers in Africa, the institutions and developments which were transferred to the African colonies persisted even after independence and also created an inequality gap between the colonies. To provide sufficient evidence to support this claim, this study will use current trends of indigenous mortality rates in the settler and non-settler European colonies.

Thus, the study will undertake a cross-country analysis in Africa with a focus on the Kenya Colony and Gold Coast Colony (present-day Kenya and Ghana respectively). The selection criteria utilized for the two colonies is based on how distinct the European colonizer (Britain) governed them as each colony had its legacy that is representative of the origins of the European colonizer. In effect, these legacies take the form of 'path dependencies'[2] that conditions post-colonial institutions and structures (Austin, 2008). For instance, in the Kenya Colony, Frankema et. al. (2016): Spear, (1997); Curtis, (2003) and Eckert, (2003) contend that, the presence of the European settlers initiated the coffee production *circa* 1890 and shared their techniques with the African farmers in Kenya. However, in the Gold Coast Colony, the cocoa boom for instance, was entirely created by the local farmers and not the European share. Thus, the difference between the European policies and legacies in the Gold Coast Colony and the Kenya Colony was that, in the latter, the British colonizers settled and transferred their European legacies or institutions by taking control of domestic coffee production (Frankema et al.,2016). Whereas in the Gold Coast Colony, during the era of Governor Sir Gordon Guggisberg (1869 – 1930),

[2] The term *Path dependency* utilized in this study can be defined as a practice which is often based on historical preference (see, Austin for further elaboration)

the British colonizers considered the colony as a peasant settlement and ensured there was complete freedom for the local farmers to produce the cocoa with their local knowledge without the presence and interference of the European colonizers (Frankema et al.,2016).

Hence, the study seeks to argue that, in settler colonies where the European colonizers settled and established their enduring institutions, the mortality rates significantly reduced compared to the non-settler colonies. Eventually, these enduring institutions contributed to the health disparities in current times after independence.

1.2 Research Motivation

Discussions on inequality in Africa primarily resort to current trends with a focus on economic variables (see, Bhorat and Pillay, 2015: IMF, 2015). However, to understand the disparity on the continent, there is the need also to consider past events that contributed to the recent happenings with a focus on social and political factors. Interestingly, one essential element which is often omitted in these studies are the disparities in health, which arguably has its roots embedded in the colonial institutions. For instance, Curtin (1961) explained that, up until the 20th century, the Western parts of Africa was considered "*The White Man's Grave*" due to the poor geographic conditions and the prevalence of the Malaria Falciparum disease. Curtin (1961, pp. 95) reports, "virtually the whole of West Africa provides an extremely favorable environment for the Anopheles gambiae and Anopheles funestus…the most efficient vectors for plasmodial parasites from one individual to another." This hindered European settlements in mostly West African countries like Ghana, which eventually resulted in lesser developments transferred to these regions in Africa.

On the other hand, in East African countries like Kenya, due to the presence of favorable weather conditions and less incidence of Malaria, the European settlers were motivated to settle and transfer their developments (like effective health systems and policies) to the colony. However, previous research also exhibited that, in certain colonies where the European colonizers received enough local revenue from the crude exports of raw materials (example is the cocoa boom in the Gold Coast Colony), they initiated some level of developments in those colonies purposely to boost productivity (Austin, 2008). In addition, it must be noted that, other short-term factors like wars, diseases, and famines, which are not associated with colonial institutions, can also affect the current health conditions of any populace. Given these compelling arguments, it therefore becomes imperative to

examine whether colonial institutions established a 'path dependency' which plausibly contributed to current disparities in health between the settler and non-settler colonies.

There is the need to also note that, hitherto, previous research on the effects of colonial institutions has not extensively exploited the research areas on the disparities colonial institutions caused between and within countries. Thus, extension of this research area of colonial institutions, to understand the origin of the health inequalities in Africa can contribute to the overarching arguments on the effects of colonial institutions on current developments in Africa which can also be extended to other settings like Asia.

1.3 Research Aim and Question

The on-going arguments indicate that, the legacies of the European colonizers vary in every economic region. Hence, by focusing on the indigenous mortality rates and considering the two distinct colonies, this thesis will aim at expounding how the legacies the European settlers transferred to their colonies also contributed to the disparities in the continent of Africa. In effect, this study argues that settler colonies had relatively lesser mortality rates due to developmental institutions established by the Europeans than the non-settler colonies, even after independence.

Thus, the thesis will adopt two fundamental approaches. First, to empirically examine the African economies to validate the conditions necessary for the settler and non-settler colonies. Secondly, the study will quantitatively examine the current-day crude death rates in the two distinct economies aforementioned to know the impact of colonial settlements on them. The study will therefore seek to answer two research questions, whether;

1. *European colonial institutions which persisted after independence resulted in current day mortality rates reductions in settler colonies.*
2. *The developments that European settlers transferred to Africa contributed to the current day health disparities in the economies.*

1.4 Research Hypotheses

Purposely, as this study endeavors to understand whether colonial institutions had any impact on current indigenous mortality rates, this thesis will hypothesize that;

H_1: *European colonial institutions which persisted after independence resulted in mortality rates reductions in settler colonies.*
H_0: *European colonial institutions which persisted after independence did not result in mortality rates reductions in settler colonies.*

H_2: *The developments that European settlers transferred to Africa contributed to the health disparities in the economies.*
H_o*: The developments that European settlers transferred to Africa did not contribute to health disparities in the economies.*
The hypothesis of the research will contribute to the long-standing discussions of colonial origins and its impact on Africa argued by Acemoglu et. al. (2001), Nathan Nunn (2008), and Austin (2008), to mention a few.

1.5 Outline of the Thesis

Following the Introduction (1), the subsequent sections are structured as follows. In section (2), the study focuses on the theoretical framework by taking a closer look at the colonial regimes and legacies of the European colonizers and conditions that necessitated them to settle or not to settle. This thesis will therefore compare the variant colonial legacies adopted in the various colonies in Africa, specifically in the Gold Coast and Kenya Colonies. The relevance of this section is to elaborate on the factors that led to European colonizers adopting variant legacies when they settled or did not settle in the colony. In section (3) the study will focus on the previous research and findings on the mortality trends in the pre and post-colonial era to understand whether the colonial settlement influenced the mortality trends in mainly the colonies of interest. The study will therefore examine the nexus between colonial institutions and current institutions. Section (4) will discuss the data, methodology and econometric model adopted for the study. In section (5) the study concurrently reports the main results for the quantitative analysis and its associated discussions in the same section. The concluding thoughts and reflections, as well as the future research, are discussed in section (6).

2 Theoretical Framework

2.1 Colonial Institutions in the Gold Coast and Kenya Colony

The theoretical arguments on colonial institutions indicate that institutions established in colonies followed a 'path dependencies' that structured the future institutional establishments (Maseland, 2017). For instance, in the 16th century, although the motive of Great Britain was primarily driven by the intention to commercialize trade through the Maritime expansion and controlled by the Navigation Act of 1651, they established settlements which exercised some rights of supervision and appointments in their colonies. Consequently, these settlements became colonies where British legacies where administered. Hence, Maseland (2017, p. 260) argues that "the kind of institutions a country faces today are strongly determined by its history, colonial or otherwise."

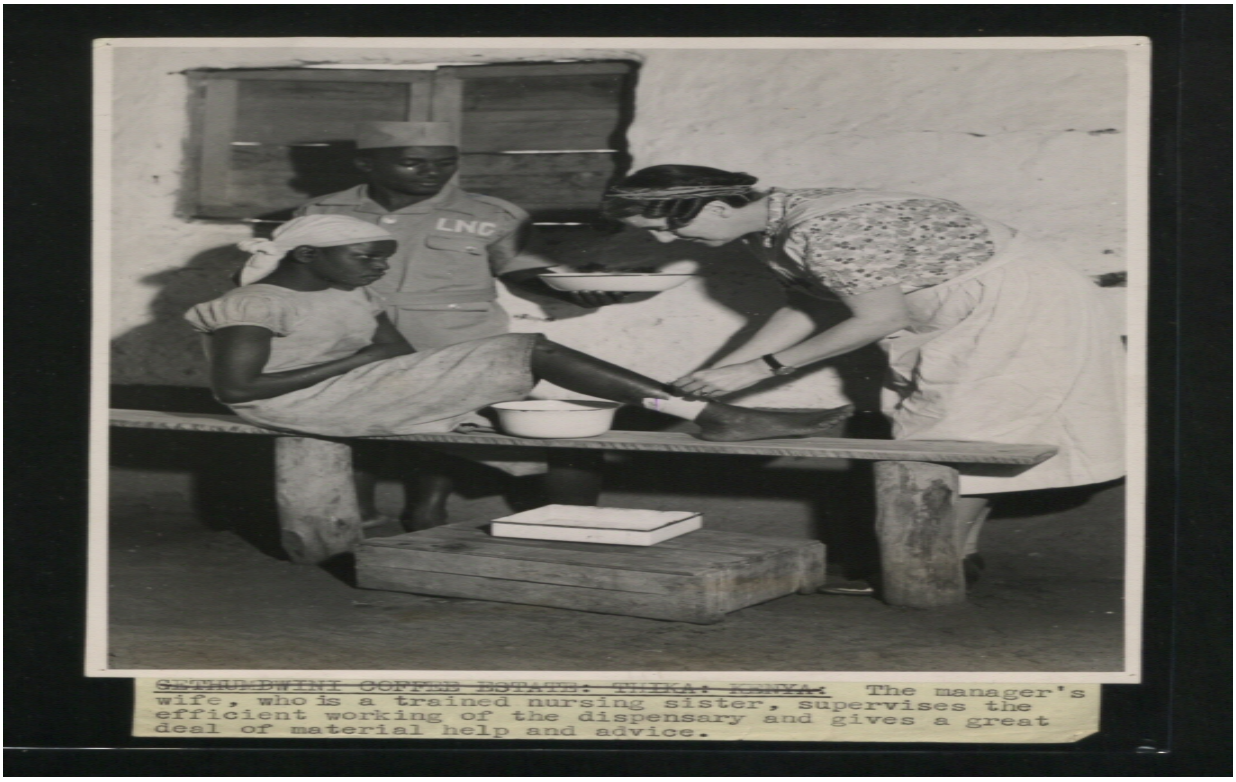
In recent years, scholarships on the modern economic history have also focused on colonial establishments to explain the economic performance and the apparent disparities in Africa (example Acemoglu et al., 2001, 2005: Nunn, 2008: Bezember et al., 2014). Most often, the literature utilizes complex historical experiences to understand this phenomenon. However, there is no consensus to confirm whether colonial institutions are good (Ferguson, 2012) or bad (Michalopoulos and Papaioannou, 2016). Thus, to give a complete understanding of this different school of thoughts, there is the need to focus on the arguments of institutional persistence that creates the path-dependencies for current institutions. Purposely, Acemoglu et al. (2001) spearheaded these arguments by indicating that by using an exogenous variation in institutions it becomes plausible to establish the institutional differences among countries colonized by Europeans which helps to estimate the impact of colonial institutions on economies.

Thus, in the context of this study, given the theoretical arguments aforementioned, the study will estimate whether colonial institutions (legacy) affected current institutions. Thus, the colonizer origins at the time of independence, derived from the study of Nunn (2008) will be utilized to control for this effect (see Table 2 in Appendix A1 for colonizers for each colony). Primarily, this control variable identifies the origin of the colonizers and also enables us to understand their colonial legacies which has persisted and endured. It must be noted that although the two colonies considered in this study were both colonized by the British, the inclusion of the origin of the colonizer is to purposely control for the share of European population who include all settlers from Europe as well as settlers of

European descent other than Britain. The Colonial Reports and Annual Medical Review of 1931 to 1933 in Kenya also provide evidence to this assertion. The reports estimated that, in the 1931 population census, there were about 16, 812 Europeans settlers of different descent, including 39, 644 Indians, 12, 166 Arabs and about 1, 346 settlers from different parts of the world.

Nevertheless, the policies of the colonizer at the time (Great Britain) dominated the internal affairs in Kenya Colony. For instance, earlier Colonial Reports and Annual Medical Review in 1920 to 1921 indicated that the Public Health Ordinance which was established by the British colonizers significantly improved the health of the populace in the Kenya Colony who were previously inflicted by the Malaria disease. This was a serious factor affecting the prosperity and development of the population in the areas of the coastal belt, the Nyanza Province bordering on the lake-shore, and in the valleys of the larger rivers in the Kenya Colony. Subsequent reports in the Colonial and Annual Medical Review in 1933 indicated that, the ultimate responsibility of the Central Government (*British Colonizers*) was then to promote public health with the Local Government acting as supervisors. To accomplish this task, it is reported that, in consonance with government policies, the Director of Medical Services prudently provided and distributed medical relief and health staffs. These medical reliefs and health staffs specifically dispense medicines and treated the unhealthy indigenes and European settlers alike. It is noteworthy also to state that, the European authorities also ensured the reliefs were made available in all the hospital dispensaries, out-dispensaries and most importantly, the government hospitals specifically in European settled areas in Kenya. Amongst the treated cases in the government hospitals included, pneumonia, Malaria, and helminthic infections. The image below depicts the colonial out-dispensary in Kenya with the trained European nurse offering treatment to an indigene.

Figure 2 - **Colonial Out-dispensary Nurse Treating an Indigene of Kenya**



Source: **National Archives of Kenya**

In contrast, in Ghana and predominantly in most British West African colonies, the policy adopted was an indirect rule operating through traditional practices and institutions. Westphal (2015) supports these assertions and indicates that the colonial regime in Ghana was a blend of traditional and modern European institutions. Haruna (2004, p. 196) also stated that the colonial legacy in Ghana was a "relic originating from British imperial rule." Findings from Apter (1959) further indicates that, although the traditional rulers of the Gold Coast and the European colonizers of British recognized the traditional authority in settling of disputes, yet the local traditional rulers were often side-lined to prevent political instability. Consequently, Dzorgbo (2001) contends the traditional rulers became subservient to alien rule. These arguments somewhat support the claims of Acemoglu et al. (2001) which indicates in colonies where Europeans did not settle they established extractive institutions.

