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ABSTRACT

Public health interventions often involve a trade-off between improving health and protecting individual rights. We study this trade-off in a high-stakes setting: prostitution regulations aimed at reducing the spread of sexually transmitted infections (STIs) in Victorian Britain. These regulations, known as the Contagious Disease Acts (CDAs), introduced a system of registration of sex workers, compulsory medical inspections, and the involuntary confinement of infected workers, in a legal market for sex. The first part of our analysis shows that the CDAs led to substantial public health improvements. However, despite their effectiveness, the CDAs were ultimately repealed. The second part of our study examines the causes of this repeal. We show that repeal was driven by concerns about the violation of the basic rights of sex workers and unequal treatment relative to men who purchased sex. These findings emphasize that the success of a public health intervention depends not only on its effectiveness as a sanitary measure but also on how the costs of the regulation are distributed.

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1 Introduction

Many public health interventions involve a tradeoff between safeguarding the health of a population and protecting individual freedoms. How these two opposing motives are balanced can determine both the extent to which the policy improves public health as well as whether it is successful in maintaining public support. We study this tradeoff in a high-stakes historical setting: the regulation of the sex trade in nineteenth-century Britain. Starting in the 1860s, the British state began intervening in what had, up to that point, been an essentially unregulated market for sex. The aim of these new regulations, which were called the Contagious Disease Acts (CDAs) was to reduce the spread of sexually transmitted infections (STIs), particularly among men in the military.

To achieve this aim, the CDAs imposed a rigorous system of physical health inspections on female sex workers, together with mandatory isolation of workers found to be infected with STIs. This system, which was implemented in two locations in 1864, was strengthened and expanded to cover 18 locations across the U.K. (including Ireland) by 1870. In each location, police were responsible for registering sex workers. These women were then required to undergo periodic invasive inspections by doctors, around 10 per year on average. Those workers found to be infected with an STI were then detained in a lock hospital for up to nine months. While detained sex workers received medical care in the lock hospitals, the state of medical knowledge at the time meant that treatments (mainly ingesting mercury) were ineffective and actually harmful. However, because sex workers were typically isolated during the most infectious stage of their disease, this system may have reduced STI spread.

The first part of our analysis shows that the CDAs were highly effective as a sanitary intervention; we document large reductions in STI rates among soldiers and sailors, large reductions in STI mortality among the general population, and a reduction in the rate of childlessness (a consequence of STI infections resulting from infertility, stillbirths, infant deaths, or reduced intercourse). However, despite this effectiveness, the CDAs were ultimately repealed. Why? The second part of our analysis seeks to answer this question. From historical evidence, we know that efforts to repeal the acts began soon after they were implemented, spearheaded by Josephine Butler and the Ladies National Association for the Repeal of the Contagious Disease Acts (LNA) that she founded. This opposition crystallized around the issue of women's rights. Specifically, forcing women to undergo invasive medical examinations–particularly in conservative Victorian society–was viewed by repealers as a flagrant violation of their rights, a concern that was heightened by worries that women who were not sex workers could be mistakenly registered. By analyzing both Parliamentary debate texts and MP voting patterns, we show that concerns about the violation of the rights

of women sex workers, and unequal treatment relative to male sex purchasers, played a key role in the repeal.

Two primary messages emerge from our analysis. First, introducing a regulatory system that involves health inspections of sex workers and isolation of workers with STIs can substantially improve public health relative to a laissez-faire environment. Second, the success of such a public health intervention depends not only on its effectiveness in improving health outcomes, but also on the perceived fairness in how the costs of the intervention are distributed. Most public health initiatives come at some cost. In the case of the CDAs, the design of the acts was such that the cost was entirely born by female sex workers; if anything, the acts likely benefited male sex purchasers, by making the purchase of sex safer. This came to be widely viewed as unjust, leading ultimately to the failure of the CDAs.

Several features of the historical context are crucial for our analysis. First, our setting features a public health intervention where the incidence of the regulation can be clearly identified, which can be challenging in other settings where the burden of regulation may be passed through from one party to another. In the setting we study, the primary burden of the regulation was the violation of the rights and privacy of sex workers who had to undergo invasive compulsory inspections and could be forcibly detained for several months. Thus, it is clear that the incidence of the regulation fell almost entirely on the sellers of sex.

Second, the CDAs were applied to only a subset of locations within the country, allowing us to apply a difference-in-difference analysis strategy when assessing the public health consequences of the acts. The first CDA districts were towns that hosted important Army or Navy stations in southeastern England. The policy was then expanded slowly to stations in other parts of Britain and Ireland. However, in 1870 this expansion was halted due in part to rising public opposition to the acts.

Third our setting allows us to evaluate the effects of regulating the sex trade in a laissez-faire environment, which has not been examined in existing work on the sex trade. Prior to the introduction of the CDAs, the sex trade in the U.K. was largely unregulated, and the market for sex remained legal during and after the regulatory period (Walkowitz, 1982). We also benefit from access to a fairly rich set of data describing the market for sex during the CDA period, as well as data on outcomes such as STI hospitalizations among the largest group of sex purchasers, soldiers and sailors, STI mortality among the general population, and census microdata allowing us to analyze rates of childlessness. These features allow us to expand our understanding of the impacts of regulating the market for sex.

Fourth, we are able to observe some outcomes before the CDAs were implemented, while they were in force, and after they were eventually repealed in the 1880s. This further strengthens our identification strategy, while also allowing us to generate new results on the

persistence of the effects of the CDAs after repeal.

We begin our analysis by looking at how the CDAs affected the market for sex. Our setting provides a rare opportunity to study the impact of regulation on the market for sex, which is often difficult to observe because the sex trade is illegal in many settings. Theoretically, the impact of the CDAs on the market is ambiguous. While we would expect the burden of the regulation on sex workers to reduce supply, if the regulations improved the safety of purchasing sex they may also have increased demand. Using newly digitized data and both time series and difference-in-difference analysis strategies, we provide evidence that the supply-side effect dominated. Specifically, we find that CDA districts experienced a decrease in both the number of sex workers and the number of brothels as a result of the regulations. The number of registered sex workers in CDA districts declined by approximately 60% while brothels declined by at least 35%. These effects do not appear to be driven by a movement of sex workers or establishments from CDA districts to nearby areas.[1] This reduction in the size of the market for sex likely affected the rate of disease spread, in addition to the impact of isolating infected sex workers while they were most infectious.

Next, we examine the impact of the CDAs on public health using several different outcomes and analysis approaches. In the first set of results, we use newly digitized data on STI infection rates among soldiers at army posts subject to the CDAs compared to those at posts not subject to the acts. We find clear evidence of reductions in STI infection rates in treated compared to untreated locations. The hospitalization rate due to syphilis declined by approximately 45% after implementation. This pattern does not appear to be driven by underlying differences between the locations since both types of locations show very similar trends prior to the CDAs. We confirm these results with a separate analysis of data on syphilis rates among Navy sailors.

In a second set of results, we examine the impact of the CDAs on STI mortality among the general population. Here, we take advantage of rich mortality statistics from the Registrar General's office, which report the number of deaths due to syphilis annually at the county level, though diagnostic challenges mean that this category likely includes some other STI-related deaths. Since syphilis was untreatable during the period we study, our data include a substantial number–over 70,000–syphilis-related deaths. Most of these deaths (around 70-75%) occurred among infants who became infected in utero. Analyzing these syphilis deaths tells us about the impact of the CDAs on an intrinsically interesting outcome while revealing underlying patterns of STI presence in an area. A valuable feature of these mortality data is that they are available before the passage of the CDAs, while the acts were in force, and

[1] The age of sex workers also increased after the introduction of the CDAs, consistent with a reduction of entry of younger women into the market.

after they were repealed, allowing us to adopt a particularly strong off-on-off identification strategy and to look for evidence of persistent effects.

Our analysis shows that syphilis death rates fell in counties where the CDAs applied after the acts came into force, while we observe no evidence of differential trends in the pre-treatment period. In terms of magnitude, the syphilis mortality rate declined by approximately 30% after implementation. The reduction in syphilis mortality following the introduction of the CDAs in a location grows over time while the acts were in operation, a pattern that we would expect given that new infections avoided in one period reduce the probability of further infections in the next. However, as soon as the CDAs were repealed, this pattern reverses and syphilis death rates begin converging back toward the rates (relative to the control locations) observed in the pre-treatment period. Within a decade after the repeal, we cease to observe statistically significant differences between syphilis mortality rates in treated compared to untreated locations. To strengthen these results, we show that similar patterns are not observed in several placebo causes of death.

In a third set of results, we examine the impact of the CDAs on the number of childless couples. STI rates may affect the prevalence of childlessness either because STIs cause infertility, because some STIs increase miscarriages and infant deaths, or because active infections may cause couples to reduce the frequency of intercourse. To study these effects, we use census microdata from two census waves before the CDAs (1851 and 1861) and two waves after (1891 and 1901) and compare the number of childless couples in locations subject to the CDAs compared to locations not subject to them. We find strong evidence of a reduction in the number of childless couples in CDA districts compared to non-treated districts in the post-treatment census waves. This provides a third set of results indicating that the CDAs had substantial effects.

Having established that the CDAs had substantial health benefits, in the second half of our study we consider why, despite these, the CDAs were eventually repealed. In particular, we are interested in testing the historical narrative that concerns about women's rights and equal treatment played a central role in the repeal.[2] We offer two complementary approaches to studying this issue. In both, we focus mainly on the critical 1883 division (vote) on a resolution against compulsory inspection of sex workers. When that resolution passed, it eliminated compulsion, effectively gutting the CDAs (they were finally repealed in 1886). We also consider evidence from a second important vote, in 1873, which was the culmination of an unsuccessful early effort to repeal the CDAs. Interestingly, both votes feature substantial crossover voting by both parties.

We begin by harnessing a large language model (LLM), specifically ChatGPT, to analyze

[2]See, most prominently, Walkowitz (1982).

the text of the Parliamentary debate that led to the 1883 resolution against the CDAs. That debate was extensive, with over 44,000 words spoken. We ask ChatGPT to provide a summary of the key arguments made for or against the resolution. The resulting summary suggests that women's rights were central to the decision to repeal the CDAs. In particular, MPs were concerned that (i) the CDAs were a violation of women's rights and (ii) the Acts treated women and men unequally, since only female sex workers, and not male sex purchasers, were subject to the acts.

We then undertake a statistical analysis of the motivations behind MPs voting decisions, using information on MPs votes on the 1883 resolution, as well as an unsuccessful 1873 resolution to repeal the CDAs, and their backgrounds. In this analysis, we identify two critical factors, beyond party affiliation, related to MPs votes. First, we find very strong evidence that MPs from CDA districts were more likely to support the CDAs. This suggests that direct exposure to the acts, and their effects, increased support for the intervention. Second, we find that concern for women's rights–which we measure using MP votes on resolutions or bills related to women's suffrage or married women's property laws–strongly predicts opposition to the CDAs. A back-of-the-envelope calculation suggests that concerns about women's rights was critical to the repeal of the CDAs, a finding that confirms the arguments made by historians (Walkowitz, 1982).

Finally, we provide more causal evidence that concerns about women influenced the votes of MPs (who were all men). To do so, we carefully reconstruct the fertility history of each MP, by manually matching individuals to censuses and other sources, in order to identify the number of sons and daughters that each had as of the 1881 census. We then hypothesize, following Washington (2008), that the presence of daughters increases MPs concern about women's rights issues relative to sons. To verify that this is the case, we show that MPs with daughters were substantially more likely to vote in favor of women's suffrage in the 1883 division. Then, we show that MPs with daughters were substantially more likely to vote to repeal the CDAs than MPs with sons. Since the number of daughters or sons that MPs had was as good as random in the population we study, this provides direct evidence that concerns about women influenced MP votes against the CDAs.[3]

Our results highlight the critical role that the design of the CDAs, and specifically how they allocated the burden of regulation across groups, played in the longevity of the policy. Other policy options that came with either a lighter burden, or at least that spread the

[3]There is no evidence that selective abortions or infanticide were carried out in the U.K. during this period, and among MPs, which were universally wealthy relative to the British population, it is highly unlikely that a gendered allocation of scarce resources among children would have led to higher mortality rates among female relative to male children. Consistent with this, we find almost perfect gender balance among the children of MPs.

burden more equitably between buyers and sellers, were considered. One alternative that was discussed involved a system that also imposed an inspection regime on soldiers, one of the primary groups of sex purchasers. However, this alternative was deemed "extremely distasteful."[4] Another alternative, advocated by opponents of the CDAs was the provision of "ample free hospital accommodation", preferably staffed mainly by women doctors, where infected sex workers could seek care and treatment on a voluntary basis.[5] Both of these alternatives were rejected in favor of the system of mandatory inspection, applied only to the female sellers of sex and not their male customers, implemented by the CDAs. Our results suggest that this design decision played a key role in the ultimate failure of the policy.

