Inherited Inequalities: Postcolonial Health Supply and Demand in India*

Kunal Panda†

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Abstract

This paper demonstrates that regions historically under direct British rule in India exhibit stunted infant growth, malnutrition, and worse living standards than those in formerly indirectly ruled areas. Colonial-era differences in state fiscal capacity emerge as a crucial mechanism, with lower revenue per capita in directly ruled regions explaining nearly half of the differences in household material conditions and a third of the infant health gap. Moreover, colonial rule translates into enduring channels: on the supply side, a novel database of 19th-century health infrastructure reveals that directly ruled regions received lower investments, despite similar facility counts. This supply deficit remains persistent, including poor quality. On the demand side, I document constrained health-seeking behavior: fewer prenatal visits, delayed postnatal care, non-institutional childbirth, and service utilization patterns that reflect underlying deprivation apart from effective healthcare provision. The findings show that extractive colonial governance undermined long-run human capital due to weak state capacity and household economic resilience.

Keywords: Colonial India, Public Health, British Rule.
JEL Codes: I15, N35, O15.

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†PhD Candidate, Department of Economics, Sciences Po, Paris. Email: kunal.panda@sciencespo.fr. Website.

Introduction

The development of postcolonial economies has been studied through property rights, governance, and human capital (Acemoglu, Johnson and Robinson, 2001; Bertocchi and Canova, 2002; Nunn, 2008). Yet, the mechanisms linking colonial administration to *health* disparities—particularly through public infrastructure and intergenerational welfare—remain understudied. While colonial public health systems often prioritized epidemic control over equitable care (Arnold, 1994; Amrith, 2006; Lowes and Montero, 2021), their enduring impacts on maternal and child health are poorly understood. Did colonial underinvestment in health infrastructure compound with worsening material conditions? Or did postcolonial development mitigate these gaps?

Anthropometric data, especially height, are widely used to measure health disparities and economic welfare. [1] Height also has a strong predictive ability for future human capital, cognitive ability, and labour productivity, prompting widespread scholarship on the effect of economic shocks on early-life conditions. (Strauss and Thomas, 1998; Perkins et al., 2016; Baten and Maravall, 2021). In this paper, I examine the case of India, which exhibits a paradox of stature - despite rapid economic growth, average heights stagnate among the world's lowest (Deaton, 2008). India's record in the global burden of disease lags behind emerging economies, ranking 125th in life expectancy and 97th in undernutrition (Grebmer et al., 2016; WHO, 2016). As of 2025, 37 % of Indian children remain stunted and 16 % underweight (Government of India, Rajya Sabha, 2025), reflecting persistent deprivation. Literature studying the roots of South Asian stature is divided between bioclimatic adaptation (Pomeroy et al., 2019) and colonial famine policy as an intergenerational driver of selective mortality (Sen, 1982; Davis, 2001; Wells, 2016).

I provide, to the best of my knowledge, the first evidence of contemporary stature loss due to colonial-era governance in India. I use rich household-level data from the Demographic and Health Survey (DHS) for infant and adult anthropometry. The exogenous variation in British rule stems from the Doctrine of Lapse (1848-1856), where the East India Company annexed regional kingdoms if the ruler died without a natural heir (Iyer, 2010). This study focuses on the durable effects of public health neglect, demonstrating how colonial-era underinvestment in health systems compounded with long-term biological disadvantages, plausibly independent of mortality shocks. By tracing these effects through both supply-side constraints and demand-side health behavior, this paper provides a unified account of how historical governance distorts contemporary human capital outcomes.

Infants in historically British-ruled regions are 9 millimeters shorter and 300 grams lighter on average—equivalent to 20 % of a standard deviation—compared to those from indirectly ruled areas. The magnitude of the height loss is 1.5 times higher than the effects of settler colonialism in French Morocco (Salem, 2024), and five times higher than the stature loss caused by Phylloxera infestation in 19th-century French vineyards (Banerjee et al., 2010). Relative to conflict-driven shocks, my findings are 1.2 times higher than the effects of the Biafra War (1967-70) (Akresh et al., 2012) and 1.8 times higher than the effects of the Vietnam War (1955-1975) (Yamada and Vu, 2025). These effects remain robust after accounting for spatial dependence and fertility differentials, though persistent infant mortality patterns suggest these estimates may understate the

[1] Fogel (1994) provides a cross-country review of height gain and reduced mortality with economic growth. Moreover, chronic malnutrition is linked with labour force participation and productivity, adjusting for labour intensity using caloric requirements. Steckel (2009) reviews height as a barometer of the standard of living, especially in historical contexts where other data is scarce.

true stunting impact, assuming that surviving children are positively selected on height. I also find that households in formerly British-ruled regions exhibit lower asset ownership and poorer access to sanitation and water. Finally, adult women in these regions demonstrate substantially poorer anthropometric outcomes, with a height and weight loss of almost 3 centimeters and 4 kilograms, respectively.

I further investigate demand and supply channels that may explain stunted infant heights. On the supply side, I examine three colonial-era channels identified by Iyer (2010): non-landlord-based land tenure systems, state revenue per capita, and whether native rulers were ever deposed for misrule. The analysis reveals that infant and household conditions in formerly British-ruled regions are comparable to the "worst-performing" native states where rulers were deposed, confirming the general role of colonial governance documented in Iyer (2010). However, contrary to Iyer's focus on public goods differences, I find that state fiscal capacity is a non-trivial mediator for household welfare. Native states raised substantially more taxes per capita than British regions, and this difference in colonial-era state revenue explains 32 % of the infant height gap and 46 % of household wealth differences, suggesting that colonial state capacity may have exerted more influence on private economic well-being than on aggregate public goods provision.

Disparities in healthcare supply were already evident in the 1870s, after British annexations ceased (1858). To the best of my knowledge, I provide the first evidence that regions under direct British rule featured lower operational investments for health institutions, despite similar facility counts. These differences may not show any persistence using aggregate data on health infrastructure (Iyer and Weir, 2025). But, using demand indicators for facility-based childbirth in the DHS, I find that women prefer non-institutional childbirth due to facility closure, distance, and lack of female providers. Thus, a persistent underinvestment in healthcare can still show up in low quantity and quality.

Finally, on the demand side, material constraints shape healthcare demand in specific ways: while prenatal care coverage is comparable, poorer households in formerly British-ruled regions make fewer visits than recommended and delay postnatal care. Women also demand more home births over private facilities due to high costs and family refusal, reflecting worse agency over intra-household decisions. Crucially, higher breastfeeding duration and uptake of the Integrated Child Development Services (ICDS) correlate with worse infant health, suggesting that service uptake in these contexts reflects acute deprivation rather than effective care (Victora et al., 2016; Kandpal, 2011). Hence, early underinvestment in healthcare may have compounded with the demand-side barriers outlined above. Together, the supply- and demand-side channels illustrated above show how colonial governance distorted both state capacity and household behavior, perpetuating intergenerational health inequalities.

This paper makes three contributions to the literature on postcolonial development. First, I provide the short-run effects of colonial rule on access to healthcare. Recently, Caum-Julio (2024) examines the effects of land tenure on health investments in British-ruled regions, wherein cultivator-based tenure was associated with investments from local public bodies. I provide novel evidence on colonial-era health infrastructure by constructing original data on health facilities and their operational costs for *both* British and Native-ruled regions in 19th-century India. I document that British-ruled regions exhibited lower operational expenditures despite similar facility counts. Moreover, in contrast to Iyer and Weir (2025), I contribute to the literature by documenting a new empirical benchmark of lower health investments in the colonial period and evidence of postcolonial persistence through poor quality.

Second, I connect postcolonial differences in public goods with household behaviour. While the literature on colonial legacies in aggregate public goods is well-established, the micro-level behavioral channels—especially in health-seeking—are understudied. Religious identity has been shown to affect health status (Bhalotra, Valente and van Soest, 2010; Brainerd and Menon, 2015), including missionary work (Menon and McQueeny, 2015; Calvi and Mantovanelli, 2018). I demonstrate that households in formerly British-ruled regions underutilise healthcare services, despite comparable modern coverage, due to persistent economic constraints and restrictive social norms. This finding contrasts with Iyer and Weir (2025), who only describe institutional mechanisms, rather than household-level behavioral responses. My results show that households are not only income-constrained but also exhibit reduced maternal agency in health decisions, reflecting a nuanced institutional legacy that operates through intra-household dynamics.

Third, this paper integrates colonial history with contemporary literature on socio-economic determinants of health (Link and Phelan, 1995). I contribute to studies focusing on short-term income shocks (Dupas, 2011; Almond and Currie, 2011; Bhalotra and Rawlings, 2011) by highlighting that the material constraints affecting healthcare demand have deep roots in colonial state capacity, which created self-reinforcing cycles of low investment in human capital. In effect, I refine the story in Iyer (2010) - British administration did not merely disincentivize investment in public goods, but they may have simply prevented the development of states that could provide them effectively. In other words, Iyer's work captures the incentives to allocate public goods from a limited budget. My findings indicate that colonial extraction may have constrained the budget itself and, by extension, the economic potential of the households it governed (not just mistrust as documented in Central Africa by Lowes and Montero (2021)). This deeper 'capacity-building' channel may be more resistant to policy intervention than the 'budgetary-allocation' channel in Iyer (2010), explaining why deficits in household wealth and human capital persist even as infrastructure gaps have converged (Iyer and Weir, 2025). This finding also aligns with historical evidence on the poor growth of fiscal capacity in British India and general evidence on the quality of modern governance based on past colonial extraction (Roy, 2019; Broms, 2017). Finally, I provide a historical basis for the fetal origins hypothesis (Mills, 2010, 2018; Wells, 2016) - stunted infants are associated with stunted mothers - indicating that colonial-era deprivation may have induced epigenetic or metabolic adaptations.

The rest of the paper is organized as follows. Section 1 outlines direct and indirect rule in British India. Section 2 details data collection and Section 3 explains the Instrumental Variables approach. Section 4 presents IV estimates. Section 5 discusses mechanisms. Section 6 concludes.