Interestingly, the health care system in Ghana also exhibited these relics of British imperial rule although not as effective as in Kenya. For instance, years before the Public Health Ordinance was established in Kenya *circa* 1920; a pre-medical system existed in Ghana in 1878. In later years around 1880, Patterson (1981) indicated that the Medical Department was then established. Subsequently,

thirty years later after the establishment of the Medical Department, the British colonizers establish the Sanitary Branch to improve the health care system. The establishment of the Sanitary Branch was spearheaded by Britain's Secretary of State for the Colonies - Joseph Chamberlain (1836 – 1914), aimed to combat the increasing mortality rates of Europeans living overseas.

Nonetheless, these establishments faced enormous challenges. Primarily, the policies were directed to only the colonial states due to lack of sufficient funds and the intent to reduce the mortality rates of Europeans who were only dominant in the colonies. It must also be noted that the primary source of finance was from the proceeds of exports from the colony as the British Government was not ready to misuse funds on unproductive colonies (Austin, 2008). An example is drawn from the era of the cocoa boom in the Gold Coast which was later affected by the series of economic instability after the World War II as well as the Great Depression (Frankema et al., 2016). In effect, the funds allocated to the colonies became meager. However, in the early years of independence after colonization, the colony experienced high levels of exports again (Frankema et al., 2016).

Quaye (1996) and Addae (1997) also exposed that another challenge that the British colonizers faced was the cultural barriers. As the indigenes somewhat rejected the new methods and practices due to poor public health education and the associated fine on violators on the need to abide by the new health standards in the Gold Coast Colony. An example is the agitation against the Mosquito Ordinance which were amongst the first policies undertaken by the Sanitary Branch in 1911. The Mosquito Ordinance was aimed at reducing the persistence of malaria and yellow fever through regular inspection of households with any violation attracting a fine (Addae, 1997). This was supervised by the "mosquito brigades" who faced fierce resistance from the indigenes when performing their duties (Addae, 1997). Predominantly, the reason for the strong agitation by the indigenous population who were relatively poor, was due to the huge fine imposed on them when they do not comply with the rules of the Malaria Ordinance (Addae, 1997). Nonetheless, it is noteworthy to state that, these drawbacks did not entirely collapse the health initiatives which were established in the colony. For instance, Patterson (1981) reports, the Medical Department became the foundation to which the Ministry of Health in present-day Ghana was established.

2.2 Colonial Settlements: *Settler and Non-Settler Colonies*

Grier (1997) indicates that the British recognized six different forms of colonial holdings namely; original Caribbean colonies, settlement colonies, protectorates, mandated territories, regular dependencies and the special case in India. In the context of this study, the focal point is on *Colonial Settlements* which is defined as a phenomenon whereby a dominant nation establishes its presence in another nation and takes control of the social, economic and political institutions of the weaker nation when conditions in the weaker nation are favorable.[3] The favorable conditions may be due to lesser European death rates and favorable natural resources (as argued by Curtin et al., 1995: Acemoglu et al., 2001: Easterly and Levine, 2009: Frankema et al., 2016). Consequently, the colonial rulers either transfer their enduring colonial institutions to these weaker nations or extracted their resources.

Considering the European settler death, Acemoglu et al. (2001) account that 80% of the mortality of the Europeans was predominantly caused by mosquito vectors which transferred the Malaria plasmodium falciparum and Yellow Fever disease. As the Europeans did not have immunity to the indigenous and infectious mosquito bites. The World Health Organization also confirm that in Africa where Malaria is endemic, the severity and death rates are high in non-immunes like the Europeans. Curtin et al. (1995 p.463) also state "because malaria species are quite local, a person may have immunity to the local version of malaria but be highly vulnerable to malaria a short distance away." Thus, it can be established that, due to the non-immunity of European Settlers to particularly the Malaria Plasmodium falciparum disease, they avoided settlements in colonies where the prevalence of the disease was high. However, Philip Curtin noted that, the prophylactic drugs "quinine" given to the military to alleviate the drastic effects of Malaria failed to eradicate the incidence of Malaria specifically in the European soldiers. In effects, in order to avoid the high incidence of European settler deaths, the population of European soldiers assigned to the colonies reduced in subsequent years that followed.

Philip Curtin indicated that a special study in medical topography which consisted empirical examination of the tropical region of Africa also gave several information regarding the conduciveness of the continents (Curtin, 1961). Amongst the information received the European colonizers realized they needed to stay aboard the ship. Besides that, it was more dangerous to go ashore at night than

[3] The definition is extracted from the concept of European settler mortality and settlements in the studies of Acemoglu et al. (2001).

during the day. Nonetheless, this information was not always regarded as reliable in certain colonies. Thus, special rules (like avoidance of sexual intercourse and eating of meat) which were in line with systems of medicine dispense to European settlers were initiated to prevent them from attracting any disease. Yet Curtin (1961) reports that, by the end of the decade in the 19th century there was a clear indication the bad geographic conditions in West African countries like Sierra Leone was not going to improve. In the Gold Coast Colony, between 1819 and 1839, Curtin (1961, pp. 110) reports the annual average death rates per mean strength of Europeans was 483 for enlisted men and 209 for officers (Acemoglu et al. reported 688 deaths which was not far-fetched). Although the quinine prophylaxis also helped to reduce the mortality to some extent, yet the absence of any improvement in medical system within this era hindered European settlements.

3 Previous Research and Findings

3.1 Nexus Between Colonial Institutions and Current Institutions

Previous research on colonial institutions in Africa mostly focus on how colonial institutions has affected the current developments. For instance, proponents of colonial institutions (including; Daron Acemoglu, Simon Johnson and James Robinson; Nathan Nunn; as well as William Easterly and Ross Levine) who spearheaded the theory of institutional persistence during the colonial era, predominantly focused on how colonial political-economic transmission determined current performance. For example, Acemoglu et al., (2001: 2005) elaborate that effective political and economic transmissions sets the foundations for inclusive institutions in economies which are persistent. Other proponents of political-economic transmissions also expound that, "economic institutions affect the distribution of resources, which may be invested in gaining political influence" (Maseland, 2017, p. 263). Moradi (2009) supports this assertion by indicating that, in Kenya, due to the land alienated to European settlers, they gained political influence. Admittedly, studies from Acemoglu et al. (2001) also found that European settlers in some colonies (Belgian colony of Congo Kinshasa) utilized extractive policies by expropriating properties in colonies where settlements were not favorable. Nonetheless, Acemoglu et al. (2001:2005) further elaborated that in colonies where inclusive policies are adopted, the economic and political transmissions serve as the bases of institutional persistence because it ensures an enduring effect on the current institutional systems. Empirical findings by Acemoglu et al. (2001), on the study - Colonial Origins of Developments, also

exhibit Settler Mortality in the *Two-Stage Least Square Model* has a direct effect on current economic performance when controlled with other variables like climate and geography.

Nonetheless, Young (2004) argues that the effectiveness of colonial institutions ended three decades after the first Sub-Saharan African country gained independence. However, Young (2004) agrees that colonial attributes of European Colonizers rightly dominated the post-colonial state and institutions, but only in the earlier years after independence. Young (2004, p. 24) stated "the lexical habit of post-colonial usage to label the African political world persists, but in many countries, little remains of the hegemonic apparatus which African rulers inherited and initially sought to reinforce and expand as an instrument of rapid development." Thus, Young's argument posits that the persistence of institutions is not enduring in current times as by 1990 the colonial characteristics eviscerated. Interesting findings from the renowned African Historian - Achille Mbembe - also expresses that the effects of colonial institutions in the Postcolony were due to the knowledge or colonial rationality of the African populace. In effect, Mbembe (2001) indicates post-colonial African government did not emerge as an invention from the African political elites but from several cultures, heritage, and traditions of which the feature has been entangled for an extended period.

Moradi (2009) somewhat supports the arguments of Mbembe (2001) and expresses that although it is fashionable to condemn colonial policies, the colonial rule in Kenya, for instance, attracted modernization of infrastructure, expansion of trade and spread of Western medicine. Evidence can be drawn from the GDP per capita in Kenya which increased at an annual rate of 3.1% from 1914 to 1964 but gradually reduced to 2.3% *circa* 1963 to 1980 (Moradi, 2009). Interestingly, Moradi (2009) also found that the net outcome of colonial policy was a significant improvement in nutrition and public health systems. Moradi (2009) elaborated, from the 1920s onwards, the health infrastructure expanded incredibly with an estimated 130,000 Kenyans treated in native hospitals. Subsequent years saw an increasing number of treated patients, from 500,000 in 1936 to one million in 1948 (Moradi, 2009). Besides that, an estimated number of 110,000 in 1923, 620,000 in 1936 and 1.4 million in 1948 were treated in out-dispensaries in Kenya. Further example is drawn from the studies of Shanks et al. (1999) who expressed how effective administration of prophylactic drugs, cured the Malaria epidemic which affected the Western Highlands of Kenya due to the labor migration of workers from the Malaria endemic areas around Lake Victoria. By the turn of 1950, Moradi (2009) reported that, modern antibiotics (example penicillin) made the treatments very effective. By applying an indirect method

using the trend in the census data, Brass and Carole (1993) also estimated that child mortality rate in Kenya dropped from 270 in 1940 to 153 in 1974 due to the introduction of Western Medicine by the Colonizers. These findings from Moradi (2009), Shanks et al. (1999) as well as Brass and Carole (1993) exhibits how effective colonial medical treatment affected the populace in Kenya even after independence.

Fieldhouse (1966) also contend that although colonial rule was generally legitimized by the idea that it was benevolent, however the variant legacies had different impacts on the colonized societies (some favorable than others). Fieldhouse (1966, pp. 374) stated, "there is much cherished myth that character of modern colonies differed widely according to which European state owned them…such distinctions flattered national vanities and were underlined by contrast in style." Grier (2011) and Bertochhi et al. (2002) also expresses that British imperialism led to better outcomes for its colonies. Grier (1999) most importantly indicates that exposure to colonial rule resulted in higher post-independence growth rates. Robin Grier further expound that, colonies that had longer period of colonial rulings performed better, on average after independence than colonies who did not (Grier, 1997). Evidence is drawn from the pooled data of 63 former colonies which exhibited that the length of colonization positively and significantly correlated with economic growth from 1961 – 1990 (Grier, 1997). Further empirical studies yielded similar results when the sample size was restricted to 24 countries particularly for British colonies. It must be noted that, human and physical capital played a pivotal role to post-colonial developments in the British Colonies (Grier, 1997).

In recent times, the arguments on institutional persistence have been extended to cover other aspects like biological transmission (Ashraf and Galor, 2013) and cultural transmission (North, 2008; Fernandez and Fogli, 2006). For instance, Maseland (2013: 2017) contends that, in considering the biological transmission, the arguments posit specific geographical characteristics have an impact on the behavioral norms of the population. Another extension is on the cultural transmission which focuses on the ideas and knowledge a nation receives as an incentive of the institutional systems transferred. These extensions indicate there is the plausibility of other factors other than colonial institutions having an impact on current institutions. As Mbembe (2001) argues, it is plausible the cultural transmissions have been entangled in established institutions that existed for an extended period. Williamson (2000) supports these arguments by indicating that institutional persistence is inevitable in societies due to the cognitive and normative structures of which institutions depend on.

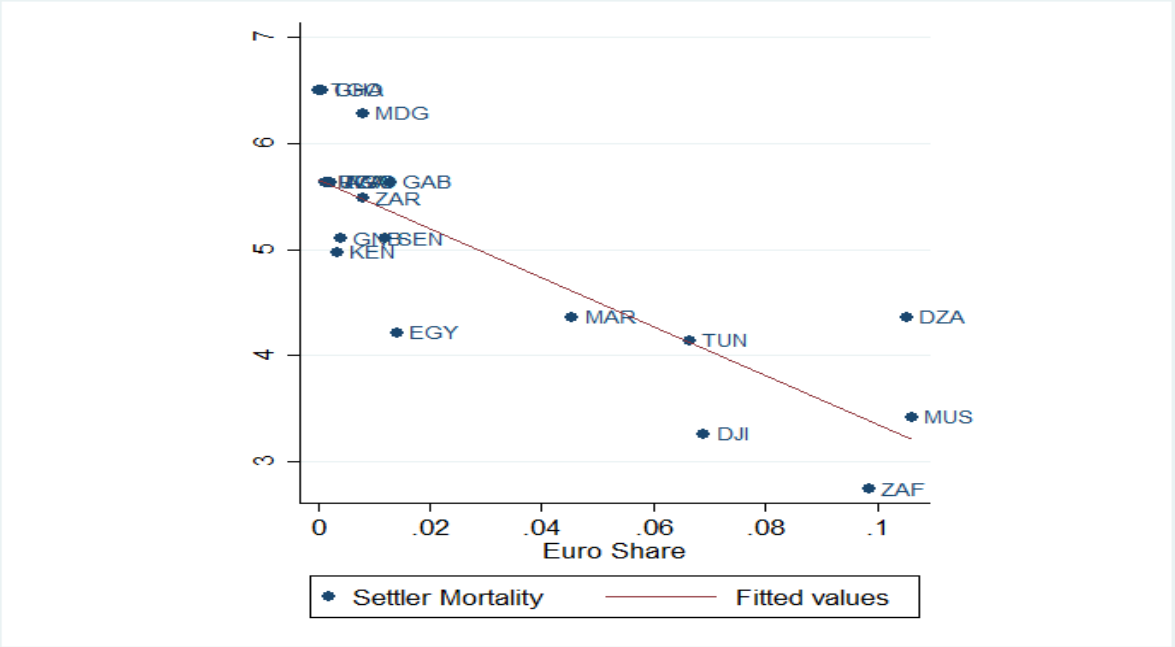
4 Methodology & Data

The study utilized multi-datasets from different literature studies to analyze the effect of European settlements on crude death rates of the indigenous population in 2010. Primarily, the study explores previous empirical studies on colonial settlement and support it with the quantitative analysis on mortality trends specifically on the colonies of interest (Ghana and Kenya). It must be noted that a non-bias approach was utilized in the selection of the data from the previous literature. However, purposefully, the approach ensured the exclusion of irrelevant variables that do not affect the dependent variable (log of crude death rates) were omitted.