Related literature and contribution: One contribution of our paper relates to the extensive literature on historical public health interventions. This is a very large literature, including work on topics ranging from digestive diseases and water supply improvements (Troesken, 2004; Cutler and Miller, 2005; Ferrie and Troesken, 2008; Beach et al., 2016; Alsan and Goldin, 2019; Anderson et al., 2020, 2021; Beach, 2022; Anderson et al., 2022; Chapman, 2022, 2019), food quality (McKeown, 1976; Anderson et al., 2023), public health efforts aimed at tuberculosis (Anderson et al., 2019; Clay et al., 2020; Egedesø et al., 2020), lead exposure (Clay et al., 2014), vaccination (Ager et al., 2018), interventions aimed at limiting the spread of influenza such as mask mandates and school closures (Markel et al., 2007; Correia et al., 2022; Dahl et al., 2023), and other interventions (Ager et al., 2023).

Despite the breadth of this literature, STIs and public health interventions aimed at limiting them remain almost completely unexplored. This is particularly surprising given that STIs were an important cause of death, infertility, and likely had even larger morbidity effects (Siena, 2004; Szreter, 2014; Szreter and Schürer, 2019; Szreter and Siena, 2021). One exception is Fung and Robles (2016) which studies mandatory antenatal testing for syphilis which was adopted in many U.S. states in the 1940s.

More broadly, our paper differs from most existing work on public health interventions in that we go beyond evaluating the efficacy of the intervention on public health, to also consider how the distribution of the burden of the intervention affects public support and, ultimately, the longevity of the policy. Our findings demonstrate that the ultimate success of the policy depends not only on whether it improves health, but also on whether the burden of the intervention is distributed in a way that allows it to maintain public support. This

[4]Specifically, the Duke of Cambridge told the Venereal Disease Committee that, "'I have consulted with the Director-General of the [Army] Medical Department..." who thought that the inspection of soldiers was "extremely distasteful, and was considered a very offensive duty by the Medical Officers of the Army; and further, that the advantages to be gained by it did not compensate for the discomfort and distaste that was felt by the Medical Officers." See *Report of the Committee appointed to enquire into the Pathology and Treatment of Venereal Disease*, 1868, Parliamentary Papers, p. xxxii.

[5]Butler (1909), p. 45.

result naturally has implications for modern public health interventions.

We also contribute to a small but rapidly growing set of modern studies focused on understanding the costs and benefits of regulating the sex trade, including Gertler and Shah (2011), Bisschop et al. (2017), Cunningham and Shah (2017), Cameron et al. (2021), and Gao and Petrova (2022).[6] Relative to existing work in this area, our study expands our understanding of the consequences of regulating the sex trade in several dimension. First, we are the first to examine the impact of imposing a system of registration and inspection in a laissez-faire environment. Our results show that, relative to laissez-faire, a system of registration and medical inspection can substantially reduce STI rates. Second, we are able to study how the impact of regulation evolves over several years, as well as the consequences of subsequently eliminating regulation. In particular, we offer new evidence showing that reducing STI rates in some locations had a persistent effect, but the half-life of that effect was rather short. Finally, we point out that the ultimate success of any public health policy aimed at the sex trade will depend crucially on how the burden of regulation is distributed.

Our paper also contributes to existing literature on the CDAs by historians and sociologists, including Blanco (1967), Sigsworth and Wyke (1972), Walkowitz and Walkowitz (1973), and–most prominently–Walkowitz (1982). This literature is largely motivated by the important role that resistance to the CDAs played in the early women's rights movement in the U.K. Our results help refine our understanding of this important historical event. In particular, while our results reinforce the historical narrative that women's rights played a crucial role in repeal of the CDAs, we also correct a common misperception in the historical literature that the CDAs were ineffective as public health interventions.[7] In fact, we show that the CDAs were highly effective. This finding, which confirms the conclusions of numerous contemporary government reports, makes the repeal of the CDAs even more noteworthy.

The rest of the paper proceeds as follows. Section 2 presents historical background.

[6]These empirical studies are motivated, in part, by theoretical work highlighting the trade-offs inherent in sex work. A seminal theoretical contribution in this area is Edlund and Korn (2002). More recent theoretical work includes Immordino and Russo (2015), which focuses on how policies toward the sex trade affect health risks, and how those risks, in turn, influence the market, and Lee and Persson (2022), which emphasizes the fact that the sex trade involves both voluntary and coerced workers. A slightly different line of work examines the factors that determine the size and spatial distribution of the market for sex. An example of work in this vein is Brodeur et al. (2018).

[7]For example, Walkowitz (1982) writes (p. 3) that, "In pressuring for the medical inspection of prostitutes without imposing periodic genital examination on the enlisted men who were their clients, architects of the acts obliterated from the start whatever effectiveness as sanitary measures the acts might have had." This misperception appears to stem from an uncritical acceptance of the propaganda produced by CDA opponents, which consistently attempted to show that the acts were ineffective as public health measures in the face of repeated Parliamentary Committee reports providing fairly clear evidence that they were reducing STI rates.

Section 3 presents results on how the CDAs affected the market for sex. Section 4 presents our main empirical results on how the CDAs affected public health. Section 5 analyzes the reasons why the CDAs were repealed. Section 6 concludes.

2 Background

This section provides historical context for our study. The first part discusses the passage and implementation of the Contagious Diseases Acts. The second part discusses opposition to the CDAs which resulted in the repeal of the acts. The third part provides a summary of the medical knowledge and available treatments for STIs in the nineteenth century.

2.1 The Contagious Diseases Acts

Before the passage of the Contagious Diseases Acts solicitation by sex workers was not criminalized in Britain (Walkowitz, 1982, p.14). Officials treated prostitution as a public nuisance and were primarily interested in containing it within particular areas of cities. This policy of geographically segregating sex work was common in other contexts as well, such as in U.S. cities in the late nineteenth century (Goehring, 2023). In contrast to these more passive approaches, the CDAs resembled systems developed in France and Germany in the early nineteenth century in which sex workers were required to undergo periodic medical inspections. These systems provided a model for the system eventually adopted, in a more limited form, in the U.K. (Harsin, 1985).

The motivation behind Britain's Contagious Disease Acts can be traced to the Crimean War of 1854-1856. The death of substantial numbers of British soldiers due to poor sanitation and health care, rather than enemy action, was highlighted through the work and advocacy of Florence Nightingale, other reformers, and journalists. This led to a rethinking of how soldiers were treated, leading to the appointment of the Army Sanitary Commission in 1857.[8] Among the health concerns highlighted by this commission were high rates of STIs among soldiers.

The initial Contagious Diseases Act was passed in 1864 with the primary objective of reducing the prevalence of STIs among British troops. The 1864 act applied to eleven areas containing military garrisons, eight in England and three in Ireland. Subsequent amendments in 1866 and 1869 expanded the geographic scope and broadened the powers police had to force sex workers to comply with the law. Each act added districts to the CDAs and extended the length sex workers could be detained in hospitals. By 1870, the CDAs were enforced in 18 subjected districts (CDA districts) located in the southern part of England as well as parts of Ireland. Appendix Table B.1 lists these locations and the year in which the CDAs

[8] Blanco (1967).

came into force in each.

Both the original 1864 act and the acts of 1866 and 1869 were passed without either substantial debate or a division. In other words, the laws were passed without a vote in Parliament.[9] This feature became an important point of criticism once resistance to the CDAs arose. It also means that we have no votes on the enactment of the CDAs to analyze.

After the final amendment in 1869, the system for regulating sex work operated in the following manner.[10] Police in subjected districts were tasked with identifying and registering all sex workers. If a woman was suspected of engaging in sex work, the police would register her and the local court would issue a summons for her to report for a medical examination. If, upon examination, no STI was identified, she was free to continue working until her next examination. However, if she was found to have an STI she could be detained at a hospital for up to nine months. The duration of medical inspections would last a year, after which, if the woman still engaged in sex work and the police wanted to continue subjecting her to examinations, they would have to reregister her and seek new court approval. Sex workers could voluntarily submit to the law as well to avoid the judicial summons. If a woman wanted to be removed from the register to avoid future inspections before the year had elapsed she was entitled to a hearing in which she had to prove that she no longer engaged in sex work. Women that did not comply with the law could be forcibly detained. As a means of ensuring compliance with the system of licensing and inspections, the CDAs also gave the police the power to fine and arrest brothel keepers as well as the owners of other establishments where unregistered women practiced sex work.

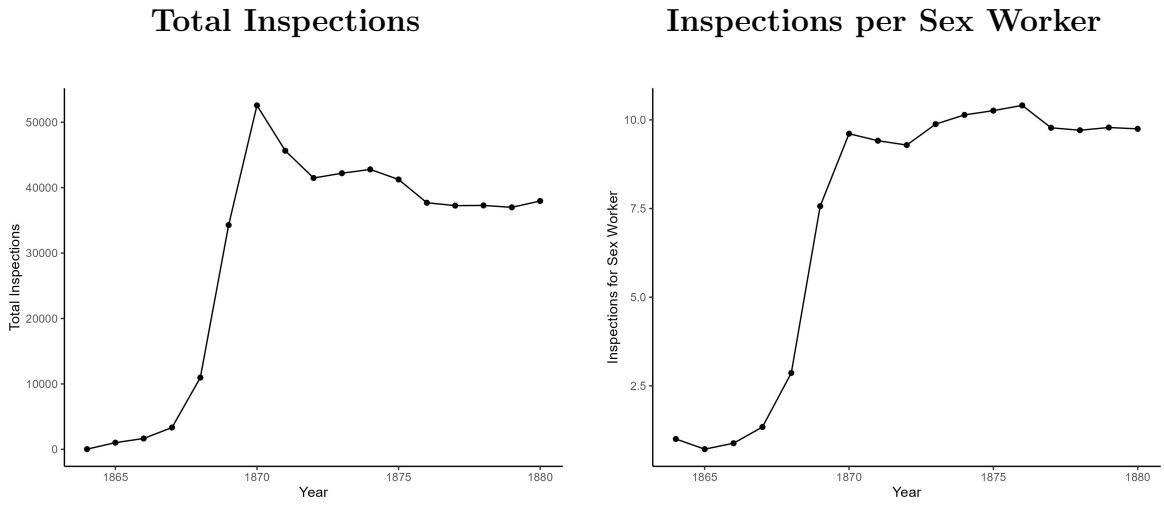
The CDAs were vigorously enforced in most subject districts. Police swept the streets, brothels, and other establishments (beer houses, public houses) to identify and register sex workers so that they could be tracked and subject to periodic medical examinations. These enforcement mechanisms became more effective over time, as local authorities gained experience. Using police records we digitized from the Parliamentary Papers, Figure 1 describes the number of inspections undertaken across all subjected districts. Between 1864 and 1870, the number of inspections increased as new districts were brought under the CDAs and the enforcement mechanism in existing districts became more comprehensive. In 1870, around 50,000 inspections (medical exams of sex workers) were conducted. After 1870, the number of inspections fell, leveling off at around 40,000 per year. By comparing the left and right-

[9]That an Act can pass without a vote may seem surprising to those not familiar with the workings of the U.K. Parliament. As Parliament's website explains, "When a vote is held the Speaker in the Commons - or Lord Speaker in the Lords - asks Members to call out whether they agree or not. The Speaker will then judge whether there is a clear result. If this cannot be determined, the Speaker or Lord Speaker calls a division" (see https://www.parliament.uk/about/how/business/divisions/).

[10]Our description of the CDAs is based in part on the Report of the Select Committee on the Contagious Disease Acts of 1882 as well as Sigsworth and Wyke (1972, p.94-95).

hand panels in Figure 1, we can see that the reduction in the total number of inspections was driven by a reduction in the number of sex workers active in the subject districts, a finding that we examine in more detail later, while the overall number of inspections per sex worker remains fairly constant at around ten per year. These inspections were backed up by an effective system of isolation for those workers who showed signs of having an STI. Between 1870 and 1880, the total number of hospitalizations ranged from 3,000 to 5,000 per year (see Appendix Figure C2). Overall, these patterns highlight the expansive scope of the CDAs, as well as the impressive level of state capacity involved in registering, inspecting, and isolating infected women.

Figure 1: Medical Inspections under the CDAs Over time



Note: The figure on the left displays the total number of medical inspections of sex workers conducted from 1864-1880. The figure on the right displays the number of medical inspections relative to the number of sex workers examined. Both graphs aggregate across all districts. The data are from the *Annual Report of the Assistant Commissioner of the Police of the Metropolis Relating to the Contagious Diseases Acts* in 1881. Appendix B.1 provides additional details.

2.2 Opposition to the CDAs

Public criticism of the CDAs started soon after they were adopted. Several organizations were formed to lobby for their repeal, the most influential of which was the LNA. Josephine Butler started the LNA in 1869 and used it to wage a public campaign to remove the CDAs. The clearest demonstration of the principles of this opposition is provided by the text of a protest letter published by the LNA at the end of 1869, reproduced in Appendix A.1.