1 (In)Direct British Rule in India

The presence of the British Empire stretches nearly 200 years, beginning from 1757 with the East India Company's control of the Bengal region. The advancement of the Company's rule extended from revenue collection to direct administration with two major watersheds -

1. *The Ring Fence* (1765-1818), wherein the still nascent Company created strategic barriers and established agreements with and subsidiary forces funded by Native States. Native States were also annexed due to debt defaults.

2. *Subordinate Isolation*, wherein annexation was more rapid post the Anglo-Maratha War

(1817-18). The Anglo-Sikh War in 1848-49 and the appointment of Lord Dalhousie as Governor-General further intensified annexations through debt default and the controversial Doctrine of Lapse, wherein Native States with no biological heirs were annexed.

Company rule dissolved after the Indian Rebellion of 1857, and the administration of the region, which included Pakistan, Bangladesh, and Burma (present-day Myanmar), passed on to the British Crown (hereafter *British Raj*). After the 1857 Rebellion, the annexation of regional kingdoms stopped.

To that end, the precise definition of regional kingdoms has changed over time within the colonial period. More generally, Native States were under autonomous internal administration by Indian kings, whereas defense and foreign policy were controlled by the British Raj [2]. After 1858, the stable set of Native States varied from small regions and towns, with Hyderabad (Deccan Peninsula), Mysore (South West), and Rajputana (Northwest) being the largest states.

The British Crown also proposed a policy of admitting British "residents" to the courts of the Native States that primarily oversaw the functioning of the native ruler's autonomous administration and, at times, settled succession disputes. The duties of the resident were particularly strong in the small Native States, but their position would subsequently wane in the larger Native States.

After gaining Independence from British Raj in 1947, the patchwork of Native States all across the subcontinent acceded to the new Union Government by 1950. Most of the ascension procedures were executed voluntarily, except in Hyderabad, where a military threat was imposed. The newly acceded Native States were subject to the same legal, administrative, and political institutions as the erstwhile British Indian territory. Moreover, the nobility of the acceded States continued to enjoy a stable presence in independent India's central/federal administration, apart from receiving privy purses, which were later discontinued in 1971.

Figure C.1 shows the extent of British Raj in dark grey. The British Foreign Office in 1910 recognised upto 45% of British India as Native States (excluding Burma and Sindh). These States were distributed all across the region, with larger concentrations in the Northwest and the Deccan Peninsula. To ensure comparability, I preserve the 1991 Census district boundaries to conform to the original British Rule assignments of Iyer (2010), where split districts are referred back to the parent district.

2 Data

Data for modern-day health outcomes are synthesised from the National Family Health Survey (NFHS) 2015-16, managed by the Ministry of Health and Family Welfare, Government of India and the Demographic and Health Surveys (DHS). The survey is a stratified two-stage design. The 2011 census serves as the sampling frame for the selection of Primary Sampling Units (PSU). PSUs are villages in rural areas and Census Enumeration Blocks (CEBs) in urban areas. Within each rural stratum, villages are selected from the sampling frame with probability proportional to size (PPS), the number of households, and socio-economic status.

[2] Definitions of 1910 British reports and the Imperial Gazetteer can be used to interpret a Native State as those regions that the British Raj had recognised as such. The precise quote from Sir William Lee Warner puts the definition in perspective: "a political community subject to a common and responsible ruler...duly recognised by the British Government, undertaking any of the functions and attributes of internal sovereignty."

I use the Women's Questionnaire supplemented with information about their reproductive history. I observe anthropometric indicators of children born to women up to 5 years preceding the survey. Along with infant height-for-age, I also explore differences in birth weight (kg), weight-for-age (z-score), and weight-for-height (z-score). Acute stunting and malnutrition are defined as height and weight below 2 standard deviations below the average of a reference population, respectively. A low birth weight is defined as less than 2.5 kg, measured less than 1 hour after birth, irrespective of gestational age. Finally, I analyse the coverage rates of critical vaccines provided at birth and later in infancy. I also observe the timing of these vaccines relative to the prescribed dosage as per the child's age (MoHFW, 2018).

For women, I explore variation in the same height and weight-for-age z-scores as infants. Stunting and wasting are defined the same way as in infants, being 2 to 3 standard deviations below the average of a reference population. I also explore the principal providers of antenatal care for mothers, including the frequency of visits and critical supplements provided to the mother, as a measure of demand and subsequent quality of the care providers. Finally, I examine the place of childbirth to understand the demand for institutional delivery and the timing of postnatal care post-childbirth. Finally, I examine breastfeeding practices, especially for neonates under 6 months of age.

To explore historical differences in the supply of healthcare, I present a novel dataset of colonial-era medical infrastructure in the late 19th Century. The data is sourced from the Administrative Reports for British Provinces and Native States from 1870 to 1880. The granularity is broadly at the district level, with some provinces reporting sub-district data that are subsequently aggregated to the district level. I collect count data on all multi-speciality hospitals and primary-care dispensaries set up by the municipal administration. Moreover, I have data on the total operational costs borne by municipal and local funds. These costs exclude private and charitable subscriptions and debt servicing costs. For some new institutions, I am only able to record foundational costs. Finally, I consider the total number of successful vaccinations, including repeated vaccinations. Due to missing reports and data, I can only provide an unbalanced panel.

For local geography, I use the International Food Policy Research Institute's 2020 GIS-DHS database for cross-sectional geographical data on soil properties, latitude, and mean rainfall. The dataset identifies survey clusters in the DHS using grid-level data from the International Soil Reference and Information Centre (ISRIC). For soil properties, I consider the proportion of clay, sand, and silt particles (< 0.002 mm) in every fine earth fraction surveyed by the ISRIC. I also use DHS Geospatial data for mean altitude in metres.

Finally, I use Bharadwaj et al. (2020) for district-level data on infant mortality from 1957 to 1990. I use the DHS for mortality estimates in 2015. I use Iyer (2010) for hospital coverage in 1981 and 1991, and I collect count data from the Rural Health Statistics of India for primary health centers from 2005 to 2011. The hospital data used here for 1981 and 1991 are the average proportion of villages having a primary health center. For comparability of estimates, I standardise all hospital data.

3 Identification Strategy

Foremost, I regress as follows

$$Y_{i,d} = \alpha + \beta \mathbb{1}\{d = British\} + \gamma X_{i,d} + \epsilon_{i,d} \tag{1}$$

Where $Y_{i,d}$ is a health indicator for household i and district d, and the variable of interest is a dummy for whether the district belonged to British Raj (the treatment). All analysis is corrected for sample weights provided in the DHS. I also account for the clustering of standard errors at the district and Native State level to account for sub-district units of observation and spatial correlation across erstwhile kingdoms.

Regression 1 does not identify a causal effect of being in British-ruled territories. Apropos the bias of the OLS estimates, there are two possible scenarios under the self-selection problem. First, the British may select themselves into regions that were already better at public health outcomes. Then, the OLS estimates will overestimate the causal effect. Second, the British may gain regions where the rulers did not adequately defend and/or manage their kingdoms. This scenario may presumably overlook the already worse-off health indicators in these kingdoms, channeling into an underestimated OLS.

Table A.2 shows clear differences in health outcomes and geography. Previously, British-ruled regions have lower material conditions today and worse anthropometric outcomes, except for birth weight. These regions also feature more silt in their soil relative to sand, higher mean rainfall, and a low altitude. OLS estimates in Table A.1 report lower anthropometric outcomes for infants and women, especially for regions that were annexed due to the misrule of the native ruler and for ceded regions. Regressing with the entire duration of British rule, infants are likely to have higher birth weight. Early annexations via conquest have no discernible effects.

3.1 Instrumental Variable: The Doctrine of Lapse

I solve the self-selection problem using Iyer's 2010 strategy. I argue that Lord Dalhousie's Doctrine of Lapse is an exogenous determinant of annexation. The policy was articulated as

"I hold that on all occasions where heirs natural shall fail, the territory should be made to lapse and adoption should not be permitted, excepting in those cases in which some strong political reasons may render it expedient to depart from this general rule."

According to this policy, eight Native States had rulers die without a natural heir during Lord Dalhousie's term in office. However, four States were annexed due to the Lapse - Satara, Sambalpur, Jhansi, and Nagpur[3]. Annexation of the other four Native States was either reversed during Lord Canning's term or disallowed by the East India Company's court of directors[4]. Hence, it is important to note that the Doctrine was not applied in a dictatorial manner. The policy was not applied before 1847, when fifteen rulers had died without natural heirs. Moreover, the doctrine was discontinued after 1857, and Native States were encouraged against future annexations. Finally, there is no record of assassinations of native rulers to acquire territory via the Doctrine.

[3]See Appendix C.1 for detail

[4]See Appendix C.2 for detail.

The instrumental variable is defined as $\mathbb{1}\{d = Lapse\}$ if the Native State was not annexed before 1848 and the ruler died without an heir between 1848 and 1856. Note here that $Lapse$ cannot be assigned to areas annexed before 1848 since the British already ruled them. Hence, the dummy assignment $Lapse$ applies to regions not annexed on or before 1847. Hence, I estimate a LATE from a *Post-1847* sample described in Figure C.2 and in line with the sampling frame in Iyer (2010). I also control for ruler deaths post 1818 and deaths regardless of an heir between 1848 and 1856, to account for health effects and British annexation driven by local factors other than geography and the main instrument.

Table A.3 provides a means test of the same outcomes as Table A.2, but on the Post-1847 sample between regions that switched to British rule due to the instrumental variable. Health outcomes broadly remain negative, and the geographical differences remain statistically significant, but now lapsed regions have a higher proportion of clay relative to sand. Table B.1 provides the first stage of the instrumental variable regression, with a range of controls defined above. The instrument is a consistent and statistically significant predictor of whether a district is assigned to direct British Rule. Moreover, the correlation is robust to removing regions that were annexed due to non-Lapse reasons, namely Punjab (war), Oudh (misrule), and Berar (nonpayment of debt).

