Where the money flows? Colonial health investment and hospital contemporary outcomes in the D.R.Congo

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Abstract

This paper examines how the historical development of health institutions shapes contemporary disparities in hospital financing and service provision. Using archival records from the Belgian Congo (1929–1959), we trace the establishment of colonial health settlements and link them to present-day hospitals. Exploiting historical variation driven by sleeping sickness prevalence, we show that colonial origins exert a persistent impact on infrastructure, largely through large colonial health investments. While service provision differences disappear once accounting for staffing, hospitals with colonial roots continue to attract greater government funding, reflecting legacies of post-independence donor support that reinforced their bargaining power and fiscal advantage.

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1 Introduction

Persistent disparities in the allocation of health resources are hampering health system performance in low-income countries. These concerns are particularly acute in the hospital sector, which represents the largest category of health-care providers in terms of spending and absorbs a substantial share of scarce public health resources (WHO, 2024). Across much of Sub-Saharan African (SSA) countries, chronic underinvestment and inequitable budget allocation have contributed to irregular or inconsistent remuneration of health workers (Wennerstrom and Smith, 2023), persistent shortages and misallocation of medical staff (Sheffel et al., 2024), and pronounced spatial inequalities in healthcare infrastructure.

What explains these disparities? Although reforms and structural adjustments in the recent past have shaped contemporary health systems in Africa, an important part of today's inequality may be rooted in colonial legacies. European colonial powers not only established extractive institutions with long-run economic consequences (Acemoglu et al., 2001), but also introduced the foundations of modern health systems, such as public financing, nationwide health policies, and delivery structures (Coghe, 2020), in ways that may continue to determine contemporary trajectories of health financing and service provision. Although a large literature links colonial investments to present-day health outcomes (Huillery, 2009; Lowes and Montero, 2021b; Calvi and Mantovanelli, 2018; Anderson, 2018; Cagé and Rueda, 2020; Lowes and Montero, 2021a; Fors et al., 2024) far less is known about how historical health investments shape the behaviour and financing of modern healthcare providers. Understanding these mechanisms is essential for diagnosing potential misallocation of public funds and for designing policies that promote equitable and efficient access to care.

This paper attempts to bring a new perspective on this issue by investigating the historical legacy of the colonial regime in Belgian Congo on modern disparities in hospital financing and service provision. We empirically examine whether hospitals established during the colonial period continue to receive systematically higher public resources today, and whether such advantages translate into differences in output production. A central hypothesis is that large initial capital endowments may have created path-dependent advantages that continue to shape contemporary allocation decisions.

The Belgian colonial state rapidly institutionalised a centralised health system after taking control of the Congo in 1908. The creation of the Department of Health in 1909 formalised a network of facilities and programmes aimed at expanding medical services and combating major epidemics, most notably sleeping sickness (Lyons, 2002). Subsequent public-health campaigns and, later, the post–World War II Ten-Year Plan generated substantial capital investments that expanded the number of hospitals, beds, and medical personnel. By the eve of independence in 1960, the Congo possessed one of the most extensive medical infrastructures on the African continent (Pepin, 2011). These large and spatially uneven colonial investments provide a natural setting in which to study how historical infrastructure shapes the allocation of contemporary health resources.

To address these questions, we assemble a new geocoded dataset linking archival records from the Belgian Congo to modern administrative data on hospitals in the DRC. We digitise detailed historical maps from the Ministry of Colonies between 1926 and 1959, which document the location of health infrastructures supported by religious, private, and colonial government funds.[1] Each colonial health facility is then matched with a contemporary hospital by using a unique database of epidemiological and financial information on the universe of modern health facilities. This linked dataset allows us to trace the evolution of hospitals from their colonial origins to their present-day financing and service delivery.

We document strong and persistent disparities in the allocation of public resources across hospitals. Colonial-origin hospitals receive substantially higher government transfers today and maintain significantly larger physical infrastructure. The magnitudes are large: colonial hospitals receive over 60 percent more central-government funding and have more than 50 percent greater bed capacity than post-independence facilities. These patterns remain robust across a wide set of geographic and institutional controls and are not explained simply by the larger initial size of colonial hospitals. Despite these substantial financial and infrastructural advantages, colonial-origin hospitals do not deliver more observable services once differences in staffing are taken into account. Total and disease-specific outpatient volumes are remarkably similar across hospital origins. The disconnect between financing and outputs suggests that colonial-origin facilities absorb a disproportionate share of public resources without generating substantial increases in service provision.

[1] While many recent studies on legacies of religious missions in the past have exploited data from historical atlases, historical archives from the Belgian Congo provide a more accurate and complete source of information, and can overcome the limited capacity of atlases to report mission activities (Jedwab et al., 2022).

The welfare implications of these patterns are twofold. First, the divergence between transfers and hospital outputs points to a potential misallocation of scarce public funds, with resources flowing to facilities where marginal returns are likely lower. Similar distortions in factor allocation across firms are shown to substantially lower total factor productivity and welfare (Hsieh and Klenow, 2009). This perspective suggests that persistent financing gaps across hospitals could reduce the effective production of health care and overall population welfare, even without differences in simple activity measures. Second, by channelling a disproportionate share of funds to already well-endowed facilities, the current allocation of resources may constrain the ability of newer hospitals to attract staff, expand capacity, or meet local health needs. Hence, even without observable differences in output, the structure of public spending may reduce the efficiency and equity of the health system and shape its long-run performance.

Are these patterns expected? Colonial hospitals were initially larger and more capital-intensive, and contemporary budgeting may favour larger facilities to allocate resources. Yet, persistence is far from inevitable: the collapse of public financing after independence, the withdrawal of private and mission actors, and the rise of new political elites could have shifted government support toward newer hospitals. Post-independence governments may also have preferred to invest in more recent facilities symbolising the new national identity. The continued funding advantage of colonial-origin facilities therefore points to a path-dependent allocation process, in which historical investments created durable advantages that cannot be explained solely by their larger initial scale.

We confirm the robustness of the results to alternative structures of the error term, groups of hospitals, and functional forms, show that they are unlikely to be driven by omitted variable bias, and rule out confounding effects of the distribution of health workers across hospitals. Next, we employ nonparametric matching estimations between colonial and post-colonial hospitals based on their geographic locations and a wide range of hospital characteristics, and confirm the results with entropy balancing that reweights observations to ensure balance in hospital characteristics (Hainmueller, 2012). To address concerns that colonial hospital placement may be endogenous (Jedwab et al., 2022), we implement an instrumental-variable (IV) strategy that exploits historical variation in exposure to sleeping-sickness control campaigns, drawing on newly digitized epidemiological maps from the colonial period.[2] Sleeping-sickness

[2]We consider sleeping sickness distribution to be the preferred measure for colonial presence over alternative measures. Following Lowes and Montero (2021b), an alternative instrument could use the suitability of the soil for cassava relative to another traditional crop in the Belgian Congo such as maize. While the instrument can

prevalence was driven primarily by ecological interactions between the parasite, tsetse flies, and human and animal hosts, rather than by colonial economic or administrative priorities (Ford, 1971), and we show that it is orthogonal to pre-existing political and economic characteristics. Moreover, historical disease prevalence does not predict the location of post-independence hospitals or other modern investments. These patterns, together with a battery of robustness checks, support a causal interpretation of the relationship between colonial health investments and contemporary hospital financing.

One could be concerned with the risk of 'compression' of history that would overlook critical periods associated with major structural changes in the political and economic landscapes (Austin, 2008). To address this concern, we build the first long-run series of public financing and health-sector budgets for the DRC and show a sharp and sustained collapse in state financing of health after independence, in contrast to relatively high and stable colonial-era investments. This discontinuity implies that colonial hospitals entered the post-independence period with substantially larger capital endowments than later-built facilities, providing a plausible channel for the persistence of their infrastructural advantage.

Our analysis on the channels of persistence rules out any mediating role of economic development, ethnicity, contemporary disease burdens, modern conflict, or local elite capture. We further show that quality of care does not systematically differ across hospitals, and thereby exclude the possibility that the central government strategically targets better working hospitals. Instead, the evidence points to a political-economy mechanism whereby colonial investments created hospitals with substantial capital endowments and administrative visibility. Post-independence governments and donors, facing limited fiscal and bureaucratic capacity, continue to direct resources toward these historical nodes, for whom the fixed costs of engagement are lowest, even when current marginal returns or needs would warrant a more equitable distribution. This dynamic reinforced historical advantages: contemporary public spending aligns more with colonial-era infrastructure than with contemporary need or marginal productivity, generating potential misallocation and spatial inequalities. Thus, the legacy of colonial health investments lies not only in the survival of historical facilities but in the reproduction of an inherited geography of public financing, with important implications for efficiency, equity, and the long-run evolution of the health system.

predict sleeping sickness, it has a low predicting power for colonial health settlements. Alsan (2015) created a tsetse fly suitability index in Africa, but colonial health authorities in Congo already provided fine grained data on the geographic distribution of tsetse flies, and reported little variations across the country.

This study relates to several strands of existing research. First, we contribute to the literature on the historical roots of modern medicine, and the demand and supply of healthcare. A growing number of studies single out the extractive nature of colonial powers in durably affecting health behaviour and mistrust in medicine. The Belgian Congo is an illustrative example where labour coercion and constant use of violence for resource extraction disrupted both local communities and the Congolese society (Kivilu, 1984; Lyons, 2002). Lowes and Montero (2021a) show that the extreme brutality employed within rubber concessions during the early colonisation of Congo continues to negatively affect the present day anthropometric outcomes among individuals living in the affected areas. Examining medical campaigns in French Central Africa where villagers were forced to receive injections of medications, Lowes and Montero (2021b) further find a lasting decline in trust in modern medicine, higher risks of anemia, and increased HIV prevalence. Additional studies document the adverse effect of colonial legacy on modern HIV burden (Cagé and Rueda, 2020; Anderson, 2018) and its role on the modern disparities of the disease (Denton-Schneider, 2024). On the other hand, proximity to religious medical missions during the colonial era is also shown to strongly predict contemporary better health outcomes (Calvi and Mantovanelli, 2018), and to reduce the use of traditional practices associated with adverse health risks (Fors et al., 2024). To the best of our knowledge, our study is the first to examine the long-term effect of colonialism on the supply side sector of healthcare, and complements the findings on health outcomes in this related literature. We demonstrate that the presence of colonial settlements may have contributed to creating a two-tier healthcare system through differential physical infrastructure, and durably affected the allocation of public resources across health care providers. The ability of colonial regimes to mobilise large health investments and skilled resources, although driven by resource exploitation, appears to be a strong channel of persistence of the colonial effects. This finding is consistent with Huillery (2009) where the author documents a positive effect of colonial investments in health, education and infrastructure on the current performance of each of these public goods. Second, our study adds to the literature on the persistent effect of historical investments in infrastructure (Huillery, 2009; Bleakley and Lin, 2012; Jedwab et al., 2017; Chung et al., 2017; Donaldson, 2018; Mitrunen, 2024). Chung et al. (2017) show that a major U.S. financing program for hospital construction and modernisation following World War II led to substantial increases in hospital bed capacity and service utilisation over the subsequent two decades. Building on this, we provide evidence that in low-income contexts, large-scale investments in the hospital sector can produce significant and even longer enduring effects not only on bed capacity but also on hospital financing. The importance of initial factor endowments echoes the results in Jedwab et al. (2017) on the role of colonial sunk investments as a channel of persistence. We maintain that in the postcolonial period, the constrained fiscal capacity of newly independent states may have limited the infrastructural development of newly built healthcare facilities. As poverty and global health burdens increased and foreign aid started to pour in, donors may have prioritised support to the pre-existing network of colonial health institutions that could deliver comparatively higher services, thereby contributing to maintaining a two-tier financing system of health institutions with different development paths.

More broadly, this study relates to the literature on the long-run persistence of colonialism on economic development and institutions (Sokoloff and Engerman, 2000; Acemoglu et al., 2001; Dell, 2010; Nunn, 2014; Jedwab et al., 2022).[3] Scholars have shown the importance of initial conditions and factor endowments on modern institutional and economic development. Although former colonial areas may also be characterised by lower investment in human and physical capital in the post-colonial period (Iyer, 2010), colonial investments in public goods could also have led to positive effects on human capital (Huillery, 2009; Wantchekon et al., 2015). Likewise, Dell and Olken (2019) show that extractive institutions could result in comparatively higher economic and social outcomes in the long run. We demonstrate that colonial investments continue to have an important role in the allocation of public health resources, but without being associated with the quality of healthcare provision. The paper suggests that coordination around existing investments could be an important channel of persistence, even in the presence of historical extractive institutions.

The focus on the Belgian Congo provides an opportunity to examine the effect of a colonial regime covering a vast spatial territory, beyond the comparatively more studied French and British colonial rules. Furthermore, no studies have, to our knowledge, explored the effects of colonialism on modern hospital outcomes. Our novel dataset allows us to estimate directly the persistence of colonial effects at the granular level and avoid losing information through data aggregation.

The roadmap of the paper is as follows. Section 2 provides historical background on the DRC and its health system. Section 3 posits explanations to understand the long-run effects of colonial settlements. Section 4 describes the data and the geographical analysis. Section 5

[3]For a thorough review of this literature, see Michalopoulos and Papaioannou (2020).

presents the long-run effects of colonial legacy. Section 6 explores multiple alternative channels for the results, and Section 7 concludes.

2 Background

2.1 Colonial health investments

Belgian colonial rule established both the administrative structure and the physical footprint of Congo's modern health system. Although the Congo Free State (1885–1908) invested almost nothing in public health, the Belgian state gradually built a more formal medical apparatus once it assumed control in 1908.[4] Large-scale interventions began only in the 1920s, with the outbreak of sleeping sickness, or Human African Trypanosomiasis (HAT), a disease transmitted through the bite of the tsetse fly. To address the disastrous effect of the disease on local populations, colonial authorities, working with Catholic and Protestant missions and with medical services financed by large firms, created mobile treatment teams, expanded disease surveillance, and opened the first facilities dedicated to Indigenous populations (Lyons, 2002). These initiatives were not motivated by broad welfare concerns but by the need to preserve a productive workforce, and health provision remained highly unequal across racial lines. Although all medical care was free of charge, the distribution of health services was highly uneven, with the best and most expensive care restricted to Europeans (Figures A1 and A2 in Online Appendix). On the other hand, the provision of health care for the native Congolese population was rudimentary and primarily geared towards a healthy and productive labour force required for both colonial health and economic concerns (Hunt, 1999). Nevertheless, the campaigns laid the initial geographic foundation of the public health network.

The more transformative phase of expansion occurred after World War II. Supported by strong economic growth and Belgian-backed fiscal surpluses, the colonial administration launched the Van Hoof-Duren Plan (1949–1959), an ambitious public investment program covering infrastructure, education, and health. Its health component sought to build a coordinated, tiered system: rural medico-surgical centres supported by surrounding dispensaries, and major hospitals in urban areas offering higher-level services (Duren, 1953). Implementation progressed rapidly. By the end of the colonial period the territory hosted nearly 3,000 facilities, including close to 300 general referral hospitals, more than 50,000 beds, and a large network of dispen-

[4] There were 2 doctors in 1896 in the Congo Free State, and 30 by 1908 (Lyons, 2002).

saries (Ministry of Colonies, 1958). Relative to the rest of sub-Saharan Africa, Congo emerged with one of the most extensive medical infrastructures on the continent (Pepin, 2011). This infrastructure continues to form the backbone of the present hospital network, and its spatial distribution generates significant variation in historical exposure to health investments.

2.2 Post-independence evolution of the health system

Independence in 1960 disrupted this system abruptly. The rapid departure of foreign administrators and medical personnel, combined with political fragmentation and secessionist conflicts, immediately weakened state capacity. During the 1970s and 1980s, macroeconomic instability, driven by declining copper prices, debt accumulation, and the effects of nationalisation, further constrained government budgets (IBRD, 1973). Health expenditures fell, maintenance of the colonial-era network was deferred, and several previously controlled endemic diseases resurged. Service delivery became increasingly fragmented across public facilities, mission providers, firm-run clinics, and private dispensaries operating with little coordination (World Bank, 1987).

The prolonged conflicts of the 1990s and early 2000s deepened the deterioration (Nest et al., 2006). Many hospitals suffered damage or abandonment; supply chains for drugs and equipment collapsed; and skilled health workers faced irregular and declining remuneration (MSP, 2011). Although the political settlement after 2003 restored territorial control and some administrative coherence, public investment remained limited. Even today, many facilities operate with severely degraded infrastructure (Figure A3 in Online Appendix), relying on intermittent donor support and local coping strategies (MSP, 2011). Further historical details appear in the Online Appendix Section A.

2.3 Contemporary system organisation

Donor programs partially compensate for the lack of domestic resources, but coordination is limited, and support varies substantially across regions and providers. This contributes to wide disparities in drug supply, equipment availability, and staffing conditions across hospitals (Brunner et al., 2019). Health workers in hospitals are normally paid by the government, and their wage comprises a salary and occupational risk allowance (*prime de risque*). However, only workers with a matriculation number can be enrolled in government payroll and thus receive a government salary. The risk allowance, by contrast, is distributed outside formal payroll systems and is therefore extended to a broader set of health personnel. Low and delayed salary payments, along with frequent non-payment of the risk allowance are frequent in the DRC (Fox et al., 2014; Bertone et al., 2016). Consequently, many health workers rely heavily on a local allowance collected from consultation fees. The contemporary system is organized around 26 provincial health departments and 516 health zones, but the effective responsibilities of each tier are shaped by financial constraints and the uneven distribution of external support. Additional institutional details are provided in the Online Appendix A.3.

3 Evolution of public finances and health care provision

3.1 Persistence of colonial health infrastructure

Colonial health infrastructure may matter today through two related channels. First, independence was followed by a sustained reduction in the state's fiscal and administrative capacity. The loss of Belgian personnel, coupled with political instability, corruption, and fragmentation of donor support, sharply limited the ability of the postcolonial government to maintain or expand the inherited hospital network (Vanthemsche, 2012). These shocks reduced its capacity to sustain public investment, decreasing both the quantity and quality of hospital infrastructure.[5]

Second, maintaining a colonial-era network of relatively effective hospitals — built through large sunk investments — may have become less costly at the margin after independence. While colonial governments financed health through substantial public spending and customs-based taxation (Gardner, 2013), the postcolonial state faced fiscal collapse and recurring crises that severely constrained healthcare funding (Frankema and Buelens, 2013).

The rise in Development Assistance for Health (DAH) in the DRC since 2008 (Figure A4 in Online Appendix) could challenge these assumptions if external funding had been primarily directed toward health infrastructure development. However, available evidence indicates that DAH has largely focused on supporting operational aspects of hospitals, particularly in the area of infectious disease control, while contributing only marginally to the upgrading of existing health facilities (World Bank, 2021). Consistent with this pattern, only four hospitals in our dataset were constructed after 2008, when DAH rose substantially. These observations motivate our examination of how historical investments continue to shape contemporary hospital infrastructure and financing.

[5] Similar investment patterns occurred across Africa following the fall of colonial regimes (Barnum, Kutzin, et al., 1993).

3.2 Historical patterns of public finances

Extensive historical evidence indicates that the colonial administration operated under substantially stronger fiscal capacity than the post-independence state (Vanthemsche, 2012). Given the major political and economic disruptions that followed independence, it is essential to document how the state's revenue base and spending priorities evolved over time, as these shifts likely shaped the ability to maintain or replace inherited health infrastructure. We therefore assemble long-run series on public revenues, expenditures, and health-sector allocations to characterise the trajectory of fiscal capacity in the DRC. Details on data construction are provided in Online Appendix C.

The Great Depression and World War II led to temporary contractions in health spending, which resumed an upward trajectory during the late colonial period. A similar pattern of colonial medical expenditures has been found in the French and British colonial administration (Vrooman, 2023). During the 1940s and 1950s, health expenditures represented a stable share of the budget, supported by relatively effective revenue collection and access to external borrowing. Figure 1 shows that domestic health spending fluctuated between 8 and 13 percent of the budget in the final decades of colonial rule.

Independence in 1960 produced an immediate and sharp fiscal contraction. Public revenues collapsed, health workers reportedly went unpaid, and the share of health spending fell close to zero (EEC, 1963). Although revenues temporarily recovered in the late 1960s, mainly through mineral exports, this improvement proved short-lived. The decline in copper prices in the 1970s durably reduced the state's revenue base, and high inflation further eroded real fiscal capacity (Bension et al., 1980). As shown in Figure A6 in Online Appendix, the revenue-to-GDP ratio deteriorated steadily, mirroring patterns documented in other resource-dependent African economies (Cogneau et al., 2021).

Importantly, periods of rising national income did not translate into increased funding for the health sector (Figure A5 in Online Appendix). Throughout the post-independence period, government expenditures were reallocated toward political and military priorities rather than health (World Bank, 1987). Even during periods of improved fiscal capacity, the share of resources directed to health remained flat. This pattern suggests that the long-run underinvestment in health reflects not only fiscal scarcity but also a persistent de-prioritisation of the sector. The combination of declining revenues and shifting spending priorities produced a prolonged shortfall in public investment in health infrastructure, leaving much of the colonial-era network without substantial replacement or upgrading.

3.3 Composition of health financing

Public financing of health care in the DRC is extremely limited: government health spending has remained below 5 percent of the national budget since independence (Figure 1). As a result, the health system relies heavily on development assistance and user fees, while government salary payments to health workers are often irregular and incomplete. This financing structure amplifies the importance of central government transfers and external aid in shaping hospital resources and incentives.

3.4 Evolution of hospital resources

After independence, a sudden exodus of European health personnel (Figure A7 in Online Appendix) temporarily reduced the number of health workers in the country. However, the share of medical personnel in the total population recovered in the early 1970s and has continued to grow with a similar trend as the one observed during the colonial period. On the other hand, the number of beds per 1,000 has sharply decreased since independence, indicating that only limited capital investment was made in building new hospitals or health centers to address population growth (World Bank, 2021). This evidence further supports the view that much of donor-driven investment has been targeting operational costs, supply chains, and vertical programmes, rather than the expansion of infrastructure.

4 Data

We construct a novel dataset linking modern administrative records on hospitals in the DRC with historical information on colonial health facilities. Below we briefly summarise the main sources; details on data construction are provided in Online Appendix Section B.1.

4.1 Sources

Colonial status. The treatment variable indicates whether a modern hospital traces its origin to a health facility operating during the colonial period. We compile a complete inventory of colonial hospitals and dispensaries using a series of geocoded maps produced by the Belgian Ministry of Colonies between 1929 and 1959. These maps report the location, type of facility, population served, and ownership (state, missions, or private companies). Additional archival materials, including maps from the *Fondation Reine Elisabeth pour l'Assistance Médicale aux Indigènes*(Foreami) and a 1929 register of Christian missions, supplement this information. We match these historical facilities to modern hospitals using geographic coordinates and names.

Modern hospital data. Contemporary hospital outcomes are obtained from the District Health Information System (DHIS2), a routine web platform managed by the Congolese Ministry of Health, that provides monthly financial and epidemiological data for all registered health facilities in the DRC between January 2017 and December 2021. Lordemus (2022) provides an introduction to these data. Following the Ministry of Health classification, we restrict the sample to hospitals, defined as facilities offering at least surgery, paediatrics, general medicine and gynaecology-obstetrics departments. Each modern hospital is then assigned a colonial or postcolonial origin based on the geographic matching described above.

4.2 Outcome variables

We examine three categories of outcomes. First, to measure hospital infrastructure, we use a facility's total bed capacity. Second, we capture public financing using the annual amount of government transfers received by each hospital. These transfers cover personnel-related expenditures, including salaries and occupational risk allowances, and are recorded for public, faith-based, and private facilities.[6] The data report the annual amount received by each hospital. The number of health workers employed in a hospital should then strongly predict government transfers. Finally, to assess service provision, we use hospital-level counts of outpatient and inpatient admissions, emergency department visits, and the number of patients treated for severe malaria and severe diarrhea. These indicators reflect the main categories of hospital-based service delivery in the DRC (Ouma et al., 2018).

All outcomes are constructed as averages over monthly observations from January 2017 to December 2021, based on administrative data from the DHIS2 system.[7]

[6] Salary payments represent the vast majority of government transfers, accounting for roughly 98% of the total (World Bank, 2021). Top-up payments from locally collected fees are not included in these figures (Bertone et al., 2016).

[7] Results are robust to using medians and to applying Correlated Random-Effects models to the panel structure of the data.

4.3 Control variables

We control for a rich set of hospital and location-level characteristics that may jointly influence historical placement, contemporary infrastructure, and public financing.

Geographic characteristics. Baseline specifications include detailed geographic controls capturing accessibility, ecology, and spatial heterogeneity. These comprise distance to major cities, rivers, and railways; elevation and terrain ruggedness; and indicators for ecological zones. We further include province fixed effects and geographic coordinates to flexibly absorb unobserved spatial variation and regional differences in administrative capacity and public investment.

Health staff. Staffing is measured by the total number of health workers employed at each hospital. The dataset distinguishes three categories of nurses (by qualification level) and two categories of physicians (general and specialist). Because job responsibilities and specialisation boundaries vary across facilities, and since individual physicians often divide their time across multiple workplaces, we aggregate all categories into a single measure of total health workers.[8]

Population and ownership. Population in each hospital's catchment area is proxied by the population of its health zone. Historical population density is obtained from colonial maps. We classify modern hospitals as public, faith-based, or private using administrative data, and identify the corresponding ownership of colonial facilities (state, missions, or private companies) from archival records.