The study also utilized two primary methods to validate its arguments. First, the study examines the African economies, to find the settler and non-settler colonies using empirical studies from previous literature. Predominantly, most empirical studies on colonial settlements try to establish its relationship with economic developments. However, this study contributes to the literature by discussing the cross-country health disparities as a result of the European settlements. Thus, the main variables utilized from the previous studies were the settler mortality to understand the European death rates extracted from Acemoglu et al. (2001) and Euro-share to understand the estimated population of the Europeans in the colonies extracted from Easterly and Levine (2009). These variables helped ascertain whether Europeans settled in their respective colonies or not, when they died less.

Figure 3 below shows the relationship between Settler Mortality and Euro-share. The Figure depicts that countries with a higher share of the European population have a reduced level of Settler Mortality. Plausibly, this is due to the developments transferred to the colonies as well as the favorable geographic conditions which made settlements conducive.

Figure 3 - **The Relationship Between Settler Mortality and Euro-share**



Data source: **Acemoglu et al. (2001)** – *Settler Mortality* and **Easterly and Levine (2009)** – *Euro-share*

Note: Isocode of country labelled in Appendix *A*1.

Secondly, after establishing the settler colonies and non-settler colonies, the study quantitatively examines the current trends of mortality in the two distinct economies in Africa after colonization (Ghana and Kenya). By using colonial fixed effects, geographical, climatic as well as health-related control variables that could likely affect the wellbeing of the populace in current times. Most importantly, the quantitative analysis is to confirm or reject the hypothesis of the study. These measures helped ascertain whether the European settlement contributed to the health disparities in Africa or not. Furthermore, as the thesis aimed to enquire how settler mortality contributed to European settlements which eventually resulted in health disparities on the continents, the study constructs an interaction variable to examine how lower or higher settler mortality with reference to colonies with no Europeans settler mortality affected current health status. Hence an interaction variable created, utilizes the settler mortality variable (transformed into categorical variable) and the continuous variables; expropriation risk index, Euro-share and the Malaria falciparum disease.[4]

[4] The Settler Mortality variable is transformed into categorical variable with colonies having European Settler mortalities below 5 but not equal to 0 as low settler mortality colonies and high settler mortality colonies have a log 5 and above. The reference category are colonies with no Settler Mortality (settler mortality equal to 0) as presumably they had no European settlements when cross-checked with Euro-share in the colony. The continuous variables were the *Expropriation Risk Index, Malaria Falciparum* and *Euro share*. See *Tables* 2 and 5 for further details.

It is noteworthy also to state that, the study employs an Ordinary Least Square Regression Model (OLS Model) for the regression estimates. Hence, it is plausible that the regression result may encounter the problem of heteroskedasticity. To check for this problem, the study conducts a Breusch-Pagan Test and run a robust standard error regression to alleviate the problem. Eventually, the study compares all findings with the previous literature to confirm or reject what the literature says.

The comprehensive approach adopted for this thesis will contribute to previous research which hitherto has focused on the effects of colonial institutions on current developments. Hence, findings from this research will help understand whether the colonial legacies resulted in health disparities in Africa which might have had an effect on the economic developments due to the spill-over effects a healthy workforce is likely to have on the productivity of every economy.

4.1 Limitation of Method

The analysis of the study encountered some limitations. The dataset utilized had both historical and current variables with more than five decades apart (variables from the colonial era of the 19th century and current variables in 2010). Thus, the study was challenged with the problem of *compression of history* elaborated by Gareth Austin which occurs as a result of conflating different pairs of dates of economic history (Austin, 2008). In effect, the complications likely to arise from this research design is that many events occurring in-between time might be omitted in the estimates as there may be other confounders. Besides that, the compression of different historical periods and paths are likely to be over-simplified in the study if the variables utilized are not necessarily important in certain historical context (Austin, 2008). Nonetheless, Austin (2008)) proposed that by checking for the robustness of the model of our dataset in our estimation and utilizing a more flexible conceptual framework that can give a more complex explanation can plausibly resolve the problem of *compression of history*.

In addition, as the study also utilized data from other literature studies, criticisms against these literature studies and the variables employed cannot be avoided. For instance, Albouy (2012) argued that, the usage of the settler mortality and expropriation risk index as an instrumental variable for estimation are problematic and statistically weak. Albouy (2012) further argued the method utilized in calculating the settler mortality variable in particular is questionable as there are no credible datasets

available to construct the exact estimates of settler mortality. In effect, the exclusion of poorly measured countries alternates the measures of expropriation risk in the cross-country estimations. In response, Acemoglu, Johnson and Robinson indicated that the results from David Albouy's study were backed by the bias method used for the data selection hence resulting in wrong estimations. Acemoglu, Johnson and Robinson further elaborated that, the inconsistency in the dataset of Albouy (2012) can be drawn from the different weighted and unweighted averages used in measuring the settler mortality variable for *campaign* mortality rates and *barrack* mortality rates.[5] Interestingly, when the variable is properly weighted the estimates produces the initial results proposed by Acemoglu et al. (2001). Nonetheless, as this study did not utilize the variables settler mortality and expropriation risk index as instrumental variables, the problem may plausible not exist in the regression estimates.

Besides the aforementioned limitations, the combination of the different dataset with substantial differences might also result in the problem of heteroskedasticity in the OLS Model. As the estimates are likely to assume that all the residuals have a constant variance resulting in a biased standard error. In simple terms, it is plausible the various variables in dataset are likely to be uncorrelated and not uniform as they were collated from different periods. To resolve this the study will conduct the Breusch-Pagan Test on the models and subsequently run a robust standard error estimation model. There is the need to note, conducting these tests will alleviate the problem of heteroskedasticity in the OLS Model but not completely eliminate the problem. In addition, the usage of the OLS is also likely to result in measurement errors as the study cannot establish the exact channel of causation of how European settler mortality resulted in lesser crude death rates in 2010. Nonetheless, the study ensured the models utilized were robust by creating an interaction variable to examine how low and high settler mortality affects current crude death rates.

4.2 Data Analysis

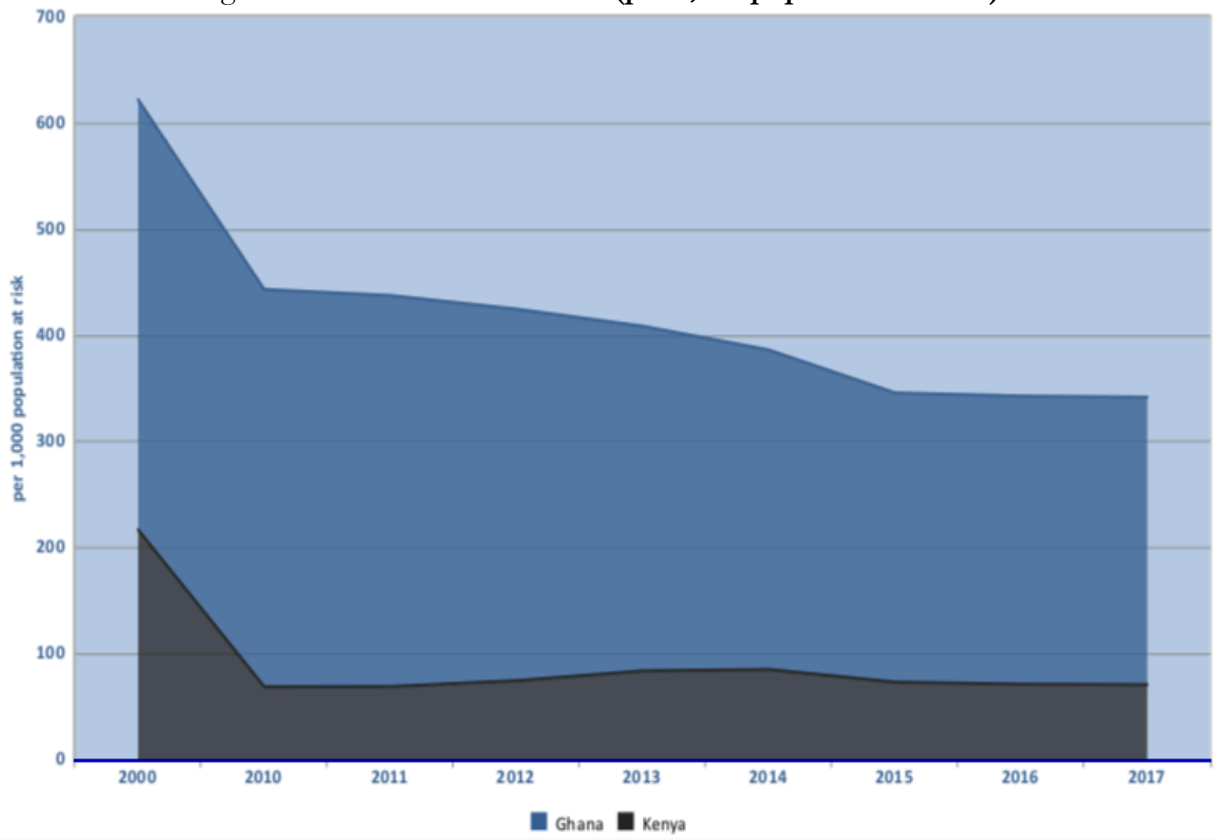
The study employed multiple datasets from the combination of data from the World Development Indicator, Maddison Database, Nunn (2008), Acemoglu et al. (2001), and Easterly and Levine (2009). The uniqueness of the dataset utilized for this study can be drawn from the reliability of the data sources. The main dependent variable, indigenous crude death rates for 2010 is derived from the World Development Indicators (a reliable source of development indicators in economies) to estimate

[5] For extensive discussions on the arguments on the variables Settler Mortality see Albouy (2012)

the current trend of mortality in 2010. Similarly, the Life Expectancy of the indigenous population is also derived from the World Development Indicators purposely to estimate the health status of the populace.

To estimate the current trend of mortality the incidence of Malaria in Africa is analyzed to know the proportion of the population at risk mostly in the colonies of interest (Ghana and Kenya). Figure 2 below shows the incidence of Malaria in the colonies of interest (Kenya and Ghana). The Figure shows that the incidence of Malaria per 1000 population at risk in Ghana (see, blue projections in Figure 4) has been exceptionally higher than in Kenya (see, black projections in Figure 4). These findings from the Figure 4 show it is possible the high incidence of Malaria in Ghana may be due to a natural condition (geography) as the parallel trend has been constant from the onset of the 21st century hitherto. Plausibly, this may also be a contributing factor for lesser European settlers in Ghana than in Kenya.

Figure 4 **- Incidence of Malaria (per 1,000 population at risk)**



Data Source: **World Developments Indicators**

Thus, to estimate the effect of malaria on the colonies of interest, the variable Malaria falciparum[6] is extracted from the dataset of Acemoglu et al. (2001) to provide evidence that European settlers would preferred areas where malaria incidence was less as it is expected that in colonies where the death from the Malaria Falciparum is higher the Europeans avoided settlements.

The independent variable of interest was the Settler Mortality utilized in the study is to analyze where European colonizers will prefer to stay if they died less and also estimate how it affected current crude death rates of the indigenous population. The Settler Mortality variable (in the *natural logged term*) is also derived from the dataset of Acemoglu et al. (2001). Formerly, Acemoglu et al. (2001, p. 1382) indicate that "data on mortality of Europeans come largely from the work of Philip Curtin." This dataset consists of systematic military medical records collated after 1815. The standardized measurement of this variable is the "annualized death per 1000 of mean strength" (Acemoglu et al., 2001, p. 1382). It is noteworthy to state that, the highest Settler Mortality was in the French Colony of the Mali Kingdom with an estimated death of 2,940 (see Table 2 in Appendix A1). Besides, the study also considered the Euro-share (derived from Easterly and Levine (2009)) and controlled with the colonizer effects derived from Nunn (2008). The colonizer effects considered; Non-colonized state, British Colony, French-Colony, Portuguese-Colony, Belgian Colony, Spanish Colony, and the Italian Colony. Table 2 in Appendix A1 exhibit the exact colonizers for each colonized region and the estimated death of European Settlers.

The geographical and climatic controls considered in the study were the distance to equator - latitude, longitude, average rainfall, humidity, temperature to understand how the natural environment and geography affected the indigenous death rates in the colonies. The relevance of the geographical variables is drawn from the argument of McArthur and Sachs (2001). The argument posits that the geographical settings can affect economic growth rate but becomes irrelevant when British and French colonies are omitted (McArthur and Sachs, 2001). The variables utilized in the regression model were the geographic controls which included: longitude (measures the longitude of each country's centroid in degrees) and latitude (measures latitude of each country centroid measured in degrees). While the climatic variables considered; rainfall (measures average rainfall measured in mil), humidity (measures

[6] Acemoglu et al. (2001) estimates that the prevalent death of European settlers was mostly caused by *Malaria* and Yellow Fever. However, this study employs only the Malaria Falciparum variable to support it arguments of European settlements.

average maximum humidity), and temperature (measures the lowest average monthly temperature). It is noteworthy to state that most colonies of the British were located in the *Tropical Rainforest*[7] region (example Ghana and the Gambia). Hence, as the malaria-causing agent - Anopheles mosquito - survives in the *Tropical Rainforest* regions with high latitudes and high temperatures the reduction in average rainfall in these colonies reduces the likelihood of incidence of malaria which will plausible decrease the crude death rates. Thus, a key point to note is that in colonies where average rainfall is high with a relatively higher latitude and temperature, there is the plausibility of higher incidence of malaria. In effects, it hindered settlements of European colonizers.