4 Results

4.1 Anthropometric Outcomes

Table 1 summarises the IV estimates of direct British Rule on infant height-for-age, controlling for geography, ruler deaths regardless of an heir, and excluding regions annexed due to non-Lapse reasons. Robust results indicate stunted height from 0.2 to 0.27 standard deviations. Among other anthropometric indicators in Table B.2, infants are also underweight by nearly the same magnitude as their height loss. There are no significant differences in birth weight. Infants also have a lower weight-for-height, but there is insufficient precision in the estimates. Table 3 shows that direct British Rule led to much worse outcomes for women's health. There is stronger evidence for stunted and underweight women in areas previously under direct rule. Table B.3 reports height and weight loss for infants and women in centimeters and kilograms, respectively. Results for infants indicate an average height and weight loss of 9 millimeters and 300 grams, respectively, due to direct British rule. Adult women exhibit an average height and weight loss of about 3 centimeters and 4.5 kilograms, respectively. Finally, table 2 reports differences in households' aggregate ownership of durables and access to basic sanitation. IV 2SLS estimates indicate that households are more likely to reside in rural areas, characterized by worsened standards of living and limited access to piped water. Households exposed to British rule also have lower access to flush toilets, although the evidence is weak, marked by low precision of estimates.

4.2 Reduced Form Estimates

Table B.4 presents reduced form estimates with further robustness checks. I first check whether the stunting effect is due to differential mortality, possibly regardless of British rule, signaling a survival bias. The threat to identification is whether households previously exposed to British rule may choose to have fewer children due to poor material conditions or more children in response to

a higher infant mortality ('replacement effects'). Hence, the height differences observed are of the best-selected and *surviving* children. Moreover, stunting can be confounded with disadvantages in the household or persistently worse environments, which remain unobserved.

Table B.6 reports minimal to zero differences in overall fertility, living children, and sex ratio in the household. Moreover, Table B.7 reports high and persistent differences in infant mortality between 1957 and 2015. Since I cannot observe the height of infants who have already died, I interact the instrument with a dummy for sibling deaths in Table B.4 Column 2. The baseline reduced form estimates remain consistent. Moreover, sibling deaths do not directly affect infant height. These results indicate that the true effect of British rule is larger than my estimates since the children observed in the DHS are positively selected and stunted.

Second, in Column 2, I control for cohort-specific trends among mothers that may drive the baseline result. Mothers born in the same cohort are exposed to similar socio-economic contexts. The baseline effect remains unchanged, which rules out the concern that infant stunting is affected by differences between older and younger mothers.

Third, I control for State-level fixed effects in Columns 4 and 5. After independence, India was reorganised into States different from British-era provinces. Moreover, healthcare remains an important purview of the State legislature. Controlling for these fixed effects in Column 4 reduces the magnitude of the baseline estimate, and there is no statistical significance. However, we see in Column 5 that households with sibling deaths still experience stunting. This indicates that the persistence of British rule is not uniform, but is likely concentrated among already worse-off households.

Column 6 reports a falsification test using ruler deaths without natural heirs after 1858, which did not lead to British annexation, since the Doctrine of Lapse was discontinued. The coefficient is positive and marginally significant, indicating that the baseline effect is specific to annexations in 1848–56 rather than any ruler's death. Finally, Columns 7 and 8 address spatial dependence by allowing for arbitrary clustering of standard errors using uniform and linear decay of residuals (Colella et al., 2023). A further sensitivity analysis is summarised in Table B.5, with residual correlation assumed to vanish at 150 and 200 km. The height loss is robust and comparable to the baseline inference, with a strong first stage.

5 Mechanisms

I now consider proximate supply and demand-driven mechanisms that may explain the infant anthropometric outcomes described above. On the supply side, I explore persistent differences in colonial-era infrastructure, governance, and state capacity. On the demand side, I consider mothers' health-seeking behaviour, namely antenatal and postnatal care. These two channels are discussed in Sections 5.1 and 5.2.

First, I present IV 2SLS estimates for the supplementary outcomes above. Second, I use the methods described in Acharya, Blackwell and Sen (2016) and Abebe et al. (2020) to find the Average Controlled Direct Effect (ACDE) due to each supplementary outcome (hereafter *mediator*). A nonparametric identification of the ACDE assumes no omitted variables in the effect of the treatment and the mediator on the outcome, conditional on pretreatment confounders (Robins, 1997). Since direct British Rule is potentially endogenous due to self-selection, I estimate the ACDE using the instrumental variable, assuming no omitted variables conditional on the geographical and

ruler death controls described in Section 2

Given infant health in household i and district d, $Y_{i,d}$, the instrumental variable $Lapse_d$, and a mediator $M_{i,d}$, I estimate the ACDE in two steps,

$$Y_{i,d} = \alpha + \beta \mathbb{1}\{d = Lapse\} + \overbrace{\gamma_1 M_{i,d}}^{\text{Demediator}} + \delta_1 X_{i,d} + + \nu_{i,d} \tag{2}$$

$$\hat{Y_{i,d}} = Y_{i,d} - \gamma_1 M_{i,d}$$

$$\hat{Y_{i,d}} = \theta + \hat{\beta} \mathbb{1}\{d = Lapse\} + \delta_2 X_{i,d} + \epsilon_{i,d} \tag{3}$$

Where $\hat{\beta}$ is the average reduced-form effect controlling for the level of a mediator M. A non-zero $\hat{\beta}$ indicates that the effect of the instrumental variable is not due to mediator M *exclusively*. I present $\hat{\beta}$ relative to the unmediated effect of height on the instrument in Section 5.3. Each subsection below also contains a brief discussion of contemporary and historical evidence that supports my results.

5.1 Healthcare Infrastructure and Supply - IV 2SLS Estimates

Foremost, I examine differences in health infrastructure in the short-run, that is, immediately after direct British rule begins in 1858. Table 4 reports differences in public health in 1870-80. Estimates show significantly lower operational costs in British-ruled regions. There is also a lower likelihood of dispensaries and vaccination volume, but there is insufficient precision in my estimates. I also find some evidence of a persistent undersupply of healthcare. Table B.17 reports differences in primary health centers in the postcolonial period. As reported by Iyer (2010), direct British rule led to a lower volume of health centers in 1981-91. Data from 2005-2011 show a similar negative magnitude, but without the precision of estimates. Importantly, Table B.11 Columns 1-3 show crucial supply constraints that limit institutional childbirth. Women are less likely to deliver in a health facility because they are closed, too far away, or they don't have a female healthcare provider.

Indeed, as is critically noted in the historiography of colonial medicine, the British model of health management in India primarily favoured colonial settlers, officials, and military personnel. (Arnold, 1993) Moreover, first attempts at sanitary/health reform remained confined to military cantonments. Of particular note is the Indian Medical Service, which experienced underfunding and capacity constraints when dealing with epidemic management (Harrison, 1994). High mortality rates among European troops led to sanitation reforms, leading up to a Royal Commission on sanitation in 1863 and a Public Health Commissioner in 1869 (Mushtaq, 2009). A piecemeal decentralisation of public health management only began in 1919 with the Montagu-Chelmsford Constitutional Reforms and later, the Government of India Act of 1935.

There has been a rapid scaling up of public health centers across India since independence. However, there is evidence of quantity-versus-quality tradeoffs, whereby geographical access may not correlate with provider effort, competence, and capacity (Das and Hammer, 2014; Banerjee, Deaton and Duflo, 2004). Moreover, public-private premia in healthcare provision may lead to costly private-sector diagnostic efforts despite potential overtreatment (Das et al., 2016).

5.2 Demand for Healthcare - IV 2SLS Estimates

Section 4.1 documents worse material conditions today in formerly directly ruled regions. Moreover, there is evidence of an undersupply of healthcare outlined in the section above. This raises a critical question: when poor households face inadequate infrastructure, which constraints bind? Households' limited ability to afford care, and/or the limited availability of accessible services, may determine health-seeking behaviour. Below, I examine service utilisation patterns for antenatal and postnatal care and uncover whether these two constraints operate jointly. If both matter, we should observe both cost-driven decisions and access-driven barriers.

Table B.8 reports differences in antenatal care among women with reproductive history. Estimates (Column 2) indicate that women are 14 percentage points more likely to demand services from the Integrated Child Development Services (ICDS), which is a landmark program to improve access to frontline healthcare delivery. However, together with Column 3, results indicate higher enrollment without service utilisation, wherein women do not visit less than 4 times during a pregnancy, contrary to recommendations (UNICEF, 2024). I test whether these differences in utilisation vary with household wealth by interacting the wealth index with the instrument, revealing that a higher antenatal demand but lower-than-ideal frequency under the ICDS is concentrated among poorer households, indicating income-constrained health-seeking behaviour.

Income constraints are also at play when we understand postnatal care in Table B.10. Households exposed to British rule are less likely to deliver in an institution (Columns 1-3), wherein mothers substitute from private sector delivery to the home, with no differences in the public sector. Table B.11 Columns 4-6 explore demand-related factors for non-institutional childbirth. Estimates show that women demand home births due to the high costs of institutional delivery. Moreover, spousal rejections are also high in this context, suggesting worsened intra-household agency. These results suggest that household behaviour operates against a backdrop of limited supply; when public facilities are distant or closed and private care is prohibitively expensive, income constraints and reduced maternal agency become binding.

Mothers are also more likely to delay the first postnatal visit to at least 2 months after childbirth. Column 6 indicates a higher overall frequency of breastfeeding, but Column 7 indicates critical feeding gaps for neonates, wherein mothers breastfeed neonates for shorter durations on average. These patterns suggest that limited postnatal counselling may leave mothers without adequate guidance on optimal feeding practices. Moreover, it may also reflect operational constraints among health centres that may be unable to provide quality postnatal care.

It is important to note that the health-seeking behaviour outlined above is not driven by institutional mistrust. I hypothesise that households may avoid formal healthcare due to mistrust. Hence, we could expect a systematic refusal of medical interventions regardless of supply quality. To test this mechanism, I explore whether survey respondents refused consent for anthropometric measurements (including their children) as a measure of mistrust. I also consider non-disclosure of disease in the family to test whether households refuse healthcare due to any societal stigma. Table B.12 shows that households exposed to direct British rule have no discernible effects on measures of mistrust. Moreover, Table B.11 also shows that mistrust in healthcare provision does explain non-institutional childbirth. These results strengthen the interpretation that material and infrastructural constraints drive health-seeking behaviour. There does not seem to be any attitudinal resistance to formal healthcare.