4.4 Final sample

The final sample comprises 1,393 modern hospitals of which 302 can be linked to a facility operating during the colonial period. We exclude from the data sample the largest hospital in the country, Kinshasa General Referral Hospital, whose financial and structural capacities largely outperform the rest of the data sample.[9] Figure 2 displays the locations of all colonial and post-colonial hospitals that could be geo-localised. Approximately 20 percent of modern facilities could not be geo-referenced; these are small, recently constructed structures located mainly in rural areas.[10] Colonial and post-colonial hospitals differ along several observable dimensions. Table 1 reports summary statistics for both groups. Post-colonial hospitals are

[8]Results are robust to distinguishing nurses and physicians as separate aggregates.

[9]The results remain qualitatively robust to the inclusion of Kinshasa General Hospital.

[10]The province and health zone of these facilities can be identified. As shown in the next section, our main results remain robust to including these facilities in the analysis.

more likely to be privately owned, located closer to urban centres, and operate with smaller infrastructure. By contrast, about two-thirds of colonial hospitals are publicly owned and nearly one-third are faith-based. These imbalances motivate the matching and permutation procedures presented in the following section.

Table A1 in Online Appendix compares ownership in 1959 and today. While the share of faith-based hospitals has remained relatively stable, the share of hospitals owned by private firms shrinks from almost 20% in 1959 to 5% in present days, mostly through a reconversion to public ownership. We also examine the extent to which colonial hospitals recorded in 1959 can be matched to modern facilities. Approximately 15% cannot be matched by either name or location and are classified as lost; an additional 11% cannot be verified with certainty due to missing or inconsistent historical coordinates, leaving some uncertainty regarding their colonial status (Online Appendix Table A2). Unmatched colonial hospitals are equally likely to be located in resource-rich areas but tend to be more remote and more frequently privately owned than matched colonial hospitals (Online Appendix Table A3). We discuss below how these cases are handled in the IV and robustness analyses. Importantly, unmatched facilities arise exclusively from colonial hospitals; postcolonial hospitals are never misclassified as colonial. As a result, any misclassification is one-sided and mechanically biases estimated effects toward zero. These matching losses reflect post-independence closures or institutional transformations rather than uncertainty about colonial origin. Finally, Online Appendix Table A4 show that, at the intensive margin, investments measured by bed capacity were strongly associated with population density during the last decade of the colonial era, consistent with patterns documented for mission settlement (Jedwab et al., 2022).

5 Long-Run effects of colonial health settlements

We begin by estimating whether hospitals with a colonial origin differ systematically in contemporary government transfers and bed capacity. A key concern is that historical and geographic factors that shaped the location of the colonial enterprise, may also influence modern hospital performance, generating spurious correlations (Good, 1991; Jedwab et al., 2022). To address this, we control for a rich set of historical and geographic covariates, allowing comparisons between facilities operating in similar environments. Under this specification, any remaining association between colonial origin and modern outcomes is unlikely to be driven solely by locational advantages. Second, we demonstrate the strength of our results with propensity score matching. Third, we assess the plausibly causal effect of colonial settlement with the instrumental variable approach that relies on the geographic distribution of sleeping sickness during the colonial period.

5.1 Relationship between colonial legacy and facility performance

We start by estimating the reduced-form relationship between colonial health investments and contemporary health facility performance using Ordinary Least Square (OLS) regressions. The cross-sectional equation is

$$\mathbf{Y}_{ij} = \alpha_j + \beta Colonial_{ij} + \mathbf{X}_{ij}^{'}\gamma + \epsilon_{ij} \tag{1}$$

where $\mathbf{Y}_{ij}$ denotes the outcome of interest for hospital i in province j, $Colonial_{ij}$ is an indicator equal to one if the facility originated during the colonial period. Provincial fixed effects α_j absorb all province-level factors affecting hospital performance. The coefficient of interest β captures the conditional association between colonial origin and contemporary outcomes. The vector $\mathbf{X}_{ij}^{'}$ includes hospital characteristics and geographic controls.

We account for historical geographic controls including elevation, distance to the provincial capital, distance to historical transportation networks (railway, road or navigable river), population density in 1951,[11] soil suitability for cassava,[12] an indicator for colonial-era resource exploitation, and the hospital's latitude and longitude. We further control for modern geographic factors with distances to the nearest pharmaceutical distribution center, the nearest hospital, and recent armed conflict. We also control for local malaria transmission intensity using the median *Plasmodium falciparum* parasite rate (PfPR) from 2017–2018, obtained from the Malaria Atlas Project.[13] All continuous variables are entered in logarithms.[14] To account for the heterogeneity across the 26 provinces in the country and the correlation of hospital performance within provinces, standard errors are clustered at this administrative level.

In our baseline specification, we exclude current staffing, bed capacity, and catchment

[11] Although the estimates are well documented at the subnational level in the colonial reports, we acknowledge the caveat that population density during the colonial time was likely underestimated (Frankema and Jerven, 2014). We establish the robustness of our results to using population density in 1800 from the History Database of the Global Environment (HYDE).

[12] Cassava was the leading crop production in Belgian Congo.

[13] PfPR measures the share of children aged 2–10 carrying the parasite. Annual rasters at 5 km resolution are provided by the Malaria Atlas Project.

[14] Results are similar using the inverse hyperbolic sine transformation.

population, which are themselves outcomes of colonial investments and contemporary political processes. The coefficient on colonial origin thus captures the total effect of historical health investments on modern transfers. However, since government transfers are formally tied to the wage bill, our key policy-relevant object is whether colonial-origin hospitals receive higher transfers conditional on staffing. Likewise, health service provision strongly depends on health workers. In subsequent specifications and mechanism analyses, we selectively introduce these variables to study allocation conditional on staffing and infrastructure.

5.1.1 Main Results

Table 2 reports the baseline estimates for six outcomes: bed capacity, government transfers, total admissions, severe malaria cases treated, severe diarrhea cases treated, and emergency department visits. All specifications include the full set of geographic controls and provincial fixed effects. For each outcome, we first report OLS specifications that omit potentially endogenous hospital characteristics such as staffing, ownership, and current catchment population, and then introduce these variables selectively to study allocation conditional on inputs (except for bed capacity). Full coefficients on all covariates are reported in Online Appendix Table A5. To better compare the magnitudes across the specifications, we report the standardised beta coefficients. Colonial origin is strongly associated with all hospital outcomes. The largest associations are found for bed capacity and government transfers: a one standard deviation (SD) predicts 0.43 more beds and 0.38 SD more transfers. Associations for health service outputs are smaller, ranging from 0.16 and 0.25 SD. Adding catchment population and ownership slightly attenuates the colonial effect for transfers and health services.[15]

We then add staffing and interpret the remaining coefficient on colonial origin as an estimate of the residual or excess funding associated with colonial origin. The coefficient on colonial origin falls by almost 70%, indicating that much of the legacy effect operates through higher staffing, but it remains positive and statistically significant. Colonial-origin hospitals still receive 51% more in transfers, indicating that colonial status is associated with budgetary advantages beyond those justified by staffing.[16] By contrast, once staffing and geographic factors are included,

[15] Estimates for health services when controlling for local population and ownership do not significantly change the results and are omitted to save space.

[16] The dependent variable is log-transformed and $Colonial_{ij}$ is a dummy variable. Hence, a one unit change in $Colonial_{ij}$ leads to $(exp(\beta - 1)) \times 100$ percent on the dependent variable.

colonial origin has little or no association with contemporary health production, except for severe malaria treatments (in the following subsection, we show that this last result is not robust to alternative empirical strategies). In particular, emergency visits and diarrhea treatments are statistically similar across colonial and post-independence hospitals after controlling for staff. This similarity indicates comparable technical efficiency in the use of given inputs, but does not justify the substantially higher funding levels allocated to colonial-origin facilities. The asymmetry between large differences in financing and limited differences in service provision conditional on inputs therefore points to persistent allocative misalignment in the public hospital network rather than differences in hospital productivity.

5.1.2 Robustness

We assess the robustness of the baseline OLS estimates along several dimensions.

Alternative estimators. Since outcomes may be jointly determined, we estimate a Seemingly Unrelated Regressions (SUR) system using Generalised Least Squares (GLS). As shown in Online Appendix Table A6, the coefficients on colonial origin are slightly lower but remain positive and significant for all outcomes.

Inference. Next, we examine a range of corrections for potential misspecification of the error structure. Standard errors clustered at the provincial level are complemented with wild cluster bootstrap procedures suitable for few clusters (Cameron et al., 2008). To further account for spatial distortions causing low standard errors (Conley and Kelly, 2025), we apply the Moran test for spatial autocorrelation in residuals. The related p-values in Online Appendix Table A7 suggest that the colonial effect is unlikely driven by spatial noise. Next, we test for spatial autocorrelation in residuals and implement Conley (1999) standard errors using distance cutoffs from 100 to 1,000 km (Colella et al., 2018). Across all approaches (Online Appendix Tables A7 and A8), estimates on colonial origin remain stable.

Geolocation uncertainty. Some hospitals could not be geocoded, raising concerns about selection into the analytical sample. Online Appendix Table A9 shows that results are unchanged when (i) excluding all geographic controls in the main sample (Panel A) or (ii) including hospitals without coordinates (Panel B).

Omitted variables. Next, we assess the sensitivity of the baseline estimates for bed capacity and government transfers to selection on observables using the methods of Oster (2019) and Diegert et al. (2024). Online Appendix Tables A10 and A11 show that coefficients on colonial origin remain stable as progressively richer sets of geographic controls are added (distance to coast, electrical infrastructure, slope, and the suitability indexes of cotton and rubber). The breakdown point estimates suggest that selection on unobservables would need to be of comparable magnitude to selection on observed covariates to overturn the baseline effects for both outcomes (see Online Appendix subsection D.1 for more details). Given the wealth of our geographical and historical level data, such a degree of unobserved selection appears unlikely. We nevertheless explore additional identification strategies in the following sections.

Panel structure. As an additional robustness check, we exploit the panel structure of the data and estimate Correlated Random Effect (CRE) models following Mundlak (1978), augmenting the random-effects specification with hospital-level averages of time-varying inputs (Online Appendix Table A10, panel C). This approach allows unobserved hospital characteristics to be correlated with observed covariates (Wooldridge, 2010). Because staffing lies on the causal pathway from colonial investments to contemporary outcomes, the estimate does not recover the total effect of colonial origin, but assesses whether the residual association between colonial origin and government transfers persists once long-run staffing patterns are flexibly controlled for. The magnitude is smaller than the baseline OLS but remains positive and statistically significant, indicating that colonial-origin hospitals receive higher transfers even after accounting for both contemporaneous staffing and persistent differences in staffing levels.

Functional forms and missing observations. Government transfers are either reported with a non-negative value or recorded as missing in our data.[17] To distinguish between the true zeros and the missing values, we assign zeros to hospitals with perfect reporting completeness (the extent to which a minimum set of indicators, defined by the Ministry of Health, is reported). The assumption is that the true zero values for government transfers are most likely to be attributable to hospitals with a perfect completeness score. Columns 4 and 5 in Online Appendix Table A10 shows that the estimated effect of colonial origin on government transfers remains positive and statistically significant when using Poisson regressions, which accommodate a large mass of zeros. By contrast, linear probability models indicate no effect on the extensive margin, suggesting that colonial origin affects the level of transfers received rather than the probability of receiving transfers. These results confirm that the baseline findings are not driven by functional-form assumptions or the handling of missing observations.

Subsamples. We further demonstrate that results are not driven by Kinshasa or by

[17] For most of the variables, zero values are not stored in the DHIS2.

provinces affected by Ebola outbreaks or armed conflict. Sequentially excluding each of these regions leaves the estimated effects largely unchanged (Online Appendix Table A12).

Permutation tests. Online Appendix Figure A9 performs permutation tests for government transfers and bed capacity, where we randomly reassign the colonial status of hospitals and re-estimate equation (1), with 1,000 replications. The intuition behind the test is that treatment effects of similar magnitudes should not be estimated in cases where hospitals do not have a colonial origin. The results rule out spuriously correlated effects: for both government transfers and bed capacity outcomes, the graphs show that the distributions of these estimated placebo effects are well outside the effect size of the actual treatment.

Data quality. A potential concern is that colonial-origin hospitals may report administrative data more accurately or completely, which could mechanically generate higher measured transfers or infrastructure. To address this, we test whether colonial-origin facilities systematically report higher-quality administrative data (see Online Appendix Section D.2). Multiple indicators (i.e., completeness, internal consistency, and reporting of transfers) show that the colonial status of hospitals does not a meaningful impact on these quality outcomes (Online Appendix Tables A13, A14, and A15). We further interpolate missing values with different simulation exercises, and show that the colonial effect on government transfers remains sizeable, which reinforces our confidence that underreporting does not drive our results (Online Appendix Table A16). A remaining concern is that some hospitals classified as postcolonial may in fact originate from colonial facilities that cannot be linked to archival records. We address this by conservatively reclassifying a corresponding share of postcolonial hospitals as colonial under worst-case assignments that minimise the colonial–postcolonial gap. The estimated colonial effect is attenuated but remains qualitatively similar ((Online Appendix Table A16).

5.2 Matching estimation

While the OLS derives a functional relationship between the outcome and observed facility characteristics, our second approach uses propensity score matching, comparing colonial and post-colonial hospitals, to allow for complex interactions. Online Appendix E provides supportive evidence for the validity of the matching estimation.

Table 3 reports the Average Treatment effects on the Treated (ATT), comparing colonial-origin hospitals to observationally similar post-independence facilities. The first two raws of Panel A reports matching estimates using the biased-corrected method proposed by Abadie and Imbens (2011) with one and three nearest-neighbour respectively. The third row presents results obtained using entropy balancing Hainmueller (2012), implemented as in Hainmueller and Xu (2013), where the weights of the post-independence hospitals are adjusted to match the mean and the variance of the covariates of colonial hospitals. Across methods, the estimated effect sizes associated with colonial origin remain comparable to the baseline OLS estimates. Panel B reports conditional matching estimates that explicitly account for contemporary inputs. The first row imposes exact matching on quintiles health worker size, and identifies nearest neighbours within each quintile using baseline covariates and geographic coordinates. The second raw imposes exact matching on hospital type (referral vs. non-referral), and the third raw adds staffing into the entropy balancing algorithm. For government transfers, the conditional matching estimates consistently indicate that colonial-origin hospitals receive higher funding even when compared to post-independence hospitals with similar staffing levels and hospital types. For service provision, by contrast, the conditional estimates show no systematic differences across hospital origins, suggesting that colonial hospitals do not deliver more services per worker. Taken together, the matching results reinforce the interpretation that persistent differences in financing are not driven by observable differences in inputs or scale, while differences in service provision largely vanish once inputs are held constant.

5.3 Instrumenting the colonial origin

We further gauge causality by addressing the potential endogeneity of the colonial presence through an instrumental variable approach to estimate equation (1). We instrument colonial settlements with the historical geographic distribution of the burden of sleeping sickness. Sleeping sickness attracted substantial medical attention from colonial authorities and strongly influenced the location of early medical campaigns and health facilities (Duren, 1953). At the same time, the geographic spread of the disease, driven by ecological interactions between humans, tsetse flies, and wildlife, was highly irregular and not anticipated by colonial administrators (Franco et al., 2014; Lyons, 2002). This generates plausibly exogenous variation in the intensity of colonial medical activity across space.

To operationalise this idea, we exploit the reporting from public health archival data of the geographic distribution of sleeping sickness during the colonial period, where the infection rate is at least equal to 1%.[18] Aggregating information across years serves two purposes. First, early

[18] This arbitrary threshold aims to consider only geographic areas where the burden of sleeping sickness became

reporting was incomplete in parts of the western Congo, making single-year measures unreliable. Second, colonial health campaigns altered local disease dynamics over time (Lyons, 2002), so combining maps provides a more comprehensive measure of underlying exposure. The resulting indicator captures geographic areas that experienced a substantial disease burden and were therefore more likely to attract medical interventions and the establishment of colonial health facilities. Online Appendix Figures A10 and A11 illustrate the distribution of sleeping sickness and its strong spatial correlation with colonial health settlements. A full historical discussion of the disease, reporting systems, and public health responses is provided in Online Appendix Section A.1.

We estimate the following first-stage equation:

$$Colonial_{ij} = \delta Sleeping_{ij} + \theta X'_{ij} + \nu_{ij} \tag{2}$$

where $Sleeping_{ij}$ is a dummy variable equal to 1 if hospital i is located in an area where the infection rate was reported greater than 1% at least once during the last three decades of the colonial period - which coincides with the expansion of public services. The fitted values are then used as explanatory variables for the indicator of colonial origin in equation (1).

Table 4 reports the instrumental-variable estimates. Panel A presents the first-stage results, Panel B the reduced-form estimates, and Panel C the 2SLS specifications. Historical sleeping sickness exposure is a strong predictor of colonial medical settlement: hospitals located in historically affected areas are more than 60 percent more likely to have been established during the colonial period. The Kleibergen–Paap F-statistics exceed 200 across specifications, indicating a strong first stage. The reduced-form estimates reveal a clear pattern. Historical sleeping sickness exposure strongly predicts modern hospital inputs (bed capacity and government transfers) but has a weaker relationship with service provision. Moreover, the reduced-form association with service volumes disappears once we condition on staffing, indicating that any effect of the instrument on service provision operates primarily through increased health-worker inputs rather than higher productivity per worker.

The 2SLS estimates reinforce this interpretation. Colonial origin has large and statistically significant effects on hospital inputs: a one standard-deviation increase in colonial medical

significant. The archival maps also report the areas where the infection rate is less than 1%, but without further information about the number of identified cases, we cannot claim that they significantly impacted the location of colonial settlements.

settlement exposure raises bed capacity by 0.52 SD and government transfers by 0.46 SD. These magnitudes are comparable to, and in some cases larger than, those documented in related studies on the long-run effects of colonial health interventions (e.g., Calvi and Mantovanelli, 2018; Lowes and Montero, 2021b). By contrast, estimates for service provision are smaller and not consistently statistically significant.

The 2SLS estimates are systematically larger than their OLS counterparts, though Wu–Hausman tests provide only limited evidence of differences between the two. A plausible explanation is attenuation bias in OLS due to misclassification of hospital origin: while colonial records list 408 health facilities in 1959, we identify only 301 colonial-origin facilities in our data, reflecting name changes and the disappearance or repurposing of some hospitals after independence. In addition, the 2SLS coefficients identify Local Average Treatment Effects for hospitals whose establishment was induced by sleeping-sickness exposure. If these "complier" hospitals benefited from particularly large initial investments or differ systematically in geography, IV estimates may exceed average effects. We examine this heterogeneity in the next subsection.

Finally, in separate 2SLS regressions, we show that colonial origin has large and significant effects on both bed capacity and staffing. However, once bed capacity is included, the IV effect of colonial origin on staffing becomes statistically insignificant (Online Appendix Table A17), indicating that higher staffing levels are largely mediated by infrastructure. Combined with the OLS decompositions that condition on staffing, this pattern suggests that colonial hospitals inherited larger causal endowments of physical capital, which in turn supported higher staffing, while still receiving excess government transfers conditional on observed inputs.

5.3.1 Identifying assumptions and robustness

Our identification relies on the exclusion restriction that historical sleeping-sickness exposure affects contemporary hospital outcomes only through its impact on colonial medical investments. A key threat to our identification is that historical sleeping sickness maps may reflect differential surveillance intensity and colonial administrative capacity, which is itself persistent and directly related to modern transfers. We address this concern through a sequence of complementary falsification and validation exercises designed to rule out these alternative channels.

Persistent location advantages. First, we examine whether historical sleeping sickness exposure predicts the placement of post-independence hospitals. If exposure simply captures time-invariant locational advantages, it should predict hospital placement both before and after independence. We rule out any statistically significant relationship, confirming that the instrument does not capture persistent location advantages (Online Appendix Table A18).

Generic administrative presence and surveillance capacity. A related concern is that sleeping-sickness exposure may reflect persistent administrative salience or surveillance capacity rather than underlying epidemic conditions. This hypothesis has a clear testable implication: if exposure captures broader state presence, it should predict non-health manifestations of administration both during and after the colonial period. We therefore examine its relationship with multiple proxies for non-health state presence, including settlement density, transport infrastructure, night-time lights, proximity to colonial *Force Publique* posts, and distance to post-independence hospitals. Across these outcomes, we find no economically meaningful effects, ruling out the interpretation that the instrument proxies for generic administrative reach (Online Appendix Section F.1).

Selective colonial response. While the preceding tests suggest that sleeping sickness exposure does not proxy for broad administrative presence, a remaining concern is that colonial medical investments may have responded selectively to disease outbreaks in locations where intervention was logistically feasible. To address this possibility, we construct a shift–share instrument that interacts sleeping-sickness exposure with pre-1920 transport routes. Reassuringly, IV estimates using this alternative instrument are quantitatively similar to our baseline results (Online Appendix Table A19), indicating that our findings are not driven by selective colonial response along transport or logistical dimensions.

Direct effects on postcolonial hospitals. We further conduct placebo tests that examine hospitals built after independence and located in areas historically exposed to the disease ("the never-takers"). If the effects of the sleeping sickness instrument are working through the colonial origin of hospitals, then simply being located in areas exposed to the disease during the colonial era should not predict higher government transfers and bed capacity for hospitals built after independence. Figure A15 plots reduced-form estimates of sleeping sickness exposure on our baseline hospital outcomes, for colonial and postcolonial hospitals. We find no effect for post-independence hospitals, whereas sizeable and statistically significant effects appear only for colonial facilities. This pattern supports the interpretation that the instrument affects modern hospital outcomes through colonial medical investments rather than through a direct long-run effect of disease exposure.

Pre-1920 economic and geographic characteristics. Second, we test whether sleeping-sickness exposure is correlated with a wide set of pre-1920 characteristics that could independently shape long-run development, including early population density, access to rivers and railways, ethnic institutions, and the location of early concession companies (Gennaioli and Rainer, 2007; Michalopoulos and Papaioannou, 2013). Figure A14 shows no systematic relationship with these predetermined factors. Predictive power emerges only for sleeping-sickness exposure after 1920, coinciding with the expansion of colonial medical interventions.

Measurement and surveillance expansion. We further mitigate concerns that recorded exposure reflects the gradual expansion of colonial surveillance by exploiting sleeping sickness maps drawn at multiple points during the colonial period. Using disease distributions from different periods reduces the likelihood that the instrument captures administrative expansion rather than epidemic dynamics. For measurement error to drive our results, areas with high exposure would need to be systematically underreported across all map waves, which is unlikely given the documented spatial progression and eventual decline of the epidemic. Any remaining measurement error would therefore bias estimates toward zero.

Alternative biological and ecological channels. A further concern is that sleeping sickness exposure may proxy for underlying ecological suitability for the tsetse vector rather than localized epidemic dynamics. However, both modern FAO land-cover–based habitat measures and historical colonial tsetse maps indicate that ecological suitability is nearly ubiquitous across the DRC, generating little cross-territory variation. Broad ecological conditions therefore cannot account for the highly localised pattern of reported sleeping sickness outbreaks or the spatial concentration of colonial medical investments. Remaining concerns related to administrative reach or surveillance capacity are addressed directly through the falsification tests with state presence discussed above.

Residual robustness. Finally, we rule out additional alternative channels through which historical disease exposure could affect modern hospital outcomes. Sleeping sickness has a negligible contemporary disease burden relative to malaria and HIV (Fèvre et al., 2008; WHO, 2017), and its ecological determinants differ markedly from those of malaria (Online Appendix Figure A13). Colonial records indicate that tsetse flies were widespread across much of the territory (Online Appendix Figure A12), suggesting that broad ecological suitability varied little at large spatial scales. Although uniform ecological suitability does not rule out local variation in reporting driven by surveillance or administrative capacity, our combined falsification tests support the interpretation that recorded sleeping-sickness exposure primarily reflects localised epidemic dynamics relevant for colonial medical expansion. To further guard against residual confounding, we reweight hospitals outside sleeping-sickness zones to match observable geographic characteristics using entropy balancing and obtain nearly identical IV estimates (Online Appendix Table A20). We also test for local violations of the exclusion restriction using causal forests following Farbmacher et al. (2022) and allow for partial violations of exogeneity using the approach of Conley et al. (2012) (Online Appendix Subsections F.2 and F.3). These exercises provide further confidence that historical sleeping sickness exposure is not correlated with unobserved determinants of modern hospital outcomes.

6 Channels

Our results point to strong persistence in both hospital infrastructure and government transfers among colonial-origin facilities, but the mechanisms underlying these two outcomes differ. Persistence in bed capacity is largely consistent with differences in initial endowments: colonial hospitals benefited from substantially higher public investments in physical infrastructure than facilities built after independence, and these large sunk investments plausibly continue to shape hospital capital today.

Persistence in government transfers is more puzzling. Even after accounting for staffing levels, the primary determinant of salary-based transfers, colonial-origin hospitals continue to receive significantly higher public funding. This pattern cannot be explained mechanically by differences in size or workforce alone. We hypothesise and provide suggestive evidence that colonial hospitals evolved into a network of facilities with greater administrative visibility and lower engagement costs for both the state and external donors. We contrast this mechanism with alternative explanatory channels, and demonstrate that none of them are predicted by colonial health settlements. In the remainder of this section, we therefore condition on staffing levels when examining government transfers. Because staffing captures the main rule-based component of transfer allocation, these specifications isolate variation in funding that is not mechanically explained by workforce size. They are not intended to recover the total effect of colonial origin, but rather to shed light on the mechanisms sustaining the persistent funding premium enjoyed by colonial-origin hospitals beyond what staffing alone would justify.