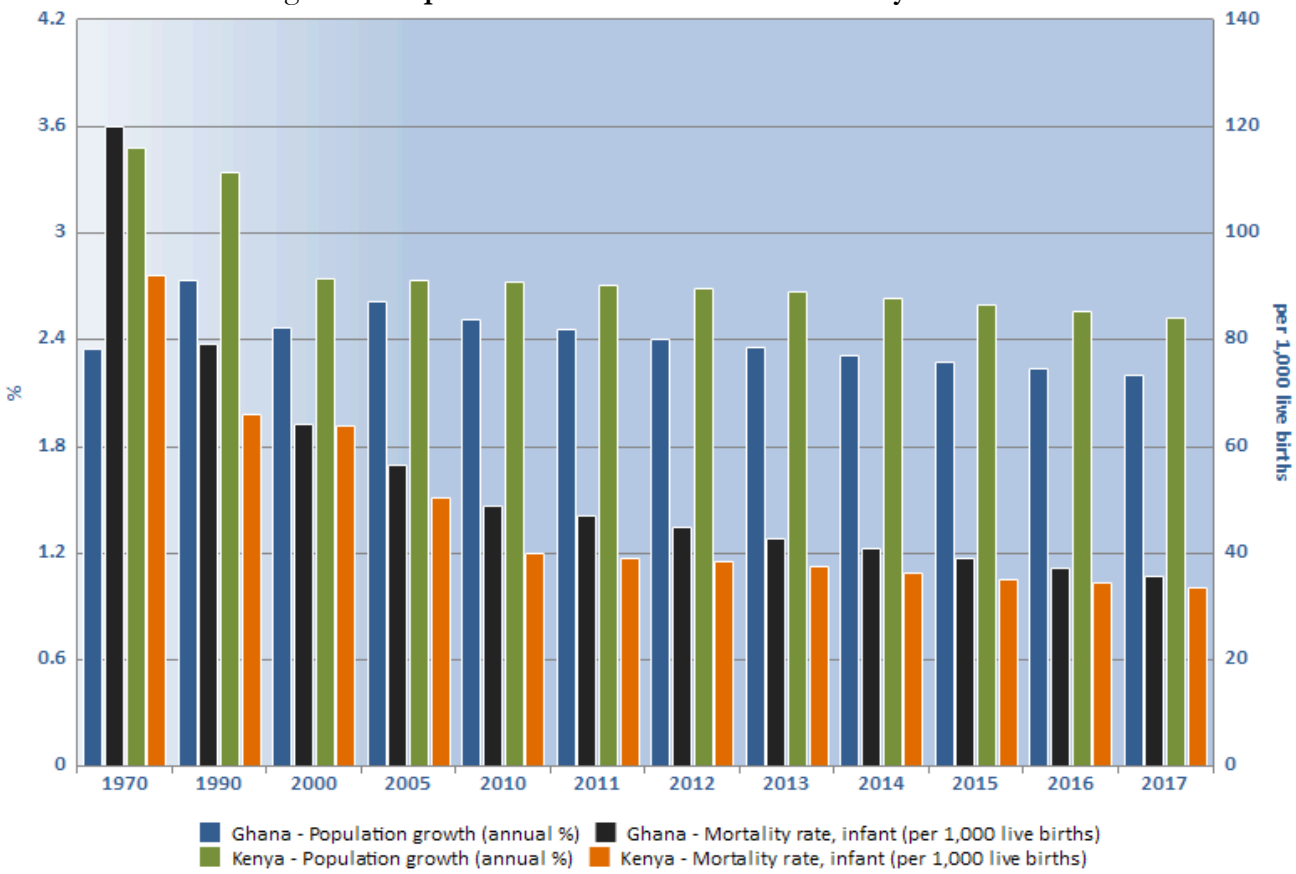
In addition, the study considered the per capita income for 2010 derived from the Maddison 2013 report and the Agricultural Raw Materials Export from the World Development Indicator to support or negate the arguments of Frankema et al. (2016). As they argued that, in the Gold Coast, the cocoa boom, for instance, was entirely created by the domestic farmers and not the European share (Frankema et al., 2016). While in the Kenya Colony, the presence of the European settlers (predominantly European missionaries) who settled in the Kenya Colony initiated the coffee production circa 1890. Frankema et al. (2016). Spear, (1997); Curtis, (2003) and Eckert, (2003) also argue that European missionaries shared their techniques with the African farmers in Kenya. Thus, the difference between the Gold Coast Colony and the Kenya colony was that the European settlers had complete control on domestic coffee production in the Kenya Colony during colonial administration in 1895 and also utilized the indigenes as a source of labour (Frankema et al., 2016). Whereas in the Gold Coast, there was complete freedom for the local farmers to produce the cocoa with no significant interruptions from the European colonizers (Frankema et al., 2016). Given these luxurious findings from Frankema et al. (2016), the study utilizes the GDP per capita income and agricultural raw material export variable as a proxy to measure inequality in the colony. Most importantly, this will help ascertain how the different colonial legacies adopted in the colonies by the British colonizers contributed to the current developments in the colonies.

[7] Tropical rainforests are found closer to the equator where it is warm. Accessed online: https://earthobservatory.nasa.gov/experiments/biome

4.2.1 Descriptive Analysis

Table 1 displays the summary statistics, source and definition of variables utilized in the study. The datasets consist of 54 African countries (see Table 2 in the Appendix for all the countries). Column 1 and 2 of Table 1 considers the mean of the variables for the colonies of interest Ghana and Kenya. Settler mortality in Ghana was averagely higher at 6.5 than in Kenya at 4.98 this plausibly translates to the higher crude death rates in Ghana averaging 9.1 compared to Kenya 7.3. The life expectancy in 2010 was also higher in Kenya than Ghana at an average of 62.9 and 60.9 respectively. Descriptively Figure 5 - below also exhibit that, within the two colonies of interest the trend of population growth rate in Kenya was relatively higher compared to Ghana since 1970 to 2017. Similarly, the trend of infant mortality in Ghana was also exceptionally higher since 1970 compared to Kenya. However, in subsequent years, the level of death diminished at same levels in Kenya. By the year 2017, the level of infant mortality rate per 1000 of live births were relatively similar.

Figure 5 - **Population Growth Rate and Mortality Rate**



Data Source: **World Developments Indicators**

Considering the geographical variables, Kenya which is located in the central-eastern part of Africa and found on the Eastern as well as the northern and southern hemisphere has the latitude of 2 degrees and Longitude of 37.9. While Ghana which is located in the western part of Africa and lies above the equator in the northern hemisphere has a latitude of 7 and a longitude of -1.2. Averagely, the percentage of humidity can rise up to 77 percent mostly in the month of August in Ghana. While in Kenya, the average humid weather condition can rise up to 62 percent. Relatively, the average rainfall in both colonies are the same at 15 degrees. However, the average temperature is higher in Ghana compared to Kenya at 15 degrees and 5 degrees respectively.

Although, the colonies of interest (Gold Coast and Kenya) were colonized by the British, they differed in policies and legacies transferred to them. For instance, the expropriation risk index which estimates the risk of private property ownership in the colonies is relatively higher in Ghana at 6.3 than Kenya at 6.1. Depicting that, Ghana had a slightly higher private property security in comparison to Kenya. Besides that, averagely, the incidence of Malaria falciparum disease was higher in Ghana than Kenya at 0.95 and 0.8 respectively. In effect, due to the high incidence of Malaria in Ghana than Kenya, it plausibly led to lesser share of the European population (Euro-share) on the Gold Coast Colony as the mean of Euro-share was 0.00074 compared to Kenya at 0.00337.

Interestingly, the GDP per capita income was higher in Ghana in the year 2010 at 2.2 compared to Kenya at 1.98. However, as the difference in the log of GDP per capita in the two countries is relatively small, it must be noted that other exogenous factors might have accounted for these differences in the GDP per capita. Nonetheless, in considering the Agricultural Raw Materials Export, the mean in Kenya were relatively higher at 10.9 compared to Ghana at 6.95.

In Africa the dataset exhibited that the independent variable settler mortality (in the natural log term) has a mean of 3.7. The dataset also shows that the maximum settler mortality was 7.99 for a total observation of 54 countries. The mean of the crude death rates of the indigenous population in Africa in 2010 was 10 (approximately) with the maximum death of 17 and a minimum of 5 approximately for the 54 Africa countries. To establish the relationship between the crude death rates and settler mortality, Table 5 exhibits that as settler mortality increase the crude death rates increases in most colonies although there were exceptional cases in South Africa (low settler mortality but high crude

death rates) and Madagascar (high settler mortality but low crude death rates). These exceptional cases may be due to other exogenous factors (like recent epidemics of HIV/AIDS in the case of South Africa) and institutional developments (in Madagascar). The colonies with no cases of settler mortality (totalling 17 countries) due to Europeans avoiding settlements were represented with high crude death rates of indigenous population. In Table 2 of Appendix A1, there are 17 countries with no European settler mortality representing no European settlements. They include the *Non-colonized states* of Eritrea, Estwani and Swaziland as well as the *Belgian Colonies* of Congo DR and Equatorial Guinea; the *British Colonies* of Botswana, Comoros, Lesotho, Somalia, Zambia and Zimbabwe; the *French Colony* of Seychelles: the *Italian Colony* of Libya; the *Portuguese Colonies* of Cabo Verde, Mozambique, Sao Tome and Principe and the *Spanish Colony* of Namibia.

The expropriation risk index which estimates the risk of private property ownership in the colonies attains a mean of 4.5 and a maximum index of 8.4 for a total sum of 48 colonies. With a total observation of 49 African countries, the mean of the Malaria Falciparum disease was 0.7 with a maximum of 0.95. The share of the European population (Euro-share) was relatively lower on the continent with a mean of 0.03, and a maximum share of 0.1 for only 37 countries.

The colonizer fixed effects which estimate the colonizers at the time of independence for the Europeans is a dummy variable (0 and 1) for all the 54 Africa countries. However, the mean variable differed with each colonizer. For instance, in the Non-colonized colonies, the mean was 0.04. The British colonies had a mean of 0.3, and the French colonies had 0.389, the Portuguese had 0.1, the Belgian colonies had 0.1, the Spanish colonies had 0.185 while the Italian colonies also had 0.2 as the mean. These averages indicate that, the French colonized most of the African countries.

The geographical and climatic variables utilized in the study is to estimate how geography and climate played a role in the death rates. The longitude which estimated each country's centroid, had a mean of 15.5 and a maximum degree of measurement as 57.8 and minimum of -24 for a total of all the 54 Africa countries. The latitude attained a mean of 12.6 for a maximum of 36 countries for all the African countries considered. The Average Rainfall, Humidity, and Temperature all attained an average of 8.168, 67.5, and 8.5 respectively. The maximum degrees of Rainfall, and Temperature were 69, and 19 respectively, while the humidity is 95%.

4.3 Econometric Model

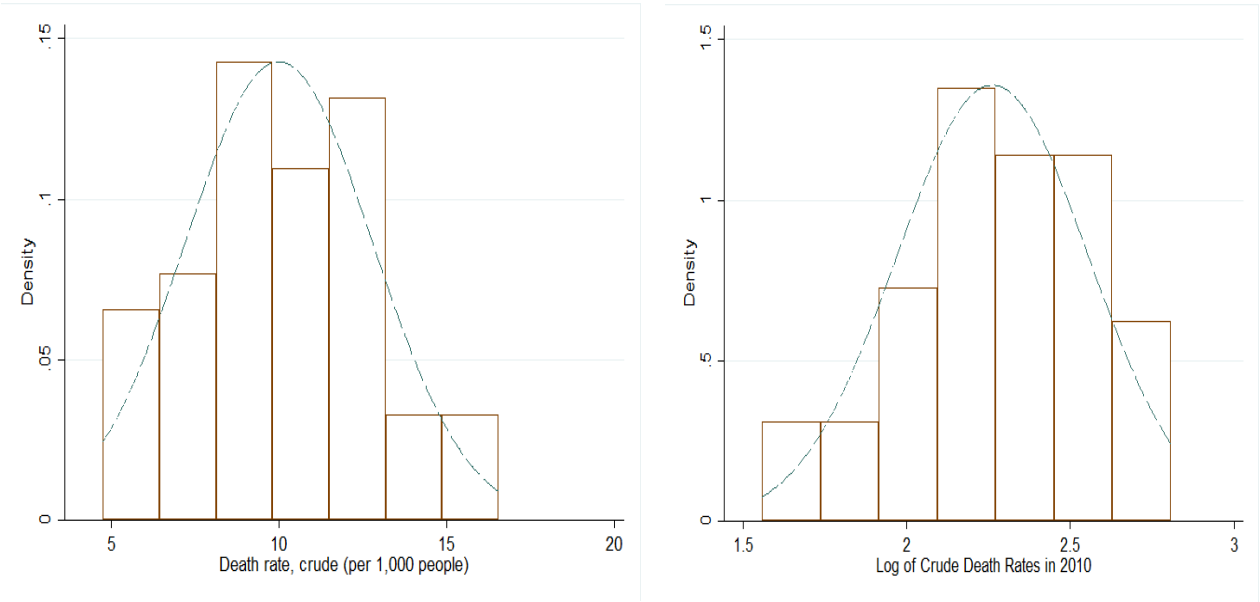
As a cross-country analysis is employed for the study, the simple Ordinary Least Square Regression Model (OLS Model) is adopted in analyzing the cross-sectional datasets utilized. The OLS Model utilized treated the log crude death rate as the dependent variable with the other additional variables as *explanatory variables*. It must be noted that, the Model is a type of linear least squares method for estimating unknown parameters in a linear regression model. The Ordinary Least Square regression equation utilized is:

$$y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$$

Where In y_i is the dependent variable, β_0 the constant, $\beta_1 x$ is the independent variables that explains the variations in the model with ε_i as the error term explaining the unobserved variation in the model. As the OLS Model is likely to face the type 1 error when the error term ε_i does not have the same variance in each observation, the problem of heteroskedasticity can occur in the estimates. To check for this problem of heteroskedasticity the study conducts a Breusch-Pagan test. Purposely, this test is to check if the variance of the errors from the regression estimates is dependent on the independent variables. It is noteworthy to state that if the test statistic assumes a *P-value* below 0.05 the null hypothesis of no heteroskedasticity is rejected. In such cases the *robust estimation* techniques are recommended.