There were three common critiques raised by the LNA and others in opposition to the acts. First, many critiques focused on the degrading and intrusive nature of the physical examinations that invaded the privacy of the women subject to them. The protest letter

articulated this point by saying, "these measures are cruel to the women who come under their action, violating the feelings of those whose sense of shame is not wholly lost, and further brutalising even the most abandoned."[11]

Beyond the intrusive and degrading treatment of sex workers, a second concern was that women not engaged in sex work had little recourse if police suspected them of being prostitutes. The protest letter describes the "momentous change in the legal safeguards hitherto enjoyed by women in common with men" which "'so far as women are concerned...remove every guarantee of personal security which the law has established and held sacred, and put their reputation, their freedom, and their person absolutely in the power of the police." In arguing against the CDAs, Butler often recounted the story of Mrs. Percy, a woman working in a musical theater on one of the military bases in a subjected district. Her sixteen-year-old daughter would accompany her to work, and one night they were stopped by the local morals police. She tried to convince the officers that they were not prostitutes, yet the police were unconvinced and wanted to register her and her daughter for medical inspections. Mrs. Percy refused to sign the registration paperwork leading to a series of retaliations by the police in which she lost her job, left the district, tried to regain employment in the district under an alias, and was continually pursued by the police. While an extreme case, Mrs. Percy's story illustrates the broad powers given to local authorities under the CDAs and the potential for police overreach (Barry, 1984, p.17-18).

A third critique that permeates much of the protest letter and other discourse among opposition leaders is that the law was unfairly applied only to women and not men. The protest letter argued it was "unjust to punish the sex who are the victims of a vice, and leave unpunished the sex who are the main cause both of the vice and its dreaded consequences; and we consider that liability to arrest, forced medical treatment, and (where this is resisted) imprisonment with hard labour, to which these Acts subject women, are punishments of the most degrading kind."

To oppose the CDAs, the LNA recruited sympathetic MPs to lead repeal efforts in Parliament, such as William Fowler, a Quaker, and the Radical Liberal James Stansfeld. The LNA held numerous public meetings and rallies, and during key debates often organized women's prayer meetings near Parliament.[12] While these efforts were rebuffed throughout the 1870s, they were eventually successful in eliminating compulsory examination in 1883 and completely repealing the CDAs in 1886. Section 5 studies the key votes in more detail.

Historians have highlighted the important role that opposition to the CDAs played in

[11] From Butler (1909). See Appendix A.1 for the full text.

[12] See Butler (1909), p. 79. At one such meeting, just before the crucial 1883 vote, Josephine Butler described "well-dressed ladies, some even of high rank, kneeling together (almost side by side) with the poorest, and some of the outcast women of the purlieus of Westminster."

the women's rights movement during the Victorian era. Feminist historian Barbara Caine writes that "some would argue that the real turning point" in the feminist movement "was not so much the early campaigns of the 1850s and 1860s as the contagious disease agitation, which...dominated feminist consciousness during the 1870s. The campaign...soon involved a national movement with a substantial membership, working through large-scale public meetings and demonstrations, direct political intervention in by-elections, and by producing effective propaganda."[13] One reason for the movement's impact was how, "drawing on the model of the abolitionist movement, it...developed a powerful religious rhetoric which tied its specific legal objective, the end of the Contagious Disease Acts, with an ideal of moral and religious transformation–and the end of the sexual double standard."[14]

2.3 STIs in the Nineteenth Century

Contemporaries had some understanding of the most common STIs in the second half of the nineteenth century, but with important gaps in their knowledge. An excellent source that reveals the level of their understanding is the report of a Committee appointed in 1864 by the Admiralty and the Secretary of State for War to survey the state of medical knowledge on STIs and what could be done to reduce their spread. This "Venereal Disease Committee", which included representatives of both the Army and Navy Medical Boards as well as leading private physicians, interviewed 56 leading medical professionals and provided a detailed report summarizing current medical knowledge related to STIs.[15]

Contemporaries understood that STIs such as syphilis–the most important STI in the context we study–were in fact real diseases (a fact which had been disputed by some) but they had trouble precisely identifying different STIs. The Committee found syphilis was a disease "universally recognized by the medical profession" though "the term 'Syphilis' at the present day includes every variety of constitutional venereal disease."[16] This point indicates that the data on syphilis used in our analysis may be capturing a wider variety of STIs.

The report also reveals a basic understanding of the progress of syphilis through its various stages. Syphilis is most contagious during the first stage of the disease in which the infected individual has a sore that normally lasts up to six weeks. In the second stage, the sore heals and is usually followed by a rash. After the rash has disappeared the individual

[13] Caine (1997), p. 90-91. Similarly, Szreter (2014) writes that "The successful battle to repeal the Contagious Disease Acts, 1864-86...was a powerful engine of mobilization for Victorian feminism."

[14] Caine (1997), p. 91.

[15] The final report is *Report of the Committee appointed to enquire into the Pathology and Treatment of Venereal Disease*, 1868, Parliamentary Papers. According to the report, the Committee also forwarded preliminary findings to Parliament in 1866, which played a role in the passage of the 1866 Contagious Disease Act.

[16] *Report of the Committee appointed to enquire into the Pathology and Treatment of Venereal Disease*, 1868, Parliamentary Papers, p. vi.

enters tertiary syphilis, and is normally no longer contagious. This stage can last years and lead to cardiovascular and neurological issues.[17] An understanding of these stages allowed contemporary doctors to diagnose the disease. However, this diagnosis relied on physical inspection, since medical advances allowing effective testing for syphilis were not invented until the early 1900s, well after our period of interest.[18]

While the diagnostic characteristics of the disease were well-understood, the etiology of the disease was not. It was understood that syphilis and other STIs could be spread through contact, but debate remained over whether it could also appear spontaneously. Moreover, the exact mechanism of spread was not well understood. However, it was understood that STIs could be transmitted through sexual intercourse, and contemporaries also knew that some, syphilis in particular, could spread from infected mothers to their infants. This "hereditary syphilis" was known to cause stillbirths and to kill many infants and young children.[19]

While contemporaries could generally diagnose STIs, they had almost no ability to effectively treat them. Simple primary syphilis sores, for example, were treated by "local applications" (compresses) to "allay pain or inflammation."[20] For more serious cases, the primary treatment was mercury "by mouth, by inuction, or by vapour baths." The committee found that "The weight of the evidence...preponderates in favour of the advantage of mercurial treatment..." though "it is contended by a minority of authorities that mercurial treatment...neither prolongs the interval of apparent health, nor modifies the severity of the future disease."[21] The main alternative to mercury was ingestion of iodine. Neither of these approaches would have been therapeutic and neither would be recommended today. Effective treatments would not arrive until 1909, when an arsenic-based treatment known as Salvarsan became available. However, the drug was toxic and led to complications for early patients. A safer version of the drug was invented in 1912, and became the main treatment for syphilis in place of mercury (Brandt, 1985, p.40-41). Penicillin, the modern treatment, did not become widely used until the 1940s (Alsan and Wanamaker, 2018).

The Report's limited discussion of methods of preventing the spread of syphilis is also revealing. The main method of prevention discussed was reducing contact between infected

[17] This webpage from the Center for Disease Control provides a useful summary of the different stages of syphilis as well as information on its contagiousness and side effects: `https://www.cdc.gov/std/syphilis/stdfact-syphilis-detailed.htm`

[18] In 1905, German researchers identified the bacteria that causes syphilis. A year later the Wassermann test was invented which became the most common way to identify syphilis infection. (Brandt, 1985, p.40-41)

[19] *Report of the Committee appointed to enquire into the Pathology and Treatment of Venereal Disease*, 1868, Parliamentary Papers, p. xi.

[20] *Report of the Committee appointed to enquire into the Pathology and Treatment of Venereal Disease*, 1868, Parliamentary Papers, p. xvi.

[21] *Report of the Committee appointed to enquire into the Pathology and Treatment of Venereal Disease*, 1868, Parliamentary Papers, p. xvi.

and non-infected persons through identifying and isolating those with infections. Thus, while the medical officials examining sex workers as part of the CDAs could not have cured their syphilis, they could have identified women with sores and rashes which would indicate they were still in the contagious period of the disease. Other modern methods for reducing STI spread, such as condoms, were not widely available in the period we study.[22] Beyond isolating infected individuals, the only other method seriously recommended for preventing spread was the provision of facilities for washing after intercourse.

3 Preliminary analysis: CDAs and the Market for Sex

Question: As a first step in our analysis, we analyze the impact of the CDAs on the market for sex. This analysis provides an indication of how the quantity of sexual transactions changed as a result of the policy, which is one important channel through which the policy affected public health. This also provides an opportunity to examine how regulation affects the market for sex, which few modern studies have been able to look at because of data constraints, with the notable exception of Cameron et al. (2021).

The impact of the CDAs on the quantity of sex transacted is theoretically ambiguous. On one hand, the CDAs represented an increase in the cost and hassle faced by women who sold sex. Sex workers incurred time costs associated with the frequent inspections. The history literature also suggests the examinations were mentally taxing for sex workers. Many did not want to be examined and considered it to be a breach of privacy. In addition, the police actively worked to discourage sex workers from practicing the trade, particularly those new to it, and to connect sex workers with resources that helped them exit the trade. We would expect all of these factors to shift supply inward. On the other hand, if the CDAs increased buyers' perception of the safety of purchasing sex, then they might also have increased demand.[23] We would expect both of these forces to increase the price in the market (which unfortunately we are unable to observe) but the effect on quantity–which is what matters for disease transmission–is ambiguous.

Data: We use two sources of data to track the impact of the CDAs on the market for sex. The first, which was produced by the police as part of the CDA intervention, we digitized from the *Annual Report of the Assistant Commissioner of the Police of the Metropolis Relating to the Contagious Diseases Acts* for 1881 (hereinafter the "police data"). The advantage of this data source is that it contains detailed information on the sex trade in each district subjected

[22] Vulcanized rubber was first used in condom production in 1855. However, condoms remained expensive, and thus rarely used, well into the twentieth century (Guinnane, 2011).

[23] Immordino and Russo (2015) present a model of the sex trade capturing these various elements. The health risk in the market is endogenous to the number of sex workers and clients. They study how various regulations of the sex trade, either prohibition or licensing regimes, impact equilibrium quantities, prices, and health risk.

to the CDAs. The disadvantage is that it is available only for these treated districts, and only starting from the year the act came into effect.

To complement the police data, we use a second data set–the "brothels data"–which we digitized from the *Judicial Statistics of England and Wales*. These data give the number of active brothels in British counties from 1860 to 1871.[24] The main advantage of this source is that it contains data for both CDA and non-CDA locations before and after the introduction of the CDAs, allowing us to conduct a difference-in-difference analysis. The main disadvantage of this data set is that we see only the number of establishments active in a location, rather than the number of sex workers.

There are some caveats to keep in mind when using either of these data sets. First, the data reflect only the number of sex workers and brothels known to the police through the registration process. They do not capture women that evaded the law and continued practicing sex work. However, as we have seen, the CDA regulatory regime was quite extensive, and so there are unlikely to be substantial numbers of unregistered women selling sex in the subject districts. Second, the number of sex workers or establishments is not a perfect measure of the quantity in the market, because it will not capture the intensive margin of supply. However, we believe that it is a good approximation of quantity because most of the women who sold sex (at least those captured in our data) did so on a full-time basis.[25] There is a clear economic rational for this, as pointed out by Edlund and Korn (2002).