6.1 When does colonial origin matter?

Early settlements and European hospitals. We first assess whether persistence differs by the timing and intended population of colonial hospitals. Early facilities were often established to serve European populations within a racially segmented health system (Figure A1 in Online Appendix), raising the possibility that lower postcolonial spending simply reflects continuity in the marginalization of African healthcare. However, Table 5 shows that neither the timing of establishment nor racial orientation of colonial hospitals significantly predicts contemporary transfers or bed capacity. Table 6 further confirms that hospitals originally dedicated to European populations do not receive systematically different funding or maintain larger infrastructure today. These results suggest that persistence is not driven by colonial racial segmentation or by particularly early investments.

Religious missions. We next consider whether early religious missions exerted lasting influence through informal authority or preferential relationships with the colonial state. While early missions often lacked direct state funding for health provision (Au and Cornet, 2021), they may have shaped subsequent public investments. Table 5 finds no evidence that early religious presence before 1929 predicts contemporary hospital outcomes, ruling out this channel as a driver of persistence.

Past and modern ownership. Finally, Table 7 investigates whether colonial funding source and modern hospital ownership differently determine the effect on government transfers and bed capacity.[19] Colonial funding source (state, mission, or private) does not generate significant differences in modern transfers or bed capacity. This absence of heterogeneity is consistent with historical accounts of colonial health policy: the colonial administration prioritised broad geographic coverage and dispersion of facilities (Duren, 1953), while missions and private firms tended to concentrate resources locally (Lyons, 2002). As a result, state-funded facilities were often more numerous but smaller, whereas mission and private companies-funded hospitals invested more intensively at the facility level.

In contrast, modern ownership matters: private hospitals receive fewer government transfers, while colonial-origin hospitals that remain privately owned tend to be larger. Faith-based hospitals, by contrast, are smaller on average. These findings indicate a historical divergence in health facility ownership and structural capacity. While hospitals were relatively similar in

[19] The teaching status of a hospital would have been another important characteristic to explore, but only scarce information was available.

size across private and religious ownership during the colonial period, private investors were more likely to retain or select larger facilities after independence, whereas faith-based providers increasingly operated smaller hospitals. These patterns likely reflect differences in investment capacity and economies of scale. Following independence, the withdrawal of private investors, the departure of mission personnel, and the collapse of public health financing sharply reduced the viability of smaller or recently established facilities. Colonial archives indicate that nearly 78 percent of private hospitals disappeared or transitioned to public ownership after independence, leaving larger, more capital-intensive hospitals more likely to persist. Their substantial sunk investments and potential economies of scale likely made them cheaper to operate at the margin and more attractive to retain (Giancotti et al., 2017).

While these results align with the proposed mechanism, they should be interpreted cautiously given limited statistical power for interaction effects.[20] Moreover, the lack of detailed post-colonial hospital-level data constrains our ability to fully trace the ownership transitions of individual facilities.

6.2 Foreign aid and the persistence of colonial hospitals?

Donors may play a mediating role in the persistence of colonial hospitals if government transfers are aligned with externally supported facilities. Direct hospital-level aid data are not systematically available, as donors rarely disclose funding at that level of granularity. We therefore proxy donor engagement using three complementary measures: (i) the availability of TB and HIV drugs in hospital pharmacies, which are almost entirely donor-financed in the DRC; (ii) hospital-level indicators of direct donor support compiled from major donor and NGO sources; and (iii) spatial proximity to geocoded aid projects.

Table 8 reports estimates of colonial settlement across multiple regressions with differing aid-related dependent variables. For binary aid receipt outcomes, we use a linear probability model; distance-based outcomes are estimated in logs. To assess whether donor engagement with colonial hospitals simply reflects differences in scale or workforce capacity, we re-estimate each specification controlling separately for bed capacity and staffing. These conditional specifications are descriptive and are not intended to identify causal effects of colonial origin on

[20] While the direction of change is consistent with the mechanism proposed, the interaction between colonial origin and private ownership yields a minimum detectable effect of approximately 70%, limiting statistical precision. Each other heterogeneity test has 80% power to detect effects at least as large as its minimum detectable effect on the coefficient scale with $\alpha = 0.05$.

donor behaviour. Columns (1)-(3) defines a binary indicator equal to one if a hospital received donor support at least once during the sample period. Columns (4)–(6) restrict this outcome to United States health aid, the largest bilateral donor in the DRC. Columns (7)–(9) measure exposure to general (non–health-specific) Western aid using the logarithm of the distance from a hospital to the nearest geocoded aid project between 1998 and 2014, based on the DRC AIMS Geocoded Research Release.[21] Columns (10)–(12) consider the log-distance to Chinese-funded aid projects, which are often characterised as more discretionary and prone to aid diversion (Isaksson and Kotsadam, 2018; Dreher et al., 2019). Colonial-origin hospitals are 13 percentage points more likely to receive health aid support, relative to a mean of 78%. The effect is significant at the one percent level. Standardized β coefficients indicate comparable magnitudes for U.S. health aid, albeit with lower precision. For general Western aid, colonial hospitals are located significantly *closer* to aid projects, by about 21.5% (equivalent to $0.215 \times 9.4 = 2$ km), as indicated by the *negative* coefficient. While staffing and bed capacity predict donor presence, colonial origin remains a significant predictor, suggesting that donors preferentially engage with historically established facilities beyond observable inputs. By contrast, Chinese aid projects are closer to postcolonial hospitals, with distances about 16% shorter (about 5–6 km at the mean distance of 34 km). Taken together, these patterns suggest that colonial hospitals remain embedded in donor networks that continue to shape the geography of external assistance. Western donors appear more likely to engage with historically established facilities, both through direct support and through spatial clustering of aid projects. Similar persistence in the location of externally funded health projects has been documented in other contexts (Alpino and Hammersmark, 2021).

This interpretation is consistent with historical accounts of post-independence aid delivery in Africa. Following independence, the chronic underfunding of health systems increased donor influence over service delivery. Even after the country gained its independence, Belgium, like most other colonial powers, continued to provide financial support to the Congo along with Western donors. In this new postcolonial setting, donors frequently relied on non-governmental organisations (NGOs) and mission-linked providers with long-standing local presence and administrative capacity (Hearn, 1998). Similar patterns of health system expansion can be observed across other former African colonies. Focusing on Ghana, Walker (2022) notes: "*Missions were laying the groundwork in the 1930s for what would become a huge part of Ghanaian health*

[21] Local aid data are unavailable for the sample period.

infrastructure and a network of health practitioners, clinics, and dispensaries that was necessary for international health campaigns to be possible from the 1950s onwards. In conceptual terms and in logistical ones, this period was critical for setting in motion international health policies in the twentieth century." In the DRC, recurrent conflict and epidemic outbreaks further increased the value of rapid deployment through existing infrastructure, giving colonial-era hospitals a comparative advantage to achieve rapid improvements in population health (Lorgen, 1998). Donor-supported projects were often integrated into the public health system, with governments required to assume recurrent costs, particularly salary payments (Hearn, 1998). Moreover, the success of local health projects supported by donors constituted clear incentives for recipient governments to integrate them into the state apparatus (Gary, 1996). This process provides a plausible channel through which donor engagement reinforced the persistence of colonial hospitals in public financing.

The contrasting spatial pattern for Chinese aid strengthens this interpretation. If colonial hospitals simply attracted aid because of better locations or higher need, Chinese projects would exhibit similar clustering. Instead, their proximity to postcolonial hospitals suggests that the observed donor–colonial link reflects institutional and relational factors rather than fungible resource allocation.

6.3 Ruling out performance-based explanations

Cost-intensive medical care. A potential interpretation of the higher transfers received by colonial-origin hospitals is that the central government optimally directs resources toward facilities that provide higher-quality or more cost-intensive care. Transfers could reward better-performing hospitals or incentivise health workers in facilities with superior infrastructure and outcomes. While we lack direct measures of clinical quality, we assess this hypothesis using several indirect tests.

First, we examine whether colonial-origin hospitals are better equipped or operate with more costly medical inputs. Online Appendix Table A22 shows no systematic relationship between colonial origin and the availability or utilization of key medical equipment, including glucometers, microscopes, spectrophotometers, and ketamine.[22] Results are similar when summarizing

[22] All are included in WHO's List of Priority Medical Devices and Essential Diagnostics List for primary and emergency care: glucometers are used for estimation of blood glucose levels (e.g. patients with diabetes); ketamine is a general anesthetic used for the management of acute pain; spectrophotometer provides quantitative analysis of biochemical substances through measuring the absorbance of light (e.g. blood analysis), but is not prioritised for primary care due to its high cost and maintenance complexity; microscopes are critical tools for

equipment availability using a principal component. We further show in Online Appendix Table A23 that colonial origin does not predict higher investment spending, medicine stocks, operating expenditures, user-fee revenues, local wage supplements, or length of hospital stay once baseline covariates and infrastructure size are accounted for. Together, these results provide little evidence that colonial hospitals deliver higher-quality or more cost-intensive care.

Second, we assess whether colonial origin differentially affects hospitals operating at higher levels of the care hierarchy. General referral hospitals provide more complex services and incur higher operating costs than district hospitals, and may therefore attract greater public funding. Online Appendix Table A24 shows that the colonial transfer premium persists within this subset, although estimates are less precise. This suggests that the observed funding differences are unlikely to reflect a preference for more complex or specialized facilities.

Infrastructure size and allocation rules. We next clarify the role of hospital size in transfer allocation. Table 9 shows that government transfers increase with both staffing and bed capacity, consistent with salary-based budgeting rules and scale-related considerations. However, conditioning jointly on staffing and bed capacity does not eliminate the colonial-origin effect: the coefficient on colonial settlement falls modestly but remains statistically significant. Moreover, among colonial-era hospitals, bed capacity does not significantly predict transfers once staffing is accounted for. These patterns indicate that while infrastructure size matters for allocation, it does not fully explain why colonial-origin hospitals receive systematically higher transfers.

6.4 Additional channels

In Online Appendix Section G, we examine a set of alternative channels that could potentially account for the persistence of colonial-origin hospitals in public financing. First, we show that colonial health settlements do not predict contemporary local economic development or population levels, ruling out the possibility that colonial hospitals are simply located in areas with greater long-run growth or demographic pressure (Table A25). Second, we confirm that our results are not driven by differences in contemporary disease environments, including malaria risk. Third, we assess whether colonial settlements disproportionately served ethnic groups that continue to hold greater economic or political power today, and find no evidence that ethnic power mediates our results. Fourth, we show that our findings are robust to controlling for

diagnosis of diseases like malaria, tuberculosis, and intestinal parasites.

the historical presence of concession companies during the Congo Free State period, alleviating concerns that early extractive activities confound the estimates. Finally, we rule out differential exposure to local government embezzlement by showing no association between colonial settlement and subsequent prosecutions of provincial governors for corruption.

Taken together, these falsification exercises indicate that the persistence of colonial hospitals in public financing is unlikely to be driven by local development, disease burden, ethnic power, extractive history, or differential corruption risk. Instead, they reinforce the interpretation that the observed patterns reflect institutional persistence rooted in colonial-era investments and their interaction with postcolonial allocation mechanisms.

7 Discussion and conclusion

In this article, we conducted a novel investigation about the heritage of colonial health activities on modern hospital outcomes. By linking newly digitised archival data on colonial medical settlements to modern administrative records, we document a striking pattern of persistence. Hospitals established during the colonial period continue to receive substantially higher government transfers and maintain significantly larger physical infrastructure than hospitals built after independence. These effects are robust across specifications and empirical strategies, underscoring the durability of colonial investments despite decades of political instability, fiscal collapse, and health-system deterioration.

A central finding is that these persistent financial and infrastructural advantages do not translate into systematically higher observed service provision once staffing is accounted for. Why should persistent transfer disparities matter if outputs appear similar across hospital origins? The absence of differences in observed service volumes does not imply that the allocation of resources is efficient or without distortion. If colonial-origin hospitals deliver better health outcomes along unobserved margins, higher transfers reinforce unequal access to effective care; if outcomes are similar, persistent funding gaps point to low marginal returns and misallocation of scarce public resources. More broadly, these patterns reveal a structural form of path dependence in public spending, whereby inherited infrastructure continues to shape resource allocation even when outputs are equalised through staffing adjustments (e.g., reallocations of staff or informal arrangements) or constrained by system-wide bottlenecks (e.g., shortages of skilled personnel, weak supply chains).

The welfare implications are substantial. Persistent transfer disparities raise concerns about both efficiency, by directing scarce public resources toward facilities with potentially low marginal returns, and equity, as the uneven spatial distribution of colonial hospitals reinforces regional disparities in health-system capacity. More broadly, the results point to a political-economy mechanism in which inherited infrastructure and administrative visibility confer durable bargaining advantages, shaping the allocation of public resources in low-capacity settings.

An important open question is the extent to which these results generalise beyond the Belgian Congo. Colonial administrations differed markedly across Africa in their modes of governance, investment priorities, and reliance on missionary or private providers, with potentially divergent implications for postcolonial state capacity and public finance (Ali et al., 2019). Nonetheless, several features emphasised in this paper - the early establishment of hospital networks under colonial rule, the concentration of capital-intensive investments before independence, and the persistence of low domestic health spending thereafter - are common across many former colonies. These shared features suggest that path dependence in health-system financing may be a broader phenomenon, warranting comparative work across colonial contexts.

Expanding the scope of the current literature to consider how different colonial systems have influenced the development path of health financing is a promising avenue for future research with relevant policy implications. In particular, the observed pattern of persistence of colonial effects on health system development could inform about potential reallocations of health resources - and in particular external aid- to reduce gaps in health labour markets, and infrastructural deficits, and improve access to care.

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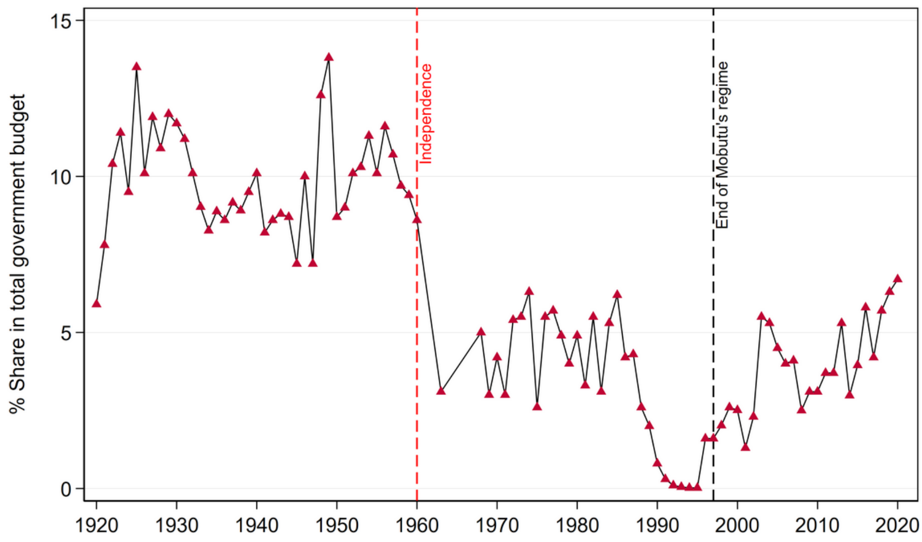
Figure 1: Share of domestic health spending in total budget, 1920-2020



Notes: The graph plots the share of domestic health expenditure as a percentage of total government budget between 1920 and 2020. Counterparts funds received from donor grants, which are not voted budgets but managed by the government, are included in its budget. No information could be found for the immediate period following independence in 1960 (1961, 1962, and 1964 to 1967). *Source:* author's computations using *Annuaire statistique de la Belgique et du Congo Belge* and *Rapport annuel, Direction Générale des services médicaux du Congo Belge 1929-58* for the colonial period; World Bank and IMF data for the 1970-2000 period and Global Health Observatory data from WHO after 2000 (https://www.who.int/gho/health_financing/public_exp_health/en/). See Appendix B.1 for details on the data sources.

Table 1: Summary statistics and difference-in-means

	PostColonial			Colonial				
	Obs. (1)	Mean (2)	s.d. (3)	Obs. (4)	Mean (5)	s.d. (6)	Difference (7)	t-stat (8)
Hospital outcomes								
Bed Capacity	904	3.69	0.02	296	4.41	0.03	0.73	-17.69
Government transfers	533	13.73	0.07	263	15.03	0.07	1.30	-13.30
Total admissions	1,042	5.44	0.03	297	5.86	0.04	0.42	-8.25
Malaria cases	1,039	2.93	0.04	301	3.93	0.04	1.01	-17.45
Diarrhea cases	1,040	1.15	0.03	300	1.58	0.04	0.43	-8.35
Emergency cases	812	3.14	0.04	289	3.81	0.06	0.68	-8.77
Baseline variables								
Nurses	1,060	2.27	0.03	301	3.10	0.05	0.83	-14.56
Physicians	1,035	0.94	0.03	301	1.53	0.06	0.59	-9.52
Population	1,088	12.43	0.01	301	12.17	0.03	-0.26	8.36
Hospital ownership								
Public	1,092	0.28	0.01	301	0.66	0.03	0.39	-12.68
Faith-based	1,092	0.36	0.01	301	0.32	0.03	-0.04	1.40
Private	1,092	0.45	0.01	301	0.06	0.01	-0.39	19.38
Geographic controls								
Distance Provincial capital	795	4.53	0.06	300	5.24	0.07	0.71	-7.85
Distance Distributional Centre	795	3.90	0.04	300	4.62	0.06	0.72	-9.54
Distance to transport	795	2.63	0.05	300	2.86	0.08	0.23	-2.44
Distance conflict	795	1.99	0.04	300	2.85	0.09	0.86	-8.67
Distance nearest hospital	797	7.78	0.07	300	9.41	0.10	1.63	-12.93
Distance to Electricity network	795	2.21	0.05	300	2.83	0.10	0.62	-5.54
Distance to coast	795	6.92	0.01	300	6.80	0.03	-0.13	4.01
Population density 1951	793	2.71	0.04	299	2.27	0.06	-0.43	6.72
Natural resources (before 1960)	798	0.54	0.02	300	0.38	0.03	-0.16	4.75
Malaria risk rate	796	0.20	0.01	300	0.26	0.01	0.06	-6.03
Soil suitability (cassava)	797	5,821.50	116.44	300	6,625.12	173.70	803.63	-3.84
Elevation	796	789.72	18.71	300	685.38	23.00	-104.34	3.52
Slope	796	1.18	0.02	300	1.15	0.04	-0.04	0.83
Longitude	798	22.77	0.21	300	22.88	0.28	0.11	-0.32
Latitude	798	-4.09	0.13	300	-2.88	0.24	1.22	-4.52

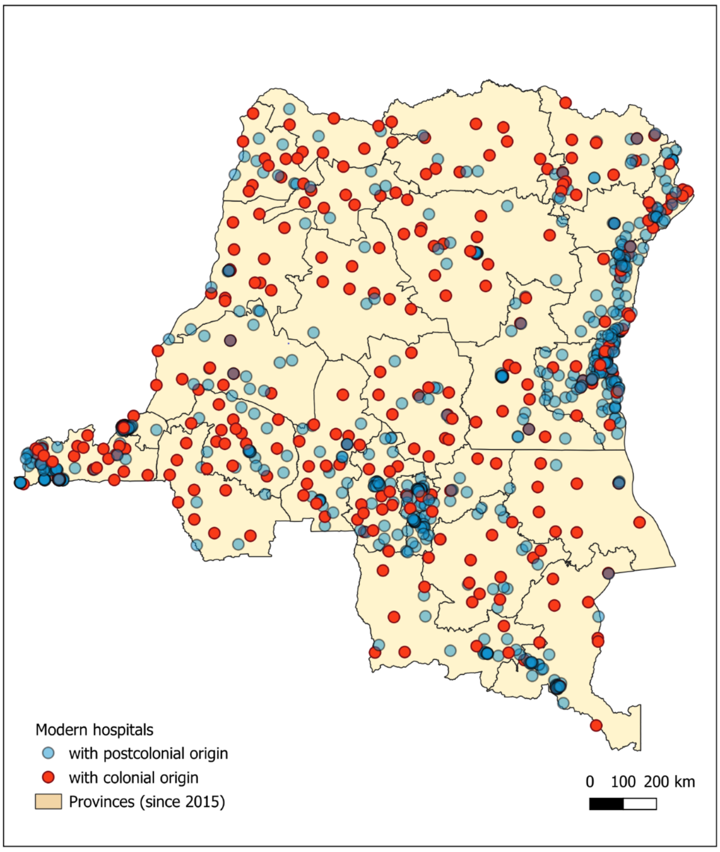
Notes: The unit of observation is hospital. All variables are taken in logarithm, except elevation, slope, longitude and latitude. The first six columns show the number of observations, sample mean and standard deviation for post-independence and colonial hospitals respectively. The last two columns indicate the difference in means between post-independence and colonial hospitals, the t-stat of the test of whether the mean coefficients in the two samples are equal.

Table 2: Colonial settlement and hospital outcomes: main results

	Bed capacity	Government transfers			Total		Malaria		Diarrhea		Emergency	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Colonial settlement	0.708***	1.204***	1.114***	0.338***	0.431***	-0.084*	0.621***	0.157***	0.291***	0.055	0.579***	0.047
	(0.069)	(0.108)	(0.119)	(0.083)	(0.068)	(0.042)	(0.078)	(0.049)	(0.065)	(0.064)	(0.129)	(0.095)
Standardised β coeff.	0.433	0.386	0.357	0.108	0.221	-0.043	0.253	0.064	0.162	0.030	0.227	0.018
R^2	0.30	0.26	0.29	0.56	0.18	0.49	0.32	0.46	0.25	0.32	0.20	0.39
Observations	991	755	755	755	1040	1040	1050	1050	1051	1051	915	915
Mean dep. var	3.94	14.25	14.25	14.25	5.64	5.64	3.32	3.32	1.32	1.32	3.44	3.44
Province Fixed Effect	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Geographic controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pop + Ownership			✓	✓		✓		✓		✓		✓
Health staff				✓		✓		✓		✓		✓

Notes: The presents the OLS estimates of equation (1). The unit of observation is a hospital. Nondummy variables are all in natural logarithms. Geographic controls include distance to provincial capital, distance to pharmaceutical distribution centres, distance to nearest transport, population density in 1951, malaria risk rate, elevation, longitude and latitude, distance to conflict events, distance to the nearest hospital, cassava suitability index, and a dummy variable equal to one for the exploitation of natural resources during the colonial period. Pop + Ownership includes current population catchment area and modern hospital ownership. Health staff comprises the size of nurses and physicians. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Figure 2: Mapping of the full sample of colonial and post-independence hospitals



Notes: The map depicts the georeferenced locations of hospitals built during the colonial period (red dots) between 1920 and 1956, and after independence in 1960 (blue dots).