It is also noteworthy to state that, in other to ensure the dependent variable (crude death rates) is normally distributed, the study transforms the variable to the log-term. Purposely, the main aim for the transformation of the dependent variable is to avoid violating the normality assumption of the observed data. In addition, the transformation of the continuous variable (crude death rates) is likely to increase the validity of the statistical analyses and plausibly reduce the skewness of the data to approximately conform to normality. Figure 6 below is the distribution of the crude death rates in Africa. In the displayed graph on the left-side of Figure 6, the normal distribution exhibit that the crude rates per 1000 of people in 2010 is not normally distributed and had the problem of kurtosis. However, in the displayed graph to the right-side of Figure 6, the log of crude death rates resolves the problem of kurtosis although moderately exhibited left skewedness.

Figure 6 - **Normal Distribution of Crude Death Rates and Log of Crude Death Rates**



Notes: The left graph represents the normal distribution of the crude death rates in 2010. The right graph represents the normal distribution of the log of crude death rates in 2010. See Table 1 for the summary statistics. *Data Source:* **World Development Indicators**

4.3.1 Interpretation of the Model

In the context of this study the OLS model utilized can be interpreted as:

$$\mathbf{In}\ y_i = \beta_0 + \beta_1 \ln(\text{settler mortality}) + \mathbf{C}_i'\delta + \mathbf{X}_i'\gamma + \beta_2(\text{control variables}) + \varepsilon_i$$

Where In y_i is the *natural log of crude death rates* of indigenes. ln (*Settler Mortality*) is the natural log of the European population that died in the colonies. β_2 control variables considers the variables used to control the variables. $\mathbf{C}_i'$ the vector dummy variables that indicate colonizer origin. $\mathbf{X}_i$ captures the difference in geography and climate, and ε_i as the error term explaining the unobserved variation in the model.

In the Exogeneity Assumption of the OLS Model the study estimates the different models for both Ghana and Kenya. The variant models utilized specifically for Table 3 is elaborated below:

$\mathbf{In}\ y_i$ (*natural log of crude death rates*) $= \beta_0 + \beta_1 \ln(\text{settler mortality}) + \beta_2$ life expectancy$_2$ + (geographic and climate)$_i\gamma + \beta_2$ expropriation risk index$_3$ + ε_i…… (1)

In y_i (*natural log of crude death rates*) = $\beta_0 + \beta_1$ ln (settler mortality) + β_2 life expectancy$_2$ + (geographic and climate)$_i\gamma$ + β_3 expropriation risk index$_3$ + β_4 Malaria Falciparum disease$_4$ + ε_i…… (2)

In y_i (*natural log of crude death rates*) = $\beta_0 + \beta_1$ ln (settler mortality) + β_2 life expectancy$_2$ + (geographic and climate)$_i\gamma$ + β_3 Malaria Falciparum disease$_3$ + β_4 Euro-share$_4$ + $\mathbf{C}_i$'Colonizer Fixed Effects + ε_i…… (3)

In y_i (*natural log of crude death rates*) = $\beta_0 + \beta_1$ ln (settler mortality) + β_2 life expectancy$_2$ + (geographic and climate)$_i\gamma$ + β_3 Malaria Falciparum disease$_3$ + β_4 Euro-share$_4$ + $\mathbf{C}_i$'Colonizer Fixed Effects + ε_i, *robust*…… (4)

In Table 4 the Exogeneity Assumption of the OLS Model included the interaction variables and measure of inequality. Again, the study estimates the different models for both Ghana and Kenya.

In y_i (*natural log of crude death rates*) = $\beta_0 + \beta_1$ ln (settler mortality) + β_2 life expectancy$_2$ + (geographic and climate)$_i\gamma$ + β_2 Settler Mortality * expropriation risk index$_3$ + ε_i…… (1)

In y_i (*natural log of crude death rates*) = $\beta_0 + \beta_1$ ln (settler mortality) + β_2 life expectancy$_2$ + (geographic and climate)$_i\gamma$ + β_3 Settler Mortality * expropriation risk index$_3$ + β_4 Settler Mortality * Malaria Falciparum disease$_4$ + ε_i…… (2)

In y_i (*natural log of crude death rates*) = $\beta_0 + \beta_1$ ln (settler mortality) + β_2 life expectancy$_2$ + β_3 (geographic and climate)$_i$ + β_4 (Settler Mortality * expropriation risk index$_3$) + β_5 (Settler Mortality * Malaria Falciparum disease$_4$) + β_6 (Settler Mortality * Euro-share$_5$) + $\mathbf{C}_i$'Colonizer Fixed Effects + ε_i…… (3)

In y_i (*natural log of crude death rates*) = $\beta_0 + \beta_1$ ln (settler mortality) + β_2 life expectancy$_2$ + β_3 (geographic and climate)$_i$ + β_4 (Settler Mortality * expropriation risk index$_3$) + β_5 (Settler Mortality * Malaria

Falciparum disease$_4$) + β_6 (Settler Mortality * Euro-share$_5$)+ β_7 GDP per capita income + β_8 Agricultural Raw Material Exports + $\mathbf{C}_i$'Colonizer Fixed Effects + ε_i…… (4)

5 Main Results and Discussion of Estimates

5.1 Cross-Sectional Estimates of Colonies of Interest

In column 1 and 2 of Table 3, the variable settler mortality had a positive correlation with the log of crude death rates but not statistically significant in all the models. The relationship between settler mortality and crude death rates attains a coefficient of 0.00739 in Ghana and in Kenya a coefficient of 0.00792 while controlling with life expectancy at birth of indigenous population, the geographical variables, and average expropriation risk index. Significantly, the life expectancy attains a negative correlation with crude death rates depicting that 1 unit decrease in the life expectancy will increase crude death rates by 0.0428 percentage points for Ghana and 0.0424 percentage points for Kenya. The regression estimates for the geographical variable - latitude also correlated positively with crude death rates and significant in both Ghana and Kenya at 0.00479 and 0.00401 respectively. In addition, the climatic variable - temperature attained significance in Ghana but not Kenya depicting how temperature adversely affected the death rates in Ghana.

The average expropriation risk index, on the other hand, attains a negative correlation with log of crude death rates. Intuitively (as explained by Acemoglu et al. 2001), a lower expropriation risk index means the private property rights of their colonies were at high risk. Thus, in the context of this study, as expropriation risk index rises by 1 unit the death rate decreases by -0.000672 and -0.000467 percentage points for Ghana and Kenya respectively. However, it must be noted that, as the magnitude of these coefficients is relatively low the interpretation should be focused on the correlating signs. To support this analogy, Easterly and Levine (2009) also argue that, in colonies where Europeans did not settle they extracted (expropriated) the resources of the colonies. However, this is evident in both colonies. To ensure the validity of the estimates, the study also conducted the Breusch-Pagan Test purposely to check for the problem of heteroskedasticity. Interestingly, the Breusch-Pagan Test exhibited no signs of heteroskedasticity with *P-values* higher than 0.05 for both Ghana and Kenya. It must also be noted that the *R-Squared* of the model was high at 0.943 for both Ghana and Kenya indicating the model explains most of the variability of the dataset.

In column 3 and 4 of Table 3, the model considered the Malaria falciparum variable as the additional control variable. Purposely, this variable is considered to estimate whether the Malaria falciparum disease which afflicted the European settlers to stay or avoid settlements affected current crude death rates of the indigenous population. The intuition behind utilizing this variable is also to analyse how the crude death rates were affected when the Malaria falciparum disease afflicted the Europeans less. Interestingly, the variable exhibited a negative correlation with crude death rates. In effect, the Settler Mortality variable increased (but by a smaller magnitude) and became significant. Plausibly, this is because in colonies where European presence was higher there is the likelihood of higher death from the Malaria Falciparum disease. Yet, the argument posits that an increase in the number of the European population (share) in a colony, is contingent on the impact of the prevalent diseases affecting the European settlers (Acemoglu et al., 2001). Thus, there is the need to control the model by considering the European share in the colony which is captured in model 5 and 6. Besides that, the variability of the model again was relatively higher at 0.955 and 0.956 for Ghana and Kenya respectively.

The inclusion of the European population in the colony for column 5 and 6 is purposely to know precisely how the share of Europeans where afflicted with the Malaria falciparum diseases and in effect how it affected current health status. Thus, in column 5 and 6 of Table 3 below, the model utilized, this additional control variable - Euro share extracted from the dataset of Easterly and Levine (2009). It is noteworthy also to state that, the study controlled for the colonizers fixed effects when the variable Euro share is included in the model. The Euro share is basically utilized to control for the specific population of the colonizers at the time of independence and how their presence affected crude death rates. Significantly, this variable reduced the incidence of settler mortality in Kenya than in Ghana. To add to that, the Malaria falciparum was significantly lower in Kenya than in Ghana. These findings confirm the arguments of Acemoglu et al. (2001) which indicates that, in colonies that Europeans died less of the Malaria Falciparum disease, their presence was higher. The Euro share variable also attains a negative correlation with crude death rates which indicates that as Euro share increases there is the likelihood of crude death decreasing as the European settlers plausibly transfer their development (like effective health systems and Western medicines) to the colonies they settled.

In column 7 and 8 a robust standard error regression model was conducted to alleviate the problem of heteroskedasticity and minimize the problem of *compression of history* as proposed by Gareth Austin.

In column 7 and 8 (in Table 3), the OLS regression model considered the robust regression of column 5 and 6. The robust regression model exhibited that, the effects of the Euro share on crude death rates in Ghana and Kenya were again negatively correlated with crude death rates and higher magnitude in Kenya than Ghana. Plausibly, (as aforementioned) this is because the European population increase in colonies that have a lower incidence of settler mortality. Interestingly, Malaria falciparum also attains a negative correlation with crude death rates in the robust regression model and significant. Thus, it can be argued that an increase in the number of European settlers in a colony, is contingent on the impact of the prevalent diseases on the European settlers. The finding also validates Acemoglu et al. (2001) study, which sets the condition for settlement of European colonizers based on their survival rate of prevalent diseases in colonies.

Table 3 - **Impact of Settler Mortality & Selected Control Variables on Indigenous Crude Death Rates in Ghana and Kenya**: *OLS Model*

	Dependent Variable (y), Log Crude Death Rate of Indigenes in 2010							
	(1) *GHANA*	(2) *KENYA*	(3) *GHANA*	(4) *KENYA*	(5) *GHANA*	(6) *KENYA*	(7) *GHANA* (ROBUST)	(8) *KENYA* (ROBUST)
Settler mortality	0.00739	0.00792	0.0132**	0.0139***	0.0160	0.0155	0.0160*	0.0155**
	(0.00536)	(0.00530)	(0.00511)	(0.00504)	(0.0111)	(0.0109)	(0.00751)	(0.00705)
Life Expectancy at birth	-0.0428***	-0.0424***	-0.0476***	-0.0471***	-0.0474***	-0.0471***	-0.0474***	-0.0471***
	(0.00196)	(0.00197)	(0.00228)	(0.00224)	(0.00546)	(0.00568)	(0.00436)	(0.00495)
Absolute Latitude	0.00479**	0.00409*	0.00294	0.00216	0.00783*	0.00662	0.00783**	0.00662*
	(0.00198)	(0.00207)	(0.00186)	(0.00193)	(0.00421)	(0.00450)	(0.00303)	(0.00361)
Longitude	0.000940	0.000997	0.00124*	0.00129**	0.00169	0.00176	0.00169	0.00176
	(0.000691)	(0.000684)	(0.000625)	(0.000614)	(0.00130)	(0.00127)	(0.00112)	(0.00123)
Humidity	0.000210	0.000113	-0.00004	-0.000171	0.00377	0.00323	0.00377	0.00323
	(0.00140)	(0.00138)	(0.00126)	(0.00123)	(0.00301)	(0.00294)	(0.00238)	(0.00211)
Average Rainfall	-0.00130	-0.00120	-0.00116	-0.00103	-0.00139	-0.00131	-0.00139	-0.00131
	(0.000908)	(0.000900)	(0.000813)	(0.000802)	(0.00216)	(0.00218)	(0.00153)	(0.00154)
Avg. Temperature	0.00669*	0.00596*	0.00731**	0.00659**	0.0130*	0.0113	0.0130*	0.0113
	(0.00333)	(0.00336)	(0.00298)	(0.00299)	(0.00645)	(0.00683)	(0.00654)	(0.00724)
Expropriation risk index	-0.000672	-0.000467	-0.00173	-0.00138				
	(0.00475)	(0.00466)	(0.00426)	(0.00415)				
Malaria Falciparum			-0.168***	-0.169***	-0.193	-0.190	-0.193*	-0.190*
			(0.0517)	(0.0506)	(0.110)	(0.112)	(0.0902)	(0.0976)
Euro-share					-0.285	-0.134	-0.285	-0.134
					(1.073)	(1.102)	(1.139)	(1.185)
Breusch-Pagan Test	0.0508	0.0667	0.3334	0.3335	0.7611	0.7047		
Constant	4.645***	4.642***	5.063***	5.058***	4.644***	4.694***	4.644***	4.694***
	(0.152)	(0.150)	(0.187)	(0.183)	(0.469)	(0.439)	(0.294)	(0.305)
Colonizer Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
Observations	47	47	47	47	26	26	26	26
R-squared	0.943	0.943	0.955	0.956	0.951	0.950	0.951	0.950

Note: Dependent variable is natural log of crude death rate in 2010. The colonizer fixed effect are indicators for colonizers at time of independence. Geography and climate controls considers: distance to equator - latitude, longitude, Average Rainfall, Humidity, Temperature. The variable Expropriation Risk Index is a governance-based rating of 1 (lowest score) and 6 (highest score). The sample is restricted to only Ghana and Kenya and missing figures for some countries reduced the size of observation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 represent significant levels. *Breusch Pagan Test* rejects null hypothesis at a significance level less than 0.05 if the variance of residuals is constant hence presence of heteroskedasticity. Robust standard error is for columns 7 and 8.