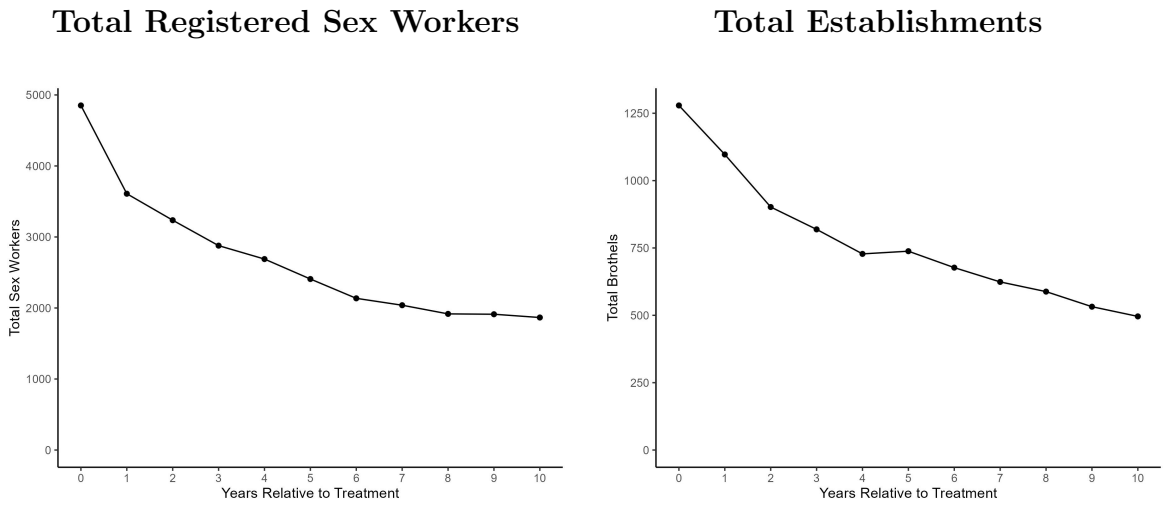
Analysis of the police data: We start by using the police data to provide a series of descriptive facts on how different aspects of the sex trade changed over time in the treated districts. As a starting point, Figure 2a shows the change in the number of sex workers in CDA districts in event time, i.e., relative to the first year in which the district came under the CDAs and the sex workers in the district were registered. The reduction in sex workers over the first few years in which the CDAs were in operation is clear. Starting from a total of nearly 5000 women in the initial year, the number of sex workers in CDA districts dropped to around 2000 after about five to seven years and then leveled off. Overall, this represents an approximately 60% reduction in the number of sex workers during the period. This drop is observable in nearly all of the CDA districts, as shown in Appendix Table C1, though there is some variation resulting from the particular circumstances in each district as well as the vigor with which the regulations were enforced. The fact that we observe such a precipitous drop in the number of sex workers following the introduction of the CDAs strongly suggests

[24]For unknown reasons, after 1871 the number of brothels is no longer reported in the Judicial Statistics.

[25]When discussing the prevalence of women that engaged in sex work only part-time, the historian Judith Walkowitz writes, "Experts doubted that working women could maintain a dual identity over any extended period – slaving away fourteen hours a day at dressmaking or launderessing and then going on the streets in the evening." (Walkowitz, 1982, p.14-15)

that the new regulations effectively reduced the size of the sex trade.

Figure 2: Registered Sex Workers & Brothels in Subjected Districts



Note: The figure on the left displays the total number of registered sex workers. The figure on the right displays the total number of establishments where sex work took place. Both graphs aggregate across all districts in event time. The data are from the *Annual Report of the Assistant Commissioner of the Police of the Metropolis Relating to the Contagious Diseases Acts* in 1881.

The reduction in the supply of sex workers coincides with a similar decline in the number of establishments where the sex trade took place. Figure 2b shows that the total number of establishments declined by approximately 60% in the first decade after implementation. Furthermore, the types of establishments also changed. In the first year the CDAs were implemented, public and beer houses comprised approximately 32% of locations. Some of these pubs would rent out permanent housing for women to reside in the bar while other sex workers resided elsewhere. A decade later, the share of public and beer houses had declined to approximately 7%. Overall, these facts reflect the reduction in the size of the market as well as the formalization of the sex trade as sex work concentrated in brothels and away from locations such as public and beer houses where other types of leisure activity occurred.

The police data also offer insight into the mechanisms through which the reduction in the number of sex workers occurred. As part of the registration process local police collected data on the age of all registered sex workers in subject districts. Appendix Figure C1 shows the age distribution aggregated across districts for the first year after treatment and a decade after treatment. There is a clear rightward shift in the distribution with more women in their twenties and thirties, indicating sex workers became older over time. During this period the average age increased nearly 4 years from 21 to 25. While it is impossible to know with certainty given available data, this fact is consistent with a reduction in younger women

entering the sex trade and existing sex workers remaining in the market for longer. Younger women choosing whether to enter the sex trade might have been dissuaded given the higher costs associated with frequent testing, or because of police interventions encouraging them not to enter, whereas the sex workers that remained may have been those with few outside options. The historians Judith and Daniel Walkowitz have presented anecdotal evidence of this fact and have argued that the CDAs led to the "professionalization" of the sex trade where women remained in the industry longer and had less occupational mobility (Walkowitz and Walkowitz, 1973).

Analysis of the brothels data: While the police data provide detailed information on the sex trade in the treated districts, a potential concern is that the observed decline in supply could be driven by other confounding factors. To address this, we use data from the *Judicial Statistics* for 1860-1871 and apply a difference-in-difference empirical strategy to assess how supply, proxied by total brothels, changed in response to the CDAs.

We estimate the following equation:

$$y_{ct} = \alpha + \sum_{s} \beta_s \mathbf{1}\{s = t - \tau_c\} + \alpha_c + \alpha_t + \epsilon_{ct} \tag{1}$$

where $\mathbf{1}\{s = t - \tau_c\}$ is an indicator equal to one for county c in the s'th year relative to when the county was treated in τ_c, and zero otherwise. β_s is estimated for each year s relative to treatment, allowing us to assess pre-trends. α_c and α_t are county and year fixed effects, respectively. The main outcome, y_{ct}, is the number of brothels in the county.

There are a few aspects of this empirical strategy to note. First, we estimate equation (1) at the county-level, so the timing of treatment, τ_c, is defined as the first year any treated district contained in the county becomes subjected to the CDAs.[26] Note that counties are substantially larger than districts. One implication of this is that our estimates will capture the net effect of the treatment in CDA districts as well as any spillover effect from treated districts into neighboring districts in the same county. This feature helps address a potential concern that our results may be affected by spillovers from treated into non-treated neighboring districts. In Section 4.3 we will provide evidence indicating that spillover effects into nearby districts were not meaningful.

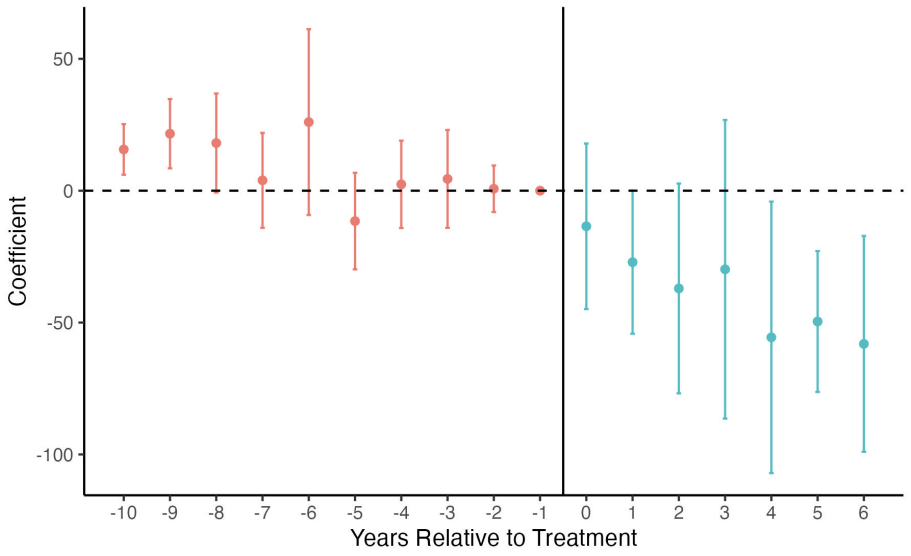
Second, treated counties are subjected to the CDAs at different times (see Table B3). There has been a recent literature highlighting issues with the common two-way fixed effect approach when treatment timing is staggered and effects are heterogeneous (Goodman-Bacon, 2021; Baker et al., 2022). Therefore, we will estimate equation (1) using the estimator

[26] London is omitted from our main analysis of the brothels data. When London is included in the analysis, in Appendix Table C2, we observe somewhat stronger estimated effects.

in Callaway and Sant'Anna (2021) which addresses the negative weighting issue in two-way fixed effects with staggered treatment timing.[27]

Figure 3 displays the event study results from estimating equation (1) using the method in Callaway and Sant'Anna (2021). While noisy, the estimated coefficients suggest treated and control counties are not trending differently prior to implementation of the CDAs. After implementation the number of brothels in counties containing treated districts begins to decline. Appendix Table C2 provides the average treatment effect corresponding to the results presented in Figure 3, as well as some robustness checks. The average effect implies that after the CDAs were implemented treated counties had approximately 39 fewer brothels, a 37% reduction for the average county. The results are even clearer if we estimate two-way fixed effects regressions in place of the method from Callaway and Sant'Anna (2021), as shown by the results in Appendix Figure C3.

Figure 3: The Effect of the CDAs on the Number of Brothels



Note: The figure shows the estimated coefficients and 95% confidence intervals for β_s in Eq. 1 estimated using the method from Callaway and Sant'Anna (2021) applied to the county-level number of brothels. The x-axis is in event time relative to the year in which the CDAs became active in any district within the county. The vertical line corresponds to the year of treatment. Standard errors are clustered at the county-level. The County of London is excluded from our analysis.

Summary: Both the patterns revealed by the police data and our analysis of the brothels data indicate that the CDAs substantially reduced the size of the market for sex in the

[27]When using this estimator the researcher must choose if only never-treated units are in the control group or whether not-yet-treated units are also added. We choose to only include never-treated units so that the composition of the control group does not change over time. Throughout the analysis we choose to use never-treated units as the control group. However, results are robust to using not-yet-treated units instead.

districts in which they applied. A reduction in the size of the sex market is one factor that can affect the spread of STIs. A second related factor, which we also documented, is the isolation of infected sex workers under the CDAs (see Figure C2). Next, we examine how these changes impacted public health.

4 Public health effects of the CDAs

This section presents our analysis of the public health effects of the CDAs. The analysis is divided into several parts, each of which uses a slightly different outcome measure and analysis strategy. We begin by looking at whether the acts reduced STI cases among soldiers, their primary aim, using data collected from military reports. Then, we consider the impact on STI mortality in the general population using the national mortality statistics. Finally, we look at how the acts affected the rate of childless couples, using census microdata.

4.1 The Impact of the CDAs on STI cases among soldiers

Question: Were the CDAs effective at reducing STI prevalence among soldiers stationed in the locations where the CDAs were applied? Answering this question will tell us whether the CDAs achieved their primary objective. It also provides a natural preliminary step toward assessing the effects of the CDAs on the broader health outcomes among the general population.

There are several reasons why the CDAs may have reduced STI prevalence in treated districts. First, as we have seen, there is evidence that the overall size of the sex market fell. To the extent that this market was an important source of STI spread, we would expect this to lead to a reduction in STI prevalence. In addition, within the sex market, the isolation of sex workers with STI symptoms should have reduced the overall risk of STI spread from any particular sex transaction. However, STI rates may not have fallen if either the sex trade was not a primary driver of the spread or if sex buyers obtained sex in other ways that also came with equivalent STI risks.

Data: To assess changes in the spread of STIs we have collected and digitized data on the number of soldiers hospitalized with STIs at military stations in the UK (which included all of modern Ireland at this time) from 1860 to 1878. The data come from a report by a committee in Parliament that was investigating how the CDAs were operating in the subjected districts. The report contains information on the hospital admissions of soldiers from various STIs. For gonorrhea and primary syphilis, only data aggregated across treated and untreated stations is reported. However, for secondary syphilis the report provides disaggregated hospital admissions for 27 military stations. We drop two of these stations, Warley and Windsor, which do not report data for the entire period. Thirteen of these

stations are located in a subjected district and twelve in untreated districts.[28] These data cover all Army stations with over 500 men. Additional details on these data are provided in Appendix B.2. Note that, to the extent that soldiers move between stations, our results will understate the impact of the CDAs on hospitalization rates.

We supplement the Army stations data with data from a similar report conducted by Parliament that contains hospitalization from syphilis of Navy sailors serving in ships stationed in a sample of treated and untreated ports from 1860 to 1875. We will not focus on the Navy data in the main portion of this analysis because those data only cover five ports in subjected districts and five ports in untreated districts. However, an analysis of the Navy hospitalization data, in Appendix C.4, generates results that match the findings from our analysis of the Army data below.[29]

Analysis strategy and results: The structure of our data on secondary syphilis allows us to use a difference-in-difference empirical strategy comparing syphilis hospitalization rates in stations in treated versus untreated districts before and after the introduction of the CDAs. Our basic estimating approach follows equation (1) except that the unit of observation is the military station rather than the county. The outcome in this regression is the log of the hospitalization rate defined as the number of annual hospitalizations from syphilis per 1,000 soldiers at the station.

Since treated stations were subjected to the CDAs at different times, we estimate results using the estimator in Callaway and Sant'Anna (2021). Appendix section B.2 lists the stations in the data and the timing of treatment. Throughout the analysis when reporting event studies we estimate the dynamic treatment effects, β_s, for years in event time where all treated units have available data. We do this so that changes in the dynamic treatment effects are not being driven by the composition of treated units over time.

Raw data describing the trends in STI hospitalizations in treated (CDA) and untreated stations can be viewed in Appendix Figure C4. That figure shows that the treated and untreated stations had very similar trends in STI infection rates prior to the CDAs. Once the CDAs were in place, we observe a reduction in STI hospitalizations in treated stations relative to untreated locations, suggesting that the CDAs reduced STI rates.