Table 3: Colonial settlement and hospital outcomes: Matching estimates

Dep. Variable	Bed capacity (1)	Government transfers (2)	Health services: admissions Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Panel A. Matching estimation with baseline controls						
Nearest-neighbor(1)						
Colonial settlement	0.646***	1.048***	0.339***	0.545***	0.199***	0.475***
	(0.068)	(0.128)	(0.073)	(0.092)	(0.071)	(0.108)
Nearest-neighbor(3)						
Colonial settlement	0.639***	1.077***	0.384***	0.543***	0.216***	0.483***
	(0.053)	(0.106)	(0.063)	(0.075)	(0.063)	(0.094)
Entropy reweighting						
Colonial settlement	0.612***	1.016***	0.333***	0.524***	0.224***	0.401***
	(0.056)	(0.113)	(0.064)	(0.080)	(0.068)	(0.104)
Panel B. Matching estimation with staffing and hospital type						
Exact matching: HW quintiles						
Colonial settlement	0.283***	0.475***	-0.037	0.166**	0.088	0.069
	(0.046)	(0.091)	(0.053)	(0.072)	(0.071)	(0.097)
Exact matching: Hospital type						
Colonial settlement	0.375***	0.427***	0.154**	0.150**	0.047	0.110
	(0.049)	(0.092)	(0.062)	(0.071)	(0.066)	(0.100)
Entropy reweighting (including HW)						
Colonial settlement	0.287***	0.380***	-0.149	0.115	-0.044	-0.051
	(0.087)	(0.137)	(0.096)	(0.108)	(0.092)	(0.149)
Observations	981	755	1040	1050	1051	915

Notes: The unit of observation is a hospital. Nondummy variables are all in natural logarithms. The table reports Average Treatment Effects on the Treated (ATT) from alternative matching estimators. Panel A uses the controls presented in Table 2, except for province fixed effects. The first two matching methods use respectively one nearest-neighbour, and three nearest-neighbours. The third matching approach reports estimates using the entropy balancing algorithm (Hainmueller, 2012) which reweights post-independence hospitals to match the mean and variance of the covariates of colonial hospitals. In addition to using the matching variables in Panel A, Panel B imposes exact matching on health workers (HW) size quintiles (fourth row), hospital type (fifth row), and includes health workers in the entropy balancing (sixth row). *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 4: Colonial settlement and hospital outcomes: IV

Dep. Variable	Colonial settlement					
Panel A. 1st stage						
Sleeping sickness	0.491***	0.504***	0.484***	0.486***	0.477***	0.518***
	(0.032)	(0.035)	(0.031)	(0.031)	(0.031)	(0.033)
Kleibergen-Paap F-statistic	234.2	207.6	237.2	245.3	230.9	251.9
	Bed	Government	Health services: admissions			
Dep. Variable	capacity	transfers	Total	Malaria	Diarrhea	Emergency
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. Reduced-form						
Sleeping sickness	0.413***	0.716***	0.234***	0.298***	0.037	0.295*
	(0.078)	(0.078)	(0.058)	(0.068)	(0.074)	(0.149)
Standardised β coefficient	0.271	0.239	0.129	0.130	0.022	0.122
Observations	981	755	1,040	1,050	1,051	915
Baseline controls	✓	✓	✓	✓	✓	✓
Province Fixed Effect	✓	✓	✓	✓	✓	✓
Panel C. 2nd stage						
Colonial settlement	0.841***	1.421***	0.484***	0.613***	0.077	0.570***
	(0.099)	(0.207)	(0.127)	(0.143)	(0.118)	(0.172)
Standardised β coefficient	0.519	0.455	0.248	0.250	0.043	0.224
Anderson-Rubin p-value	0.000	0.000	0.000	0.000	0.510	0.001
Hausman p-value	0.090	0.181	0.583	0.968	0.040	0.981
R^2	0.19	0.15	0.07	0.18	0.04	0.07
Observations	981	755	1,040	1,050	1,051	915
Baseline controls	✓	✓	✓	✓	✓	✓
Province Fixed Effect	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table presents the 2SLS estimates of equation (1). The sleeping sickness instrument is a dummy variable equal to one if the hospital is located within an area where the infection rate was at least equal to 1% at any time during the 1929-1953 period. Baseline controls are those presented in Table 2. Robust standard errors are in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 5: Early and late colonial settlement

Dependent variable:	Government transfers				Bed capacity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Colonial settlement	0.334***	0.426***	0.293***	0.416***	0.276***	0.275***	0.282***	0.267***
	(0.081)	(0.079)	(0.094)	(0.090)	(0.046)	(0.064)	(0.045)	(0.054)
× Early settlement		-0.147*				0.002		
		(0.081)				(0.053)		
× Late settlement			0.132				-0.020	
			(0.081)				(0.058)	
× Early religious mission				-0.131				0.014
				(0.088)				(0.049)
R^2	0.558	0.558	0.558	0.558	0.592	0.592	0.592	0.592
Observations	755	755	755	755	981	981	981	981
Baseline controls	✓	✓	✓	✓	✓	✓	✓	✓
Health workers	✓	✓	✓	✓	✓	✓	✓	✓
Province Fixed Effect	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table presents the OLS estimates. The dependent variables are government transfers and bed capacity, both taken in logarithm. Early settlement is a dummy variably equal to one if the colonial settlement was constructed before 1936 and 0 otherwise. Late settlement is a dummy variable equal to one if the settlement was built after 1945. Early religious mission is a dummy variable equal to one if the settlement was a religious mission prior to 1929 (without necessarily providing health services) and is reported as providing health services before 1936. Baseline controls are those presented in Table 2. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 6: Historical targeted population

Dependent variable:	Government transfers			Bed capacity		
	(1)	(2)	(3)	(4)	(5)	(6)
Colonial settlement	0.334***	0.373***	0.428***	0.276***	0.270***	0.282***
	(0.081)	(0.071)	(0.087)	(0.046)	(0.045)	(0.074)
× Colonial Europeans		-0.155			0.024	
		(0.137)			(0.050)	
× Colonial Congolese			-0.135			-0.008
			(0.102)			(0.062)
R^2	0.558	0.558	0.558	0.592	0.592	0.592
Observations	755	755	755	981	981	981
Baseline controls	✓	✓	✓	✓	✓	✓
Health workers	✓	✓	✓	✓	✓	✓
Province Fixed Effect	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table presents the OLS estimates. The dependent variables are government transfers and bed capacity, both taken in logarithm. Colonial Europeans is an indicator equal to one if the colonial health settlement had at least one unit providing health services to Europeans only. Colonial Congolese is an indicator equal to one if the colonial health settlement had at least one unit providing health services to Congolese. Baseline controls are those presented in Table 2. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 7: Historical and modern hospital ownership

Dependent variable:	Government transfers				Bed capacity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Historical ownership								
Colonial settlement	0.334***	0.431***	0.303***	0.305***	0.276***	0.329***	0.251***	0.255***
	(0.081)	(0.087)	(0.079)	(0.089)	(0.046)	(0.048)	(0.050)	(0.043)
× Colonial state		-0.207**				-0.109**		
		(0.087)				(0.051)		
× Colonial mission				0.085				0.062
				(0.111)				(0.051)
× Colonial private			0.123				0.113	
			(0.118)				(0.072)	
Panel B. Modern ownership								
Colonial settlement	0.334***	0.413***	0.438***	0.306***	0.276***	0.277***	0.340***	0.239***
	(0.081)	(0.108)	(0.116)	(0.084)	(0.046)	(0.079)	(0.048)	(0.041)
× Public hospital		-0.128				0.019		
		(0.147)				(0.079)		
× Faith-based hospital			-0.207				-0.138*	
			(0.148)				(0.068)	
× Private hospital				0.384				0.412**
				(0.287)				(0.166)
Public hospital		0.140				-0.222***		
		(0.118)				(0.042)		
Faith-based hospital			0.269**				0.297***	
			(0.097)				(0.033)	
Private hospital				-0.541***				-0.038
				(0.183)				(0.042)
F-test joint significance		0.01	0.04	0.02		0.00	0.00	0.00
R^2	0.56	0.56	0.56	0.57	0.59	0.60	0.61	0.59
Observations	755	755	755	755	981	981	981	981
Baseline controls	✓	✓	✓	✓	✓	✓	✓	✓
Health workers	✓	✓	✓	✓	✓	✓	✓	✓
Province Fixed Effect	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. Colonial state, mission and private refer to the source of funding of the health settlement during the colonial period. Public, faith-based and private hospital refer to modern hospital ownership. Baseline controls are those presented in Table 2. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 8: Colonial settlement and local aid

	Health aid			US health aid			dist(Local aid)			dist(Chinese local aid)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Colonial settlement	0.118***	0.057**	0.048**	0.053***	0.029	0.036*	-0.242***	-0.183**	-0.192**	0.149**	0.148**	0.100
	(0.026)	(0.022)	(0.019)	(0.016)	(0.021)	(0.018)	(0.075)	(0.085)	(0.086)	(0.062)	(0.068)	(0.075)
Standardised β coefficient	0.135	0.065	0.055	0.145	0.079	0.099	-0.086	-0.065	-0.068	0.044	0.044	0.030
R^2	0.13	0.15	0.16	0.11	0.13	0.12	0.53	0.53	0.53	0.77	0.77	0.77
Observations	991	981	991	991	981	991	991	981	991	991	981	991
Mean dep. var	0.80	0.80	0.80	0.03	0.03	0.03	2.24	2.24	2.24	3.53	3.53	3.53
Province Fixed Effect	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Health Workers		✓			✓			✓			✓	
Bed Capacity			✓			✓			✓			✓

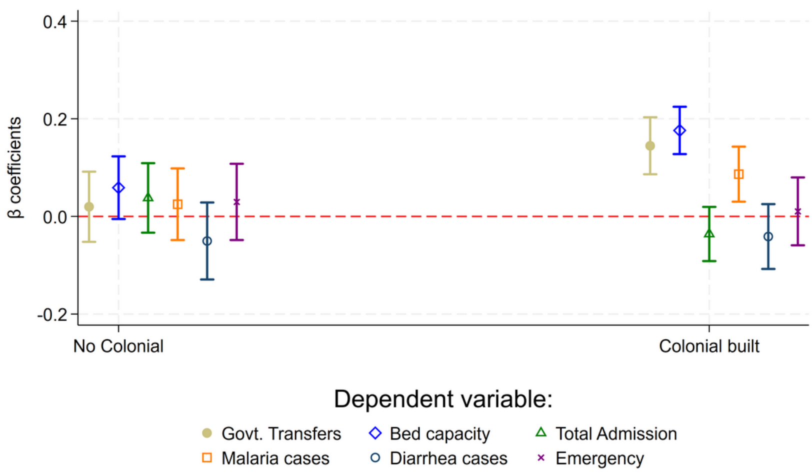
Notes: The unit of observation is the hospital. The table presents OLS estimates. Health aid and US health aid are dummy outcome variables respectively equal to one if a hospital receives general health aid from international donors and US health aid specifically, and zero otherwise. Local aid and Chinese local aid outcomes are measures of the distance between the hospital and its closest aid project as geocoded from the DRC AIMS Geocoded Research Release. Baseline controls are those presented in Table 2. Health workers corresponds to the size of nurses and physicians. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 9: Government transfers, health workers and bed capacity

	Government transfers			
	(1)	(2)	(3)	(4)
Nurses	0.549***	0.336***	0.346***	0.348***
	(0.057)	(0.078)	(0.078)	(0.078)
Physicians	0.719***	0.652***	0.633***	0.633***
	(0.089)	(0.070)	(0.075)	(0.075)
Bed capacity		0.420***	0.353***	0.360***
		(0.086)	(0.086)	(0.103)
Colonial settlement			0.267***	0.286***
			(0.084)	(0.090)
Colonial settlement × Bed capacity				-0.033
				(0.147)
R^2	0.51	0.56	0.57	0.57
Observations	731	731	731	731
Mean dep. var	14.30	14.30	14.30	14.30
Province Fixed Effects	✓	✓	✓	✓
Geographic controls	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table presents the OLS estimates of equation (1) with only government transfers as the dependent variable. The nurse variable includes all categories of nurses, and physicians include generalists and specialists. Bed capacity is the total number of beds centered at the mean for postcolonial hospitals. Non-dummy variables are in logarithm transformation. All columns include the baseline controls. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Figure 3: Reduced-form estimates of hospital outcomes on sleeping sickness



Notes: The graph plots the coefficient estimates and 95% confidence intervals of the effects of the distribution of sleeping sickness during the colonial period on each hospital outcomes (government transfers, bed capacity, total hospital admissions, admissions for malaria, admissions for diarrhea, and admissions in the emergency unit) in hospitals built during the colonial era (left) and after independence (right) independence.

Appendix for online publication

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Table A1: Change in hospital ownership: past and present numbers

	1959		Actual	
Period:	No.	Share (%)	No.	Share (%)
Colonial hospitals				
Public	145	48.0	189	62.5
Faith-based	99	32.8	96	31.8
Private	58	19.2	17	5.6
Total	302		302	

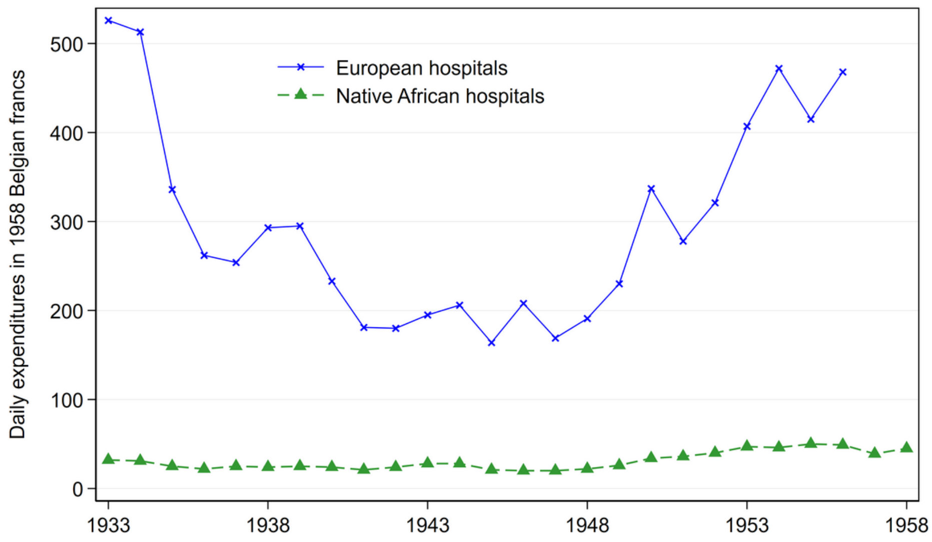
Notes: The table shows the number of colonial hospitals in the data sample that changed ownership after independence. The table reports the number and share of hospitals by ownership right before independence (1959) and with actual data as reported from the DHIS2. Public, faith-based and private present-day ownerships correspond respectively to government, religious missions and private firms during the colonial period.

Table A2: Lost colonial hospitals

	1959 No.	Actual No.	Share in total 1959 (%)
Panel A. Total recorded hospitals	408	302	73.8
Panel B. Hospitals lost after Independence			
Public		20	4.9
Faith-based		19	4.7
Private		22	5.4
Panel C. Lost hospitals			
Total recorded		62	15.2
Total unrecorded		46	11.3

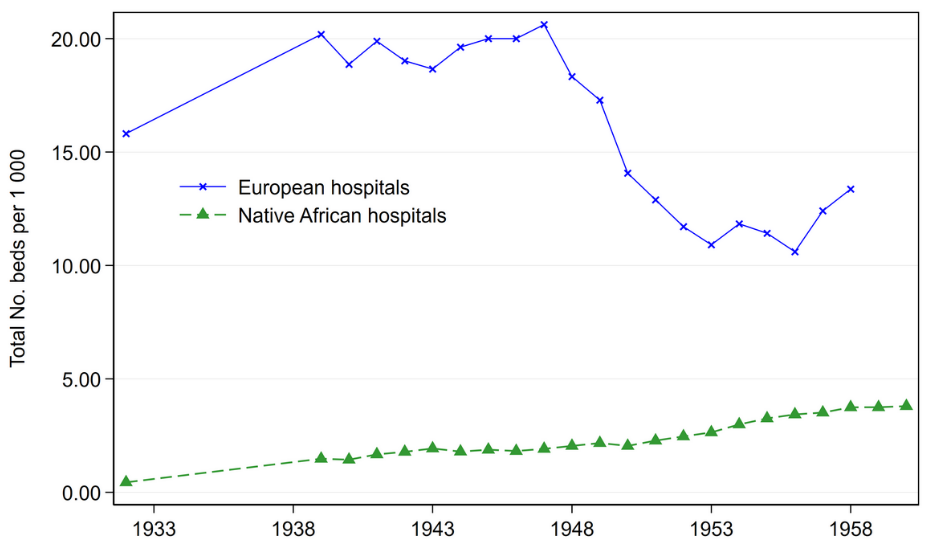
Notes: The table presents the number and share of colonial hospitals recorded in the archives and in the modern list of hospitals in panel A, and in panel B the hospital lost during the postcolonial period by ownership (government, religious missions and private firms). Panel C lists the number of colonial hospitals with a recorded georeferenced location in the archives and that could not be found in the modern list of hospitals. Panel C further reports the number of colonial hospitals whose georeferenced locations were not recorded in the archives (total unreported). This number is derived using the difference between the reported number of hospitals aggregated at the national level in the latest colonial archives (1959), and the latest georeferenced locations of colonial hospitals. Public, faith-based and private present-day ownerships correspond respectively to government, religious missions and private firms during the colonial period.

Figure A1: Daily cost of European and native hospitals



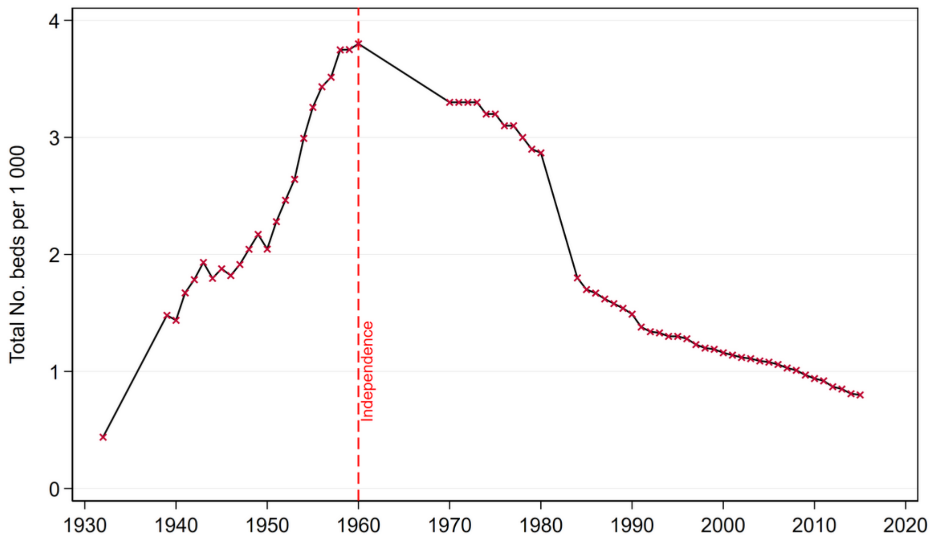
Notes: The graph plots the country average daily cost (for the colonial government) of hospitalisation in European and native (dashed line) hospitals between 1933 and 1958. The estimated cost of hospitalisation includes health treatment costs, salary, provision of drugs and health equipment, and general maintenance costs. *Source*: Archival data from annual medical report in Belgian Congo for each year of the covered period.

Figure A2: Bed per capita between European and Congolese populations



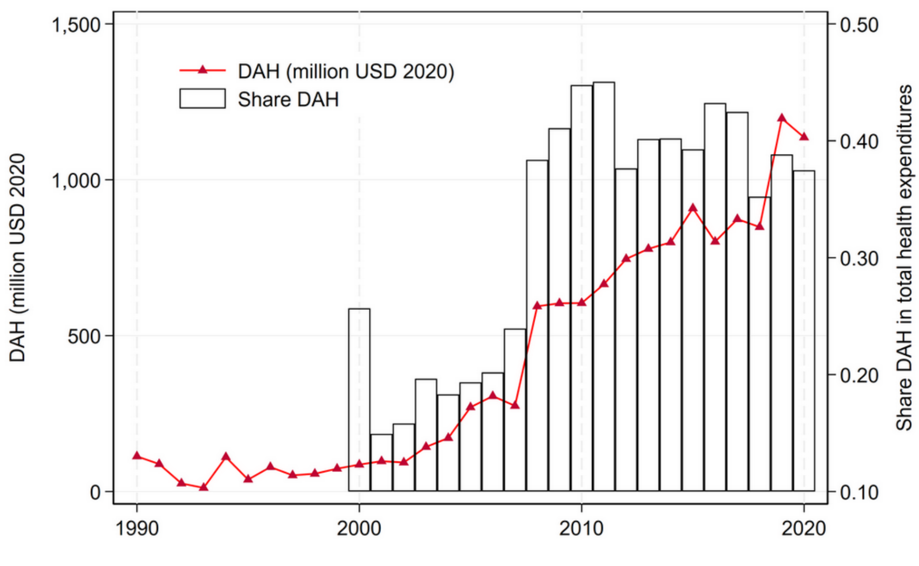
Notes: The graph plots the shared of bed per capita for European (blue) and Congolese (dashed green line) hospitals between 1933 and 1958. *Source*: Archival data from annual medical report in Belgian Congo for each year of the covered period.

Figure A3: Evolution of bed capacity, 1930-2020



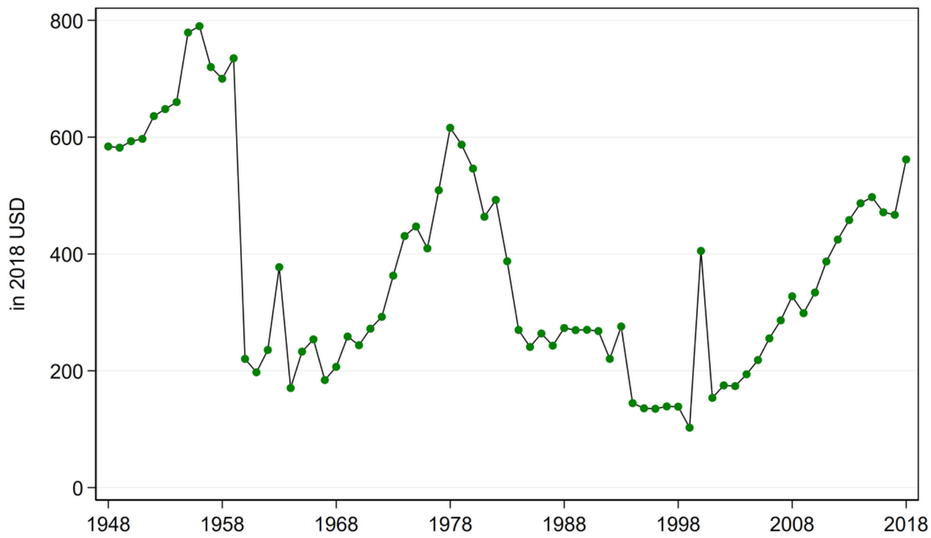
Notes: The graph plots the evolution of the total number of beds per 1,000 among the Congolese population during the 1930-2020 period. *Source:* author's computations using data on the Annual Medical reports of the Colony and population estimates from *Annuaire statistique de la Belgique et du Congo Belge* and *Rapport annuel, Direction Générale des services médicaux du Congo Belge* for the colonial period; World Bank estimates in the post-colonial period (`Source:https://data.worldbank.org/indicator/SP.DYN.CDRT.IN?locations=CD`). See Appendix B.1 for details on the data sources.

Figure A4: Development Assistance for Health in the DRC, 1990-2020



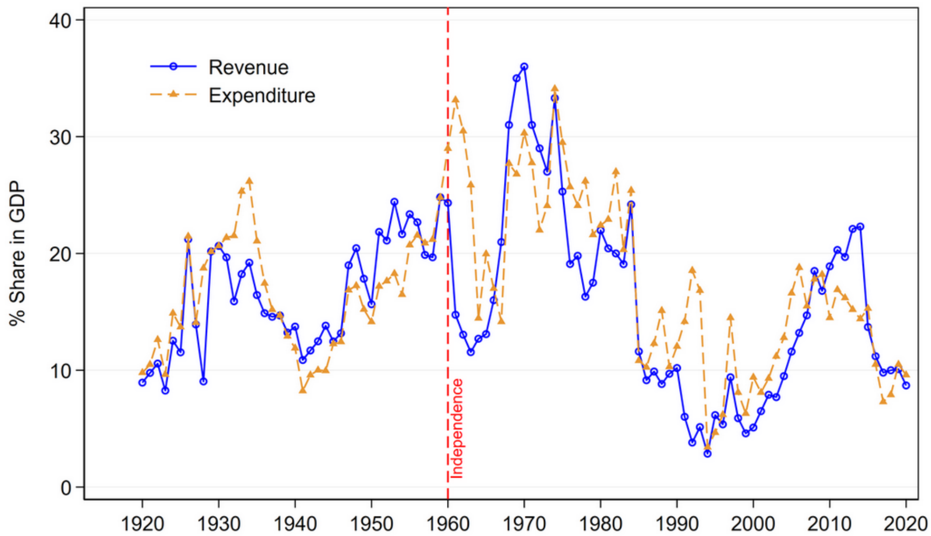
Notes: The graph plots the total Development Assistance for Health (DAH) between 1990 and 2020 in millions of 2020 USD in the DRC and its share in total health expenditure starting from 2004.
Source: author's computations using the Development Assistance for Health Database 1990-2020 from IHME Global Health Data Exchange (`http://ghdx.healthdata.org/`) and Global Health Observatory data from WHO (`http://apps.who.int/gho/data/node.home`).

Figure A5: DRC Gross National Income per capita in 2018 USD, 1948-2018



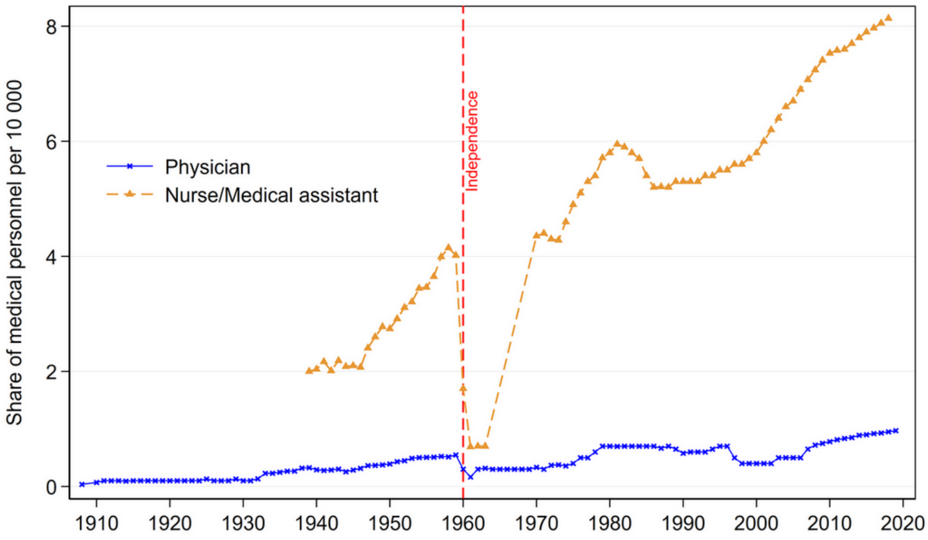
Notes: The graph plots the Gross National Income per capita of the DRC in 2018 USD between 1948 and 2018. *Source:* World Bank national account data (`https://data.worldbank.org/indicator/NY.GNP.PCAP.CD`).

Figure A6: Total government revenue and expenditure to GDP, 1920-2020



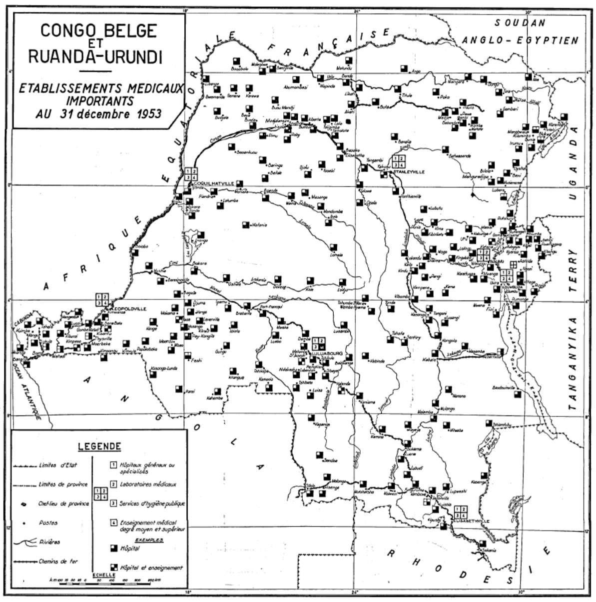
Notes: The graph plots the evolution of total government revenue and expenditure to GDP between 1920 and 2020. *Source:* author's computations using *Annuaire statistique de la Belgique et du Congo Belge* and *Rapport annuel, Direction Générale des services médicaux du Congo Belge 1929-58* for the colonial period; World Bank and IMF data for the post-independence period (see Appendix B.1 for details on the data sources).