5.2 Cross-Sectional Estimates with Interaction Variables

In Table 4 the regression model included the interaction variables and the control variables utilized in Table 3. To add to that, other explanatory variables that measures inequality (GDP per capita income and Agricultural Raw Materials Export) were added. The interaction variables considered the Settler Mortality variable which is transformed into categorical variable with colonies with no European settler death as reference category. The colonies with settler mortality *less than 5 but not 0* represent Low Settler Death colonies and colonies with settler mortality with a log of *5 and higher* represent High Settler Death colonies. See Table 5 for further details. The continuous variables utilized in creation of the interaction variable were; expropriation risk index, Malaria falciparum and Euro-share.

In columns 1 and 2, the Settler Mortality attained a positive correlation in Ghana and Kenya. The health variable life expectancy at birth attained a negative correlation and significant at all levels. Indicating how decrease in life expectancy resulted in increase in mortality rates. The climatic variable-temperature positively correlated with log of crude death rates and significant at 5% for the two colonies. However, the geographic variable - latitude which also positively correlated with log of crude death rates in both Ghana and Kenya was strongly significant in Ghana than in Kenya at 5%. Yet, the magnitude was relatively low. The disparities in the significant level in geographic variables indicates how the latitude of the colony played a pivotal role in the decisions of the Europeans regarding settlements. As there is a higher incidence of death if the geographic conditions were not conducive which translates to lesser developments transferred to colonies. In addition, given the fact that, the mean latitude of the two colonies was higher in Ghana than Kenya at 7 degrees and 2 degrees respectively (see Table 1) it is plausible this argument is valid. However, this is not definite, unless controlled with other variables likely to result in bad health given the bad geographic conditions.

Hence, the inclusion of the interaction variable between Settler Mortality and expropriation risk index exhibited a positive correlation with crude death rates in Kenya and a negative correlation in Ghana. Broadly speaking, this may indicate that, there is the likelihood of the Europeans settlers expropriating the private properties of the indigenes in Kenya when they settled although they might have transferred some developments to the colony. Findings from Frankema et. al. (2016) also exhibit that, in Kenya, production of coffee was dominated by the Europeans who were politically potent and successful in lobbying a ban on domestic productions of indigenes. Moradi (2009) supports these

arguments by indicating that after the British dominance in Kenya the indigenous Africans were dispossessed of their best farming lands with the land alienated to a small number of European settlers. However, it must be noted that these estimates were not significant.

Thus, in columns 3 and 4, another interaction variable was created between the Settler Mortality and Malaria Falciparum disease whilst retaining the previous interaction between the Settler Mortality and expropriation risk index as well as the geographic and climatic variables. The regression estimates again, exhibited no significance for settler mortality although it was positively correlated. The climatic variable (temperature) positively correlated with log of crude death rates and significant at 5% for only Ghana. However, in both colonies the geographic variable (latitude) positively correlated with log of crude death rates in both Ghana and Kenya but was strongly significant in Ghana at 5%. Yet, the magnitude was relatively low. The interaction variable between Settler Mortality and expropriation risk index also showed no sign of significance in Ghana but in Kenya at 5% significance level indicating the plausibility of expropriation of private property in the Kenya Colony which affected the crude death rates. In addition, the interaction variable of settler mortality with Malaria falciparum disease was negatively correlated with log of crude death rates and was weakly significant in Kenya. The interpretation of the coefficient can be expressed as; in colonies where settler mortality was low (like Kenya), due to the low incidence of the Malaria Falciparum disease the crude death rates was significantly reduced by - 0.123 percentage points at 10% significance level compared to non-settler (like Ghana) colonies at -0.0483 percentage points.

In column 5 and 6 an additional interaction variable; settler mortality and Euro-share, was also added to the model. In Ghana, the addition of this interaction variable exhibited that a unit increase in the interaction variable between settler mortality and Euro-share resulted in log of crude death rates increasing by 3.640 percentage points compared to lower death rates of 0.895 percentage points in Kenya. However, none of the coefficient were significant. Nevertheless, the interaction between settler mortality and Malaria falciparum attained significance at 10% in Ghana depicting how the Europeans settlers were highly affected by the Malaria disease in high latitude areas like Ghana as argued by Acemoglu et al. (2001). Evidence is also drawn from the strong significance level of the geographical variable latitude in the model which also positively correlated with log of crude death rates and strongly significant in at 1% with coefficient of 0.0101 in Ghana, compared to Kenya with coefficient of 0.00464.

In column 7 and 8 the model included the GDP per capita income and Agricultural raw material exports as a measure of inequality in the colonies in addition to all the variables utilized. In Ghana, the inclusion of these variables resulted in none of the geographic and climatic variables attaining any significance but were positively correlated with log of crude death rates. The interaction variable between settler mortality and Euro-share however had a negative correlation with log of crude death rates in Kenya at -0.786. On the other hand, in Ghana, the correlation was positive at 1.80. The findings exhibit that the higher the share of Europeans in a colony the lesser the death rates in that colony as argued by Easterly and Levine (2009). The GDP per capita income and the Agricultural raw materials exports in the colonies were also positively correlated with crude death rates but not significant. It is noteworthy to state that, the coefficients of the GDP per capita income and the Agricultural raw materials exports were both higher in Kenya at 0.0874 and 0.0243 than Ghana at 0.0442 and 0.00538. Exhibiting how the productivity in Kenya yielded positive impacts in the current Kenya economy. Interestingly, in columns 7 and 8, the inclusion of the measure of inequality also changed the positive correlation sign of independent variable settler mortality to negative. Thus, in Ghana the coefficient of the settler mortality negatively correlated with log of crude death rates at -0.00418 and in Kenya it was -0.0244. However, the Life expectancy variable significantly remain robust and unchanged in all the models at 1% significance level.

Table 4 - **Impact of Interaction Variables on Indigenous Crude Death Rates in Ghana and Kenya**: *OLS Model*

	Dependent Variable (y), Log of crude death rates in 2010							
	(1) *GHANA*	(2) *KENYA*	(3) *GHANA*	(4) *KENYA*	(5) *GHANA*	(6) *KENYA*	(7) *GHANA*	(8) *KENYA*
Settler mortality	0.00822	0.00515	0.0129	0.00449	0.0157	0.00437	-0.00418	-0.0244
	(0.00614)	(0.00549)	(0.00878)	(0.00529)	(0.0179)	(0.0124)	(0.0422)	(0.0253)
Life expectancy at birth	-0.0429***	-0.0434***	-0.0436***	-0.0435***	-0.0377***	-0.0429***	-0.0391***	-0.0380***
	(0.00197)	(0.00202)	(0.00220)	(0.00195)	(0.00390)	(0.00389)	(0.00896)	(0.00729)
GEOGRAPHIC AND CLIMATIC CONTROLS								
Absolute latitude	0.00471**	0.00313	0.00446**	0.00238	0.0101***	0.00464	0.00597	0.00467
	(0.00200)	(0.00210)	(0.00204)	(0.00205)	(0.00321)	(0.00464)	(0.00752)	(0.00574)
Longitude	0.000895	0.000949	0.000805	0.00129*	0.00149	0.00212	0.00294	0.00417
	(0.000713)	(0.000644)	(0.000727)	(0.000642)	(0.00117)	(0.00153)	(0.00226)	(0.00265)
Humidity	0.000181	0.000356	0.000389	-0.000164	0.00593*	0.00279	0.00209	0.00422
	(0.00138)	(0.00134)	(0.00141)	(0.00131)	(0.00294)	(0.00358)	(0.00657)	(0.00531)
Average Rainfall	-0.00129	-0.00140	-0.00138	-0.00174*	0.000908	-0.00191	0.00317	-0.00158
	(0.000910)	(0.000885)	(0.000924)	(0.000867)	(0.00224)	(0.00230)	(0.00537)	(0.00323)
Temperature	0.00684**	0.00683**	0.00707**	0.00787**	0.00805	0.0150*	0.00740	0.0176
	(0.00301)	(0.00303)	(0.00304)	(0.00296)	(0.00566)	(0.00796)	(0.0122)	(0.0116)
INTERACTION VARIABLES								
Settler Mortality * Expropriation Risk Index	-0.00168	0.0105	-0.00003	0.0156**	0.0550*	0.0172	0.0720	0.0123
	(0.00593)	(0.00714)	(0.00635)	(0.00732)	(0.0268)	(0.0174)	(0.0936)	(0.0248)
Settler Mortality * Malaria			-0.0483	-0.123*	-0.344*	-0.260	-0.432	1.735
			(0.0641)	(0.0610)	(0.177)	(0.148)	(0.615)	(1.891)
Settler Mortality * Euro Share					3.460	0.895	1.800	-0.786
					(7.524)	(1.082)	(15.86)	(1.733)
MEASURE OF INEQUALITY								
Per capita income log							0.0442	0.0874
							(0.0956)	(0.0837)
Agricultural raw materials exports							-0.00538	0.0243
							(0.0265)	(0.0255)
Constant	4.649***	4.689***	4.682***	4.735***	3.976***	4.602***	4.249***	3.443***
	(0.153)	(0.149)	(0.160)	(0.145)	(0.335)	(0.313)	(0.961)	(0.833)
Colonizer Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
Observations	47	47	47	47	26	26	22	22
R-squared	0.943	0.946	0.944	0.952	0.957	0.953	0.962	0.971

Note: Dependent variable is natural log of crude death rate from 2010. The colonizer fixed effect are indicators for European colonizers at time of independence. Geography and climatic controls consider: distance to equator - latitude, longitude, Average Rainfall, Humidity, Temperature. The interaction variables considered categorized European Settler mortality considers settler death below 5 but not 0 as settler colonies and above 5 as non-settler colonies and the continuous variable Expropriation Risk Index, Malaria falciparum and Euro share. Agricultural raw materials comprise of the Standard International Trade Classification section 2 which includes crude materials except fuels with performance score from 0 (lowest score) to 100 (highest score). The sample is restricted to only Ghana and Kenya and missing figures for some countries reduced the size of observation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 represent significant levels.

6 Conclusion

6.1 Discussion by Way of Conclusion

To a greater extent, the findings from this study has exhibited that the European legacies still lingers in current affairs of African developments. Using analytical datasets from scholarly articles and focusing on British Gold Coast and Kenya Colony the findings presents new results to previous research. In general, findings in the theoretical framework, exhibited that the British colonizers utilized different policies to govern their colonies. In effect, these legacies were used as foundations for establishment of current institutions. For instance, in the Kenya Colony where Europeans settled and transferred suitable health institutions and policies (like the Medical Department and Public Health Ordinance) the mortality rates of the indigenous population was reduced. However, in the Gold Coast, the European settlers were hindered by factors like; unfavourable geographic and climatic conditions resulting in high incidence of Malaria, lack of funds due to the economic instability of the World II and Great Depression as well as the agitation from the local inhabitants from the policies administered. Nonetheless, although the Europeans most often avoided settlements in the Gold Coast, the initial institutions established set the foundations for current institutions like the Ministry of Health.

To quantitatively assess the theoretical arguments, the datasets of Acemoglu, Johnson and Robinson as well as Easterly and Levine was utilized to give evidence to how low settler mortality translates to higher Euro-share which consequently translates to lesser death rates of the indigenous population in current years. Table 5 (in the Appendix) confirmed this analogy by exhibiting that in colonies where settler mortality were low the crude death rates of the indigenous population in current years were also low. In contrast, colonies with high settler mortality were associated with high crude death rates of indigenous population in current years. These findings somewhat negate the findings of Young (2004) which indicates the effectiveness of the colonial institutions ended *circa* 1990 few years after the independence of most Sub-Saharan African countries. Yet, previous literature from Acemoglu et al. (2001) exhibits that in a Two-Stage Least Square Model colonial institutions or legacies have a direct effect on current economic performance when controlled with other variables like climate and geography. Hence, it is plausible high incidence of settler mortality might have hindered the developments that the Europeans might have transferred to the colony.

Besides that, the regression estimates from the OLS Models utilized also supported these findings and concurrently answered the research questions of the study. Extensively, the findings from the regression estimates provided sufficient answers to the research questions put forward. For instance, estimates from Table 3 confirmed that *European colonial institutions which persisted after independence resulted in mortality rates reductions in settler colonies.* Most importantly, the regression estimates exhibited that the settler mortality was relatively higher in Ghana compared to Kenya due to the high incidence of the Malaria given the geographical and climatic conditions. Thus, in the first hypothesis of the study, the null hypothesis is rejected as the estimates confirmed that in colonies where Europeans settled (like, Kenya) the crude death rates were relatively low than colonies they avoided settlements (like, Ghana) even after independence. The key variables that influence their decisions were; the Malaria falciparum disease, the geographical variables – latitude and temperature which attained significance in most of the models utilized. Previous studies like; McArthur and Sachs, (2001): Nunn (2008): Acemoglu et al., (2001): Easterly and Levine (2009) also found strong correlation between Malaria, Latitude and Euro-share on current developments in Africa.