However, in stark contrast, Table B.13 reports no differences in immunisation rates in regions

exposed to British rule, including rates of timely administration of doses within the prescribed period after birth. It is also important to note that the rates of coverage for basic and critical vaccines and high in regions exposed to Native rule. Non-significant differences in immunisation seem to reflect intensive campaigns by the post-independent Indian government, such as the Universal Immunisation Program (1985 onwards) and the Polio Eradication Program (1995 onwards).

In conclusion, the results indicate British-ruled regions exhibit an interplay of constrained demand and inadequate supply for healthcare. Income constraints and reduced maternal agency—evidenced by cost-driven home births and spatially limited service utilisation—explain poor health-seeking behaviour, not institutional mistrust. These demand-side limitations are compounded by a persistently weak health infrastructure, reflected in fewer facilities and critical access barriers like distance and absent staff. Thus, historical underinvestment appears to perpetuate disadvantage through low-quality public supply meeting income-constrained demand.

5.3 Mediation Analysis

To unpack the mechanisms behind the observed anthropometric deficits, I conduct a mediation analysis exploring the channels through which colonial rule impacts contemporary infant health. The analysis proceeds in two stages, moving from historical and fundamental mechanisms to proximate household behaviour. Hence, I estimate the Average Controlled Direct Effect (ACDE) for proximate supply- and demand-side mediators using the instrumental variable framework described in equations 2 and 3.

If proximate gaps in household standards of living largely drive differences in infant health, a deeper question is to investigate their origin. Here, I turn to indicators of colonial governance identified by Iyer (2010). I consider differences in colonial land tenure (landlord vs. cultivator-based) and state revenue per capita, and whether a native ruler was deposed for misrule. Iyer (2010)'s primary hypothesis is that direct British rule, characterised by inequitable land tenure and overall colonial governance, affects the incentive to provide public goods. They also rule out colonial extraction as a driving mechanism, as colonial revenue per capita does not explain differences in public goods.

I separately mediate the colonial-era mediators on infant height-for-age and on the household wealth index. Figures 1 and 2 visualise my findings, and Table B.15 summarises the effect of the mediator on the two outcome variables considered. My results confirm that British-ruled regions are comparable to the worst-performing native states (where rulers were deposed for misrule), as the reduced form coefficient of the instrument on infant height remains unchanged after controlling for ruler deposition. Moreover, infant health outcomes are better in places with historically equitable land tenure, as cultivator-based tenure explains more than a third of infant height differences.

However, contrary to Iyer (2010), I find that state fiscal capacity is also a crucial mediator. Native states raised significantly more revenue per capita than British-administered regions. This historical divergence in fiscal capacity explains 32 % of the infant height gap and 46 % of the household wealth gap observed today.

Additionally, surviving Native States had to pay a tribute to the British in order to maintain subsidiary alliances. Apart from state revenue, the obligation to pay tribute may have created incentives to enlarge state capacity. I digitize tribute data from Chakrabarti (1895). It is impor-

tant to note that tribute only exists in Native States that maintained autonomy. In areas where the instrument applies, i.e., annexed regions, tribute becomes zero. Hence, this particular type of fiscal capacity is *directly* affected by direct British Rule. Table B.16 further reports reduced form estimates by regressing the household outcomes on the instrument and its interaction with state revenue and tributes. The interaction estimates suggest that colonial-era state revenue operates similarly across both British-ruled and native states. A higher tribute is associated with better outcomes in the surviving Native States. But, this relationship is significantly weaker (or reversed) in areas that faced annexation risk, as evidenced by the negative and significant interaction term between the instrument and tribute. This suggests that tribute's developmental benefits are specific to the native state context and may reflect selection effects or the value of maintaining autonomy.

This finding refines Iyer (2010)'s thesis: the extractive nature of British rule did not merely disincentivize investment in public goods; it may have actively stunted the development of state capacity itself. These results indicate that a historical weakness in state capacity created a long-term legacy of economic fragility, continuing to limit household wealth accumulation and, consequently, investments in child health. Historical evidence further demonstrates that British India was characterized by a weak growth in fiscal capacity, leading to an inability to provide public investment (Roy, 2019). More generally, land taxation was a crucial source of state revenue in regions under British rule. However, Suryanarayan (2017) shows that fiscal capacity in directly ruled regions declined after the enfranchisement reforms in 1919 in areas with higher levels of caste inequality.

Finally, I consider demand behaviours described in Tables 2, 3, B.8, and B.10 as mediators for the anthropometric differences for infants in Table 1. Figure 3 demonstrates that worsened standards of living today explain the majority of the variation in infant height-for-age (79 %), followed by stunted mothers (63 %). This indicates that living standards and intergenerational transmission matter for infant health. Differences in the demand for institutional care seem to matter much less than household material conditions, wherein the reduced form effect on height-for-age remains similar in magnitude. Table B.14 summarises the mediation analysis outlined above, along with the effect of the mediator on infant height-for-age.

The effect of most mediators on infant height is in the intuitive direction. It is important to note, however, that increased duration of breastfeeding and higher demand for ICDS services are associated with lower infant height-for-age. These seemingly unintuitive effects are also sizeable, representing 45 % and 33 %, respectively. This possibly indicates in-utero exposure to worse maternal health and unobserved inadequacies in the type of antenatal care demanded.

6 Conclusion

This paper demonstrates that the present-day health penalties of British colonial rule in India manifest in stunted growth and reduced weight among infants and women. Using the exogenous variation provided by the Doctrine of Lapse, I find that regions exposed to direct British rule exhibit infant anthropometric deficits of twenty percent of a standard deviation compared to indirectly-ruled areas. These effects reflect intergenerational transmission, with mothers in formerly directly-ruled regions also showing significantly lower height and weight.

The mechanisms analysis reveals that colonial extractive institutions operated through both supply-side underinvestment and demand-side income effects. Regions under direct British rule reduced health infrastructure investment during the colonial period. These supply-side deficits may have created lasting capacity constraints that persist despite post-independence healthcare policy. Simultaneously, colonial governance appears to have fostered poor health-seeking behaviors among mothers due to worsened material conditions, leading to inadequate utilization of available healthcare services even when coverage has improved.

These findings contribute to our understanding of institutional persistence by demonstrating that colonial legacies extend far beyond the mortality outcomes typically studied in the literature. The health penalties documented here affect the physical development and life prospects of living children, suggesting that the welfare costs of colonial rule may be substantially larger than previously recognized. The persistence of these effects through both infrastructure constraints and behavioral responses highlights the multifaceted nature of institutional legacies.

For policymakers, these results underscore that addressing colonial health legacies requires comprehensive interventions targeting both healthcare infrastructure and community health-seeking behaviors. Supply-side improvements alone may be insufficient to overcome deeply embedded patterns of underinvestment in human capital. Instead, effective policy must simultaneously expand healthcare capacity while actively promoting demand for preventive care and nutritional support, particularly among vulnerable populations in formerly directly-ruled regions.

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Tables

Table 1: Infant Anthropometric Outcomes: IV 2SLS Estimates

	Infant Height-for-Age (z-score) - DHS 2015							
	(1) RF	(2) IV	(3) RF	(4) IV	(5) RF	(6) IV	(7) RF	(8) IV
Ruler death w/o a natural heir in 1848-56 (Instrument)	-0.005		-0.015		-0.273**		-0.218*	
	(0.093)		(0.060)		(0.108)		(0.112)	
Direct British Rule		-0.007		-0.021		-0.263**		-0.266*
		(0.142)		(0.085)		(0.111)		(0.141)
Control Mean	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43	-1.43
Geography Controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	No	No	No	No	Yes	Yes	Yes	Yes
Non-Lapse Annexations	-	-	-	-	-	-	Excluded	Excluded
Districts	179	179	179	179	179	179	159	159
Native States	72	72	72	72	72	72	68	68
First Stage F		13.98		31.90		43.25		45.58

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. "RF" refers to the Reduced Form estimate, and "IV" is the second-stage estimate. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table 2: Differences in Living Standards in DHS 2015 - IV 2SLS Estimates

		Household Assets (z-score)		
	$\mathbb{1}\{\text{Rural}\}$	Wealth Index	Piped Water	Flush Toilet
	(1)	(2)	(3)	(4)
	IV	IV	IV	IV
Direct British Rule	0.115*	-0.582***	-0.433***	-0.270
	(0.063)	(0.201)	(0.132)	(0.171)
Control Mean	0.75	0.01	0.08	0.08
Geography Controls	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes
Districts	179	179	179	179
Native States	72	72	72	72
First Stage F	41.96	41.96	41.96	41.96

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. Wealth Index in the DHS comprises an aggregate standard of living based on household durables, including sanitation. Access to piped water and a flush toilet is thus standardised for comparability of estimates across the table. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Reduced form estimates omitted due to brevity. "IV" is the second-stage estimate. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table 3: Adult Female Anthropometric Outcomes in DHS 2015: IV 2SLS Estimates

	Height-for-Age (z-score)		Weight-for-Height (z-score)	
	(1)	(2)	(3)	(4)
	RF	IV	RF	IV
Ruler death w/o a natural heir in 1848-56 (Instrument)	-0.498***		-0.361***	
	(0.096)		(0.103)	
Direct British Rule		-0.483***		-0.350***
		(0.103)		(0.112)
Control Mean	-1.75	-1.75	-1.00	-1.00
Geography Controls	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes
Districts	179	179	179	179
Native States	72	72	72	72
First Stage F		41.93		42.18

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. I regress health outcomes for women regardless of their reproductive history. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. "RF" refers to the Reduced Form estimate, and "IV" is the second-stage estimate. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