For one category of STI hospitalizations, secondary syphilis infections, we have data broken down at the station-level, allowing us to conduct a difference-in-difference analysis.

[28] Specifically, our data come from the *Report from the Select Committee on the Contagious Disease Acts, 28 July 1881* p. 445-455. The data in the report distinguish between primary and secondary syphilis. These refer to the stage in the progression of the disease. Appendix B.2 provides additional details on the data.

[29] Specifically, the estimated effects in the Navy data suggest that the CDAs reduced the syphilis hospitalization rate by approximately 72%. This effect is statistically significant despite the smaller sample size in this analysis.

Figure 4 presents the event study results generated by estimating equation (1) using the method in Callaway and Sant'Anna (2021) on the secondary syphilis hospitalization data. The results show that, in years prior to implementation of the acts, hospitalization rates were not trending differently in subjected and untreated stations. After implementation, hospital admissions begin to decline in subjected stations relative to the untreated. The divergence between treated and untreated stations builds over time, consistent with what we would expect given that (i) enforcement effectiveness improved during the first few years in which the Acts were enforced and (ii) reducing disease prevalence should have cumulative effects, since reducing infections in one year lowers the chance of further spread in the next.

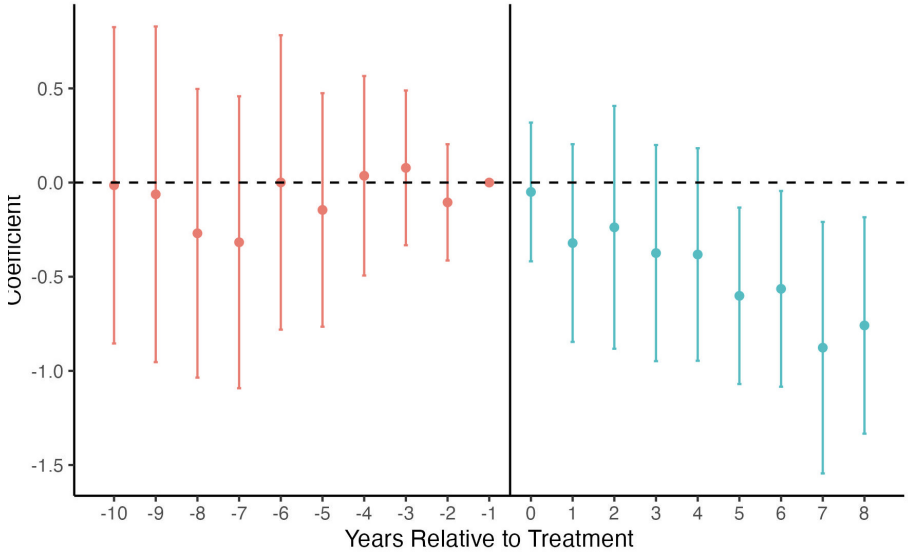
Appendix Table C3 column 1 presents the average of the dynamic treatment effects corresponding to the results in Figure 4. The estimate suggests the CDAs reduce the syphilis-related admissions rate by approximately 45% where the pre-treatment average annual admissions rate was approximately 30 hospitalizations per 1,000 soldiers. Table C3 also provides some additional robustness checks on these results. For example, we show that similar results are obtained if we use the hospitalization rate in levels rather than in logs as our outcome variable. We also show that similar results are obtained if we focus only on stations in England and Wales, a sample that corresponds more closely to the geographic area used in our other analysis.

Summary: The results in this subsection indicate that the CDAs substantially reduced STI admissions rates among soldiers stationed in districts covered by the acts, relative to soldiers in stations where the CDAs did not apply. Our analysis of STI rates among sailors in the Navy, in Appendix C.4, reinforce these results. There are several mechanisms that likely contributed to this reduction. As we saw in the previous section, the size of the sex market fell after the CDAs were introduced. That alone likely reduced the rate of STI spread. In addition, because women showing symptoms of an STI infection were being quarantined, the risk of disease spread during any sex transaction was also likely to have been lower. Next, we look at whether similar reductions appear to have occurred among the general population.

4.2 The impact of the CDAs on general STI mortality

In this section, we examine how the CDAs changed STI rates among the general population. Direct measures of STI rates among the general population are not available in the historical setting that we study. However, we are able to observe mortality rates due to the most important STI, syphilis, at the county-level for all of England and Wales. These STI deaths are interesting in themselves, and they also reveal underlying patterns of STI presence. Note that, as we discuss in more detail below, most of these deaths likely occurred among infants who contracted the disease from their mother and then died soon after. This

Figure 4: The Effect of the CDAs on Hospital Admissions for Secondary Syphilis



Note: The figure shows the estimated coefficients and 95% confidence intervals for β_s in Eq. 1 estimated using the method from Callaway and Sant'Anna (2021) applied to the station-level hospitalization rate of soldiers from secondary syphilis. The x-axis is in event time relative to the year in which the CDAs became active in a district where the station was located. We estimate β_s for years in event time in which all treated stations have data available. The vertical line corresponds to the year of treatment. Standard errors are clustered at the station-level.

fact is relevant for our analysis because it means that deaths are likely to respond fairly rapidly to changes in the underlying disease environment.

Question: How did the CDAs affect STI mortality rates among the general population in locations subjected to the acts? Answering this question speaks to the broader impacts of the CDAs on STI spread as well as the impact that untreated STIs had on health during the period that we study. Given the previous results, we might expect to find that the CDAs reduced STI mortality as a result of a reduction in the number of sex transactions as well as a reduction in the chance that a women selling sex was currently infected with an STI. However, the direction of the effect is not certain ex ante. That is because, as we have seen, the CDAs also reduced the supply of sex available for purchase. This may have caused buyers to seek sex through consensual or non-consensual sex with women who were not sex workers.[30] If some of these buyers were infected with STIs, then this shift in their sexual

[30]Several studies have found that changing how the sex trade is regulated affects cases of sexual violence. For example, Cunningham and Shah (2017); Gao and Petrova (2022) find that policies decriminalizing supplying sex work have reduced cases of sexual violence. Bisschop et al. (2017) study a policy in the Netherlands that shares many features with the regulations in the CDAs in which sex workers are licensed and undergo health tests. They find that this licensing and testing regime reduces cases of rape. Motivated by these other studies we collected data on reported cases of rape and sexual assault against women from

habits may have increased the rate of STI spread among the broader population.

Data: The analysis in this section uses data on mortality due to STIs that we digitized from the Annual Reports of Births, Deaths, and Marriages produced by the Registrar General's office. By 1855, when our data begin, the Registrar General's office was overseeing an extensive network of local Registrars responsible for gathering comprehensive mortality statistics. Registrar General's reports, and particularly the mortality statistics, are generally regarded to be of very high quality.[31] However, it is important to note that challenges in diagnosing specific STIs mean that our syphilis mortality series likely includes deaths associated with other STIs as well, though most of these deaths were likely due to syphilis. We collect data from 1855 until 1906, allowing us to assess the existence of pre-trends for a decade before the CDAs were passed as well as two decades after the Acts were suspended. We end the sample in 1906 because that is the year the Wassermann test, the first diagnostic test for syphilis, was invented.

Our analysis uses data on syphilis deaths, which are reported annually for 45 counties in England and Wales. Syphilis deaths account for 3.6 out of every thousand deaths in England and Wales from 1860 to 1899, a total of 75,559 deaths. So, while syphilis was not a major cause of death, it was also not insignificant. Most of these deaths occurred among infants and young children. From 1860 to 1865, 70% of syphilis deaths occurred among children aged 0-1 and 76.7% were among children aged 0-5.

As placebos, we have also collected morality data on two other causes of death: cancer and deaths due to respiratory infections. These placebos were chosen based on two main criteria. First, these represent two important causes of death that are unlikely to be affected in the short-run by a change in STI infection rates (which may influence mortality from some other causes through competing risks or comorbidities). Second, specifically for respiratory mortality, these causes of death are likely to be related to other potential confounding factors that we may be concerned about, such as poverty rates. Further details and time series plots of deaths in these categories are available in Appendix C.5.

Analysis strategy and results: The structure of the STI mortality data allow us to use the same difference-in-difference empirical strategy described earlier where we estimate equation (1), but with some important differences. The most important difference is that we are able to look at effects in treated and control locations before the CDAs were passed, while the Acts were in operation, as well as after they were repealed. One common concern in difference-in-difference study designs is that the parallel trends assumption might be

the *Judicial Statistics*, the same source we use to obtain data on the number of brothels used in section 3. In contrast to these other studies, we find no significant change in reported cases of sexual violence in response to the CDAs.

[31] Woods (2000) calls the mortality statistics the "shining start of Victorian civil registration."

violated. A standard approach to guarding against this concern is to study pre-trends in the data. While parallel pre-trends do not guarantee that the treated units would have also experienced parallel trends during the treatment period in the absence of treatment, parallel pre-trends at least suggest that such a concern is unlikely. While our analysis passes this test, our setting allows us to go further. In particular, the off-on-off nature of the policy we study means that our results cannot be due to differential trends except in the highly unlikely case that those differential trends reversed at precisely the moment when the policy was repealed. Given what we know about the sources of the repeal, which occurred across all treated locations in the same year as a result of national agitation for women's rights, it seems extraordinarily unlikely that the identification assumptions could be violated in a way that reveals precisely the patterns we will find. A second advantage of being able to look before the CDAs came into effect, while they were in force, and after they were repealed is that we are able to analyze whether any reductions in STI rates resulting from the regulations persist after the regulations are removed.

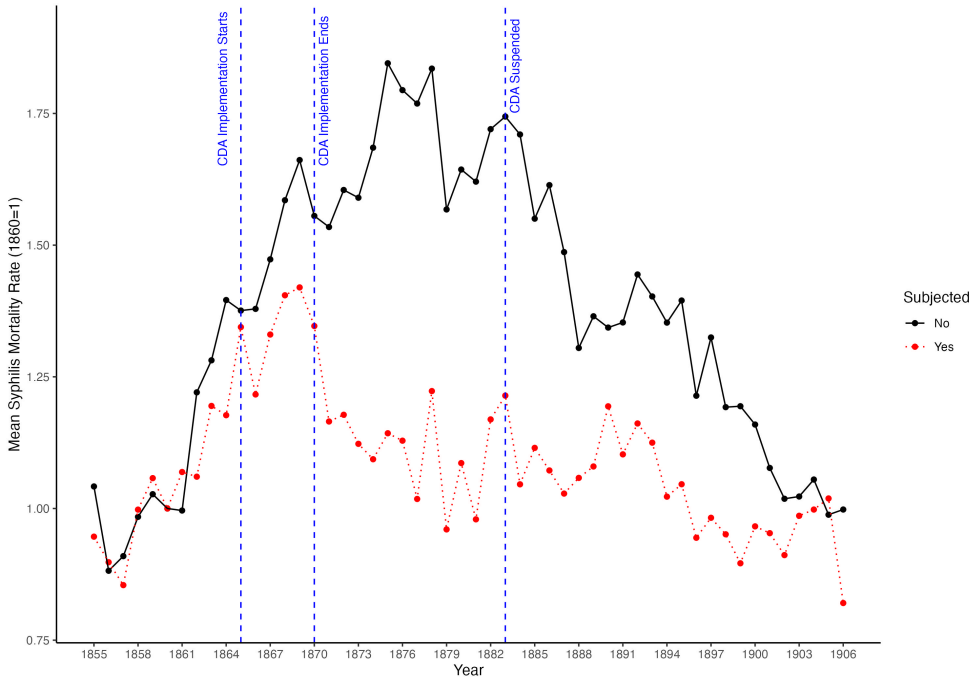
It is also useful to note that our unit of observation in this analysis is the county. We treat any county with a district subject to the CDAs in a particular year as treated. Counties are relatively large units; the whole of England and Wales are covered by just 45 counties.[32] One benefit of running our analysis at the county level is that it will help us deal with concerns that our results may be driven by spillovers between treated districts and other nearby districts. Since most districts that are neighbors to treated districts will be in the same county, and most spillovers are likely to occur over relatively short distances, results obtained from a county-level analysis will likely capture both direct treatment effects as well as any spillovers to other nearby districts. However, evidence presented in Section 4.3 suggests that spillovers were not important in our setting.

Before presenting the main regression results, Figure 5 plots the syphilis mortality rates in counties containing subjected districts and those without. As discussed previously, the CDAs were implemented over a period of several years as amendments to the acts were passed adding subjected districts. In the period prior to implementation, syphilis mortality rates in treated and control counties display a similar upward trend. After implementation, the two groups began to diverge as the mortality rate in the treated counties falls and the syphilis rate in control counties continues to increase. After 1883, when the CDAs are no longer implemented, the mortality rates in treated and control counties begin to reconverge.