Figure A7: Evolution of the share of medical personnel, 1908-2020



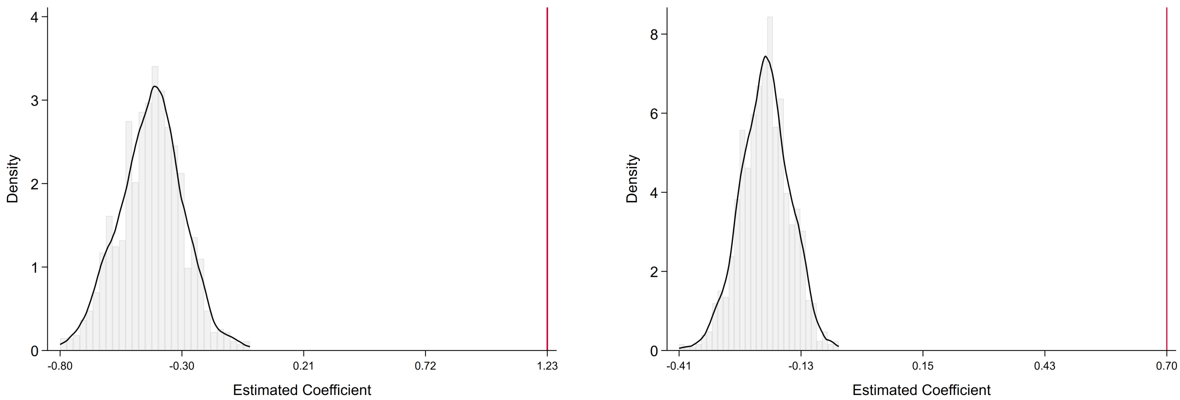
Notes: The graph plots the share of medical personnel (blue for physicians, orange for nurses) per 10,000 between 1908 and 2020. All numbers of medical personnel and population estimates were collected from the annual reports of public health in Belgian Congo during the colonial period, and from a combination of IMF, IBRD and World Bank reports in the post-colonial period. *Source:* author's computations using data on medical personnel and population estimates from *Annuaire statistique de la Belgique et du Congo Belge* and *Rapport annuel, Direction Générale des services médicaux du Congo Belge* for the colonial period; IMF, IBRD and World Bank reports in the post-colonial period (see Appendix B.1 for details on the data sources).

Figure A8: Mapping of colonial medical structures in 1953



Notes: The map depicts the location of all major health infrastructures in 1953. *Source:* Ministry of Colonies.

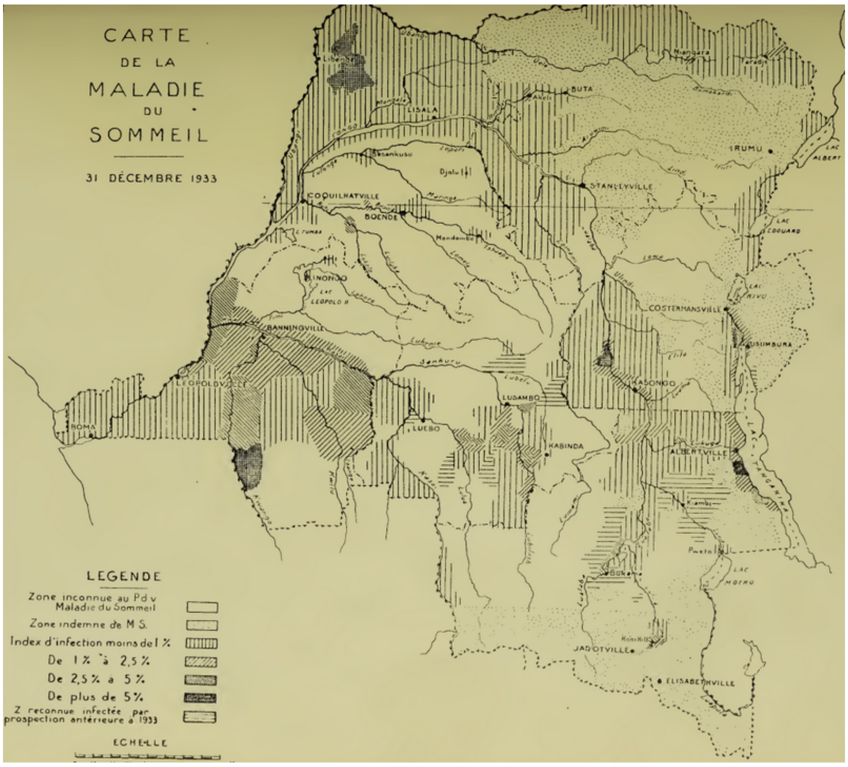
Figure A9: Permutation tests at hospital level



(A) Government funding (B) Bed Capacity

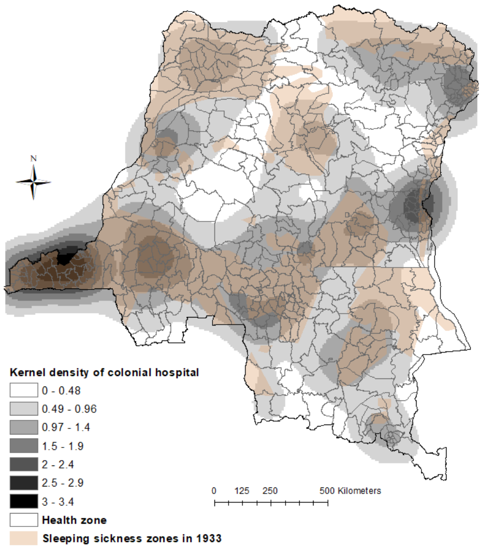
Notes: The graphs plot the histograms with the distribution of coefficients obtained from permutation tests based on 1,000 replications, for government funding and bed capacity respectively at the top and bottom panel. The permutation inference is obtained by reassigning the colonial status of hospitals with an equal number of randomly drawn hospitals in the DRC. The vertical line indicates the estimated coefficient from the real assignment in the baseline sample (Table 2).

Figure A10: Map of sleeping sickness in 1933



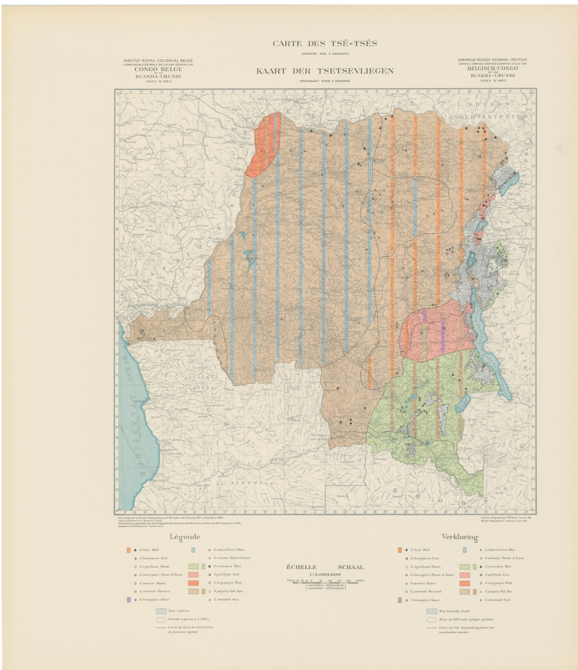
Notes: The figure shows the geographic distribution of the sleeping sickness in Belgian Congo in December 1933. Source: Bureau of Hygiene and Tropic Disease.

Figure A11: Kernel density of colonial settlements and the presence of sleeping sickness in 1933



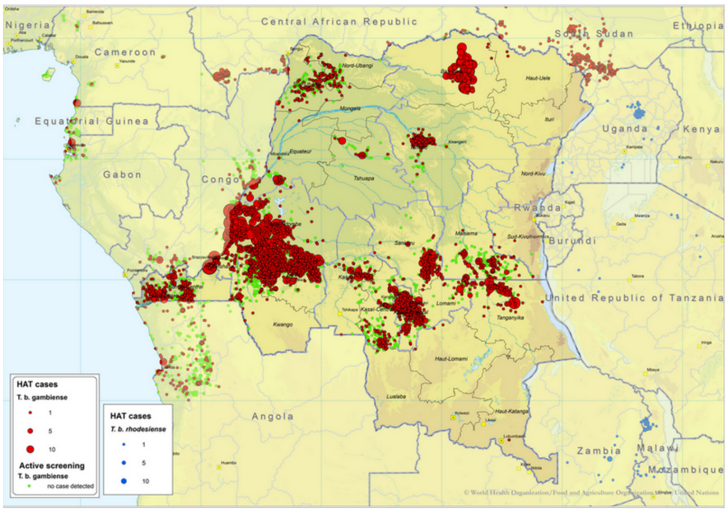
Notes: The map depicts the kernel density of colonial health settlements and the geographic distribution of the sleeping sickness (in brown) by health zones (district level) as reported in the public health data of the Ministry of Colonies between 1928 and 1933 (Lyons, 2002). A health zone is reported with sleeping sickness when the prevalence of the disease is at least equal to 1%.

Figure A12: Geographic distribution of the tsetse fly in 1950

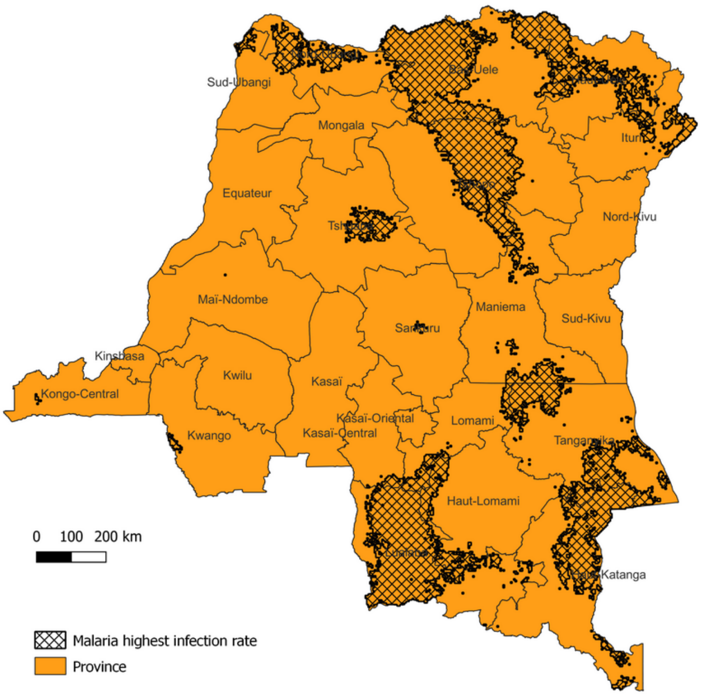


Notes: The figure shows the geographic distribution of the tsetse fly by species in 1950. The only free zones of tsetse fly (*zone indemne*, in light blue dots) are located in the Kivus (Eastern region) and the Katanga province (South East). Source: Service Cartographique du Ministere des Colonies.

Figure A13: Geographic distribution of historical sleeping sickness and modern malaria



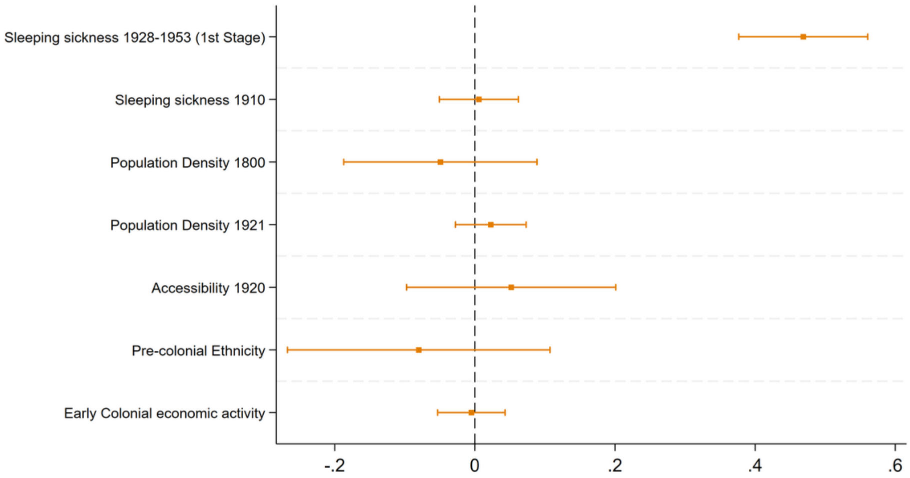
(A) Distribution of sleeping sickness (2012-2016)



(B) Distribution of PfPR rate (2017)

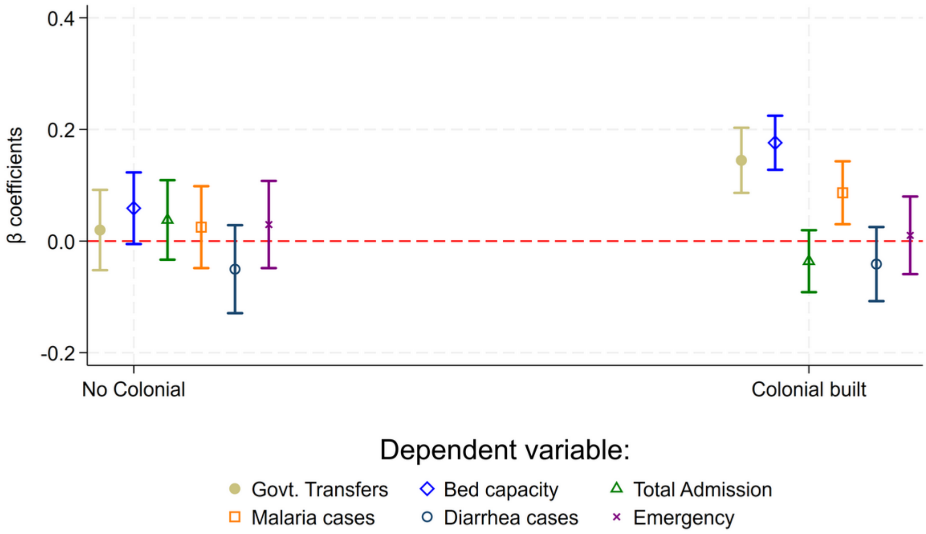
Notes: The map in Panel A depicts the geographical distribution of sleeping sickness (Human African Trypanosomiasis) through the reported number of new cases between 2012 and 2016. Panel B shows the geographic distribution of the highest (above median) Plasmodium falciparum parasite rate (PfPR) using median values for 2017 from the Malaria Atlas Project (MAP). *Source:* Panel A is produced by Franco et al. (2020) and accessed from the WHO website (`https://www.who.int/trypanosomiasis_african/country/foci_AFRO/en/`). Panel B was obtained from author's computation using the MAP data on PfPR in the DRC in 2017.

Figure A14: Falsification tests



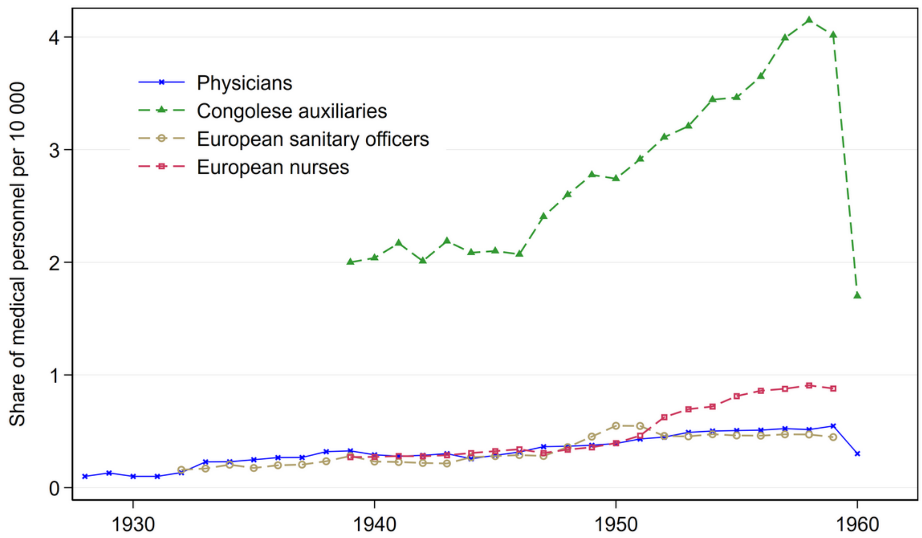
Notes: The graph plots the standardised coefficient estimates and 95% confidence intervals from OLS estimations of equation (2) with a range of alternative pre-1920 outcomes. Accessibility 1920 corresponds to the (logarithm) distance to the nearest transportation in 1920, pre-colonial ethnicity corresponds to ancestral characteristics of ethnic groups using the Ethnographic Atlas, coded by Murdock (1967) and updated by Nunn and Wantchekon (2011). Early colonial economic activity is a dummy variable equal to 1 if a hospital falls into an area that belongs to a concession granted to private companies under the Congo Free State (1885-1908). All regressions include provincial fixed effects as well as the baseline controls. Standard errors are clustered at the provincial level.

Figure A15: Reduced-form estimates of hospital outcomes on sleeping sickness



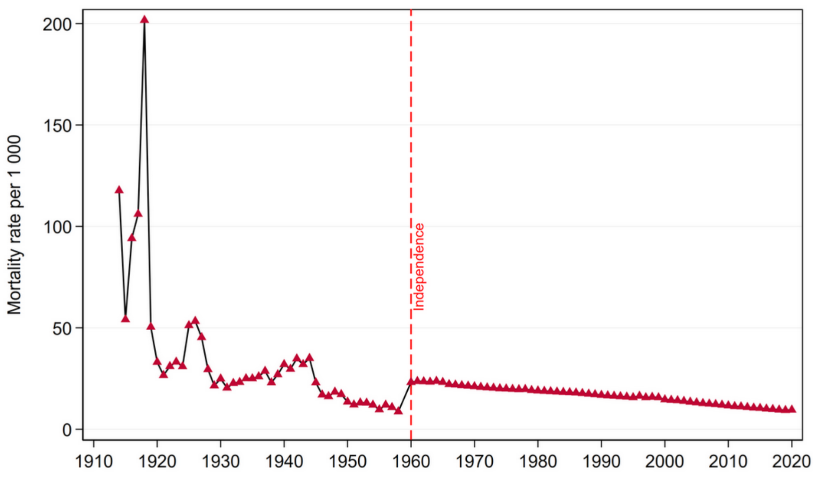
Notes: The graph plots the coefficient estimates and 95% confidence intervals of the effects of the distribution of sleeping sickness during the colonial period on the seven measures of hospital characteristics, in areas with no sleeping sickness (left) and with the disease presence (right).

Figure A16: Decomposition of medical personnel during the colonial period



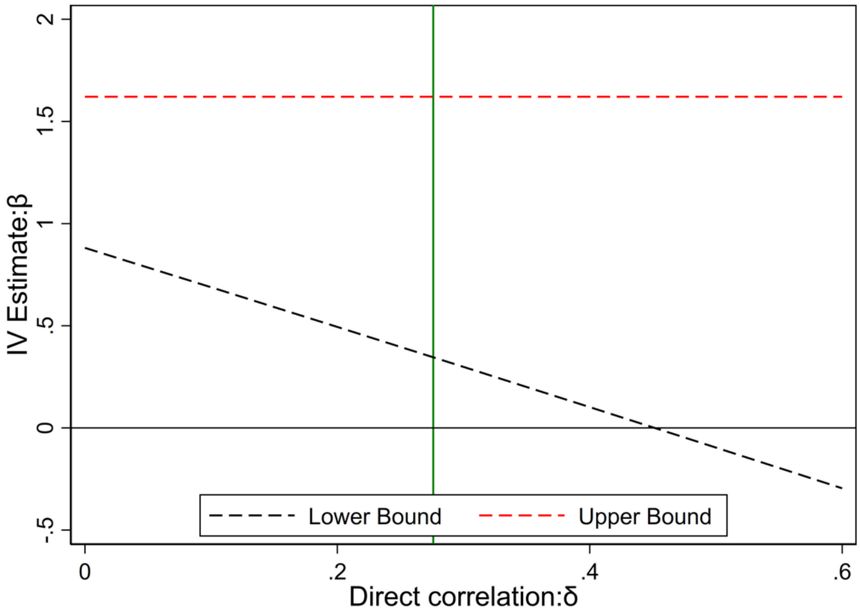
Notes: The graph plots the decomposition of the share of medical personnel between physicians (blue), European nurses (red) and sanitary officers - *agent sanitaire* (brown), and Congolese medical auxiliaries (green). Medical auxiliary corresponds to assistant nurse. European nurses includes religious missionaries when they were reported to provide medical assistance. The *agent sanitaire* was in charge of mobile health teams in rural areas, under the supervision of a medical officer (Janssens, 1972). *Source:* author's computations using data on medical personnel and population estimates from *Annuaire statistique de la Belgique et du Congo Belge* and *Rapport annuel, Direction Générale des services médicaux du Congo Belge* for the colonial period.

Figure A17: Evolution of mortality rate, 1910-2020

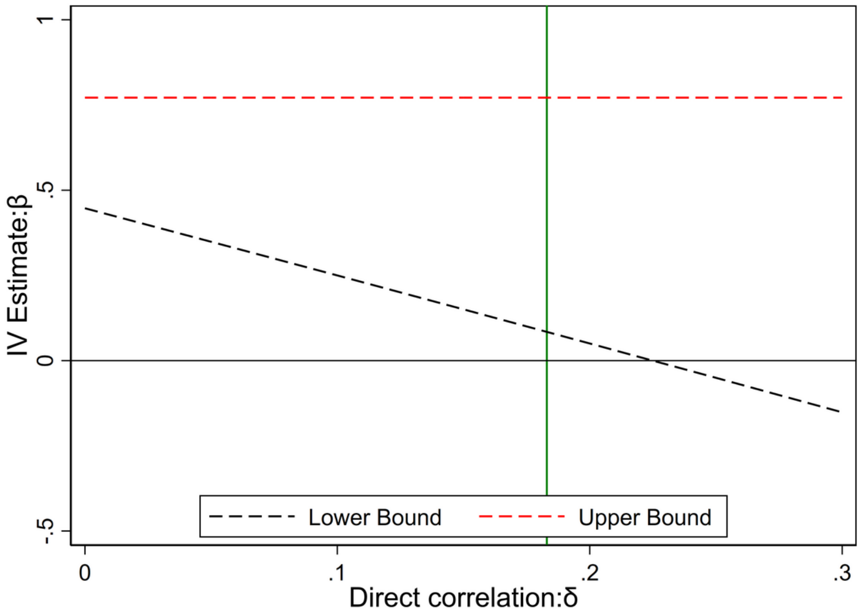


Notes: The graph plots the evolution of the mortality rate per 1,000 among the Congolese population during the colonial period (1910-1960) and in the country in the post-colonial period (1960-2020). Data on mortality rate were collected from the annual reports of public health in Belgian Congo during the colonial period, and from a combination of IMF, IBRD and World Bank reports in the post-colonial period. *Source:* author's computations using data on medical personnel and population estimates from *Annuaire statistique de la Belgique et du Congo Belge* and *Rapport annuel, Direction Générale des services médicaux du Congo Belge* for the colonial period; World Bank estimates in the post-colonial period (`Source:https://data.worldbank.org/indicator/SP.DYN.CDRT.IN?locations=CD`). See Appendix B.1 for details on the data sources.

Figure A18: Confidence intervals of IV Estimates under plausible exogeneity



(A) Government transfers



(B) Bed capacity

Notes: The graphs plot the upper and lower bounds of the union of 95% confidence intervals of the IV estimates for government transfers and bed capacity using Conley et al. (2012)'s methodology on Union of Confidence Intervals approach. The algorithm was implemented by Clarke and Matta (2018). In each graph, the vertical green line indicates the value of the reduced-form coefficient. The maximum δ for which the lower bound is nonnegative is 0.451 in graph (A) and 0.225 in graph (B).

Table A3: Summary statistics: Lost vs. matched colonial hospitals

	Matched colonial hospitals			Lost colonial hospitals				
	Obs. (1)	Mean (2)	s.d. (3)	Obs. (4)	Mean (5)	s.d. (6)	Difference (7)	t-stat (8)
Pop. density (1951)	299	14.06	0.85	62	5.55	0.62	-8.51	8.08
Mineral resources	300	0.38	0.03	62	0.39	0.06	0.01	-0.10
Distance Provincial city	300	2.42	0.08	62	3.12	0.12	0.70	-4.82
Distance Transport	300	36.98	2.47	62	50.20	5.36	13.22	-2.24
Distance hospital	300	46.02	1.82	62	64.88	5.94	18.86	-3.03

Notes: The unit of observation is hospital. Mineral resources is a dummy variable equal to one if the hospital is located within an area with mineral resources as reported in the colonial maps. All distances are expressed in km. Matched colonial hospitals are hospitals listed in the colonial maps that could be matched with a modern hospital. Lost colonial hospitals are those with a recorded georeferenced location in the archives and that could not be matched with any modern hospitals. The first six columns show the number of observations, sample mean and standard deviation for post-independence and colonial hospitals respectively. The last two columns indicate the difference in means between post-independence and colonial hospitals, the t-stat of the test of whether the mean coefficients in the two samples are equal.