To validate the second hypothesis of the study which indicates that, *the developments that European settlers transferred to Africa contributed to the health disparities in the economies,* the answers were primarily drawn from Table 4. The method utilized to empirically validate the hypothesis is the creation of the interaction variable which gave a complete understanding to the channels that contributed to the health disparities. The interaction variable categorized the variable settler mortality into (No Mortality, Low Mortality and High Mortality) and the continuous variables considered were average expropriation risk index, Malaria falciparum and Euro-share. The interaction between Low Settler Mortality colonies and Malaria Falciparum disease significantly led to less crude death rates of indigenous population in 2010 in Kenya in comparison to Ghana. In addition, the inclusion of the interaction variable between settler mortality and Euro-share had an adverse effect on crude death rates in 2010 in Ghana than Kenya. One key finding from Table 4 is drawn from the interaction between Settler Mortality and Expropriation Risk Index which were exceptionally low in the settler colony - Kenya compared to non-settler colony - Ghana. These findings provide substantial evidence to previous studies of Frankema et. al. (2016) and Moradi (2008). Besides that, the variable life expectancy consistently had a stable negative correlation sign across all the models and was relatively higher in Kenya compared to Ghana. Nonetheless, in the last model (in columns 7 and 8 of Table 4) the study exposed that there is the plausibility the variable settler mortality might not attain a stable correlation sign with crude

death rates if additional control variables are employed. the change in the correlation sign was purposely due to the inclusion of the GDP per capita and agricultural export of raw materials which influence the variable settler mortality to negatively correlate with crude death rates in current times. Depicting the economic influence of European colonizers on their colonies.

To this end, although Kenya and Ghana had a history of crises which were held constant (ceteris paribus) in this study, it must be noted that this could not negate the relevance of colonial legacies. For instance, in 1890s, the Kenya Colony were hit by Rinderpest which caused cattle losses of about 80% to 90% (Mack, 1970). In addition, the Locust swarms and a lengthy drought which led to a famine in 1897 to 1899, the Influenza Pandemic in 1918, food shortages in 1943 in Kenya, as well as the three consecutive years of severe drought from 1980 to 1983 in Ghana might plausibly have contributed to the death rates in the colonies. Nonetheless, whatever detrimental effects these short-term crises had on the colony, the long-term influence of colonial legacies and institutions cannot be ignored. Therefore, as this paper seeks not to establish any causality, it will be prudent for future research to utilize a more complex model (example Two-Stage Least Square Models) to know the exact channel of causation of current health disparities.

6.2 Future Research

As the study focused on estimation between-country to find the disparities between the two colonies of interest in Africa, future research can also consider estimations within-country. This will help understand whether the effects of colonial institutions are visible within the specific settler colonies and how the disparities have contributed to the regional inequality within the country. Thus, the focus of the study can be on European settler and non-settler colony within the country.

In addition, although all the models utilized gave sufficient evidence to reject the null hypothesis, in column 7 and 8 of Table 4 the model exhibited that there was the need for further test on the robustness of the model. Thus, Future research can employ complex models like the Two-Stage Least Square or Difference-in-Difference. The Two-Stage Least Square model utilizes instrumental variables likely to affect the variable of interest but not the dependent variable to establish the exact channel of causation. While, the Difference-in-Difference can be utilized to establish the disparity by focusing on the effect of colonial legacies on specifically colonized European countries compared to non-

colonized countries. Purposely, this is to help establish the exact channel through which the dependent variable is affected.

Besides the aforementioned likely potential research areas, future research can also employ longitudinal datasets of population trend which will likely capture events occurring in-between time which might be obscured by the cross-sectional datasets. Concurrently, utilizing of a longitudinal dataset is likely to also resolve the problem of *compression of history* discussed by Gareth Austin. As the problem of conflating different pairs of dates of economic history will be resolved with the omitted variables of the estimates in-between time captured.

References

Acemoglu, D., Johnson, S., and Robinson, J. A. (2001). The Colonial Origins of Comparative Development: An Empirical Investigation. *The American Economic Review*, Vol. 91, No. 5, pp. 1369 – 1401.

Acemoglu, D., S. Johnson and J., A. Robinson (2005). 'Institutions as a fundamental cause of long-run growth', in P. Aghion and S. Durlauf (eds) *Handbook of Economic Growth Vol. 1*, North Holland: Elsevier, pp. 385–472.

Acemoglu, D., and S. Johnson and (2005) 'Unbundling institutions', *Journal of Political Economy*, **113**(5): 949–95.

Addae, S. K. (1997). The History of Western Medicine in Ghana 1880-1960. Edinburgh; Durham United Kingdom: *Durham Academic Press*.

Ashraf, Q., and Galor O. (2013) 'The "Out of Africa" hypothesis, human genetic diversity, and comparative economic development', *American Economic Review*, **103**(1): 1–46.

Austin, G. 2008). The 'Reversal of Fortune' Thesis and The Compression of History: Perspectives from African and Comparative Economic History. Journal of International Development. 20, pp. 996 – 1027.

Albouy, D. Y. (2012). "The Colonial Origins of Comparative Development: An Empirical Investigation: Comment." *American Economic Review*, 102 (6): 3059 - 76.

Bhorat, H., K. and Pillay, K. (2015). "Growth, Poverty and Inequality Interactions in Africa. An Overview of Key Issues," Mimeo, Inc.

Bertochhi, G., and Fabio, C. (2002). "Did Colonization Matter for Growth? An Empirical Exploration into the Historical Causes of Africa's Underdevelopment," *European Economic Review*, 46, 1851 – 1871.

Bezember, D., Bolt, J., and Lensink, R., (2014). Slavery, Statehood, and Economic Development in Sub-Saharan Africa. *World Development*. Vol. 57, pp. 148 – 163.

Brass, W. and Carole L. J. (1993). Population Dynamics of Kenya, Population Dynamics of Sub-Saharan Africa. Washington, DC: *National Academy Press*.

Colonial Reports and Annual Medical Review in 1920 – 1921. Accessed at http://libsysdigi.library.illinois.edu/ilharvest/Africana/Books2011-05/5530244/5530244_1920_1921/5530244_1920_1921_opt.pdf (Accessed on May 2019)

Colonial Reports and Annual Medical Review in 1933. Accessed at http://libsysdigi.library.illinois.edu/ilharvest/Africana/Books2011-05/5530244/5530244_1933/5530244_1933_opt.pdf (Accessed on May 2019).

Conrad, J. (1899). 'Heart of darkness', *Blackwood's Magazine*, **165**(2–4): 164–460.

Curtin, P. D. (1961). "The White Man's Grave:" Image and Reality, 1780-1850. *Journal of British Studies*, Vol. 1, No. 1, pp. 94-110.

Curtin, P. D., Feierman, S., Thompson, L., and Vansina, J. (1995). African History**:** From Earliest Times to Independence, *2nd Edition London*: Longman.

Curtis, K. R. (2003). Smaller is Better: A Consensus of Peasants and Bureaucrats in Tanganyika, in W.G. Clarence-Smith, and S. Topik (eds), *The Global Coffee Economy in Africa, Asia and Latin America 1500 – 1989*. Cambridge: *Cambridge University Press*, pp. 312 – 334.

Doyle, A. C. (1909). The Crime of the Congo, London: Hutchinson & Co.

Dumett, R. E. (1968). The Campaign against Malaria and the Expansion of Scientific Medical and Sanitary Services in British West Africa, 1898-1910. *African Historical Studies*. Vol. 1, No. 2 (1968), pp. 153-197

Dzorgbo, D., S. (2001). Ghana in search of development: The challenge of governance, economic management and institution building. *London, England*: Ashgate.

Easterly, W., and Levine, R. (2009). The European Origins of Economic Developments. NBER *Working Paper*. Cambridge, MA: National Bureau of Economic Research.

Easterly, W., and Levine, R. (2009). "Africa's Growth Tragedy: Policies and Ethnic Divisions." *Quarterly Journal of Economics*. 112 (4), pp. 1203 – 50.

Eckert, A. (2003). Comparing Coffee Production in Cameroon and Tanganyika, C. 1990 to 1960: Land Labour and Politics, in W.G. Clarence-Smith, and S. Topik (eds), *The Global Coffee Economy in Africa, Asia and Latin America 1500 – 1989*. Cambridge: *Cambridge University Press*, pp. 286 – 311.

Ferguson, N. (2012) *Empire: How Britain made the modern world*, London: Penguin UK.

Fernandez, R., and Fogli, A. (2006). 'Fertility: The role of culture and family experience.' *Journal of the European Economic Association*, **4**(2–3): 552–61

Fieldhouse, D. K. (1966). The Colonial Empires: A comparative survey from the eighteenth century, *London:* Weidenfeld & Nicolson.

Frankema, E., Green, E., and Hillbom, E. (2016). Endogenous Processes of Colonial Settlement. The Success and Failure of European Settler Farming in Sub-Saharan Africa. *American Economic History*. Vol. 34, No. 2: 237 – 265.

Grier, R. (2011). The Effect of Religion on Economic Development: A Cross National Study of 63 Former Colonies. Vol. 50 – 1997 – Fasc. 1, 47 – 62.

Haruna, P. F. (2004). Training public administrators in Africa: A case study of civil service employees in Ghana. *International Journal of Public Administration, 27*(3–4), 171–195.

IMF (2015). *Regional Economic Outlook: Sub-Saharan Africa*. April 2015, International Monetary Fund, Washington.

Jones, E. L., (1981). The European Miracle: Environments, Economies and Geopolitics in the History of Europe and Asia. Cambridge: *Cambridge University Press*.

Mack, R., (1970). "The Great African Cattle Plague Epidemic of the 1890s." *Tropical Animal Health and Production* 2, no. 4 (1970): 210–19.

Maddison, A. (2003). The World Economy. Historical Statistics. Paris: OECD, accessed at <http://www.ggdc.net/maddison/maddison-project/data.htm> (Accessed on May 2019).

Maseland, R. (2013). 'Parasitical cultures? The cultural origins of institutions and development', *Journal of Economic Growth*, **18**(2): 109–36.

Maseland, R. (2017). Is colonialism history? The declining impact of colonial legacies on African institutional and economic development. *Colonial Institutions and African Development*. pp 259 – 287.

Mbembe, A. (2001). *On the Postcolony* (University of California Press, Berkeley, CA, 2001).

Michalopoulos, S., and Papaioannou, E. (2016). The Long-Run Effects of the Scramble for Africa. *American Economic Review*. Vol. 106, pp. 1802 – 48.

McArthur, J. W. and Sachs, J. D., (2001). Institutions and Geography. Program(s): *Economic Fluctuations and Growth*. NBER Working Paper No. 8114.

Moradi A. (2008). Confronting Colonial Legacies: Lessons from Human Development in Ghana and Kenya, 1880 – 2000. *Journal of International Development*. 20, pp. 1107 – 1120.

Moradi A. (2009). "Towards an Objective Account of Nutrition and Health in Colonial Kenya: A study of stature in African Army Recruits and Civilians, 1880 – 1980." *Journal of Economic History*. 69(3). pp. 720 – 55.

North, D., and Thomas, R. P. (1973). The Rise of the Western World: A New Economic History. New York: *Oxford University Press.*

North, D. (1990). Institutions, Institutional Change and Economic Performance, Cambridge: *Cambridge University Press.*

North, C. N. (2008). Institutions and the Performance of Countries Overtime. Handbook of new institutional economics. Springer, Berlin, Heidelberg.

Nunn, N. (2008). The Long-Term Effects of Africa's Slave Trades. *The Quarterly Journal of Economics.* **123**(1): 139 – 176.

Patterson, K. D., (1981). Health in Colonial Ghana Disease Medicine and Socioeconomic Change. 1900-1955 *Waltham Mass Crossroads.* 8.vo-pp-xiv-187.

Quaye, R. (1996). Underdevelopment and Health Care in Africa, Lewiston, New York: *Edwin Mellen Press.*

Shanks, G., D. et al. (2005). "Malaria in Kenya's Western Highlands." *Emerging Infectious Diseases* 11(**9**): pp. 1425–32.

Spear, T. (1997). Mountain Farmers: Moral Economics of Land and Agricultural Development in Arusha and Meru. Oxford: James Currey.

Williamson, O. E. (2000). 'The new institutional economics: Taking stock, looking ahead', *Journal of Economic Literature*, **38**(3): 595–613.

World Bank, World Development Indicators (2019). Accessed at <http://data.worldbank.org/indicator> (Accessed on May 2019).

Westphal, J. (2015). Colonial Legacies in Ghana: The cause for developmental challenges? Politics and International Relation.

Young, C. (2004). 'The end of the post-colonial state in Africa? Reflections on changing African political dynamics. *African Affairs*, **103**(410): 23–49.