Event study results obtained from applying the specification in equation (1) to the county-level syphilis mortality data are presented in Figure 6. As in the previous analysis, we deal

[32]We omit the County of London from our main analysis, but we also present robustness results showing that this does not affect our findings.

Figure 5: Syphilis Mortality in Treated and Untreated Counties



Note: The figure plots the average syphilis mortality rate in counties containing districts subjected to the CDAs and counties without treated districts (excluding the County of London). The dashed, red line shows the average mortality rate for the subjected counties. The solid, black line shows the average mortality rate for untreated counties. Rates are normalized, so for each group the value is equal to one in 1860. The first vertical line represents the year where the CDAs began to be implemented. The second vertical line represents the year implementation was complete in all subjected districts. The third vertical line shows the year the CDAs were suspended from operation in all subjected districts.

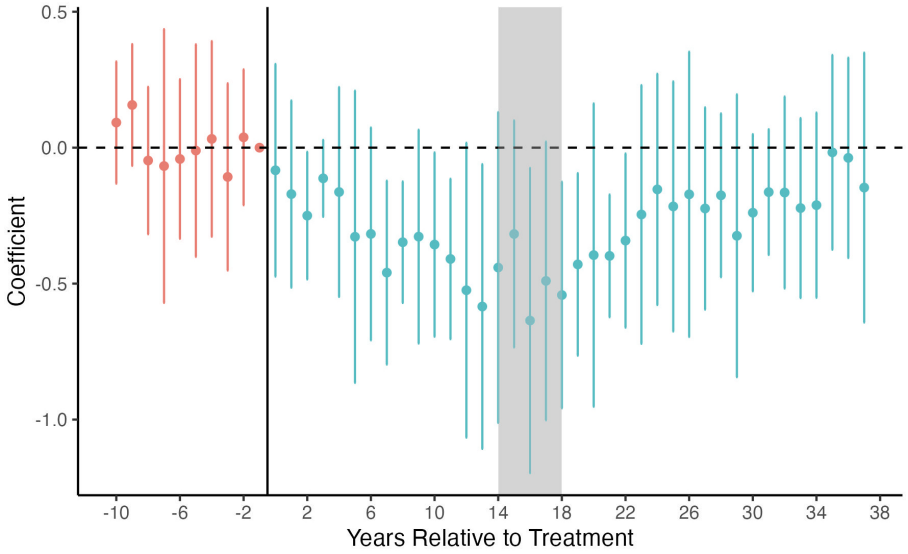
with the fact that we have staggered treatment timing by using the estimation approach from Callaway and Sant'Anna (2021).[33] A first feature to notice in these results is that there is no evidence that counties treated by the CDAs had differential trends in syphilis mortality in the years leading up to treatment. Next, notice how after treatment we see a relative decrease in syphilis mortality in counties subject to the CDAs.

The shaded rectangle in the graph indicates the period, in event time, corresponding to the suspension of the CDAs. Note that while suspension occurred in the same year (1883) for all locations, it shows up at a different point in event time for counties depending on when they were initially treated. To the right of the shaded rectangle we see another important finding. After that point, syphilis mortality in the treated counties begins to converge back toward zero. Within about six years, the difference relative to control counties becomes sta-

[33] Appendix Figure C9 shows that very similar and if anything somewhat stronger results are obtained if we instead use a two-way fixed effects approach.

tistically insignificant. Furthermore, after two decades the coefficients have nearly converged back to no difference between treatment and control counties

Figure 6: The Effect of the CDAs on Syphilis Mortality



Note: The figure shows the estimated coefficients and 95% confidence intervals for β_s in Eq. 1 estimated using the method from Callaway and Sant'Anna (2021) applied to the log county-level mortality rate from syphilis. The x-axis is in event time relative to the year in which the CDAs became active in any district within the county. We estimate β_s for years in event time in which all treated counties have data available. The vertical line corresponds to the year of treatment. The shaded region corresponds to the years in event time when the law was suspended. While suspension occurs in 1883 for all counties, this occurs in different years of event time because of staggered treatment timing. Standard errors are clustered at the county-level. London is excluded from the analysis.

Table 1 presents estimated average effects of the CDAs on the syphilis mortality rate in a variety of different specifications.[34] Across different specifications, the CDAs reduce the syphilis mortality rate by approximately 30%. Column 1 provides the baseline estimate where we restrict the analysis to the period up to 1883, when the CDAs were being actively enforced. Column 2 provides the estimate when using the full sample of data from 1855-1906 and corresponds to the average of the dynamic treatment effects from the event study in Figure 6. Column 3 includes London in the analysis. In Column 4, we look at the effect of the CDAs including only counties in the southern part of England. We do this because the CDAs were implemented only in districts in the south, which may mean that counties in the northern part of the England and Wales are not good control counties, though this appears to be unlikely given that in the event study results from Figure 6 show that treated

[34]The reported coefficients correspond to the average of the dynamic treatment effect using the procedure in Callaway and Sant'Anna (2021).

and control counties were trending similarly prior to implementation. When we restrict our analysis to the counties in the south eastern, south midland, and south western divisions of England and Wales, in Column 4, the results are slightly smaller but still quite strong despite the fact that this specification restricts our sample to only 19 of 45 counties.

A different concern is that our results may be affected by spillovers to control counties if sex workers leave districts where the CDAs operated. As we have discussed, several factors suggest that such spillovers are unlikely.[35] Nevertheless, in Column 5 we estimate results excluding any county that borders on a CDA county and show that our results are largely unchanged. In Appendix Table C4 we report estimated effects analogous to columns 1-5 in Table 1 where the outcome is the mortality rate in levels instead of logs. These results show a similar decline in syphilis mortality after the implementation of the CDAs.

In Columns 6 and 7, we estimate effects on two placebo causes of death, cancer and respiratory deaths. If our identification strategy is working well, then neither of these should be impacted by the introduction of the CDAs. Consistent with this expectation, the results show that there is no meaningful relationship between the CDAs and mortality due to these placebo causes of death. Further results for these placebos are in Appendix Figure C8.

Summary: These results tell us that the CDAs led to a reduction in STI mortality in treated districts, and that this effect begins to reverse after the CDAs were repealed. The fact that we observe clear responses both to treatment and to the removal of treatment is notable, because it means that our results are extraordinarily unlikely to be due to differential underlying trends.

4.3 CDAs and childless couples

Question: Exposure to STIs comes with a risk of infertility, increased risk of miscarriage or stillbirth, and an increase chance of infant mortality. Several different STIs, including chlamydia and gonorrhea, when untreated, can lead to pelvic inflammatory disease resulting in infertility.[36] STIs, particularly syphilis, can also increase the chances of miscarriages and stillbirths as well as mortality among infants that contract the disease from their mothers. Finally, STI infections may increase childlessness if they cause couples to have intercourse less frequently. These medical facts, together with the changes to STI prevalence documented in previous sections, raise the following question: did the CDAs affect the prevalence of

[35] The historical accounts suggest the migration of sex workers during this period was local in nature. If job prospects were scarce in the countryside, women might move to a nearby town to practice sex work (Walkowitz, 1982). Furthermore, there is work by economic historians suggesting there was less geographic mobility in the UK relative to the US (Long and Ferrie, 2004). Finally, in the analysis in Section 4.3 we look at whether there is any evidence of cross-district spillovers within counties. The fact that we find no evidence of cross-district spillovers suggests that cross-county spillovers are even less likely to be an issue.

[36] There is some descriptive work in demographic history connecting STI prevalence in Britain historically to infertility (Szreter and Schürer, 2019).

Table 1: The Effect of the CDAs on County-Level Mortality Rates

	DV: $\log(rate_{ct})$						
						Placebo results	
	Pre-Suspension	Full Period	London	Southern	No Nearby	Cancer	Respiratory
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ATT	-0.317***	-0.293***	-0.302***	-0.247**	-0.341***	0.008	-0.030
	(0.076)	(0.104)	(0.062)	(0.119)	(0.087)	(0.053)	(0.043)
Observations	1232	2288	1260	504	896	903	1276

Note: *** p<0.01, ** p<0.05, * p<0.1. Each column provides the average of the dynamic treatment effects from estimating Eq. 1 using the method from Callaway and Sant'Anna (2021) for different types of mortality. In all specifications, the outcome is the log mortality rate, calculated as the number of deaths per 100,000 people. Data are annual at the county-level. The county of Greater London is excluded unless stated otherwise. The first column presents the results for syphilis restricting the sample prior to 1883 when the CDAs are suspended. The second column presents the results for syphilis using the full sample from 1855-1906. This specification corresponds to the event study in Figure 6. The third row presents the estimate when the Greater London county is added to the analysis and restricting to pre-suspension. The fourth column restricts the analysis to counties in the south-western, south midland, or south-eastern registration areas pre-suspension. The fifth column removes counties that border treated counties and restricts to pre-suspension. The sixth column presents the estimate for cancer mortality using data from 1860-1880. The seventh column presents the estimate for respiratory mortality using data from 1851-1880. Standard errors are clustered at the county-level.

childless couples in treated districts?

Data: To analyze how the CDAs affected the rate of childless couples in treated locations, we turn to the census microdata for England and Wales. Using information on household structure included in the census, we identify all households with both a husband and wife present. We focus on couples where the wife's age falls into a middle age range, since older couples are likely to have children who have left the home and younger couples may not have been married long enough to have conceived even if they are able (the census does not include information on the year that couples were married). In our main analysis, we use couples where the wife is between 25 and 40, though we explore alternative age cutoffs in robustness exercises. For each couple satisfying this criteria, we then count the number of children in the household and identify childless couples.

Note that the unit of observation in this analysis is the district. This geographic unit is substantially smaller than the counties analyzed in the previous section; there are over 600 districts in England and Wales compared to just 45 counties. This feature allows us to analyze spillovers from CDA districts into other nearby districts within the same county.

We draw our data from four census waves: 1851, 1861, 1891, and 1901. The first two provide pre-CDA observations, while 1891 and 1901 will reflect post-treatment outcomes. We do not consider the 1881 census because families in the age range we consider would have had some fertile years before the CDA and some years during the CDA, so that is not clearly either a pre-treatment or treatment observation (microdata for the 1871 census are not currently available to our knowledge). We exclude the County of London from our preferred results, though we show that our findings are stronger when London is included.

Table 2 presents some basic statistics showing the rate of childless couples in the country as a whole as well as in the CDA and non-CDA districts and the difference between those two. In the first column, we can see that the rate of childless couples was high in 1851 and 1861, fell in 1891, and then increased again by 1901. There are two forces that can help explain this pattern. First, we know that health was improving in the second half of the nineteenth century, and that this improvement was particularly notable in terms of the reduction in child mortality (Woods et al., 1988). This trend, which begins in the 1860s, will tend to reduce the rate of childless couples. However, starting in 1877, fertility in Britain began to rapidly decline, a factor that will tend to increase the rate of childless couples, particularly by 1901 (Beach and Hanlon, 2023).

The statistics in Columns 2 and 3 show that CDA districts had higher rates of childless couples in the pre-CDA period. One explanation for this is the higher rate of STI prevalence in the CDA districts in the pre-treatment period. However, we also see, in Column 4, that the gap between the rates in CDA and non-CDA districts falls sharply between 1861 and

Table 2: Rates of Childless Couples in CDA and Non-CDA Districts

Year	All districts	CDA districts	Non-CDA districts	Rate in CDA districts - rate in non-CDA districts
1851	0.159	0.188	0.158	0.03
1861	0.158	0.19	0.157	0.033
1891	0.143	0.167	0.143	0.025
1901	0.166	0.192	0.165	0.027

Note: This table presents the share of couples with wives aged 25-40 with no children in the home in CDA and all other districts in each census based on census microdata. Districts in London are not included.

1891, when the CDA was in operation. This pattern provides suggestive evidence consistent with a relative reduction in infertility, miscarriages, stillbirths, and infant/child mortality in CDA districts following the introduction of the CDAs.

Analysis strategy and results: We apply a difference-in-difference analysis strategy to study the impact of the CDAs on the rate of childless couples in a district. Our main regression specification is:

$$CHILDLESS_{it} = \beta(CDA_i * POST_t) + \gamma_i + \eta_t + \epsilon_{it} \tag{2}$$

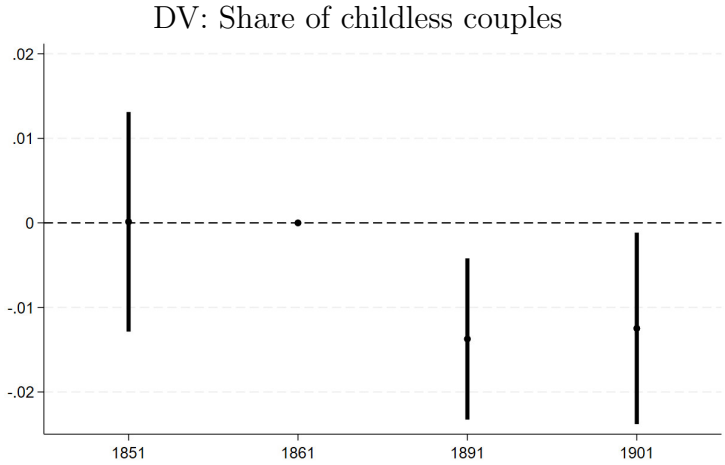
where $CHILDLESS_{it}$ is the share of childless couples in district i in census year t, CDA_i indicates CDA districts, $POST_t$ indicates post-CDA periods (1891 and 1901), and γ_i and η_t are district and time fixed effects. We cluster standard errors by district to allow for serial correlation. In our main specification, we exclude London, though we also examine robustness to this choice.