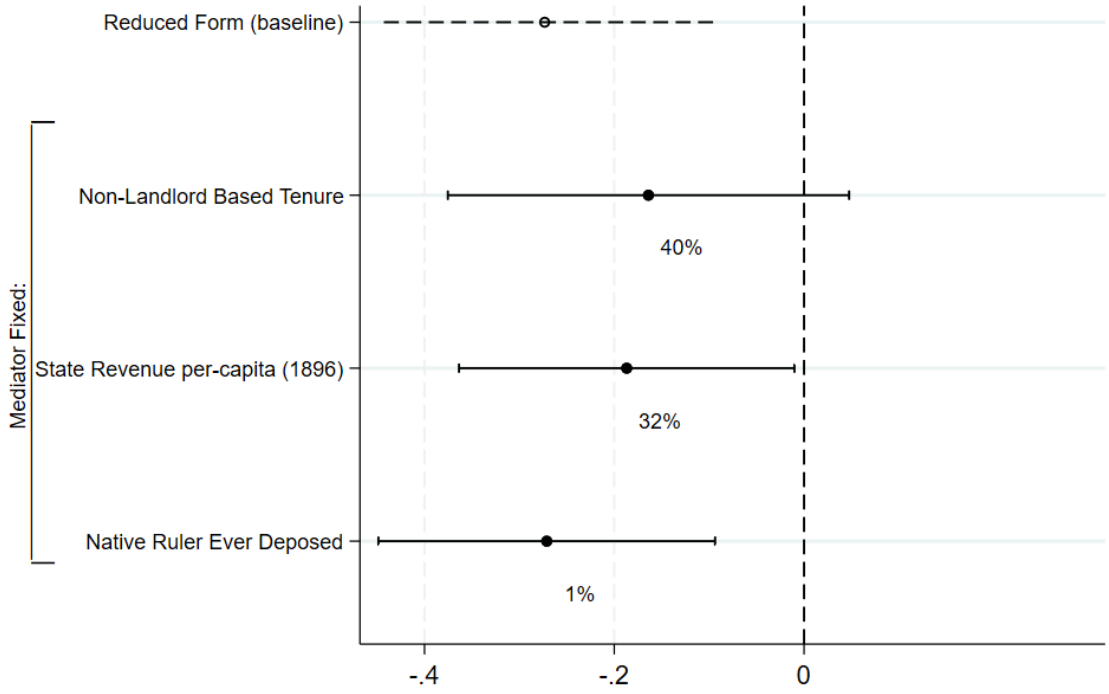
Table 4: Standardized Differences in Colonial Health Infrastructure (1870-80) - IV 2SLS Estimates

	Dispensaries		Vaccinations		Operating Costs	
	(1)	(2)	(3)	(4)	(5)	(6)
	RF	IV	RF	IV	RF	IV
Ruler death w/o a natural heir in 1848-56 (Instrument)	-0.282		-0.536		-1.270**	
	(0.219)		(0.385)		(0.516)	
Direct British Rule		-0.238		-0.423		-0.679**
		(0.182)		(0.283)		(0.287)
Control Mean	-0.02	-0.02	-0.01	-0.01	0.24	0.24
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes
Districts	64	64	49	49	38	38
Native States	31	31	24	24	15	15
First Stage F		69.88		42.52		55.61

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. "RF" refers to the Reduced Form estimate, and "IV" is the second-stage estimate. The data are an unbalanced panel from administrative reports between 1870-80. The data are also standardized using the sample mean and standard deviation. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

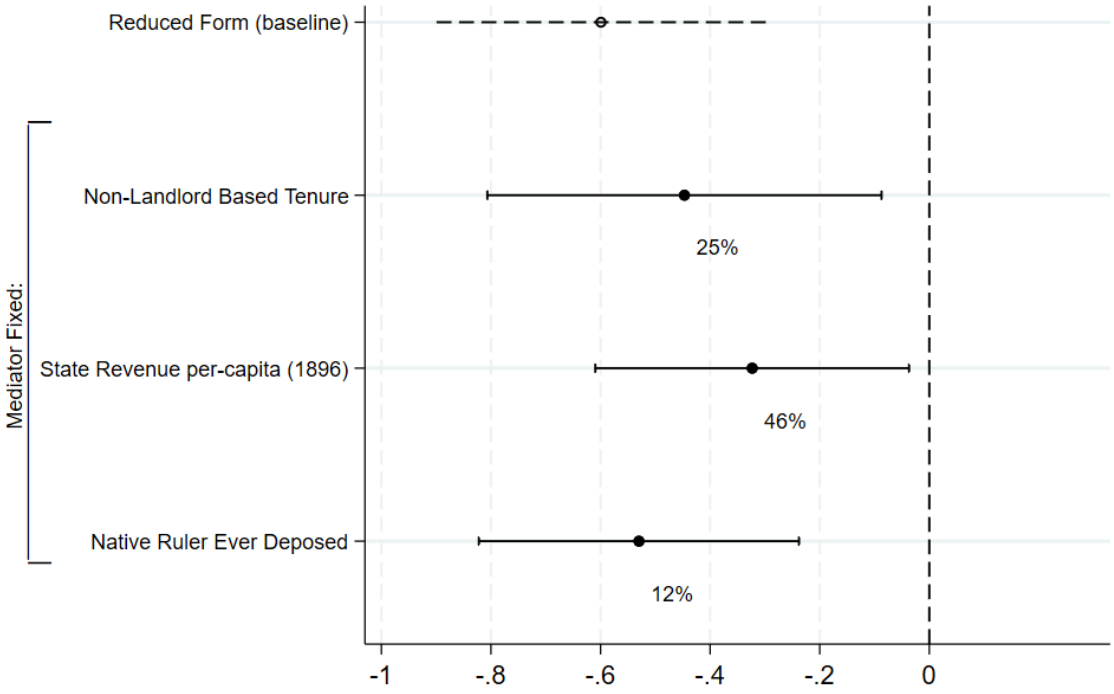
Figures

Figure 1: Mediation on Infant Height-for-Age z-scores (DHS 2015)



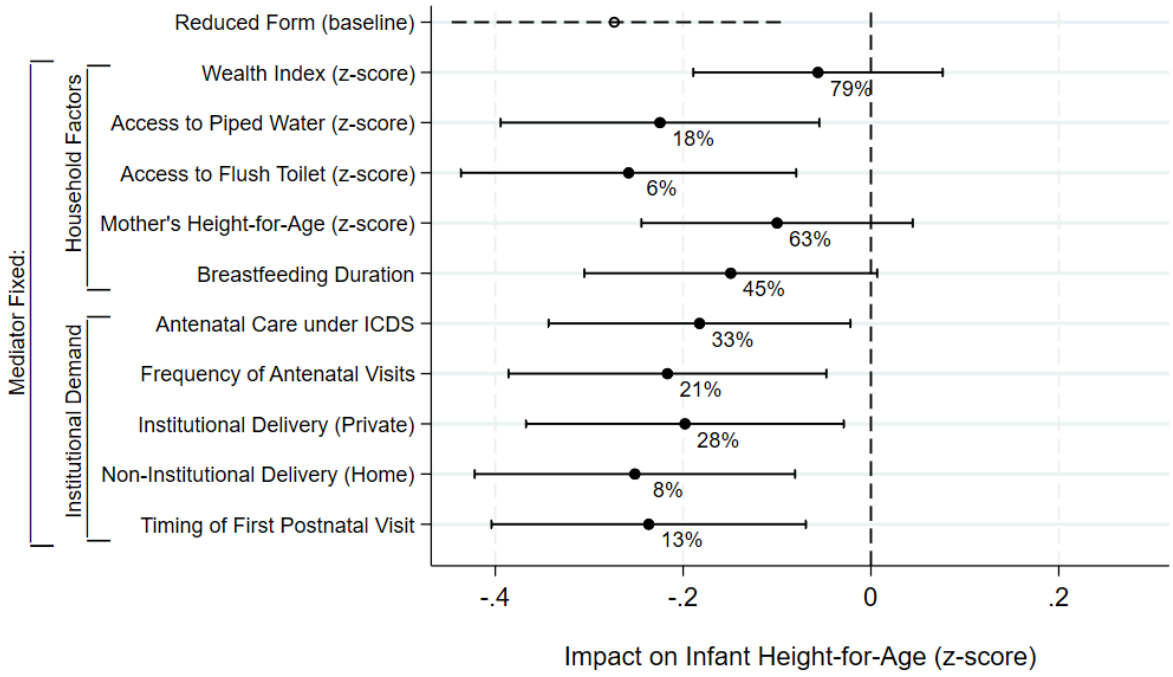
Note: The reduced form refers to regressing height-for-age z-scores for infants on the Lapse instrument. The figure decomposes the baseline reduced form effect (first row) with the percentage of the effect explained by each mediator. Using methods described in Acharya, Blackwell and Sen (2016) and Abebe et al. (2020), I control for each mediator in the reduced form equation and regress the predicted (or demediated) z-score on the Lapse instrument.

Figure 2: Mediation on Household Wealth Index z-scores (DHS 2015)



Note: The reduced form refers to regressing height-for-age z-scores for infants on the Lapse instrument. The figure decomposes the baseline reduced form effect (first row) with the percentage of the effect explained by each mediator. Using methods described in Acharya, Blackwell and Sen (2016) and Abebe et al. (2020), I control for each mediator in the reduced form equation and regress the predicted (or demediated) z-score on the Lapse instrument.

Figure 3: Mediation on Infant Height-for-Age z-scores



Note: The reduced form refers to regressing height-for-age z-scores for infants on the Lapse instrument. The figure decomposes the baseline reduced form effect (first row) with the percentage of the effect explained by each mediator. Using methods described in Acharya, Blackwell and Sen (2016) and Abebe et al. (2020), I control for each mediator in the reduced form equation and regress the predicted (or demediated) z-score on the Lapse instrument.

Appendices

The appendix contains the following tables supporting the main analysis:

1. Means Tests and OLS - Tables A.1, A.2, and A.3 provide means tests for British and Native-ruled regions, and OLS estimates for anthropometry, respectively

2. First Stage and Additional Results - Tables B.1 provides the first stage of the Instrumental Variable (IV) strategy. Tables B.2 to B.17 provide IV differences in supplementary outcomes and mechanisms

3. Additional Tables and Figures - Tables C.1 and C.2 provide details on the instrumental variable used, and Figures C.1 and C.2 provide a map for all previously British-ruled regions and the study sample used in this study.