Table A4: Characteristics of colonial health investments

	Bed capacity	
	(1)	(2)
Population density 1951	0.110	0.094
	(0.044)	(0.044)
Distance Provincial capital	-0.095	-0.078
	(0.051)	(0.047)
Distance to transport	-0.026	-0.026
	(0.034)	(0.034)
Distance to coast	-0.074	-0.072
	(0.291)	(0.243)
Natural resources (before 1960)	0.121	0.115
	(0.087)	(0.090)
Elevation	-0.000	-0.000
	(0.000)	(0.000)
Longitude	0.010	0.012
	(0.035)	(0.035)
Latitude	0.021	0.020
	(0.052)	(0.046)
Cassava suitability	0.000	0.000
	(0.000)	(0.000)
Ruggedness	-0.003	-0.003
	(0.003)	(0.003)
White European population	0.116	0.107
	(0.074)	(0.082)
Sleeing sickness	0.033	0.033
	(0.113)	(0.114)
Population density in 1921		0.032
		(0.189)
Population density in 1800		0.076
		(0.053)
Sleeping sickness in 1910		0.007
		(0.078)
Concessions in CFS		0.026
		(0.115)
R^2	0.36	0.37
Observations	295	295
Mean dep. var	4.41	4.41
Province Fixed Effect	✓	✓

Notes: The unit of observation is a hospital. The table presents the OLS estimates. The dependent variable is bed capacity (in logarithm), a proxy for the amount of colonial health investment. The data sample is restricted to hospitals with a colonial origin. Natural resources is a dummy variable equal to one for the exploitation of natural resources during the colonial period. White European population is an indicator equal to one if the colonial health settlement had at least one unit providing health services to Europeans only. Colonial Congolese is an indicator equal to one if the colonial health settlement had at least one unit providing health services to Congolese. Concessions in CFS is a dummy variably equal to one if a hospital is located in an area historically belonging to a private concession during the Congo Free State (CFS). Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A5: Extended results of Table 2 panel B

	Bed capacity	Government transfers			Total		Malaria		Diarrhea		Emergency	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Colonial settlement	0.708***	1.204***	1.114***	0.338***	0.431***	-0.084*	0.621***	0.157***	0.291***	0.055	0.579***	0.047
	(0.069)	(0.108)	(0.119)	(0.083)	(0.068)	(0.042)	(0.078)	(0.049)	(0.065)	(0.064)	(0.129)	(0.095)
ln Nurses				0.583***		0.640***		0.542***		0.280***		0.683***
				(0.070)		(0.040)		(0.044)		(0.036)		(0.074)
ln Physicians				0.621***		-0.005		-0.014		0.000		0.014
				(0.077)		(0.045)		(0.064)		(0.054)		(0.100)
Hospital ownership			-0.355***	-0.116*		0.043**		-0.030		-0.002		0.006
			(0.086)	(0.061)		(0.021)		(0.028)		(0.014)		(0.045)
ln Population			0.116	-0.198**		0.058		0.022		0.037		0.041
			(0.115)	(0.085)		(0.045)		(0.130)		(0.045)		(0.132)
ln Distance Provincial capital	0.001	-0.100	-0.107	0.017	-0.028	0.001	0.118	0.137	-0.009	0.002	0.009	0.042
	(0.040)	(0.083)	(0.082)	(0.064)	(0.039)	(0.031)	(0.094)	(0.093)	(0.038)	(0.036)	(0.093)	(0.077)
ln Distance Distributional Centre	0.048	0.099	0.113	0.139*	0.016	0.034	0.094	0.111**	0.043	0.053	0.058	0.093
	(0.037)	(0.075)	(0.073)	(0.072)	(0.031)	(0.022)	(0.059)	(0.046)	(0.035)	(0.032)	(0.079)	(0.061)
ln Distance Transport	0.012	0.038	0.026	-0.010	0.012	0.007	0.001	-0.010	0.027	0.023	0.008	-0.001
	(0.023)	(0.031)	(0.033)	(0.029)	(0.026)	(0.020)	(0.038)	(0.035)	(0.022)	(0.020)	(0.041)	(0.040)
Population density 1951	0.050**	0.125**	0.125**	0.052	0.049	0.025	0.028	0.009	0.015	0.003	0.077*	0.039
	(0.024)	(0.048)	(0.055)	(0.053)	(0.037)	(0.034)	(0.065)	(0.064)	(0.034)	(0.028)	(0.039)	(0.043)
Natural resources (before 1960)	-0.132	0.272	0.291	0.081	0.116	0.040	0.045	0.001	0.044	0.015	0.137	0.044
	(0.161)	(0.179)	(0.172)	(0.109)	(0.170)	(0.114)	(0.177)	(0.113)	(0.156)	(0.123)	(0.201)	(0.132)
Malaria risk rate	-0.023	0.020	-0.094	0.491	-0.395**	-0.148	0.209	0.383	0.192	0.285	-0.028	0.264
	(0.215)	(0.397)	(0.385)	(0.413)	(0.182)	(0.168)	(0.426)	(0.417)	(0.286)	(0.290)	(0.491)	(0.462)
Elevation	0.000	-0.000*	-0.000	-0.000	-0.000**	-0.000	-0.001***	-0.001***	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Longitude	0.001	0.005	-0.010	0.043	0.006	0.022	0.074**	0.085**	0.032	0.040*	-0.006	0.014
	(0.016)	(0.052)	(0.050)	(0.037)	(0.028)	(0.024)	(0.034)	(0.034)	(0.021)	(0.020)	(0.032)	(0.031)
Latitude	-0.008	0.062	0.078	0.079*	-0.001	0.007	0.003	0.013	-0.039	-0.035	-0.053	-0.039
	(0.025)	(0.065)	(0.062)	(0.044)	(0.042)	(0.030)	(0.033)	(0.024)	(0.030)	(0.032)	(0.048)	(0.042)
ln Distance conflict	-0.063***	-0.143***	-0.137**	-0.030	-0.084***	-0.030	-0.065***	-0.023	-0.051*	-0.027	-0.097**	-0.024
	(0.020)	(0.050)	(0.051)	(0.042)	(0.025)	(0.027)	(0.022)	(0.021)	(0.030)	(0.026)	(0.042)	(0.033)
ln Distance nearest hospital	0.005	-0.002	-0.015	0.016	-0.030*	-0.006	0.068**	0.085***	0.008	0.018	0.049	0.077**
	(0.012)	(0.041)	(0.045)	(0.044)	(0.015)	(0.012)	(0.026)	(0.022)	(0.021)	(0.018)	(0.042)	(0.032)
cassava	0.000	0.000	0.000	-0.000	0.000	0.000	0.000	0.000	0.000***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Standardised β coefficient	0.433	0.386	0.357	0.108	0.221	-0.043	0.253	0.064	0.162	0.030	0.227	0.018
R^2	0.30	0.26	0.29	0.56	0.18	0.49	0.32	0.46	0.25	0.32	0.20	0.39
Observations	991	755	755	755	1,040	1,040	1,050	1,050	1,051	1,051	915	915
Province Fixed Effect	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table reports the estimated coefficients on the control variables in Panel B of Table 2. Non-dummy variables are all in natural logarithms. Robust standard errors are in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A6: Colonial settlement and hospital outcomes: SUR model

Dep. Variable	Bed capacity (1)	Government transfers (2)	Health services: admissions Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Colonial settlement	0.573	1.077	0.324	0.469	0.240	0.449
s.e.	0.050	0.111	0.057	0.072	0.060	0.088
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Standardised β coefficient	0.408	0.357	0.210	0.239	0.151	0.196
Observations	672	672	672	672	672	672

Notes: The unit of observation is a hospital. Generalised Least Squares (GLS) estimation of equation equation (1) using the Seemingly Unrelated Regressions (SUR) technique (Zellner and Huang, 1962). All baseline controls and provincial fixed effects are included. Robust standard errors are in parentheses.

Table A7: Robustness to alternative standard errors

	Bed capacity (1)	Government transfers (2)	Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Colonial settlement	0.708***	1.204***	0.431***	0.621***	0.291***	0.579***
	(0.070)	(0.110)	(0.068)	(0.079)	(0.066)	(0.131)
Inference Robustness (β)						
p-value: Robust S.E.	0.000	0.000	0.000	0.000	0.000	0.000
p-value: Wild Bootstrap	0.000	0.000	0.000	0.000	0.000	0.000
p-value: Moran I Test	0.253	0.337	0.119	0.257	0.319	0.234
Standardized β coefficient	0.433	0.386	0.221	0.253	0.162	0.227
Province Fixed Effects	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓
R^2	0.301	0.259	0.182	0.321	0.250	0.201
Observations	991	755	1,040	1,050	1,051	915

Notes: The unit of observation is a hospital. The table presents the OLS estimates of equation (1). Robust standard errors are in parentheses. The table reports p-value with robust standard errors clustered at the province level, wild bootstrap with 9,999 replications clustered at the province level p-value, and the p-value of Moran's I statistics for spatial autocorrelation. All baseline controls and provincial fixed effects are included. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A8: Robustness to different cutoff radii for spatial clustering

Dep. Variable	Bed capacity (1)	Government transfers (2)	Health services: admissions Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Baseline: cluster by province						
Colonial settlement	0.708***	1.204***	0.431***	0.621***	0.291***	0.579***
	(0.069)	(0.108)	(0.068)	(0.078)	(0.065)	(0.129)
Observations	991	755	1,040	1,050	1,051	915
Standard errors: Spatial correction using correction thresholds						
100 km	(0.064)***	(0.105)***	(0.067)***	(0.074)***	(0.057)***	(0.111)***
150 km	(0.064)***	(0.099)***	(0.065)***	(0.060)***	(0.061)***	(0.115)***
200 km	(0.072)***	(0.105)***	(0.065)***	(0.071)***	(0.071)***	(0.126)***
250 km	(0.074)***	(0.108)***	(0.065)***	(0.071)***	(0.066)***	(0.129)***
500 km	(0.082)***	(0.119)***	(0.067)***	(0.080)***	(0.050)***	(0.132)***
750 km	(0.079)***	(0.100)***	(0.076)***	(0.078)***	(0.071)***	(0.144)***

Notes: The unit of observation is a hospital. The table presents the OLS estimates. Following Conley (1999) and using the approach developed by Colella et al. (2018), standard errors are adjusted for spatial dependence by clustering observations within circles of varying distances. The first panel reports the coefficient of the colonial settlement from equation 1 and the second panel reports the standard errors when changing the variance-covariance matrix through varying the distance thresholds of the spatial clusters. All regressions include baseline the baseline controls and province fixed effects. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A9: Colonial settlement effects: adding hospitals without locations

Dep. Variable	Bed capacity (1)	Government transfers (2)	Health services: admissions Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Panel A. Baseline sample						
Colonial settlement	0.713***	1.182***	0.348***	0.752***	0.293***	0.589***
	(0.090)	(0.105)	(0.076)	(0.090)	(0.064)	(0.136)
Standardised β coefficient	0.436	0.374	0.177	0.302	0.163	0.230
R^2	0.29	0.23	0.14	0.24	0.23	0.19
Observations	991	765	1,057	1,068	1,068	922
Baseline controls	✓	✓	✓	✓	✓	✓
Province Fixed Effect	✓	✓	✓	✓	✓	✓
Panel B. Adding hospitals with no recorded locations						
Colonial settlement	0.764***	1.285***	0.453***	0.858***	0.334***	0.685***
	(0.090)	(0.112)	(0.085)	(0.090)	(0.065)	(0.136)
Standardised β coefficient	0.438	0.393	0.196	0.311	0.172	0.248
R^2	0.29	0.23	0.15	0.23	0.23	0.20
Observations	1,200	796	1,339	1,340	1,340	1,101
Baseline controls	✓	✓	✓	✓	✓	✓
Province Fixed Effect	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table presents the OLS estimates. Panel A reports the estimates using the main data sample, and without controlling for the geographic factors. Panel B adds hospitals with unknown geo-coordinates. Robust standard errors are in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A10: Colonial settlement and government transfers (extended)

	(ln) Government transfers OLS		Government transfers Poisson		LPM
	(1)	(2)	(3)	(4)	(5)
Panel A. Estimates					
Colonial settlement	1.189***	1.234***	1.310***	1.287***	0.115***
	(0.106)	(0.101)	(0.158)	(0.153)	(0.035)
R^2	0.23	0.26			0.35
Observations	765	765	874	874	1,092
Mean dep. var		14.230	3.74e+06	3.74e+06	0.701
Standardised β coefficient		0.391			
Province Fixed Effects		✓	✓	✓	✓
Baseline controls		✓	✓	✓	✓
Additional controls		✓		✓	
Panel B. Omitted variable - breakdown points					
Oster δ: $R^2_{long} = 1.3 \times \hat{R}^2_{med}$		3.45			
DMP: $\bar{r}_X^{\mathsf{bp}}$		0.98			
Panel C. Panel data - Correlated Random Effects					
Colonial settlement	0.252***				
	(0.081)				
Observations	17298				
Hospitals	735				
Mean dep. var	14.29				
Province Fixed Effect	✓				
Baseline controls	✓				
Wald test χ^2	11.52				
Wald test p-value	0.00				

Notes: The unit of observation is a hospital. The table presents the OLS estimates for log government transfers in the first two columns, the Poisson estimates in the following two columns, and the estimates from a linear probability model (LPM) in the last column where government transfers is expressed as a dummy variable. Additional controls include distance to electrical infrastructure, slope, distance to coast, suitability index for rubber, and for cotton. Oster δ refers to the test of the relative importance of observed and unobserved variables in selection bias, as suggested in Oster (2019), with the rule of thumb choice of $R^2_{long} = 1.3 \times \hat{R}^2_{med}$. The parameter $\bar{r}_X^{\mathsf{bp}}$ refers to the method proposed by Diegert et al. (2024) (DMP) that captures the proportion of selection on unobservables relative to observables where the coefficient on colonial settlement would still be non-negative, while allowing correlation between omitted variables and the controls. All additional controls are used as comparison variables. Panel C reports estimates from the Random Effect Mundlak model using the panel structure of the data, with time fixed effects and within-hospital averages of the number of health workers and physicians. The Wald test assesses the join significance of all hospital averages (i.e. Mundlak variables) included in the model. Non-dummy variables are all in natural logarithms. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A11: Colonial settlement and bed capacity (extended)

	(ln) Bed capacity (OLS)		Bed capacity (Poisson)	
	(1)	(2)	(3)	(4)
Panel A. Estimates				
Colonial settlement	0.708***	0.706***	0.694***	0.691***
	(0.069)	(0.070)	(0.078)	(0.078)
R^2	0.30	0.30		
Observations	991	991	991	991
Mean dep. var		3.940	66.946	66.946
Standardised β coefficient		0.432		
Province Fixed Effects		✓	✓	✓
Baseline controls		✓	✓	✓
Additional controls		✓		✓
Panel B. Omitted variable - breakdown points				
Oster δ: $R^2_{long} = 1.3 \times \hat{R}^2_{med}$		2.76		
DMP: $\bar{r}_X^{\mathsf{bp}}$		0.99		

Notes: The unit of observation is a hospital. Columns (1)–(2) report OLS estimates for log bed capacity; Columns (3)–(4) report Poisson estimates. Additional controls include distance to electrical infrastructure and the coast, slope, and suitability indices for rubber and cotton. Oster δ measures the relative importance of selection on unobservables versus observables following Oster (2019), using $R^2_{long} = 1.3 \times \hat{R}^2_{med}$. The parameter $\bar{r}_X^{\mathsf{bp}}$ is the breakdown point proposed by Diegert et al. (2024) (DMP) allowing for correlation between omitted variables and controls. Robust standard errors in parentheses clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A12: Colonial settlement and hospital outcomes: subsample robustness

Dep. Variable	Bed capacity (1)	Government transfers (2)	Health services: admissions Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Panel A.			subsample: **Excluding Kinshasa**			
Colonial settlement	0.690***	1.228***	0.437***	0.660***	0.281***	0.551***
	(0.071)	(0.105)	(0.073)	(0.080)	(0.067)	(0.132)
Standardised β coefficient	0.432	0.399	0.235	0.275	0.161	0.222
R^2	0.32	0.26	0.20	0.34	0.27	0.23
Observations	920	744	953	963	962	857
Panel B.			subsample: **Excluding North & South Kivu**			
Colonial settlement	0.689***	1.168***	0.414***	0.641***	0.329***	0.568***
	(0.077)	(0.116)	(0.075)	(0.079)	(0.060)	(0.131)
Standardised β coefficient	0.430	0.388	0.216	0.272	0.190	0.236
R^2	0.31	0.25	0.20	0.32	0.26	0.24
Observations	786	613	859	865	863	735
Panel C.			subsample: **Excluding Ituri**			
Colonial settlement	0.719***	1.238***	0.454***	0.673***	0.301***	0.594***
	(0.071)	(0.110)	(0.073)	(0.080)	(0.069)	(0.136)
Standardised β coefficient	0.436	0.397	0.230	0.272	0.166	0.231
R^2	0.30	0.27	0.19	0.33	0.26	0.21
Observations	944	728	1010	1021	1021	877
Panel D.			subsample: **Excluding Kasaï Oriental & Kasaï Central**			
Colonial settlement	0.734***	1.271***	0.450***	0.656***	0.279***	0.620***
	(0.062)	(0.102)	(0.070)	(0.078)	(0.066)	(0.129)
Standardised β coefficient	0.452	0.408	0.229	0.268	0.156	0.241
R^2	0.32	0.27	0.19	0.33	0.26	0.22
Observations	903	677	965	973	976	835

Notes: The unit of observation is a hospital. The table reports the OLS estimates of equation (1), with alternative samples. Panel A removes hospitals from Kinshasa province, panel B excludes hospitals from North and South Kivu provinces, panel C from Ituri province, and panel D from the Kasaï region. Non-dummy variables are all in natural logarithms. All baseline controls listed in Table 2 and province fixed effects are included. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A13: Completeness and timeliness scores

	Completeness		Promptness	
	(1)	(2)	(3)	(4)
Colonial settlement	0.038**	-0.001	-0.052***	-0.012
	(0.017)	(0.018)	(0.009)	(0.008)
Standardised β coefficient	0.063	-0.002	-0.142	-0.034
R^2	0.12	0.14	0.20	0.23
Observations	1,092	1,092	1,092	1,092
Mean dep. var	0.88	0.88	0.06	0.06
Province Fixed Effect	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓
Referral Hospital		✓		✓

Notes: The unit of observation is a hospital. The table presents the OLS estimates of equation (1) where the dependent variable is completeness rate (the extent to which expected data is reported) in Columns (1) and (2), and timeliness score (whether data is submitted on time) in Columns (3) and (4). Columns (1) and (3) include all hospitals, and columns (2) and (4) control for the referral general hospital (HGR) status as a dummy variable. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A14: Government transfers and missing values

	Government transfers			
	(1)	(2)	(3)	(4)
Colonial settlement	1.235***	1.307***	1.533***	1.582***
	(0.105)	(0.119)	(0.146)	(0.153)
Quality threshold				
Completeness score $\geq$		80%	80%	80%
Timeliness score $\geq$		80%	65%	50%
Standardized β coefficient	0.391	0.357	0.296	0.254
Province Fixed Effects	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓
R^2	0.261	0.207	0.177	0.218
Observations	765	768	780	791

Notes: The unit of observation is a hospital. The table presents the OLS estimates of equation (1), replacing the missing values in the dependent variable (government transfers) according to various assumptions about the data quality. When the reporting data from a hospital reaches a minimum quality threshold, missing values are replaced with zero. The quality of data reporting is defined as reaching minimum threshold for completeness (how much of the expected data has been reported) and timeliness (whether a hospital has submitted the data within a certain period), two scores used to assess data quality by the central health system in the DRC. The minimum set objective by the central health authorities is 80% for both completeness and timeliness scores. Column (1) corresponds to the baseline results. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A15: Summary statistics for unreported govt. transfers

	Non-missing values			Missing values			Difference-in-means	
	Obs.	Sample mean	s.d.	Obs.	Sample mean	s.d.	Diff-in-means	p-value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Colonial hospital	796	0.32	0.02	597	0.06	0.01	-0.26	0.00
Nurses	795	2.56	0.03	566	2.31	0.04	-0.25	0.00
Physicians	783	1.10	0.03	553	1.03	0.04	-0.07	0.18
Public hospital	796	0.50	0.02	597	0.17	0.02	-0.33	0.00
Faith-based hospital	796	0.43	0.02	597	0.25	0.02	-0.18	0.00
Private hospital	796	0.16	0.01	597	0.63	0.02	0.47	0.00
Distance to provincial city	767	5.11	0.04	328	3.84	0.11	-1.27	0.00
Distance to distribution centres	767	4.37	0.04	328	3.47	0.07	-0.89	0.00
Access	767	2.96	0.05	328	2.09	0.07	-0.87	0.00
Population density 1951	765	2.44	0.03	327	2.95	0.06	0.51	0.00
Presence natural resouces	768	0.47	0.02	329	0.57	0.03	0.10	0.00
Malaria risk rate	768	0.23	0.01	328	0.17	0.01	-0.06	0.00
Elevation	768	773.13	17.24	328	733.12	29.89	-40.02	0.25
Population	796	12.27	0.02	593	12.50	0.02	0.23	0.00
Longitude	768	23.49	0.18	329	21.21	0.36	-2.27	0.00
Latitude	768	-3.23	0.14	329	-5.00	0.20	-1.76	0.00
Distance to conflict	767	2.52	0.05	328	1.54	0.06	-0.97	0.00
Distance to electrical infrastructure	767	2.52	0.06	328	2.06	0.08	-0.45	0.00
Slope	768	1.17	0.02	328	1.17	0.04	-0.01	0.88
Distance to coast	767	6.88	0.02	328	6.92	0.02	0.04	0.13

Notes: The unit of observation is a hospital and all financial characteristics are expressed in 2018 U.S. Dollars. All indicators correspond to monthly average numbers. The first six columns show the number of observations, sample mean and standard deviation for hospitals with and without missing values for government transfers. The last two columns indicate the difference in means between the two hospital groups, and the *p*-value of the test of whether the mean coefficients in the two samples are equal.