Appendix *A*1

Table 1- **Summary Statistics, Source and Definition of Variables for Africa**

VARIABLES	*GHANA (MEAN)*	*KENYA (MEAN)*	*AFRICA MEAN*	*AFRICA MAXIMUM*	*AFRICA MINIMUM*	*AFRICA N*	*SOURCE*	*DEFINITIONS*
Settler Mortality (1800 and 1900)	6.504	4.978	3.725	7.986	0	54	Acemoglu et. al. (2001)	The death rates of European population from predominantly Malaria and Yellow Fever.
Expropriation Risk Index	6.273	6.0454	4.525	8.409	0	48	Acemoglu et. al. (2001)	Risk of expropriation from private foreign investment of government. Ranges from 0 to 10 with the minimum number as the highest risk of expropriation and the maximum number as the lowest risk.
Malaria Falciparum	0.95	0.798	0.729	0.95	0	49	Acemoglu et. al. (2001)	Originally extracted from Gallup and Sachs (1998) to determine the population living where the Malaria falciparum is endemic. The unit of measurements is *Percent*.
Euro Share	0.00074	0.00337	0.029	0.117	0	28	Easterly and Levine (2009)	Share of Europeans that was a European or of European descent.
Colony 0	0	0	0.037	1	0	54	Nunn (2008)	Non-colonized state
Colony 1	1	1	0.315	1	0	54	Nunn (2008)	British Colonies
Colony 2	0	0	0.389	1	0	54	Nunn (2008)	French-Colonies
Colony 3	0	0	0.093	1	0	54	Nunn (2008)	Portuguese-Colonies
Colony 4	0	0	0.056	1	0	54	Nunn (2008)	Belgian Colonies
Colony 5	0	0	0.185	1	0	54	Nunn (2008)	Belgian Colonies
Colony 6	0	0	0.185	1	0	54	Nunn (2008)	Spain (Equatorial Guinea)
Colony 7	0	0	0.185	1	0	54	Nunn (2008)	Italian Colonies
Longitude	-1.207	37.858	15.497	57.794	-24	54	Nunn (2008)	The longitude of each country's centroid measured in degrees
Latitude	7	2	12.567	36	0	54	Nunn (2008)	The latitude of each country's centroid measured in degrees

Table 1 - **Summary Statistics, Source and Definition of Variables for Africa** *(CONTINUED)*

VARIABLES	*GHANA (MEAN)*	*KENYA (MEAN)*	*AFRICA MEAN*	*AFRICA MAXIMUM*	*AFRICA MINIMUM*	*AFRICA* ***N***	*SOURCE*	*DEFINITIONS / DESCRIPTIONS*
Rainfall	15	15	8.168	69	0	54	Nunn (2008)	The average rainfall measured in mil.
Humidity	77	62	67.519	95	0	54	Nunn (2008)	Average maximum humidity measured in percentage
Temperature	15	5	8.519	19	-9	54	Nunn (2008)	Lowest average monthly temperature measured in degrees
Population Growth Rate	2.512	2.728	2.495	4.516	0.238	54	World Development Indicator	Population Growth rates in 2010
Crude Death Rate	9.148	7.273	10.003	16.572	4.754	54	World Development Indicator	Crude Death Rates per 1000 deaths
Life Expectancy	60.924	62.936	59.764	74.793	47.56	54	World Development Indicator	Life expectancy at birth per 1000
Infant Mortality	48.9	36.9	55.489	108.4	12.2	54	World Development Indicator	Infant Mortality (per 1000 of live birth)
Log of GDP per capita Income in 2010	2.214	1.984	2.262	2.808	1.559	52	Maddison Database	Per capita income in considers the 2013 reports of Maddison
Agric. Raw Material Export	6.947	10.932	7	55.88	0	54	World Development Indicator	Total agric. raw materials export as % of GDP

Table 2 - **African Countries Considered and their European Colonizers**

COUNTRY	*ISOCODE*	*COLONIZER*	*ESTIMATED SETTLER MORTALITY*
Burundi	*BDI*	Belgian Colony	280
Congo, Dem. Rep.	*ZAR*	Belgian Colony	0
Equatorial Guinea	*GNQ*	Belgian Colony	0
Rwanda	*RWA*	Belgian Colony	280
Botswana	*BWA*	British Colony	0
Cameroon	*CMR*	British Colony	280
Central African Republic	*CAF*	British Colony	280
Chad	*TCD*	British Colony	280
Comoros	*COM*	British Colony	0
Congo	*COG*	British Colony	240
Cote d'Ivoire	*CIV*	British Colony	668
Egypt	*EGY*	British Colony	68
Gambia, The	*GMB*	British Colony	1470
Ghana	*GHA*	British Colony	688
Kenya	*KEN*	British Colony	145
Lesotho	*LES*	British Colony	0
Malawi	*MWI*	British Colony	18
Mauritius	*MUS*	British Colony	31
Nigeria	*NGA*	British Colony	2004
Sierra Leone	*SLE*	British Colony	490
Somalia	*SOM*	British Colony	0
South Africa	*ZAF*	British Colony	15,5
Tanzania	*TZA*	British Colony	145
Uganda	*UGA*	British Colony	280
Zambia	*ZMB*	British Colony	0
Zimbabwe	*ZWE*	British Colony	0
Sudan	*S.SDN*	British Colony	88
Algeria	*DZA*	French Colony	78
Benin	*BEN*	French Colony	256
Burkina Faso	*BFA*	French Colony	280
Djibouti	*DJI*	French Colony	26
Gabon	*GAB*	French Colony	280
Madagascar	*MDG*	French Colony	536
Mali	*MLI*	French Colony	2940
Mauritania	*MRT*	French Colony	280
Morocco	*MAR*	French Colony	782
Niger	*NER*	French Colony	400
Senegal	*SEN*	French Colony	165
Seychelles	*SYC*	French Colony	0
Togo	*TGO*	French Colony	688
Tunisia	*TUN*	French Colony	63
Ethiopia	*ETH*	Italian Colony	26
Libya	*LBY*	Italian Colony	0
Eritrea	*ERT*	Non- Colonized States	0
Estwani	*ESW*	Non- Colonized States	0
Swaziland	*SDN*	Non- Colonized States	0
Liberia	*LBR*	United States of America	490
Angola	*AGO*	Portuguese Colony	280
Cabo Verde	*CPV*	Portuguese Colony	0
Guinea-Bissau	*GNB*	Portuguese Colony	78
Mozambique	*MOZ*	Portuguese Colony	0
Sao Tome and Principe	*STP*	Portuguese Colony	0
Namibia	*NAM*	Spanish Colony	0

Note*: Data compiled from Acemoglu et al. (2001) and Nunn (2008). Isocode represent the code for the countries*

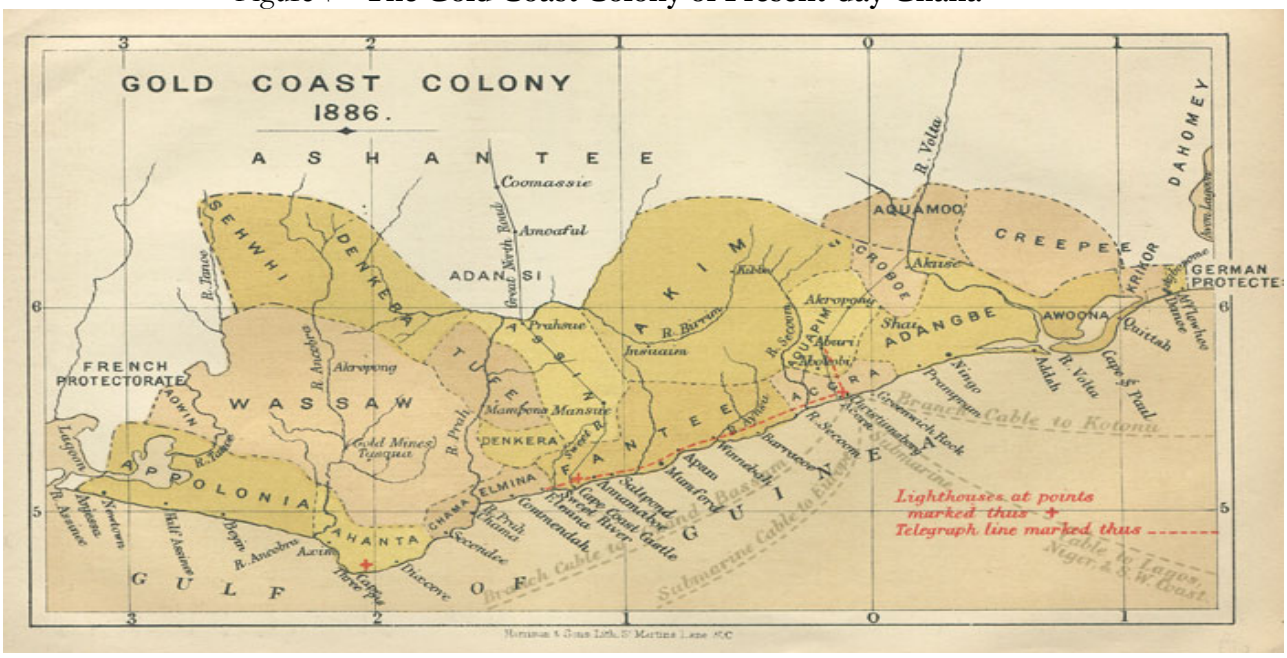
Table 5 - **Estimated Settler Mortality and Current Crude Death Rates**

DESCRIPTION	*NATURAL LOG OF EUROPEAN SETTLER MORTALITY*	*ESTIMATED NUMBER OF EUROPEAN SETTLER MORTALITY IN EACH COLONY*	*ESTIMATED CRUDE DEATH RATES OF INDIGENOUS POPULATION*	*NUMBER OF COUNTRIES /COLONIES*
No European Settler Death	0	0	9.942	17
Low European Settler Death	2.741	16	12.997*	1
	3.258	26	8.642	2
	3.418	31	7.300	1
	4.143	63	6.239	1
	4.217	68	6.206	1
	4.359	78	5.031	2
	4.480	88	8.205	1
	4.977	145	7.273	1
High European Settler Death	5.104	165	9.657	2
	5.481	240	10.438	2
	5.585	266	10.093	1
	5.635	280	10.988	11
	5.991	400	11.786	1
	6.180	490	11.982	3
	6.284	536	7.274*	1
	6.504	688	11.179	3
	7.293	1470	9.030	1
	7.603	2004	14.306	1
	7.986	2940	12.481	1
Total		**9994**		**54**

Notes: Data is compiled from studies of **Acemoglu et al. (2001)** and **World Development Indicators**. The 17 colonies with zero (**0)** Settler Mortality indicate that there were *No European Settler Death* as there were no recorded European settlements. Colonies with the Natural Log of Settler Mortality below 5 but not equal to 0 represent *Low European Settler Death* and colonies with *High European Settler Death* have a log of 5 and above. Numbers with *Asterix* (*) are for South Africa with 12.997 and Madagascar with 7.274 which exhibits exceptional characteristics of crude death rates.

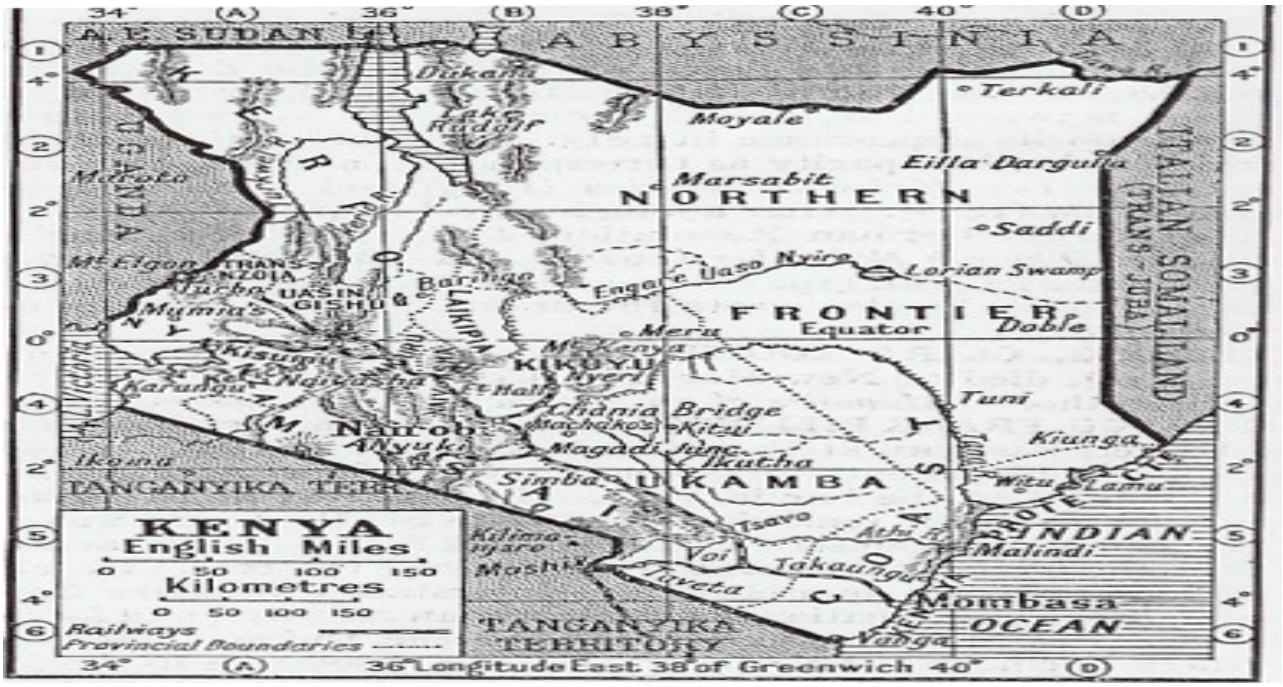
Appendix *A2*

Figure 7 **- The Gold Coast Colony of Present-day Ghana**



Note: This map represents the territorial occupation of British Gold Coast Colony during the colonization era. It encompasses mostly the southern-most part of Present-day Ghana which constitute; Central Region, Greater Accra Region and Southern Volta Region.
Source: **National Archives of Ghana**

Figure 8 - **The Kenya Colony of Present-day Kenya**



Note: This map represents the territorial occupation of British Kenya Colony during the colonization era.
Source: **National Archives of Kenya**