Table A.1: Infant and Maternal Health Outcomes: OLS Estimates

	British Dummy		British Dummy ## Mode of Annexation				Years of British Rule
	No Controls	Geography Controls	Conquest	Ceded	Misrule	Lapse	(×1/100)
Infant Health							
Birth Weight (kg)	0.037*	0.020	0.014	0.015	-0.034	0.000	0.035**
	(0.021)	(0.017)	(0.020)	(0.016)	(0.022)	(0.019)	(0.014)
Weight-for-Age (z-score)	-0.063	-0.131*	-0.006	-0.064	-0.163***	-0.082	-0.042
	(0.075)	(0.076)	(0.098)	(0.062)	(0.063)	(0.050)	(0.057)
Height-for-Age (z-score)	-0.135	-0.144*	0.050	-0.128*	-0.317***	0.004	-0.087
	(0.094)	(0.080)	(0.111)	(0.074)	(0.073)	(0.054)	(0.068)
Women's Health							
Height-for-Age (z-score)	-0.324***	-0.267***	-0.041	-0.135*	-0.272***	-0.056	-0.226***
	(0.084)	(0.084)	(0.113)	(0.072)	(0.078)	(0.045)	(0.055)
Weight-for-Height (z-score)	-0.045	-0.062	0.006	0.031	-0.237**	-0.089	-0.032
	(0.107)	(0.096)	(0.144)	(0.089)	(0.101)	(0.057)	(0.094)
Districts	405	405	405	405	405	405	405
Native States	97	97	97	97	97	97	97

Standard errors clustered for Native States and Districts in parentheses. Geography controls include altitude, latitude, mean rainfall, and proportion of silt and clay relative to sand.
*p< 0.1, **p< 0.05 ***p< 0.01

Table A.3: Test of Means between Lapsed and Non-Lapsed Districts

	(1) Native States		(2) Lapsed States		(1)-(2) Pairwise t-test	
Variable	N/Clusters	Mean/(SE)	N/Clusters	Mean/(SE)	N/Clusters	Mean difference
Wealth Index (z-score)	59481	-0.018	8129	-0.083	67610	0.065
	159	(0.060)	20	(0.101)	179	
Birth Weight (kg)	47587	2.770	7059	2.779	54646	-0.009
	159	(0.008)	20	(0.026)	179	
Infant Weight-for-Age (z-score)	51380	-1.569	7151	-1.662	58531	0.093**
	159	(0.027)	20	(0.033)	179	
Infant Height-for-Weight (z-score)	51380	-1.039	7151	-1.150	58531	0.111*
	159	(0.023)	20	(0.064)	179	
Infant Height-for-Age (z-score)	51380	-1.468	7151	-1.473	58531	0.005
	159	(0.039)	20	(0.072)	179	
Woman Height-for-Age (z-score)	58715	-1.867	8044	-2.009	66759	0.142***
	159	(0.032)	20	(0.034)	179	
Woman Weight-for-Height (z-score)	58296	-1.024	8004	-1.131	66300	0.107*
	159	(0.034)	20	(0.056)	179	
Proportion Clay to Sand	59288	1.048	8079	1.233	67367	-0.185**
	159	(0.047)	20	(0.079)	179	
Proportion Silt to Sand	59288	0.828	8079	0.880	67367	-0.052
	159	(0.028)	20	(0.037)	179	
Mean Rainfall (mm)	59252	982.222	8079	1244.187	67331	-261.965***
	159	(35.563)	20	(42.673)	179	
Altitude (m)	59392	351.184	8102	333.049	67494	18.136
	159	(24.371)	20	(30.487)	179	

Note: Mean differences corrected for clustering at the district level. N represents the number of households in the DHS 2015 data, and Clusters represent the number of districts each under Native rule. Data includes districts as part of the post-1847 sampling frame in Iyer (2010), considering districts annexed by the British after 1847.

*p< 0.1, **p< 0.05 ***p< 0.01

Table A.2: Test of Means between British and Native-ruled Districts

	(1) Native States		(2) British Rule		(1)-(2) Pairwise t-test	
Variable	N/Clusters	Mean/(SE)	N/Clusters	Mean/(SE)	N/Clusters	Mean difference
Wealth Index (z-score)	52861	0.083	110826	-0.180	163687	0.263***
	143	(0.055)	262	(0.044)	405	
Birth Weight (kg)	43733	2.770	80097	2.808	123830	-0.037***
	143	(0.009)	262	(0.007)	405	
Infant Weight-for-Age (z-score)	45779	-1.538	96484	-1.601	142263	0.063*
	143	(0.030)	262	(0.018)	405	
Infant Height-for-Weight (z-score)	45779	-1.053	96484	-1.031	142263	-0.021
	143	(0.024)	262	(0.016)	405	
Infant Height-for-Age (z-score)	45779	-1.401	96484	-1.536	142263	0.135***
	143	(0.035)	262	(0.025)	405	
Woman Height-for-Age (z-score)	52186	-1.780	109382	-2.104	161568	0.324***
	143	(0.025)	262	(0.017)	405	
Woman Weight-for-Height (z-score)	51861	-0.977	108371	-1.022	160232	0.045
	143	(0.035)	262	(0.026)	405	
Proportion Clay to Sand	52692	1.074	110431	0.995	163123	0.078
	143	(0.053)	262	(0.029)	405	
Proportion Silt to Sand	52692	0.773	110431	0.998	163123	-0.225***
	143	(0.029)	262	(0.025)	405	
Mean Rainfall (mm)	52656	978.824	110354	1261.998	163010	-283.174***
	143	(42.265)	262	(32.031)	405	
Altitude (m)	52772	392.130	110635	182.313	163407	209.817***
	143	(26.382)	262	(12.770)	405	

Note: Mean differences corrected for clustering at the district level. N represents the number of households in the DHS 2015 data, and Clusters represent the number of districts each under Native rule. Data includes districts as part of the full sampling frame in Iyer (2010), regardless of the type of British annexation.
*p< 0.1, **p< 0.05 ***p< 0.01

B First Stage and Additional Results

Table B.1: First Stage of IV Regression.
Dependent Variable: British Dummy

	(1)	(2)	(3)	(4)
Ruler death w/o a natural heir in 1848-56 (Instrument)	0.637***	0.919***	0.941***	0.748***
	(0.182)	(0.184)	(0.180)	(0.149)
Ruler Death Controls				
Ruler died w/o an heir		-0.242	-0.161*	0.024
		(0.153)	(0.096)	(0.016)
Ruler died in 1848-56		-0.160	-0.196*	0.012
		(0.109)	(0.109)	(0.014)
Geography Controls				
Proportion Clay to Sand			-0.362**	-0.056*
			(0.168)	(0.031)
Proportion Silt to Sand			0.736***	0.133*
			(0.276)	(0.073)
Latitude			-0.013*	-0.006*
			(0.007)	(0.004)
Mean Rainfall (mm)			-0.000**	0.000
			(0.000)	(0.000)
Cluster Altitude (m)			-0.000**	0.000
			(0.000)	(0.000)
Districts	179	179	179	159
Native States	72	72	72	68
R^2	0.252	0.339	0.471	0.760

Standard errors clustered for Districts and Native States in parentheses. The table reports estimates from regressing British rule on a dummy on whether a native ruler died without a natural heir (Lapse), for regions annexed after 1847. Column 4 excludes annexations for non-Lapse reasons, namely, Punjab, Oudh, and Berar.
*p< 0.1, **p< 0.05 ***p< 0.01

Table B.2: Infant Anthropometric Outcomes in DHS 2015: IV 2SLS Estimates

	Birth Weight (kg)		Weight-for-Age (z-score)		Weight-for-Height (z-score)	
	(1)	(2)	(3)	(4)	(5)	(6)
	RF	IV	RF	IV	RF	IV
Ruler death w/o a natural heir in 1848-56 (Instrument)	-0.002		-0.250***		-0.101	
	(0.031)		(0.094)		(0.075)	
Direct British Rule		-0.002		-0.240**		-0.097
		(0.031)		(0.097)		(0.074)
Control Mean	2.76	2.76	-1.54	-1.54	-1.03	-1.03
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes
Districts	179	179	179	179	179	179
Native States	72	72	72	72	72	72
First Stage F		54.90		43.25		43.25

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. "RF" refers to the Reduced Form estimate, and "IV" is the second-stage estimate. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.3: Differences in Height and Weight (DHS 2015) - IV 2SLS Estimates

	Infants				Adult Female			
	Height (cm)		Weight (kg)		Height (cm)		Weight (kg)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	RF	IV	RF	IV	RF	IV	RF	IV
Ruler death w/o a natural heir in 1848-56 (Instrument)	-0.948**		-0.342***		-2.938***		-4.615***	
	(0.477)		(0.131)		(0.576)		(1.058)	
Direct British Rule		-0.916**		-0.331***		-2.849***		-4.474***
		(0.459)		(0.123)		(0.616)		(1.210)
Control Mean	83.58	83.58	10.46	10.46	153.22	153.22	49.69	49.69
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Districts	179	179	179	179	179	179	179	179
Native States	72	72	72	72	72	72	72	72
First Stage F		43.47		43.57		41.83		41.87

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. I regress outcomes for infants born within 5 years preceding the survey. I regress health outcomes for women regardless of their reproductive history. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. "RF" refers to the Reduced Form estimate, and "IV" is the second-stage estimate. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. *$p < 0.1$, **$p < 0.05$ ***$p < 0.01$