Table A16: Government transfers and underreporting

	Government transfers					
	(1)	(2)	(3)	(4)	(5)	(6)
Colonial settlement	1.235***	0.338**	1.266***	1.685***	1.606***	0.811***
	(0.105)	(0.133)	(0.128)	(0.127)	(0.131)	(0.141)
Interpolated data						
Postcolonial		bottom 5%				
Public hospitals			bottom 1%		top 1%	bottom 1%
Private hospitals				bottom 1%	bottom 1%	top 1%
Standardized β coefficient	0.391	0.110	0.338	0.354	0.325	0.184
Province Fixed Effects	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓
R^2	0	0	0	0	0	0
Observations	765	765	813	945	987	987

Notes: The table presents the OLS estimates of equation (1), replacing values in the dependent variable (government transfers) according to various simulations. Since about 46 colonial hospitals could not be verified with certainty due to missing or inconsistent coordinates (Table A2), Column (1) reclassifies the 46 lowest-transfer of hospitals currently coded as postcolonial as colonial. Column (2) reports the baseline results. Columns (3) and (4) replace the missing values for respectively public and private hospitals with the bottom 1% of the transfers distribution. Columns (5) and (6) alternatively replace the missing values with the top 1% and bottom 1% of the distribution. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A17: Effects on Transfers, beds, and staff: IV

	Government transfers	Bed capacity	Health workers	
	(1)	(2)	(3)	(4)
Colonial settlement	1.525***	0.864***	0.823***	0.129
	(0.208)	(0.101)	(0.120)	(0.108)
Standardised β coefficient	0.483	0.529	0.412	0.065
R^2	0.16	0.19	0.20	0.52
Observations	765	991	987	987
Mean dep. var	14.23	3.94	2.62	2.62
Province Fixed Effects	✓	✓	✓	✓
Geographic controls	✓	✓	✓	✓
Bed Capacity				✓

Notes: The unit of observation is a hospital. The table presents the 2SLS estimates of equation (1). The sleeping sickness instrument is a dummy variable equal to one if the hospital is located within an area where the infection rate was least equal to 1% at any time during the 1929-1953 period. Baseline controls are those presented in panel A of Table 2. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A18: Sleeping sickness exposure and state presence: Falsification tests

	Distance postcolonial		Locality		Road length		Nightlight		Distance Public Force	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sleeping area	0.151	0.112	0.336	0.292	0.830	0.787	-0.021	-0.024	-0.424	-0.398
	[-0.275,0.577]	[-0.321,0.546]	[-0.129,0.800]	[-0.152,0.737]	[0.086,1.573]	[-0.043,1.616]	[-0.138,0.095]	[-0.137,0.089]	[-1.061,0.213]	[-0.974,0.179]
Standardised β coefficient	0.041	0.031	0.105	0.092	0.148	0.141	-0.022	-0.025	-0.133	-0.125
R^2	0.46	0.48	0.47	0.52	0.68	0.68	0.33	0.35	0.27	0.32
Observations	239	237	137	136	239	237	239	237	237	237
Mean dep. var	3.04	3.03	6.17	6.18	3.51	3.50	0.47	0.47	3.89	3.89
Province Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Geo. controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Additional controls		✓		✓		✓		✓		✓

Notes: The unit of observation is a territory (main administrative unit below provinces). The table reports reduced-form regressions of historical sleeping sickness exposure on proxies for non-health state presence. Outcomes include distance to hospitals constructed after independence, number of localities, total road area, night-time lights, and proximity to *Force Publique* posts. All outcomes are taken in logarithm ($ln(1+x)$). Sleeping area is an indicator that a territory was exposed to sleeping sickness during the colonial period. Baseline geographic controls are early colonial population density (1921), ruggedness, and territory surface area. Additional controls include geological resource endowments, distance to coast, distance to major rivers, and the presence of early concessions during the Congo Free State. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A19: Colonial settlement and hospital outcomes: IV shift-share

Dep. Variable	Colonial settlement					
Panel A. 1st stage						
Sleeping sickness	0.481***	0.502***	0.476***	0.480***	0.472***	0.509***
	(0.032)	(0.035)	(0.031)	(0.031)	(0.031)	(0.033)
Kleibergen-Paap F-statistic	225.2	209.4	233.3	244.5	231.3	241.8

Dep. Variable	Bed capacity (1)	Government transfers (2)	Health services: admissions Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Panel B. 2nd stage						
Colonial settlement	0.860***	1.507***	0.463***	0.685***	0.054	0.580***
	(0.101)	(0.207)	(0.127)	(0.145)	(0.117)	(0.173)
Standardised β coefficient	0.526	0.478	0.236	0.276	0.030	0.227
Anderson-Rubin p-value	0.00	0.00	0.00	0.00	0.64	0.00
R^2	0.19	0.16	0.08	0.19	0.04	0.07
Observations	991	765	1,057	1,068	1,068	922
Province Fixed Effect	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table presents the 2SLS estimates of equation (1). The sleeping sickness instrument is interacted with distance to pre-1920 transport routes. Baseline controls are those presented in Table 2. Robust standard errors are in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A20: Colonial settlement and hospital outcomes: IV and Entropy balancing

Dep. Variable	Colonial settlement					
Panel A. 1st stage						
Sleeping sickness	0.483***	0.493***	0.473***	0.479***	0.470***	0.513***
	(0.033)	(0.036)	(0.032)	(0.032)	(0.032)	(0.034)
Kleibergen-Paap F-statistic	218.4	184.4	217.3	227.6	212.8	231.9

Dep. Variable	Bed capacity (1)	Government transfers (2)	Health services: admissions Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Panel B. Reduced-form						
Sleeping sickness	0.432***	0.717***	0.248***	0.294***	0.123	0.351**
	(0.078)	(0.096)	(0.054)	(0.076)	(0.086)	(0.144)
Standardised β coefficient	0.293	0.259	0.152	0.148	0.077	0.159
R^2	0.28	0.18	0.21	0.22	0.26	0.23
Observations	981	755	1,040	1,050	1,051	915
Province Fixed Effect	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓
Panel C. 2nd stage						
Colonial settlement	0.893***	1.454***	0.525***	0.615***	0.261**	0.685***
	(0.111)	(0.224)	(0.134)	(0.151)	(0.130)	(0.176)
Standardised β coefficient	0.586	0.515	0.309	0.298	0.157	0.302
Anderson-Rubin p-value	0.00	0.00	0.00	0.00	0.05	0.00
R^2	0.22	0.20	0.09	0.14	0.07	0.07
Observations	981	755	1,040	1,050	1,051	915
Province Fixed Effect	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table presents the 2SLS estimates of equation (1) after using entropy weights from the balancing algorithm Hainmueller (2012) that imposes the control group (areas without sleeping sickness) to have the same mean and the same variance as the treatment group (areas with sleeping sickness) for all geographic variables. The sleeping sickness instrument is a dummy variable equal to one if the hospital is located within an area where the infection rate was least equal to 1% at any time during the 1929 - 1953 period. Baseline controls are those presented in panel A of Table 2. Robust standard errors are in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A21: Test results of the validity of Sleeping sickness

Dep. Variable	Bed capacity	Government transfers	Health services: admissions			
			Total	Malaria	Diarrhea	Emergency
	(1)	(2)	(3)	(4)	(5)	(6)
t-stat	0.920	0.000	0.000	0.939	0.080	-2.287
critical value $c(\alpha)$	2.241	1.960	2.394	2.128	2.241	1.959
p-value	0.715	0.999	0.999	0.522	0.999	0.999

Notes: The unit of observation is a hospital. The table presents the results of the procedure developed by Farbmacher et al. (2022) that employs causal forests to detect and test local violations of the exclusion restriction. The instrument tested is sleeping sickness. The set of covariates includes all baseline and geographic controls presented in Table 2. Rejecting the null hypothesis indicates that the exclusion assumption is violated at least in one subpopulation. The software package `LATEtest` in R was used to implement the tests.

Table A22: Hospital equipments

	Glucometer	Microscope	Spectrophotometer	Anesthesia	Equipment utilisation	Prob(Equipment)
	(1)	(2)	(3)	(4)	(5)	(6)
Colonial settlement	-0.328	-1.208	-0.519	1.380**	-0.012	0.003
	(1.037)	(1.402)	(0.676)	(0.636)	(0.102)	(0.029)
Standardised β coefficient	-0.013	-0.041	-0.034	0.064	-0.005	0.003
R^2	0.26	0.16	0.16	0.39	0.25	0.18
Observations	732	613	865	858	876	1,064
Mean dep. var	21.71	15.33	28.34	13.88	0.15	0.48
Province Fixed Effects	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓

Notes: The unit of analysis is a hospital. The table presents the OLS estimates of equation (1) with four hospital equipments as dependent variables: Glucometer, Microscope, Spectrophotometer, Ketamine for medically-delegated analgesia. Column (5) defines equipment utilisation by extracting the first principal component of Columns (1-4). Column (6) corresponds to the probability of having all the four equipments. All regressions add to the baseline controls the total number of hospital admissions. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A23: Additional hospital outcomes

	Investment	Value of ward stock	Expenditure		Revenue		Local allowance		Length of stay	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Colonial settlement	0.066	0.181	0.354***	0.230*	0.284**	0.207	0.184**	0.073	0.189***	0.045
	(0.123)	(0.167)	(0.115)	(0.129)	(0.127)	(0.126)	(0.087)	(0.083)	(0.058)	(0.062)
Standardised β coefficient	0.019	0.032	0.093	0.061	0.064	0.047	0.054	0.022	0.075	0.018
R^2	0.47	0.24	0.49	0.51	0.47	0.48	0.53	0.55	0.62	0.68
Observations	716	846	776	776	814	814	816	816	937	937
Mean dep. var	12.84	14.30	14.59	14.59	14.80	14.80	14.68	14.68	6.21	6.21
Province Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total outpatients	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
No. Beds				✓		✓		✓		✓

Notes: The unit of analysis is a hospital. The table presents the OLS estimates of equation (1) with additional hospital characteristics as dependent variables. Value of ward stock corresponds to the value of the medicine in the stock. Expenditure includes social charges, purchase of furniture and medicines. Local allowance corresponds to another source of revenue coming from user fees collected by hospitals to cover the salary of health workers. Length of stay corresponds to the total number of days that patients spend in hospital. All outcomes are taken in logarithm. All regressions add to the baseline controls the total number of hospital admissions, and Columns (4), (6), (8) and (10) further control for the number of beds. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A24: Colonial settlement and hospital outcomes: Referral hospitals

Dep. Variable	Bed capacity (1)	Government transfers (2)	Health services: admissions Total (3)	Malaria (4)	Diarrhea (5)	Emergency (6)
Panel A. OLS						
Colonial settlement	0.325***	0.436***	0.161***	0.248***	0.064	0.186*
	(0.039)	(0.068)	(0.046)	(0.059)	(0.074)	(0.097)
Standardised β coefficient	0.279	0.201	0.117	0.148	0.043	0.090
R^2	0.35	0.30	0.32	0.32	0.30	0.25
Observations	478	423	474	478	478	472
Province Fixed Effect	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓
Panel B. 2SLS estimation						
Colonial settlement	0.373***	0.382**	0.132	0.220*	-0.077	0.090
	(0.091)	(0.177)	(0.110)	(0.131)	(0.127)	(0.176)
Standardised β coefficient	0.321	0.176	0.096	0.131	-0.052	0.044
Anderson-Rubin p-value	0.00	0.03	0.22	0.09	0.52	0.59
R^2	0.20	0.18	0.19	0.20	0.07	0.07
Observations	478	423	474	478	478	472
Province Fixed Effect	✓	✓	✓	✓	✓	✓
Baseline controls	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The Table presents a replication of the baseline results, restricted to general referral hospitals. Panel A presents the OLS estimates of equation (1). Non-dummy variables are all in natural logarithms. Baseline controls are those presented in panel A of Table 2. Robust standard errors in parentheses are clustered at the provincial level. Panel B presents the 2SLS estimates with the sleeping sickness instrument introduced in Section 5. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table A25: Colonial settlement: exploring additional channels

	ln(0.01 + Light) (1)	(2)	Malaria risk (3)	(4)	Ethnic power (5)	(6)	Concessions in CFS (7)	(8)	Local gov. (9)
Colonial settlement	-0.096	-0.081	0.004	0.004	-0.019	-0.013	-0.014	-0.004	0.089
	(0.099)	(0.061)	(0.010)	(0.007)	(0.021)	(0.011)	(0.030)	(0.019)	(0.057)
Standardised β coefficient	-0.025	-0.021	0.015	0.013	-0.020	-0.014	-0.013	-0.004	0.015
R^2	0.61	0.77	0.30	0.61	0.61	0.88	0.59	0.79	0.94
Observations	1,092	1,092	1,092	1,092	1,086	1,086	1,086	1,086	1,086
Mean dep. var	0.32	0.32	0.21	0.21	0.23	0.23	0.64	0.64	3.28
Province Fixed Effect		✓		✓		✓		✓	✓
Geographic controls	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The unit of observation is a hospital. The table presents the OLS estimates of equation (1). The dependent variables are $\ln(0.01+Light)$ to capture economic activity through nightlight, contemporary malaria risk, ethnic power, a dummy variably equal to one if a hospital is located in an area historically belonging to a private concession during the Congo Free State (CFS). In the last column, the dependent variable is defined as an indicator equal to one if the province governor was prosecuted for corruption (before 2017) interacted with the distance to the capital of the province to capture the influence of potential elite capture of government transfers. Robust standard errors in parentheses are clustered at the provincial level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

A Additional background information

A.1 Sleeping sickness and colonial medical expansion

Human African Trypanosomiasis (sleeping sickness) is a parasitic disease transmitted by tsetse flies and was endemic in large parts of Central Africa prior to European colonisation. Historical evidence indicates that African populations were aware of the ecological determinants of the disease and adapted settlement and economic activity accordingly (Janssens and Burke, 1992; Koerner et al., 1995).

In the early twentieth century, sleeping-sickness outbreaks escalated into large-scale epidemics across equatorial Africa, including the Belgian Congo. While the precise drivers of epidemic intensity remained poorly understood at the time, subsequent research shows that spatial variation in disease exposure was primarily driven by localized ecological interactions between parasites, vectors, humans, and animal hosts, rather than by colonial economic or administrative priorities (Ford, 1971; Franco et al., 2014). The disease spread along river systems and trade routes but remained geographically uneven. Colonial authorities responded to these epidemics by expanding medical surveillance and treatment capacity. Initial containment strategies relying on population isolation were gradually replaced by decentralized medical interventions, including mobile health teams operating in rural areas. These teams were tasked with population screening, treatment, and disease monitoring and frequently led to the establishment of permanent clinics and hospitals dedicated to sleeping sickness and other infectious diseases (Lyons, 2002). By the late 1930s, the burden of sleeping sickness had declined substantially, and by the end of the colonial period the disease was largely controlled (Ekwanzala et al., 1996).

Two features are critical for identification. First, tsetse fly habitat suitability was widespread across much of the territory, implying that observed variation in sleeping-sickness exposure reflects localized epidemic intensity rather than coarse ecological gradients alone. Second, colonial medical expansion followed disease exposure rather than preceding it, making historical sleeping sickness prevalence a strong predictor of colonial hospital placement while remaining orthogonal to pre-existing economic or political conditions.

A.2 Colonial health investments and persistence.

Prior to World War I, public health spending in the Belgian Congo was limited and largely confined to military and missionary medicine. During the interwar period, and especially after World War II, colonial authorities substantially expanded health investments in response to epidemic risks and economic exploitation needs (Dubois and Duren, 1947). The creation of the Department of Health in 1909 formalized a centralised system, and subsequent medical campaigns, combined with the Ten-Year Plan (1949–1959), generated large capital investments in hospitals, laboratories, and medical personnel.

These investments were sizeable by historical standards and resulted in a dense network of hospitals with comparatively high structural capacity by the eve of independence. This period represents the peak of public investment in health infrastructure. Following independence in 1960, state capacity deteriorated sharply: European medical personnel exited, public health budgets collapsed, and capital investment in hospitals stagnated (Mock et al., 1990). Kornfield (1986) examines how the quality of healthcare provision varies with hospital ownership. Using Lubumbashi, the second largest city in the country, as a case study, the author notes: "*There were three hospitals in the city. The most fully staffed and adequately equipped was the private hospital run by the large mining company. It was run very much like an American hospital with* *strict visiting hours. Parents were not hospitalized with their children as the staff was sufficient to give the complete attention to sick infants. It served the employees of the company and Zairian elite and Europeans. The least well-equipped and most inadequately staffed hospital which served the general population of the city was the public hospital run by the Zairian government. In this overcrowded hospital, families stayed with the patients, often slept on the floors of the hospital rooms, cooked their food, washed their laundry, and visited on the grounds within the inner court yard of the hospital buildings. The third hospital [...] was originally established by Catholic missionaries for the colonial community of the city. At the time of the study it served the university employees, including those professors and administrative staff who could not afford to use the mining company hospital, and those members of the population who could afford to pay for better care than was offered at the public hospital. It was better equipped than the public hospital but not as well as the mining hospital. The adequacy of its facilities and staff fell far below the minimum standards required of American and European hospitals*". Government health spending thereafter largely covered salaries, often irregularly, with little funding for new infrastructure or modernization.

This sharp discontinuity implies that hospitals established during the colonial period entered the post-independence era with substantially larger capital endowments than facilities built later. In a context of persistently low domestic health spending, these initial differences were never offset, providing a plausible mechanism for long-run persistence in hospital infrastructure and financing.

A.3 Modern-day health sector

The health system in DR Congo is made up of three levels: central, intermediate and peripheral. At the central level, the Ministry of Health is responsible for the national health strategies for each province of the country, and directly manages all general referral hospitals. In 2015, the DRC underwent a significant administrative reform that increased the number of provinces from 11 to 26. The intermediate level comprises provincial health divisions that coordinate between the central and local levels. In the decentralised Congolese economy, each of the 26 provinces of the DRC is ruled by a local government with a small autonomous budget. However, central government transfers account for the bulk of public health spending, while provincial governments contribute little (MSP, 2019).

The peripheral or operational level is the health zone. Each health zone integrates a network of health centres (first line of care, e.g. providing only ambulatory care) around a general referral hospital (serving as the main referral centre for health zones). Some rural health zones with limited access to a hospital also include referral health centres, which provide medical and surgical emergencies. The majority of non-hospital care is provided by the private sector, run mainly by health care professionals (Chenge et al., 2010).

The contemporary health system in the DRC is characterised by low domestic public financing and heavy reliance on external resources. Central government transfers account for the bulk of public health spending, while provincial governments contribute little. Development Assistance for Health represents roughly 40 percent of total health expenditures, and out-of-pocket payments account for nearly half (MSP, 2019).

Hospitals rely heavily on user fees to fund operating costs, including medicines, equipment, administrative staff, and wage supplements. Government salary payments are often irregular and incomplete. In this setting, historically established hospitals with larger infrastructure and administrative visibility face lower fixed costs of engagement for both the state and external donors.

Overall, the long-run evolution of the mortality rate suggests a steady improvement in population health (Figure A17 in Online Appendix) compared to the colonial era.

B Data Sources and variables definitions

B.1 Archival data

Georeferenced locations of colonial health settlements and modern hospitals. To construct a novel dataset of all geocoded colonial health settlements during the colonial period, we digitise and geocode colonial maps on health settlements between 1929 and 1959, 7 in total. These maps, produced by the Belgian Ministry of Colonies, provide information on the location of all hospitals and dispensaries that reported health activities to the colonial government.

We obtain the georeferenced locations of modern hospitals in the DRC primarily using DHIS2. Since the database provides incomplete information about the geographic coordinates of health facilities, we triangulated the geographic information of facilities from additional sources: ReliefWeb maps with detailed locations of health facilities in each of the 26 provinces in the DRC; the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) database, OpenStreetMap files and the International Committee of the Red Cross health maps.[23] ReliefWeb provides a list of geocoded health facilities in the DRC related to OCHA's humanitarian activities and OpenStreetMap is an open database routinely enriched by field observations, satellite images and integrated datasets. We supplement these maps with the location of health facilities supported by the International Committee of the Red Cross in 2018.

We then matched contemporary hospitals with colonial settlements based on the name of the facility and its geographic coordinates. As all hospital names with Belgian references changed after independence, we tracked all hospital names with a former Belgian name from multiple post-colonial sources to match the colonial names with modern hospitals (an example of such sources includes the following: https://en.wikipedia.org/wiki/List_of_renamed_places_in_the_Democratic_Republic_of_the_Congo).[24]

B.2 DHIS2 data

The DHIS2 (District Health Information System Version 2), is a health information system management developed, and supported by the University of Oslo (www.dhis2.org). The widespread implementation of the platform (more than 110 countries) is supported by global health partners such as the Global Fund, World Health Organization (WHO), UNICEF, USAID and GAVI, with the objective to strengthen Health Information System (HIS), and thereby inform evidence-based decision-making and strengthen health services delivery (Okonjo-Iweala and Osafo-Kwaako, 2007).

DHIS2 was first implemented in the DRC in 2013 at the national level. Routine data on key components such as health care programs, disease surveillance, stock management, finance, human resources, and infrastructure are collected at the health facility level. Additional information on a facility's catchment area is collected data on paper forms and transmitted to the facility by community health workers. At the end of each month, facilities send their

[23]These maps are obtained from the following websites: (ReliefWeb) https://reliefweb.int/; (OCHA) https://data.humdata.org/organization/ocha-dr-congo); (Red Cross) https://www.croixrouge-rdc.org/organisations/ and OpenStreet map (https://www.openstreetmap.org/).

[24]Using geographic location alone is insufficient as colonial maps only provide approximate geo-locations and new hospitals may have been built within a closed distance to colonial hospitals after independence.

Table A26: Maps of the colonial period

Document & Author	Year	Information
Administrative map, Goossens	1926	Administrative map
Institut cartographique militaire	1928	Communication channels
Religious missions map, Mission scientifique belge	1929	Religious missions
Annual Public Health report Belgian Congo	1933	map of sleeping sickness
Annual Public Health report Belgian Congo	1934	map of sleeping sickness
Annual Public Health report Belgian Congo	1934	Medical infrastructure
Annuaire des missions catholiques au Congo	1935	Colonial settlements
Annual Public Health report Belgian Congo	1935	Medical infrastructure (FOREAMI)
Annual Public Health report Belgian Congo	1936	Medical infrastructure
Annual Public Health report Belgian Congo	1936	map of sleeping sickness
Annual Public Health report Belgian Congo	1937	map of sleeping sickness
Annual Public Health report Belgian Congo	1938	map of sleeping sickness
Annual Public Health report Belgian Congo	1938	Medical infrastructure
Annual Public Health report Belgian Congo	1939	Medical infrastructure
Institut cartographique militaire	1939	Communication channels
Institut cartographique militaire	1940	Communication channels
Institut Géographique du Congo Belge	1946	Protestant missions
Annual Public Health report Belgian Congo	1947	map of sleeping sickness
Annual Public Health report Belgian Congo	1948	map of sleeping sickness
Annual Public Health report Belgian Congo	1948	Medical infrastructure
Institut Royal Colonial Belge, Index 624	1951	Population density
Annual Public Health report Belgian Congo	1952	map of sleeping sickness
Institut Royal Colonial Belge, Index 661.1	1953	Medical infrastructure
Institut Royal Colonial Belge, Index 663.2	1953	Map of Tse-tses
Institut Royal Colonial Belge, Index 622	1953	Mining concessions map
Institut Royal Colonial Belge, Index 67	1953	Public Force

Notes: Medical infrastructure refers to the geographic location of hospitals and health centres in Belgian Congo, along with their ownership (public, private, religious missions). Maps from Institut Royal Colonial Belge were collected from the Royal Academy for Overseas Sciences (https://www.kaowarsom.be).

routine data on key epidemiological, social, and financial indicators to the coordinating health zone office (*Bureau Central de la Zone de santé, BCZ*), and the paper forms are subsequently entered into the DHIS2 platform, managed and owned by the *Système National d'Information Sanitaire* (SNIS), of the Ministry of Health. The facility data are collected and analysed at the provincial level, and transmitted to the Ministry of Health to monitor the evolution of national programme outcomes, stock management, and disease surveillance. We cross-validate the self-reported data in the DHIS2 with estimates from external sources (IMF, World Bank, WHO) on the number of health workers, doctors, beds, and health aid. The matching of these estimates with the reported data in the DHIS2 at the national level gives further confidence in the accuracy of the database.

The following variables are extracted from the DRC DHIS2 (https://snisrdc.com/):

Population: Log of population in the catchment area of a hospital (approximately equal to district population) as reported in the DHIS2.

Government transfers: Funding allocated from the central government to a hospital, that

Table A27: Sources for Public health in Belgian Congo

Document	Year	Information
Annual Public Health report Belgian Congo	1932	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1933	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1934	Colonial settlements & public health spending
Annual Public Health report Belgian Congo	1935	Colonial settlements & public health spending
Annual Public Health report Belgian Congo	1936	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1937	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1938	Healthcare organisation & public health spending
Annual Public Health report Belgian Congoo	1939	Colonial settlements & public health spending
Annuaire des missions catholiques au Congo	1935	Colonial settlements & Healthcare organisation
Annual FOREAMI report	1935	Colonial settlements & Healthcare organisation
Annual Public Health report Belgian Congo	1940 - 1944	Colonial settlements & public health spending
Annual Public Health report Belgian Congo	1946	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1947	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1949	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1950	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1951	Colonial settlements & public health spending
Annual Public Health report Belgian Congo	1953	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1954	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1955	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1956	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1957	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1958	Healthcare organisation & public health spending
Annual Public Health report Belgian Congo	1959	Healthcare organisation & public health spending
Annual statistics: Medical missions	1938	Healthcare organisation & public health spending
Annual statistics: Medical missions	1946	Healthcare organisation & public health spending
Annual statistics: Medical missions	1947	Healthcare organisation & public health spending
Annual statistics: Medical missions	1948	Healthcare organisation & public health spending
Annual statistics: Medical missions	1949	Colonial settlements & public health spending
Annual statistics: Medical missions	1950	Healthcare organisation & public health spending
Annual statistics: Medical missions	1951	Healthcare organisation & public health spending
Annual statistics: Medical missions	1950	Healthcare organisation & public health spending
Annual statistics: Medical missions	1952	Healthcare organisation & public health spending
Annual statistics: Medical missions	1953	Colonial settlements & public health spending
Annual statistics: Medical missions	1954	Healthcare organisation & public health spending
Annual statistics: Medical missions	1955	Healthcare organisation & public health spending
Annual statistics: Medical missions	1956	Healthcare organisation & public health spending
Annual statistics: Medical missions	1957	Healthcare organisation & public health spending
Annual statistics: Medical missions	1959	Colonial settlements & public health spending

Notes: Colonial settlement refers to geographic information about a health settlement. Healthcare organisation refers to any information about the number of doctors, nurses, beds, European and Congolose populations, and the disease burdens in Belgian Congo reported by the public health authorities.

is essentially used for payments of health worker salaries and occupational risk allowances. The amount is expressed in 2017 US Dollars.

Bed capacity: Total number of beds in a hospital as reported in the DHIS2.

Health workers: Total number of nurses working in a hospital, including A1 (nursing colleges with undergraduate degree), A2 (secondary level of nursing school (diploma)) and L2 (graduated with a 5 year university degree)levels.

Physicians: Total number of general and speciality physicians in a hospital as reported in the DHIS2.

Total patients: Monthly average of total inpatients and outpatients.