Before we come to our main results, we present some event study results, in Figure 7, where in place of the $POST_t$ term in equation (2) we include a vector of year fixed effects, with 1861 as the reference decade. We can see that there is no evidence of pre-trends from 1851-1861 and a clear reduction in the rate of childless couples in CDA districts in the post-CDA years.

Table 3 presents our main results for childless couples. The simplest specification, in Column 1, shows that couples living in CDA districts were substantially less likely to be childless in 1891 and 1901 than in the pre-CDA years (1851 and 1861). In terms of magnitude, these results suggest a reduction in the rate of childless couples of around 1.3 percentage points. This is equivalent to a decrease of around 7% in the rate of childlessness observed in the CDA districts in the pre-CDA period (see Table 2).

One advantage of using district-level data in these regressions is that we can look for

Figure 7: The Effect of the CDAs on Childless Couples: Event Study Results



Note: The figure shows the estimated coefficients and 95% confidence intervals for coefficients estimated using Eq. 2 but replacing $POST_t$ with a set of year indicator variables. Data cover all couples in England and Wales where the wife's age at the time of the census is in [25-40]. N = 1,572. The unit of observation is the district-year and standard errors are clustered by district. The regression includes district and year fixed effects. Districts in the County of London are excluded from the analysis.

evidence of spillovers from CDA districts into other nearby districts. We do this in Columns 2, 3, and 5. In Column 2, we look at how the rate of childlessness evolved in CDA counties overall in the post-CDA period, while separately estimating the effect in the CDA districts. We observe no evidence of spillovers from CDA districts to other districts in the same county. In Columns 3 and 5, we look for evidence of spillovers into just those districts that border CDA districts.[37] In these results, we see weak evidence of reduced childlessness in nearby districts. This pattern suggests that STI reductions in CDA districts may have also led to smaller reductions in bordering districts, though we would not want to draw strong conclusions from these results. None of these results provide any support for the possibility that reductions in STI rates in CDA districts may have been due to a displacement of the sex trade into other nearby districts. That makes sense given that districts were large enough (at least outside of London) that customers in CDA districts were unlikely to be able to travel to nearby unregulated districts in order to purchase sex.

Columns 4 and 5 presents results from a specification that includes county-by-year fixed effects. We can see that the inclusion of these fixed effects has almost no effect on our main results despite the fact that they soak up a large fraction of the variation in the data (as indicated by the R-squared values).

In Appendix Table C5 we consider the robustness of our results. In one set of robustness check we look at how our results change if we extend our sample to include couples where

[37] Bordering districts are included regardless of whether they are in the same county as the CDA district.

Table 3: Analysis of the Effect of the CDAs on Childless Couples

	DV: Share of childless couples				
	(1)	(2)	(3)	(4)	(5)
CDA District x Post	-0.0132***	-0.0161***	-0.0136***	-0.0121**	-0.0161**
	(0.00486)	(0.00597)	(0.00489)	(0.00538)	(0.00635)
CDA County x Post		0.00344			
		(0.00400)			
Bordering dist. x Post			-0.00486		-0.00714
			(0.00335)		(0.00540)
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes		
County-year FE				Yes	Yes
Observations	1,572	1,572	1,572	1,568	1,568
R-squared	0.146	0.147	0.147	0.692	0.692

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered by district. Based on couples where the wife's age is between 25 and 40. London is excluded from the analysis. Based on specification in Eq. 2.

the wife's age was between 25 and 45. In a second set, we extend the geographic scope of the analysis to include London. Neither has a meaningful impact on our results.

We can also generate similar results using households rather than districts as the unit of observation. Household-level results have the advantage that we can include some individual-level controls such as wife's and husband's age. However, those results use a linear probability model which relies on assumptions that may not be as valid. Household-level results, presented in Appendix Table C6 show that households living in CDA districts were less likely to be childless in the post-treatment years, though the results are only marginally statistically significant. Interestingly, we also find clear reductions in childlessness among couples where either the husband or the wife was born in a CDA county (district of birth is not observed), suggesting that couples were likely affected by whether they grew up in a treated location in the CDA or post-CDA period.

Summary: The results in this section show that couples who were exposed to the CDAs were less likely to be childless, a pattern that is consistent with what we would expect to observe in the presence of lower STI rates in CDA districts. This provides additional evidence that the CDAs improved public health, while also showing that those health improvements had meaningful impacts on people's lives.

5 Repeal of the CDAs

Why were the CDAs ultimately repealed despite the fact that–as we have shown–they were successful from a public health perspective? One potential answer to this question is

that contemporary policymakers may have been unaware of the public health benefits of the acts. However, we know from historical evidence that this is not the explanation. While contemporaries did not have the statistical tools we have applied, the data available to them led a series of Parliamentary committees to conclude, correctly, that the acts were effective in reducing STIs among soldiers and sailors in the treated districts and likely brought health benefits to the broader population.[38] The fact that Parliament appeared to be aware of the public health benefits of the CDAs makes their repeal particularly puzzling. In the analysis below, we try to understand this decision.

Our analysis takes two complementary approaches. In the first part, we conduct a text analysis of the debates in Parliament over the repeal of the CDAs. In the second step, we analyze the votes of MPs in Parliament and how they were influenced by MPs views on issues such as women's rights. In both parts of the analysis, we focuses mainly on the critical vote, on April 20, 1883, on a resolution condemning the compulsory inspection of sex workers under the CDAs. This was the pivotal vote in the elimination of the Acts. When the resolution passed, with a division of 182 MPs in support compared to 110 against, it effectively eliminated compulsory inspection, rendering the CDAs a dead letter.[39] Once compulsory examination was eliminated, it was only a matter of time until the full repeal of the CDAs. We also consider a second, unsuccessful, repeal vote that took place on May 21, 1873. This vote, which occurred as a consequence of rising resistance to the acts led by Josephine Butler and the LNA, represented the first major test of their popularity.

5.1 Parliamentary debate text analysis

The successful 1883 resolution that eliminated compulsion as part of the CDAs was proceeded by an extensive Parliamentary debate, with over 44,000 words spoken. We want to analyze this debate in order to identify the key arguments made for or against the resolution.[40] To do this, we use a large language model (LLM), specifically ChatGPT 3.5.

[38]For example, the "Report from the Select Committee on Contagious Disease Acts" submitted on 7 August, 1882, after gathering hundreds of pages of evidence over several years of investigation, concluded that the acts reduced STI rates among soldiers. Beyond that, the committee reported that (p. xvii), "Your Committee have had evidence tending to show that the Acts have diminished venereal disease in the Civil Population of those areas of Great Britain where they have been in operation." The committee also noted (p. xviii) "the very general opinion of the medical profession, both inside and outside of the subjected districts, who on hygienic grounds strongly advocate the maintenance of the Acts." While these conclusions were disputed by opponents of the CDAs, they were consistent with the findings of other reports, such as the Parliamentary Committee of 1871.

[39]Note that the number of MPs that were present at the division is only a fraction of the 650 total MPs sitting in Parliament at this time. It was normal for many MPs to be absent for any particular debate, and in fact this was one of the best-attended divisions of the year.

[40]An alternative to studying the debate in Parliament that we considered is to study newspaper articles surrounding the repeal. However, a review of newspaper articles about the repeal effort reveals that they were mainly composed of verbatim reporting on the debates held in Parliament. For this reason, we choose

Summarizing the key points made in a larger piece of text is a task at which LLMs such as ChatGPT excel, because it is one of the tasks they were designed for. The main advantages of this approach are that LLMs are arguably more objective than relying on human judgment and they are better able to parse nuanced ethical arguments than simpler keyword methods.

We interact with ChatGPT using a two-step procedure that is fairly standard when using the engine to summarize large amounts of text.[41] After an initial prompt describing what we need, we begin by feeding the engine one speech at a time and asking it to summarize the main points.[42] When we do this, we tell ChatGPT whether the MP was in favor of or against the resolution. In the second step, once all of the speeches have been summarized, we ask ChatGPT to summarize the key moral, ethical, and legal arguments in favor or against the resolution.[43] As discussed in more detail in Appendix C.7, we specifically ask about moral, ethical or legal arguments as a way to get at the core motivations for support for or opposition to the CDAs, as apart from, e.g., procedural concerns or debates about the effectiveness of the acts relative to potential alternatives. However, we also ask ChatGPT for other arguments for or against the repeal of the CDAs which we present in Appendix C.7. Finally, we ask ChatGPT to provide an overall summary, in 3-4 bullet points, of the main arguments made in favor or against the resolution. Here is the response:

For the Resolution:

1. Moral and Ethical Concerns: *MPs argued that the Contagious Diseases Acts (CD Acts) were morally wrong, infringing on personal liberty and dignity.*

2. Protection of Women: *There was a strong sentiment that the Acts were harmful to women, subjecting them to invasive medical examinations and stigmatization.*

3. Public Morality: *Some MPs contended that the Acts promoted immorality by condoning and facilitating prostitution, which was seen as detrimental to society.*

4. Repeal for Progress: *Advocates of the resolution believed that repealing the Acts was necessary for societal progress and the advancement of women's rights.*

Against the Resolution:

1. Effectiveness and Support: *MPs argued that the CD Acts were effective in combating the spread of venereal diseases and had strong support in areas where they were enforced.*

2. Protection of Public Health: *There was a concern for public health, with supporters of the Acts highlighting the role they played in preventing disease transmission.*

to focus instead on the text of the Parliamentary debate.

[41] This is the procedure that ChatGPT recommends.

[42] For one long speech, it is necessary to break the speech into three parts which are analyzed separately.

[43] This complete summary can be found in Appendix C.7.

3. Community Support: *MPs cited local support from clergy, doctors, and magistrates in areas where the Acts were enforced as evidence of their positive impact.*

4. Government's Role: *Some argued that it was not the right time to repeal the Acts without a clear alternative proposed by the government, emphasizing the need for a structured approach to addressing the issue.*

This summary is consistent with our own reading of the debates. It highlights the central role played by concerns about the unequal treatment of women and the violation of women's rights in this debate, which is mentioned in points 1, 2, and 4 in favor of the resolution. We also see, in the third point in favor of the resolution, that opponents were also concerned about the fact that the CDAs amounted to the government condoning prostitution. These results together with the historical narrative motivate our focus on the role of concerns about women's rights in our analysis of MP voting behavior leading to the repeal of the CDAs. Finally, it is worth noting how closely this summary of the 1883 debate corresponds to the set of arguments–and even the specific language–of the LNA appeal published in 1869, discussed in Section 2.2 and reproduced in Appendix A.1. This similarity suggests the influence of the LNA movement on the views of MPs.

The arguments against the resolution are also interesting. These show that supporters of the CDAs emphasized the public health benefits of the acts (points 1 and 2). They also highlight, in point 3, how direct exposure to the CDAs and their effects was associated with increased support for the Acts. We also explore these channels in the next section.

5.2 Votes analysis

This section provides a statistical analysis of the votes of MPs. In the first part, we look at how MP votes in the critical CDA divisions are affected by variables that capture their support for women's rights, direct exposure to the CDAs, and their views on the use of compulsory regulations to improve public health. In the second part, we provide more causally identified evidence on how support for women's rights affected MP's votes by exploiting variation in whether they had daughters or sons, following Washington (2008).

Data: Our voting data, from Eggers and Spirling (2014), includes the votes of each MP who was present for each of these critical votes, as well as information such as their constituency, party affiliation, and age. Using the constituencies, we identify MPs that represented locations subject to the CDAs. This will tell us something about how exposure to the CDAs and their consequences affected the opinions of MPs and their constituents.

We are particularly interested in how MP's votes on the CDA repeal were affected by their stance towards women's rights more generally. To measure this, we use their votes in other divisions on issues related to women's rights occurring around the same time. For

the 1883 analysis, we use votes on a resolution declaring that the franchise should be extended to women. For the 1873 analysis, we use votes in a series of divisions related to (1) married women's property laws and (2) the women's disability removal bill which aimed (unsuccessfully) to grant women voting rights.