Table B.4: Infant Anthropometric Outcomes: Robustness Checks

	Infant Height-for-Age (z-score) - DHS 2015							
			Fixed Effects				Spatial Inference	
	Baseline	Sibling Deaths	Mother	State	State	Falsification	Uniform	Bartlett
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	RF	RF	RF	RF	RF	RF	IV	IV
Ruler death w/o a natural heir in 1848-56 (Instrument)	-0.273**	-0.268**	-0.273**	-0.107	-0.101			
	(0.108)	(0.108)	(0.110)	(0.104)	(0.104)			
Instrument ## Sibling Died		-0.106*			-0.140***			
		(0.064)			(0.053)			
$\mathbb{1}$\{Sibling Died\}		-0.039			0.023			
		(0.047)			(0.042)			
Ruler death w/o a natural heir in 1858-84 (Falsification)						0.156*		
						(0.094)		
Direct British Rule							-0.263**	-0.263**
							(0.129)	(0.103)
Control Mean	-1.43	-1.53	-1.43	-1.43	-1.53	-1.43	-1.43	-1.43
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Districts	179	179	179	179	179	143		
Native States	72	72	72	72	72	64		

Note: The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. Columns 2 and 5 control for the instrument interacted with a dummy on whether a sibling has died in the household within the 5 years preceding the survey. Column 3 controls for the birth cohort of the mother. Column 6 is a falsification exercise on the Native states with a dummy on ruler deaths without natural heirs post 1858 that did not lead to British annexation. Columns 7 and 8 correct standard errors for spatial dependence (Colella et al., 2023). Residual correlation is assumed to vanish within 100 km, with uniform weighting (Col. 7) and linear decay (Col. 8). $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.5: Infant Height in DHS 2015: Spatial Dependence

	Infant Height-for-Age (z-score)			
	150 km Bandwidth		200 km Bandwidth	
	Uniform	Bartlett	Uniform	Bartlett
	(1)	(2)	(3)	(4)
	IV	IV	IV	IV
Direct British Rule	-0.263*	-0.263**	-0.263*	-0.263**
	(0.144)	(0.116)	(0.140)	(0.123)
Control Mean	-1.43	-1.43	-1.43	-1.43
Kleibergen-Paap Wald rk *F* Stat	42.30	77.99	38.02	62.69
Geography Controls	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes

Note: The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Columns 1 to 4 correct standard errors for spatial dependence (Colella et al., 2023). Residual correlation is assumed to vanish within 150 and 200 km, with uniform weighting (Col. 1 and 3) and linear decay (Col. 2 and 4). $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.6: Differences in Fertility in DHS 2015 - IV 2SLS Estimates

	# Under-5 Children		Sex Ratio		Wish to Have Another Child	
	(1)	(2)	(3)	(4)	(5)	(6)
	RF	IV	RF	IV	RF	IV
Ruler death w/o a natural heir in 1848-56 (Instrument)	0.006		8.484		0.010	
	(0.042)		(5.585)		(0.033)	
Direct British Rule		0.006		8.181		0.009
		(0.041)		(5.614)		(0.031)
Control Mean	1.58	1.58	136.12	136.12	0.48	0.48
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes
Districts	179	179	179	179	179	179
Native States	72	72	72	72	72	72
First Stage F		59.78		60.39		51.34

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. The unit of analysis is the primary sampling unit (PSU), i.e., I average outcomes for each household per PSU. Sex ratio is calculated from the total boys and girls per PSU. Columns 5 and 6 report estimates from a dummy variable of whether the mother wishes to have another child. "RF" refers to the Reduced Form estimate, and "IV" is the second-stage estimate. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.7: Under-12 Infant Mortality - IV 2SLS Estimates

	1957	1960	1970	1980	1990	Mean 1957-1990	2015
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	IV	IV	IV	IV	IV	IV	IV
Direct British Rule	75.652***	33.668**	19.143	3.271	6.700	14.537**	8.608**
	(15.679)	(16.826)	(19.648)	(10.034)	(5.471)	(6.481)	(3.449)
Control Mean	82.91	68.20	68.86	40.20	20.72	47.92	18.64
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Districts	58	122	159	155	173	177	179
Native States	26	51	66	68	70	71	72
First Stage F	85.31	25.95	21.71	24.09	27.32	26.61	27.01

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. Mortality rates per 1000 live births from 1957 to 1990 come from Bharadwaj et al. (2020). Data for 2015 are my calculations from the DHS. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.8: Antenatal Care in DHS 2015 - IV 2SLS Estimates

	Provider and Frequency			Services	
	Public Sector	ICDS	$\leq$ 4 Visits	Iron Supplement	Tetanus Injection
	(1)	(2)	(3)	(4)	(5)
	IV	IV	IV	IV	IV
Direct British Rule	-0.041	0.142***	0.128***	0.038	-0.013
	(0.029)	(0.053)	(0.047)	(0.046)	(0.034)
Control Mean	0.26	0.20	0.42	0.81	0.66
Geography Controls	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes
Districts	179	179	179	179	179
Native States	72	72	72	72	72
First Stage F	68.08	68.08	47.85	47.95	47.95

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. All variables are measured as dummies. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Reduced form estimates omitted for brevity. "IV" is the second-stage estimate. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.9: Living Standards and Antenatal Demand: Reduced Form Estimates

	Antenatal Care	
	Provider: ICDS	$\leq$ 4 Visits
	(1)	(2)
	RF	RF
Ruler death w/o a natural heir		
in 1848-56 (Instrument)	0.098*	0.103*
	(0.053)	(0.055)
Wealth Index (z-score)	-0.086***	-0.044***
	(0.010)	(0.015)
Instrument ## Wealth Index (z-score)	-0.067***	-0.051*
	(0.024)	(0.027)
Control Mean	0.20	0.42
Geography Controls	Yes	Yes
Ruler Death Controls	Yes	Yes
Districts	179	179
Native States	72	72

Note: The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. All columns control for the household's wealth index, which is a measure of the standard of living. All dependent variables are dummies $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.10: Postnatal Care in DHS 2015 - IV 2SLS Estimates

	Place of Delivery			First Postnatal Visit		Breastfeed Frequency	
	Public	Private	Home	Immediate	Within 2 Months	Overall	Neonatal
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	IV	IV	IV	IV	IV	IV	IV
Direct British Rule	0.037	-0.170***	0.058**	0.001	0.123**	2.511***	-0.213***
	(0.051)	(0.064)	(0.025)	(0.018)	(0.055)	(0.733)	(0.063)
Control Mean	0.50	0.22	0.13	0.04	0.32	15.84	3.36
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Districts	179	179	179	179	179	179	179
Native States	72	72	72	72	72	72	72
First Stage F	47.85	42.04	42.04	41.96	48.37	49.34	47.66

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. All variables are measured as dummies, except Columns 6 and 7, which are measured in number of months. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Reduced form estimates omitted for brevity. "IV" is the second-stage estimate. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.11: Reasons for Non-Institutional Childbirth in DHS 2015 - IV 2SLS Estimates

	Supply Constraints			Demand Constraints		
	Facility Closed	Too Far	No Female Provider	Mistrust	Expensive	Family Refusal
	(1)	(2)	(3)	(4)	(5)	(6)
	IV	IV	IV	IV	IV	IV
Direct British Rule	0.005**	0.013***	0.002*	0.000	0.015***	0.014***
	(0.002)	(0.005)	(0.001)	(0.002)	(0.004)	(0.004)
Control Mean	0.011	0.024	0.004	0.005	0.012	0.013
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes
Districts	179	179	179	179	179	179
Native States	72	72	72	72	72	72
First Stage F	42.02	42.02	42.02	42.02	42.02	42.02

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. All dependent variables are measured as dummies. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.12: Institutional Trust in DHS 2015 - IV 2SLS Estimates

	Refusal of Anthropometric Measurement		
	Respondent Height	Infant Height	Non-Disclosure of Disease
	(1)	(2)	(3)
	IV	IV	IV
Direct British Rule	0.008	0.003	0.002
	(0.006)	(0.006)	(0.034)
Control Mean	0.005	0.008	0.127
Geography Controls	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes
Districts	179	179	179
Native States	72	72	72
First Stage F	42.03	43.59	46.68

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. All dependent variables are measured as dummies. Columns 1 and 2 present dummies for whether a respondent refused anthropometric measurement, and Column 3 uses non-disclosure of Tuberculosis diagnoses in the family as a proxy for stigma and mistrust in health infrastructure. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.13: Immunisation in DHS 2015 - IV 2SLS Estimates

	Overall Immunisation Rates			Critical Coverage Rates					
				BCG		DPT		Polio	
	Full	Birth	On-Time	Rate	On-Time	Rate	On-Time	Rate	On-Time
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	IV	IV	IV	IV	IV	IV	IV	IV	IV
Direct British Rule	0.065	0.075	0.026	0.014	0.029	0.020	-0.001	0.018	0.005
	(0.061)	(0.068)	(0.039)	(0.031)	(0.029)	(0.056)	(0.006)	(0.044)	(0.060)
Control Mean	0.36	0.68	0.79	0.90	0.88	0.70	0.01	0.54	0.32
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Districts	179	179	179	179	179	179	179	179	179
Native States	72	72	72	72	72	72	72	72	72
First Stage F	45.23	44.91	120.20	43.36	95.27	43.59	97.34	43.32	41.96

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. A child is considered vaccinated if their records are verified or reported by the mother. Results are robust to excluding the mother's self-report. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Reduced form estimates are omitted for brevity. "IV" is the second-stage estimate. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

A child is considered fully immunised (Col. 1) if they have received 1 BCG and DPT shots at birth, 1 Polio shot at birth and 3 subsequent, 1 Measles shot, 1 Hepatitis B shot at birth and 3 subsequent. Fully immunised at birth (Col. 2) includes 1 BCG, Polio, and Hepatitis B shots administered immediately at birth. Columns 3, 5, 7, and 9 are dummies on whether all relevant doses were administered within their prescribed period after birth. Information on the prescribed period is sourced from the National Health Mission (MoHFW, 2018).