Malaria: Monthly average of severe malaria cases treated between January 2017 and De-

Table A28: Documents collected on Public financing

Document	Year	Author	Publisher
Annuaire Statistique Congo Belge 1924-25	1927		Ministere Interieur et Hygiene
Le probleme economique au Congo Belge	1932	O. Louwers	Institut Royal Colonial Belge
Budget bill Congo Belge	1932		
Budget bill Congo Belge	1934		
Budget bill Congo Belge	1935		
Budget bill Congo Belge	1936		
Indices conjoncture économique du Congo Belge	1933	G. Eyskens	Bulletin de l'Institut de Recherches Économiques et Sociales
Le Congo économique	1938	J. Onckelinx	Bulletin de l'Institut de Recherches Économiques et Sociales
Le Congo Belge et la politique de conjoncture economique	1946	Van de Putte	Institut Royal Colonial Belge
La situation économique du Congo belge 1940-46	1948	M. Masoin	Bulletin de l'Institut de Recherches Économiques et Sociales
Bulletin de l'Institut de Recherches Économiques et Sociales	1949		
Situation économique du congo belge	1950		Etudes et conjoncture - Economie mondiale
Situation économique du congo belge	1953		Ministere des Colonies
Bulletin d'information et de documentation Congo Belge	1952		Banque Nationale de Belgique
Essai sur la zone monétaire belge	1954	C. Lefort	Revue économique
Budget bill Congo Belge	1954		
Economic planning and development in Belgian Congo	1955	J. Huge	Annals of the American Academy of Political and Social Science
Annuaire Statistique Congo Belge 1956	1957		Institut National de la Statistique
Rapport EA-77A Economy of Belgian Congo	1957		IBRD
Economie du Congo	1958		Bulletin de la Banque centrale du Congo belge et du Ruanda-Urundi
The economy of the Belgian Congo	1959	R. Bertieaux	Institut de Sociologie de l'Université de Bruxelles
La situation économique du Congo	1961	R. Bertieaux	Louvain Economic Review
La situation économique du Congo	1963	J. Lacroix	Louvain Economic Review
Sante Congo	1963		Mission assistance technique CEE Congo
L'Économie Congolaise 1960-65	1968	M. Norro	Institut de Recherches Economiques et Sociales
Rapport AF-23A Economie de la Republique du Congo	1964		IBRD
Blocage de la croissance economique en RDC	1967	H. Vander Eycken	Revue Tiers Monde
African Public Finances	1968	G. Martner	Latin American Institute for Economic and Social Planning
Situation Economique et Sociale Congo	1971	F. Bezy	IBRD
Rapport 821-ZR Economie du Zaire	1975		IBRD
Rapport 1407-ZR Economie du Zaire	1977		World Bank Archives
Rapport 2518-ZR Economie du Zaire	1979		World Bank Archives
Rapport 4077-ZR Economie du Zaire	1982		World Bank Archives
Rapport 5417-ZR Economie du Zaire	1985		World Bank Archives
Zaire population, Health, Nutrition	1989		World Bank Archives
Rapport 8995-ZR Zaire examen Depenses de l'Etat	1991		World Bank Archives
Zaire: Background information and Statistical data	1996		IMF country report
Zaire's hyperinflation 1990-96	1997	P. Beaugrand	IMF country report
DRC: : Poverty Reduction Strategy Paper	2003		IMF country report
DRC: : Poverty Reduction Strategy Paper	2004		IMF country report
DRC: : Poverty Reduction Strategy Paper	2007		IMF country report
DRC: : Poverty Reduction Strategy Paper	2010		IMF country report
DRC: : Poverty Reduction Strategy Paper	2011		IMF country report
DRC: : Poverty Reduction Strategy Paper	2013		IMF country report
DRC: : Poverty Reduction Strategy Paper	2015		IMF country report
Rapport 96172-ZR Revue de la gestion des depenses publiques	2015		World Bank
DRC Country report	2018		IMF country report
DRC Country report	2021		IMF country report

Notes: IBRD: International Bank for Reconstruction and Development; IMF: International Monetary Fund.

cember 2021. Severe malaria treatment relies on artesunate injection and differs from uncomplicated malaria treatment (artemisinin-based combination therapies).

Diarrhea: Monthly average of patients treated for diarrhea.

Emergency: Monthly average of patients treated in the emergency department.

Investment: Monthly average of investment in a hospital as reported in the DHIS2. The amount is expressed in 2017 US Dollars.

Value of ward stock: Monthly average of the value of ward stock pharmacies in a hospital as reported in the DHIS2. The amount is expressed in 2017 US Dollars.

Expenditure: Monthly average of expenditure in a hospital as reported in the DHIS2. The amount is expressed in 2017 US Dollars, as a monthly average between January 2017 and December 2021.

Revenue: Monthly average of revenue in a hospital as reported in the DHIS2. The amount is expressed in 2017 US Dollars.

Local allowance: Local allowance corresponds to the share of user fees collected by a hospital that is distributed to health workers. The amount is expressed in 2017 US Dollars.

Length of stay: Number of days stayed by all inpatients in a hospital.

US Health aid: dummy variable that indicates whether a hospital receives medical or financial support from the U.S. Agency for International Development (USAID), as reported in DHIS2.

Health aid: dummy variable that indicates whether a hospital receives medical or financial support from external sources. This information was collected from the DRC websites of Médecins Sans Frontières (MSF), the International Committee of the Red Cross, U.S. Agency for International Development (USAID), the Global Fund, World Health Organization (WHO), World Bank, and the United Kingdom Department for International Development (DFID).

B.3 Additional data

Distance to coast: The geodesic distance from each hospital to the nearest coastline measured in km. Colonial hospital locations are obtained from multiple maps from colonial archival data between 1929 and 1956. Figure A8 presents such a map.

Distance to transport: The geodesic distance from each hospital to the nearest transportation mode, which comprises railways, paved road and main rivers as navigation mode measured in km. The communication channels during the colonial period are obtained from a 1928 map on public services in Belgian Congo from the *Institut Cartographique militaire Service Cartographique du Ministère des Colonies*. Additional information on transport connections from the International Bank for Reconstruction and Development (IBRD, 1957) supplements the mapping before independence in 1960. Euclidean distances are calculated with ArcGIS.

Natural resources: A dummy variable equal to one if a hospital is located within a geographic area that contains natural resources (gold, diamond, copper, tin, bauxite, coal, cobalt, iron, manganese, and uranium), as reported by the colonial administration (using the 1953 mining concessions map from the *Institut Royal Colonial Belge*, and after independence (with the 1969 map of mines and industries from *Institut géographique du Congo*).

Distance to electrical infrastructure: data on electricity infrastructure in the DRC obtained from a model developed in collaboration between the Energy Sector Management Assistance Program (ESMAP) at the World Bank, KTH Royal Institute of Technology, World Resources Institute (WRI), the University of Massachusetts Amherst and Facebook. The model combines night lights imagery collected from the Visible Infrared Imaging Radiometer Suite (VIIRS) band sensor on board the NASA Suomi satellite with GIS data on roads from OpenStreetMap and global land cover Moderate Resolution Imaging Spectroradiometer (MODIS).

Distance to the provincial city: The geodesic distance from each hospital to the main provincial city during the colonial period measured in km (Leopoldville, Costermansville, Albertville, Elisabethville, Stanleyville).

Distance to armed conflicts: The geodesic distance from each hospital to a civilian conflict (defined as political violence and protest). The data is obtained from the Armed Conflict Location and Event Data Project (ACLED) which reports georeferenced information on political violence and protests between January 2017 and December 2021.

Distance to Regional Distribution Centre: The geodesic distance from each hospital to the nearest Regional Distribution Centre (*Centrale de Distribution Régionale*, CDR). The 19 CDRs across the DRC supply public, private and faith-based health facilities with essential medicines and other pharmaceutical products. The list of CDRs in 2017 was obtained from the Department of Pharmaceuticals and Medicines (*Direction de la Pharmacie et du Médicament)*, Ministry of Health (`https://http://dpmrdc.org/BASE-DES-DONNEES`).

Malaria risk rate: indicator of the malaria parasite transmission intensity in 2017 obtained from the Malaria Atlas Project to account for the spatial heterogeneity of malaria transmission in the DRC. The *Plasmodium falciparum* parasite rate (PfPR) is an index of malaria transmission intensity which estimates the proportion of children aged 2 to 10 who carries the parasite (Hay and Snow, 2006). Annual median of PfPR in 2017 was obtained at approximately 5 km resolution from the Malaria Atlas Project (https://map.ox.ac.uk).

Ethnic Political Power: a dummy variable to indicate whether the ethnic group in the geographic area where a hospital belongs is politically active, with access to executive government power. Data was collected from the GROWup platform on settlement patterns of politically active ethnic groups developed by Bormann et al. (2015). We code as dominant an ethnic group that has been dominant either during the Mobutu regime or at anytime since 1999, corresponding to the modern DRC period.

Light: nightlight data obtained from the NASA/NOAA Visible Infrared Imaging Radiometer Suite (VIIRS) sensor between 2018 and 2020.

Elevation: Data collected using satellite images obtained from the Shuttle Radar Topography Mission (SRTM). The data provide elevation information at the 30 arc-second resolution, corresponding to approximately to a cell of one square kilometer near the equator.

Slope: Calculated in degrees using information from the Shuttle Radar Topography Mission (SRTM).

Historical population density: Population density during the colonial period using a digitised map on population density in 1921 from Trewartha and Zelinsky (1954), and a 1951 map from the Institut Royal Colonial Belge. we further collect data on population density in 1800 from the History Database of the Global Environment (HYDE) version 3.3

Ruggedness index: Terrain Ruggedness index using the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (GDEM) version 3 (https://lpdaac.usgs.gov/products/astgtmv003/).

Soil suitability: Suitability of index for cassava, maize, cotton and rubber collected from the Food and Agriculture Organization's Global Agro-Ecological Zones v4 model (FAO-GAEZ v4): https://gaez.fao.org/.

Development Aid: Geocoded aid projects reported by the government of the DRC Aid Information Management System (AIMS) between 1998 and 2014. The donors are the Department for International Development (UK), European Commission, KfW Bankengruppe, Embassy of Sweden, Embassy of Canada, Embassy of Japan, Embassy of Sweden, Embassy of Belgium, Embassy of Netherlands, Embassy of Germany, Korea International Cooperation Agency, USAID, World Bank, UNDP, Deutsche Gesellschaft Technische Zusammenarbeit, African Development Fund. Data collected from DRC AIMS Geocoded Research release, version 1.3.1, 2016.

Chinese Aid: Geocoded Chinese aid projects in the DRC, which correspond to loans and grants from official sector institutions in China. Data collected from AidData's Global Chinese Development Finance Dataset, Version 3.0 (Custer et al., 2023).

Local government corruption: a dummy variable equal to one if the province governor between 2017 and 2021 was prosecuted for corruption before 2017, and interacted with the distance to the provincial capital to capture the influence of potential elite capture of government transfers. Data on the existence of a motion of no confidence initiated against a provincial governor was collected from local media websites for each of the 26 provinces (e.g. Radio Okapi : https://www.radiookapi.net/; Actualite CD: https://actualite.cd/; 7sur7 CD: https://7sur7.cd/; Congo Quotidien: https://www.congoquotidien.com/).

C Long-run series of public finances

We build long-run series of the share of domestic health expenditures in the total budget, public revenue, and expenditure by drawing on numerous data sources for different sub-periods: during the colonial period, the series primarily relies on national reports of the Belgian Congo from Ministry of Economic and Financial Affairs, statistical yearbooks and bills containing the ordinary budget. In the post-independence period, data was mostly obtained from the International Monetary Fund (IMF), the World Bank, and the International Bank for Reconstruction and Development (IBRD) reports. Additional reports from the Central Bank of the Congo (Zaire) supplemented the data collection. A full description of these data sources is presented in Online Appendix Section B.1. We further cross-validate the data from the Colonial reports of the Belgian Congo with IMF, World Bank and IBRD reports to ensure that observed differences between the colonial and postcolonial periods are not driven by differing reported measures between the Belgian colonial administration and the international institutions. The novel data covers the period from 1920 to 2020, which allows to examine public finances from the inception of the health system in the colony to the end of the colonial period, the transition to independence, and the evolution until the modern period. For data from 1950 onward, we cross-validate aggregate population and revenue figures with Maddison (2001), in addition to using national sources.

We further construct a series of Gross Domestic Product (GDP) using existing estimates for the 1920 - 1960 period from Eycken and Vorst (1967) and Lacroix et al. (1967), national accounts (Zaire and modern DRC), and IMF reports for the post-colonisation period.

D OLS Results

D.1 Omitted variables

Online Appendix Tables A10 and A11 report in Panel B estimates of the breakdown point (the proportional degree of selection of unobservables relative to observables needed to overturn the baseline results) δ at which the colonial effect $\beta = 0$ remain above the minimum recommended threshold of one (Altonji et al., 2005; Oster, 2019). We follow the recommendations of Diegert et al. (2024) to calculate the correct δ with the choice $R^2_{long} = 1.3 \times \hat{R}^2_{med}$, where R^2_{med} and R^2_{long} correspond respectively to the R^2 in the regression with a minimum set of covariates, and the long regression with additional controls. The estimates suggest a limited scope for omitted variable bias. The methodology developed by Oster (2019) relies on the assumption that the omitted variables are uncorrelated with all observed covariates. Diegert et al. (2024) (DMP) propose an alternative approach that relaxes the exogeneity assumption. We report estimates of the breakdown point $\bar{r}_X^{\mathsf{bp}}$ proposed by Diegert et al. (2024) in the second row of Panel B. The set of calibration covariates includes the baseline geographic controls and province fixed effects. The breakdown point estimates indicate that omitted variables would have to be as strong as all observed geographic controls to overturn the colonial effect, both for government transfers and bed capacity.[25] Given the wealth of our geographical and historical level data, it seems rather implausible that the strength of the correlation between between colonial settlement and unobservables is greater than the correlation with observables. Nonetheless, we investigate alternative strategies in the following sections to address the concern of potential omitted variable bias.

[25] Diegert et al. (2024) show that we can no longer compare the estimates to the benchmark of one with equal selection when controls are endogenous.

D.2 Missing values and data quality

Hospital outcomes are drawn from administrative data reported through the DHIS2 platform. A potential concern is that colonial-origin hospitals may exhibit systematically higher reporting quality, mechanically generating higher measured government transfers or infrastructure. To assess this possibility, Online Appendix Table A13 examines the relationship between colonial origin and two data-quality indicators used by the Ministry of Health: completeness (the share of required indicators reported) and timeliness (whether reports are submitted within the prescribed period). Colonial origin is associated with a statistically significant but quantitatively small increase in completeness and a reduction in timeliness. Both effects disappear once we control for whether a facility is classified as a general referral hospital. This pattern suggests that the raw differences primarily reflect the over-representation of larger referral hospitals among colonial facilities, which face more complex reporting requirements and therefore tend to report with greater delay.

A second concern relates to missing values in government transfer data. The DHIS2 system does not allow hospitals to report zero values, raising the possibility that some missing observations correspond to true zeros. This concern is mitigated by the long observation window (48 months), which makes persistent non-receipt of transfers unlikely for most facilities. To further assess sensitivity, we interpolate missing values using information on reporting completeness and timeliness, following the Ministry of Health's benchmark of 80 percent for each indicator.[26] As shown in Online Appendix Table A14, the estimated effect of colonial origin on government transfers remains positive and statistically significant, though less precisely estimated as the share of interpolated observations increases.

We further characterise hospitals that never report government transfers (Table A15). These facilities are smaller, more urban, less exposed to malaria risk and conflict, and substantially less likely to have a colonial origin. Approximately two-thirds are private hospitals, for which transfers are typically smaller (MSP, 2019). Consistent with this pattern, the share of private hospitals falls below 20% among facilities reporting transfers.

Finally, Table A16 reports simulation-based imputations in which missing transfer values are replaced with extreme values from the distribution (e.g., bottom or top 1 percent, by ownership type). Across all scenarios, the estimated effect of colonial origin on government transfers remains sizeable, reinforcing the conclusion that differential reporting or underreporting does not drive the main results.

E Matching procedure

The matching procedure imputes counterfactual observations by pairing colonial hospitals with their nearest post-independence neighbours from a predefined set of matching covariates, and exploits the large size of the control group (post-independence) relative to the treatment group (colonial hospitals). To reduce heterogeneity, we impose exact matching on the type of hospital (referral vs non-referral).

Spatial matching should ensure that matched hospitals share similar geographic characteristics and, consequently, address the concern that colonial settlements are located in areas with better geographical access or better climatological and epidemiological conditions (or conversely, some hospitals could operate under more adverse environmental factors).

The identification and consistency of the estimate rely on two assumptions: i) unconfoundedness or random assignment of the treatment (*i.e.* the exposure to the treatment is independent

[26] https://dhis2.org/drc-data-use/.

of the outcome variable conditional on all relevant characteristics to the probability of treatment being observed) and ii) common support assumption, whereby the probability of being a colonial or a post-independence hospital given a set of observable covariates should be positive.

We argue that both assumptions should be valid in this exercise. Although the location of colonial settlements might be motivated by several factors that include geographic characteristics, the exact location of a medical mission at a sufficiently small geographic level should also bear a randomised component. The favourable conditions that could motivate a settlement decision such as the proximity to a transportation mode, the economic activity of the area or the burden of disease among the local population locally form a continuum of location points with pre-defined characteristics of interest. The optimal location site of a hospital is then unlikely to be unique and should bear a random component. The colonial settlement should not preclude the construction of hospitals in its vicinity if the geographical area of optimal conditions is sufficiently large, or the population density is high enough.[27] The existing public infrastructures during the colonial period might also have opened up additional possibilities of locations for new hospitals and increased, thereby, the area of potential construction sites. Our assumption is further supported by the absence of spatial context in which hospital plans were designed and sketched. According to De Nys-Ketels et al. (2019), hospital plans were "[...] drawn in an empty, blank environment. Although these hospitals would be constructed at numerous, different locations, their varying surroundings were deemed irrelevant and reduced to a virtually homogeneous emptiness. Rural Congo was assumed a climatically and socio-culturally isotropic territory."

F IV: sleeping sickness

We collect data on the geographic distribution of the sleeping sickness from the public health reports of the Ministry of Colonies (maps in 1910, 1928, and 1933 to 1938). The maps were produced as a result of surveys of sleeping sickness conducted across regions of the Congo by the colonial medical services in the corresponding years. After digitising the maps, we constructed the sleeping instrument as the geographic area where the reported prevalence of the disease is at least equal to 1% (i.e. a threshold set by the colonial authorities).

F.1 Historical sleeping sickness exposure and falsification tests

Does historical sleeping-sickness exposure proxy for persistent location advantages, such as administrative reach, accessibility, or development, that would also attract hospitals after independence? We examine this question by assessing whether territories (the main administrative unit below provinces) historically affected by sleeping sickness are systematically closer to hospitals constructed after independence. Columns (1)–(2) of Table A18 report estimates from OLS regressions of the log distance from a territory centroid to the nearest post-independence hospital on an indicator for historical sleeping sickness exposure. Shorter distances would indicate greater postcolonial hospital density in areas historically exposed to the disease. We find no such relationship, suggesting that sleeping sickness exposure does not proxy for time-invariant locational advantages that mechanically attract hospitals across periods.

Yet, sleeping sickness exposure may proxy for persistent administrative salience and state presence, beyond colonial medical investments. We address this concern by assessing the rela-

[27] The geographical distribution of hospitals in the DRC is often characterised by a concentration in urban centres (Chenge et al., 2010).

tionship between sleeping sickness exposure and several complementary proxies for non-health state presence. First, settlement density is measured using the count of officially recorded *localités* and the presence of administrative centres (*chef-lieux*). Second, transport infrastructure is proxied by the total length of primary and secondary roads within a territory. Third, night-time lights are used to proxy for local economic activity. Lastly, we exploit a 1953 map of the colonial public security force, *Force Publique*, that depicts the locations of military and administrative facilities during the colonial period. If sleeping sickness exposure were capturing persistent administrative salience or general location advantages, it should predict these non-health proxies of state presence.

Although these falsification tests are not designed to yield causal estimates, the resulting confidence intervals are informative about economic magnitudes. In particular, for proximity to post-independence hospitals, locality density, night-time lights, and *Force Publique* presence, the 95% confidence intervals rule out economically meaningful effects of sleeping sickness exposure in the direction implied by the state presence hypothesis. For example, for distance to postcolonial hospitals and night-time lights, the upper bound of the confidence interval corresponds to less than 20% of the mean outcome, while for distance to *Force Publique* it is less than 5% of the mean. Estimates for road infrastructure are less precise, reflecting the noisier measurement of transport networks at this level of aggregation, but are not systematically different from zero.

F.2 Testing LATE assumptions

We follow the test procedure developed by Farbmacher et al. (2022) that employs random forests and classification and regression trees to find violations of exclusion assumption. The test first consists of splitting the data sample along the covariate space using pruned regression trees to find relevant subgroups where potential violations are more likely to be found. The full data sample is partitioned with the classification and regression trees (CART) algorithm along the observable covariates in a way that maximises effect heterogeneity across the newly formed partitions. Causal forests are then used to estimate the magnitude of the potential violations in these subgroups by combining results from a large number of trees built on random subsamples of the data. Positive values of the causal forest estimates indicate local violations. Finally, the null hypothesis of no local violation of the exclusion assumption is tested using Bonferroni-corrected critical values for multiple hypothesis testing. Any violation in at least one subpopulation would challenge the validity of the instrument. The results in Table A21 rule out local violations and provide further confidence that the historical distribution of sleeping sickness should not be correlated with modern hospital characteristics.

F.3 Relaxing instrument exogeneity

In this section, we relax the strict exogeneity assumption by following the plausibly exogenous methodology in Conley et al. (2012) that allows for a direct effect of sleeping sickness on government transfers and bed capacity respectively. Consider the following structural equation:

$$\mathbf{Y}_{ij} = \beta Colonial_{ij} + \delta Sleeping_{ij} + \epsilon_{ij}$$

with $Colonial_{ij}$ the endogenous variable, and $Sleeping_{ij}$ the instrumental variable. Under strict exogeneity assumption, the instrument $Sleeping_{ij}$ has no direct effect on the outcome $\mathbf{Y}_{ij}$ and δ is equal to zero. Conley et al. (2012)'s methodology departs from this latter assumption by allowing to flexibly specify a range of non-zero values that δ can take, in the above structural equation. Conley et al. (2012) show that their approach is particularly well suited to empirical applications with strong instruments, which is the case with the sleeping sickness instrument. The graphs in Figure A18 display all estimated 95% confidence intervals for β that vary with $\delta \in [0, g_{max}]$ using the "Union of Confidence Interval" approach (g_{max} denotes the maximum value of δ, set at 0.6 for government transfers and 0.3 for bed capacity). To contextualise the magnitude of δ, note that the overall reduced-form estimate of the effect of the sleeping sickness instrument on the outcome of interest is 0.276 for government transfers and 0.183 for bed capacity (indicated by vertical green lines in the graphs). The figure illustrates that to overturn our IV results, the direct effect of sleeping sickness on the outcome would have to exceed two-thirds of the reduced-form effect for government transfers (with an estimated $\hat{\delta}$=0.451), and over 85% of the reduced-form for bed capacity (with an estimated $\hat{\delta}$=0.225). Given the weak association established through the multiple falsification tests, such conditions appear highly implausible.

G Additional channels

We explore in this section additional channels that could drive our results.

Economic development. We first explore whether the colonial effect could operate through higher levels of local economic development across the country, using nightlight luminosity data. Early colonial exposure could have favoured state-making and higher public investments with positive long-term effects on contemporary development. The colonial effect on government transfers would then be mediated by the government's promotion of areas with higher economic development through greater provision of public goods (Besley and Persson, 2011). Columns (1-2) of Table A25 report the effect with and without province fixed effect and document a negative relationship with economic outcome.

Malaria risk. The enormous modern health burden of malaria could find its origin in colonial development. Although we control for the risk of malaria burden in our baseline results, the statistically significant effect of colonial origin found with OLS estimation on patients treated with malaria suggests that the disease may have an important role. However, Columns (3-4) of Table A25 do not show any statistical significance of colonial settlement on malaria risk.

Ethnic favouritism. Colonial activities could have favoured the establishment of an educated and politically-oriented group that evolved into a powerful, corrupted elite after independence. This political elite could subsequently have favoured their home regions/towns for the allocation of public (including health) resources (Burgess et al., 2015). To test the relevance of ethnic representation at the national level, we retrieve information on politically relevant ethnic groups from the Ethnic Power Relations (EPR) dataset (Vogt et al., 2015), where a group is defined as politically relevant if at least one political organization claims to represent it in national politics or its members are subjected to state-led political discrimination. We construct an indicator variable equal to one if the geographical ethnic area to which a hospital belongs is politically relevant during the 2017-2021 period, or if it was historically relevant during the 1965-1997 Mobutu era, and zero otherwise.[28] Because of the small number of persons who ruled the country in the postcolonial period, we are likely to identify the presence of ethnic favouritism with the central government if it exists in the government transfers to hospitals.[29]

[28] A concern about the validity of this coding could be that ethnic identity of the government forces and the executive power may differ in some settings (Harkness, 2022). Using information from the Ethnic Stacking in Africa Dataset (ESAD) confirms that this concern does not apply to the DRC, where the ethnicity of both political leaders and the military has historically been aligned.

[29] Joseph Mobutu ruled the Congo from 1965 to 1997. Laurent Kabila became the new President of the DRC until his assassination in 2001. He was succeeded by his son, Joseph Kabila, who remained President until 2019.

Our results in Columns (5-6) rule out this possibility.

Congo Free State and mining concessions. We next consider mining concessions which may have indirect persistent effects. During the Congo Free State (before 1908), the state partitioned the territory into economic and social areas, to ensure the preponderance of Belgian capital through granted concessions to private enterprises. Although the largest companies were dissolved after 1908, the interdependence between the state and private enterprises continued to affect the development of institutions and political control during the latter period of the colonisation of the Belgian Congo (Vellut, 1981). It is then possible that colonial health investments were higher in these areas. Historical exposure to the concessions also has a negative long-run effect on local development and health outcomes (Lowes and Montero, 2021), which could motivate differential allocations of public resources. We do not find supportive evidence for this channel in Columns (7-8).

Institutional quality. Another possibility is that colonial settlements contributed to establishing relatively higher-performing local institutions. To circumvent the lack of information on local governance quality, we investigate whether colonial settlements are associated with the current level of corruption. Whilst misuse of public funds could prevent health facilities from reaching their full share of government funding, the local institutions established by colonial settlements may participate in deterring the embezzlement of public funds (for example, dedicated departments of inspection of local resources, or transparency indicators). To explore this assumption, we collect data on motion of no confidence initiated against a provincial governor before 2017 as a proxy for the embezzlement of public funds. We construct a dummy variable equal to one if the province governor was prosecuted for corruption, interacted with the distance to the provincial capital to capture the influence of potential elite capture of government transfers. Column (9) of Table A25 shows that the colonial effect is not statistically significant at the conventional level.

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A member of the Ngbandi ethnic group, Mobutu was born in the Mongala province but grew up in the village of Gbadolie, in the province of Nord-Ubangi, where he later established his infamous presidential palace; Laurent Kabila was from the Tanganyika province with both Luba and Lunda ethnic origins; Joseph Kabila is from the South Kivu province.

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