Table B.14: Infant Anthropometric Outcomes: Mediation Estimates in Reduced Form

	Effect on Infant Height-for-Age (z-score)			
	Coefficient (1)	SE (2)	P-value (3)	% Mediated (4)
Wealth Index (z-score)	0.354	0.022	0.000	79.4
Access to Piped Water (z-score)	0.110	0.020	0.000	17.8
Access to Flush Toilet (z-score)	0.059	0.018	0.001	5.6
Mother's Height-for-Age (z-score)	0.355	0.014	0.000	63.4
Breastfeeding Duration	-0.029	0.003	0.000	45.4
Antenatal Care under ICDS	-0.264	0.039	0.000	33.2
Frequency of Antenatal Visits	-0.072	0.059	0.227	20.7
Institutional Delivery (Private)	0.402	0.035	0.000	27.6
Non-Institutional Delivery (Home)	-0.371	0.046	0.000	8.0
Timing of First Postnatal Visit	0.078	0.037	0.035	13.4

Note: The table produces the coefficients, standard error, and the percentage of the effect explained by each mediator controlled for in the reduced form regression of height-for-age on the Lapse instrument. I use methods described in Acharya, Blackwell and Sen (2016) and Abebe et al. (2020).

Table B.15: Mediation Using Colonial Variables: Reduced Form Estimates

	Effect on DHS 2015 Variables			
	Coefficient (1)	SE (2)	P-value (3)	% Mediated (4)
Infant Height-for-Age (z-score)				
Non-Landlord based Tenure	0.229	0.102	0.025	40.0
State Revenue per-Capita	0.031	0.019	0.099	31.6
Native Ruler Ever Deposed	0.005	0.080	0.954	0.8
Household Wealth Index (z-score)				
Non-Landlord based Tenure	0.366	0.192	0.057	25.4
State Revenue per-Capita	0.099	0.040	0.012	46.1
Native Ruler Ever Deposed	0.151	0.149	0.308	11.6

Note: The table produces the coefficients, standard error, and the percentage of the effect explained by each mediator controlled for in the reduced form regression of infant height-for-age and household wealth index on the Lapse instrument. I use methods described in Acharya, Blackwell and Sen (2016) and Abebe et al. (2020). Non-Landlord based Tenure and Native Ruler Ever Deposed are dummies.

Table B.16: Controlling for Fiscal Capacity in 1895: Reduced Form Estimates

	Outcomes in DHS 2015					
	Wealth Index (z-scores)			Infant Height-for-Age (z-score)		
	Baseline	State Revenues	Native Tribute	Baseline	State Revenues	Native Tribute
	(1)	(2)	(3)	(4)	(5)	(6)
	RF	RF	RF	RF	RF	RF
Ruler death w/o a natural heir in 1848-56 (Instrument)	-0.599***	-0.182	-0.238	-0.273**	-0.262*	-0.043
	(0.183)	(0.268)	(0.261)	(0.108)	(0.143)	(0.123)
State Revenue per Capita		0.102**			0.029	
		(0.041)			(0.019)	
Instrument ## State Revenue		-0.085			0.045	
		(0.081)			(0.050)	
log(1 + Tribute)			0.035**			0.016**
			(0.015)			(0.008)
Instrument ## Tributes			-0.096***			-0.026**
			(0.019)			(0.010)
Control Mean	0.01	0.01	0.01	-1.43	-1.43	-1.43
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes
Districts	179	177	104	179	177	104
Native States	72	70	66	72	70	66

Note: The reduced form estimates above regress outcomes on the death of a ruler without an heir between 1848-58. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. State revenue per capita is from Iyer (2010). Tributes paid to the British by surviving Native States are digitised by the author from Chakrabarti (1895). Standard Errors are clustered at the district and Native State level in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table B.17: Standardized Differences in Postcolonial Health Infrastructure - IV 2SLS Estimates

	Primary Health Centers (Standardized Values)					
	Mean 1981 & 1991		Mean 2001 & 2011		Mean 2005-2011	
	(1) RF	(2) IV	(3) RF	(4) IV	(5) RF	(6) IV
Ruler death w/o a natural heir in 1848-56 (Instrument)	-1.070**		-0.878***		-0.133	
	(0.431)		(0.321)		(0.258)	
Direct British Rule		-1.144**		-0.933***		-0.142
		(0.452)		(0.340)		(0.292)
Control Mean	0.05	0.05	0.22	0.22	0.25	0.25
Geography Controls	Yes	Yes	Yes	Yes	Yes	Yes
Ruler Death Controls	Yes	Yes	Yes	Yes	Yes	Yes
Districts	178	178	179	179	179	179
Native States	72	72	72	72	72	72
First Stage F		27.02		27.01		27.01

Note: The IV estimates use the death of a ruler without an heir between 1848-58 as an instrument for direct British Rule. The estimates are calculated from the Post-1847 sample of areas not annexed in or before 1847. "RF" refers to the Reduced Form estimate, and "IV" is the second-stage estimate. Data from 1981 and 1991 are from Iyer (2010), which records the proportion of villages per district that have a primary health center. Data from 2001 and 2011 are the proportion of villages per district with a medical facility from the Village Directory, Census of India. Data from 2005-2011 are hospital counts from the Rural Health Statistics of India. All variables are standardized for comparability of estimates. Geography controls include latitude, altitude, mean rainfall, and proportions of clay and silt relative to sand. Ruler death controls include ruler deaths regardless of an heir post 1818 and between 1848-56. Standard Errors are clustered at the district and Native State level in parentheses. Kleibergen-Paap F statistics reported. $^{*}p < 0.1$, $^{**}p < 0.05$ $^{***}p < 0.01$

C Additional Tables and Figures

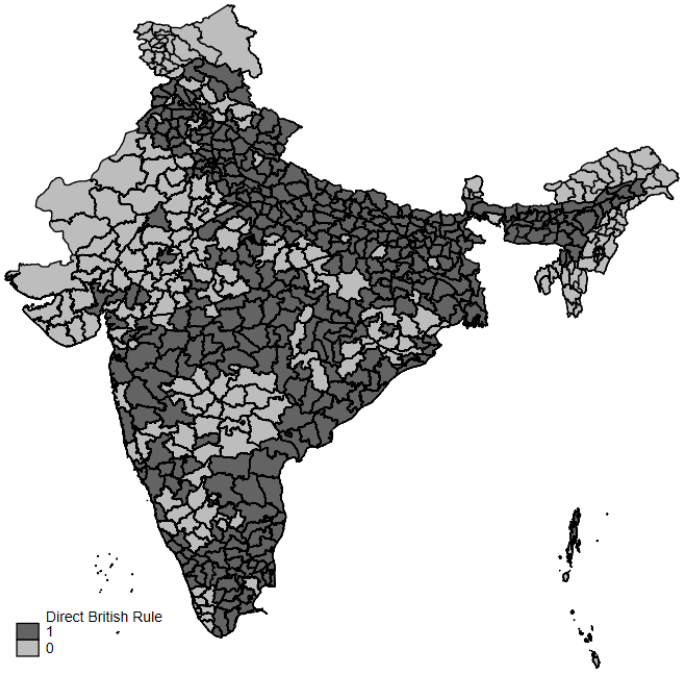
Table C.1: Native States Annexed by Lapse

Native State	Year Ruler Died	Detail
Satara	1848	Kingdom created in 1818. The ruler was deposed in favor of his brother in 1842, annexed by Lapse in 1848
Sambalpur	1849	Handed over from the Bhonsla Kingdom to a local ruler (Maharaja Sahi) in 1818, passed over to the queen in 1827. Kingdom passed to relative Narayan Singh in 1883 after a regional insurrection. Annexed by Lapse in 1849
Jhansi	1853	Treaty with the British in 1804. Ruler died without natural heir in 1835 and in 1838 but succession installed by the British without annexation. State annexed by Lapse in 1853.
Nagpur	1854	Kingdom under British administration only until 1830 after the defeat of the Bhonsla ruler. Independence reversed via Lapse in 1854 after ruler died in December 1853.

Table C.2: Kingdoms where Rulers died without an heir in 1848-1856 but were not Annexed

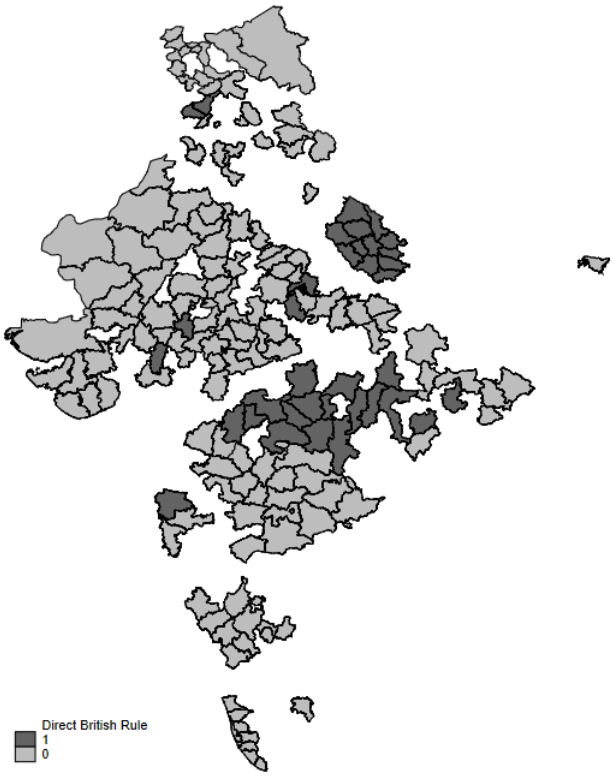
Native State	Year Ruler Died	Detail
Orchha	1852	The State had a prior agreement with the British in 1841 which allowed the Queen to adopt an heir. Lord Dalhousie did not annex on the grounds of a non-tributary state.
Karauli	1853	Recommended annexation denied by the East India Company's Court of Directors.
Chhatarpur	1854	Ruler succeeded by a nephew
Ajaigarh	1855	Ruler died in 1855 and the kingdom was annexed by Lord Dalhousie. The State maintained allegiance to the British during the 1857 Rebellion and hence, the state was returned to the adopted heir by Lord Canning in 1857.

Figure C.1: British India, Full Sample (1947)



Note: The full sample refers to British India from 1858 to 1947. All British annexations stopped after the Indian Rebellion in 1857. Areas marked in light grey are Native States under indirect British Rule.

Figure C.2: Study Sample -
Annexations from 1848 to 1858



Note: The study sample refers to the last phase of British annexations between 1848 and 1858. Native States marked in light grey were never annexed. I use the districts highlighted here in all OLS and IV estimates.