We are also interested in measuring how MP's views on compulsory public health legislation affected their votes on the CDAs. Policies that involved government compulsion were controversial in Britain during the nineteenth century. This was a period when classical liberal ideas such as laissez-faire, were widely popular (Hanlon, 2024). At the same time, however, there was a strong public health movement that saw government action, including compulsory regulations, as absolutely necessary for improving health and welfare. In our analysis, we measure MP's views on the acceptability of compulsory public health legislation by looking at how MPs voted on an 1882 bill on compulsory vaccination, where the critical issue was whether government had the right to compel behavior that improved public health.

To obtain more exogenous variation in MP's attitudes towards women's rights, we have laboriously reconstructed MP's fertility history in order to identify their sons and daughters as of 1881. The MPs are a special population. Many are very wealthy and travel often, so they are often enumerated outside of their household during the census (or not enumerated at all, if they are abroad). Their children often attend boarding schools. MPs often have complex names which change over their lifetimes. Because of these features, reconstructing their fertility histories requires a labor-intensive manual review of all available information for each MP, including census records and other sources such as Burke's, the Oxford Dictionary of National Biography, and newspaper obituaries. We are able to identify the number of daughters and sons born to each MP as of the 1881 census for all but 35 out of the 294 MPs involved in the 1883 division.[44] Further details about the construction of these data, and some summary statistics, are available in Appendix B.4.

Analysis: As a starting point for our analysis, it is useful to note that neither of the critical votes on the CDAs broke down along party lines. While Conservatives tended to support retaining the CDAs and most Liberals were in favor of repeal, a substantial number of MPs split from the majority of their party in both the 1873 and 1883 votes. Table 4 describes the breakdown of votes by party. We can see that, in both votes, there was a non-trivial amount of crossover voting. We can also see that the share of voting MPs who were Liberals increased between 1873 and 1883, following the substantial Liberal victory in the 1880 election (note that it was common for many MPs to not be present for any particular

[44]Most of those missing are Irish MPs. Those are more difficult to find because Irish census microdata is limited. Note that our procedure may miss some children, particularly those who died at a young age. However, there is no reason to expect that infant deaths varied depending on whether MPs were ultimately in favor or against the repeal of the CDAs, so these missing children are unlikely to be a source of bias.

Table 4: Votes for or against repeal by party

Party	1873 division			1883 division		
	Against repeal	For repeal	Share for repeal	Against repeal	For repeal	Share for repeal
Conservative	132	16	0.11	77	15	0.16
Liberal	97	104	0.52	21	147	0.88
Home Rule/Other	12	10	0.45	13	21	0.62
Total	241	130	0.35	111	183	0.62
Liberal share of voters		0.54			0.57	

Note: Vote and party affiliation data from Eggers and Spirling (2014).

vote, so the number of votes does not equal the number of MPs). However, the most notable change between the unsuccessful 1873 repeal vote and the successful 1883 vote was the shift in favor of repeal for MPs of every party. This shift in attitudes appears to have been the critical factor in the defeat of the CDAs. If we hold support for repeal among MPs of each party at the 1873 levels but increase the share of Liberal Party voters as in the 1883 vote, that does not generate a majority in favor of repeal. In contrast, if we hold the shares of voters from each party at the 1873 levels but apply to them the share in favor of repeal for each party in the 1883 vote, that would generate a majority in favor of repeal.

To understand the motivations behind MP voting choices, we analyze how different factors affected MP votes. Table 5 presents our results. The first two columns focus on the 1873 repeal vote while Columns 3-5 look at the 1883 vote. The first row of results shows that in both votes, Conservatives were more likely to vote against repeal. The second row of results shows that MPs from districts that were actually subject to the CDAs were strongly against repealing them, particularly in 1883. This is consistent with the MPs supporting the laws because of direct exposure to the public health benefits documented above.

For the 1873 votes, we have two indicators for MP support for women's rights: their votes in divisions on the Married Women's Property Bill (MWP) and votes on the Women's Disability Removal Bill (WDB). The first of these, which allowed women to retain rights over their property after marriage, was ultimately successful, while the second, which would have given some women voting rights, was not. Supporters of either of those were substantially more likely to vote in favor of repealing the CDAs. For the 1883 vote, we have one indicator of MP support for women's rights: their vote on a resolution calling for women's suffrage in 1883. Again, we can see that supporters of women's rights were substantially more likely to favor repealing the CDAs in 1883. Note, however, that we cannot make any direct comparison between the magnitude of the coefficients on women's rights in the 1873 and 1883 votes, since they are measured using votes on substantially different types of resolutions. At the bottom

Table 5: Analysis of MP votes on resolutions against the CDAs

	DV: MP vote in favor of repealing the CDAs				
	1873 resolution		**1883 resolution**		
	(1)	(2)	(3)	(4)	(5)
Conservative	-0.238***	-0.226***	-0.407***	-0.392***	-0.278
	(0.0685)	(0.0692)	(0.108)	(0.108)	(0.223)
CDA district	-0.180	-0.184	-0.514***	-0.516***	-0.788***
	(0.146)	(0.148)	(0.111)	(0.110)	(0.203)
MWP supporter	0.185**	0.204***			
	(0.0723)	(0.0735)			
WDB supporter	0.219***	0.215***			
	(0.0646)	(0.0645)			
Suffrage supporter			0.332***	0.334***	0.521***
			(0.0910)	(0.0903)	(0.147)
MP age		-0.00303		0.00455*	0.00869*
		(0.00238)		(0.00252)	(0.00436)
Compulsion supporter					-0.126
					(0.121)
Observations	241	240	129	129	49
R-squared	0.222	0.226	0.412	0.425	0.467

Note: *** p<0.01, ** p<0.05, * p<0.1. Linear probability regressions with robust standard errors in parenthesis.

of Column 5, we also examine whether MP votes on another measure in which the state compelled individuals to take actions to improve public health, in this case vaccination, can predict votes on the CDAs. While we can only analyze this for a smaller set of MPs, the results do not indicate that support for state compulsion in order to improve public health was a strong predictor of support for the CDAs. To summarize, we find MPs who were most exposed to the public health benefits of the CDAs were more likely to support them, while those who were stronger supporters of women's rights opposed them.

One potential concern with the results in Table 5 arises from the fact that only a subset of MPs voted. To deal with this issue, in Appendix C.8 we introduce a multinomial logit analysis approach in which MPs choose between voting for repeal of the CDAs, voting against repeal of the CDAs, or not voting at all. The main results from this analysis are that, relative to a reference choice of not voting at all, (i) MPs who voted in the suffrage division were more likely to participate in the division on the CDAs, (ii) MPs who voted in favor of women's suffrage were more than three times more likely to show up and vote against the CDAs than to not vote at all, while MPs who voted against women's suffrage were more likely to vote in favor of the CDAs, and (iii) conservative MPs were much more likely to show up and vote against repealing the CDAs and much less likely to show up and vote for repeal. These results reinforce the findings from Table 5.

While the correlation between CDA votes and votes on other legislation related to women's rights described in Table 5 suggest that those issues are likely to be closely connected, we want to generate more causal evidence that concern for women affected MP's votes. To do so, we follow Washington (2008) and consider the role of having daughters versus sons on MP's attitudes towards women's rights. The basic assumption in this approach is that, while MPs could make decisions about the number of children that they had, whether they had sons or daughters was effectively random. Given that sex-selective abortion or infanticide was not practiced in our setting, and that the population we study was quite wealthy (so daughters were unlikely to die at higher rates due to lack of resources) this assumption seems reasonable.[45]

As noted in recent literature building on Washington (Costa et al., 2019; Green et al., 2023; Van Effenterre, 2020), the influence of daughters may be context dependent. So, the first step in this analysis is to establish that having daughters influenced MP attitudes towards women's rights in the context that we study. Column 1 of Table 6 looks at how having daughters or sons affects MP votes on the 1883 resolution in favor of women's suffrage. Following the existing literature, we focus on whether an MP has any daughter or any son while controlling for the total number of children.[46] Column 1 tells us that having any daughter substantially increases the probability that an MP supports women's suffrage, while having sons reduces the probability. An F-test, shown at the bottom of the table, shows that there are strong differences between the daughter and son effects in Column 1. In terms of magnitude, the difference between coefficient on daughters and the coefficient on sons in Column 1 is equal to 0.584. Comparing this to, for example, the estimated effect of party affiliation, we can see that having a daughter rather than a son has more impact on MP votes than their party. These results establish that in our context having a daughter rather than a son influences MP's attitudes towards women's rights.

In Columns 2-3, we look at how having daughters versus sons affects votes on the 1883 resolution against compulsory inspection under the CDAs. In Column 2, we see clear evidence that having a daughter makes MPs more likely to vote against the CDAs, while the effect of having a son is the opposite. A test of the difference between having at least one daughter and having at least one son, at the bottom of the table, shows that those effects are statistically distinguishable at the 95% level. We have also examined whether the number of daughters or sons matters. As in the case of women's suffrage, it appears that what matters is whether the MP has any daughters, or any sons, rather than the number. In Column 3, we look at

[45] In fact, our data show quite balanced sex ratios. The 259 MPs in our data had 446 daughters and 421 sons by 1881 according to our reconstructed fertility histories.

[46] Consistent with previous studies, we find that it is whether someone has any daughters or any sons, rather than the number, that matters, which motivates our focus on this margin.

whether the effect of having a daughter differs for Conservative MPs relative to other (mostly Liberal) MPs. We find that effect of daughters is not substantially different for MPs from different parties. Overall, these results provide more causal evidence that concerns about women's rights affected the attitudes of MPs towards the CDAs.

Table 6: Influence of daughters on suffrage and CDA votes

	DV: MP vote in favor of women's suffrage	**DV: MP vote against the CDAs**	
	(1)	(2)	(3)
Any daughter	0.327***	0.120*	0.127*
	(0.120)	(0.0633)	(0.0714)
Any son	-0.257**	-0.0707	-0.0710
	(0.104)	(0.0651)	(0.0654)
Any daughter * Conservative			-0.0298
			(0.103)
No. of children	-0.0197	0.00406	0.00431
	(0.0183)	(0.0127)	(0.0128)
CDA district		-0.203***	-0.198***
		(0.0497)	(0.0551)
Conservative	-0.440***	-0.666***	-0.647***
	(0.0798)	(0.0531)	(0.0809)
Observations	129	259	259
R-squared	0.250	0.472	0.472
	Test that daughter effect equals son effect		
F-stat	10.91	4.18	4.00
p-value	0.0013	0.0419	0.0466

Note: *** p<0.01, ** p<0.05, * p<0.1. Linear probability regressions with robust standard errors in parenthesis. All regressions include controls for MP age.

One way to assess the magnitude of these results is to compare the estimated difference between the daughter and the son coefficients (0.191 in Column 2 and 0.198 in Column 3) to the estimated effect of other factors that affected MP's votes. For example, we can see that having a daughter rather than a son had as much impact on MP's voting decision as being from a CDA district, and about one-third of the impact of party affiliation.

Note that if we take the ratio of the coefficient of the estimated effect of having a daughter on voting to repeal the CDAs from Column 2 of Table 6 to the coefficient of the estimated effect of having a daughter on voting for women's suffrage from Column 1, this is equivalent to the instrumented effect of supporting woman's suffrage on supporting repeal.[47] This ratio

[47]Note that in principle we could just estimate this value directly using TSLS. However, we only observe suffrage votes and CDA votes for 114 MPs, which means that those IV regressions, while delivering strong results, suffer from a weak instruments problem. Of course, interpreting the ratio of the coefficients on having a daughter from Column 2 to the coefficient from Column 1 as equivalent to the IV coefficient does require additional assumptions about the pattern of selection into voting in each of the two divisions.

is 0.120 / 0.327 = 0.367, which is very similar to the effect estimated without instrumenting in Table 5. This suggests that the simple regression in Table 5 is close to unbiased.

How pivotal was support for women's rights in the passage of the 1883 resolution? To provide a back-of-the-envelope answer to this question, we use the estimates from Columns 4-5 of Table 5, which suggests that supporting women's suffrage increased the probability that an MP voted against the CDAs by about thirty percent. So, given that 62% of Liberal MPs voted in favor of suffrage, we can attribute around 31 out of 147 Liberal votes against the CDAs to support for women's rights. Applying this methodology to each party, and then removing this effect from the observed votes, we estimate that without the support for women's rights the resolution against the CDA would have failed by a vote of around 154 to 140. While this is only a rough calculation, it suggests that support for women's rights was likely a pivotal factor in the passage of the resolution against the CDAs.

6 Conclusions

One lesson from our results is that, when well-designed and effectively enforced, regulating the sex trade can substantially reduce STI spread relative to a laissez-faire regime, even in an environment in which STI treatment is ineffective. Of course, this does not mean that the policy we study improved welfare, since it also had other consequences not captured here. However, from a public health perspective the CDAs were clearly effective.

A second lesson from our study, however, is that even when a public health policy is effective at achieving its primary aim–in this case reducing the spread of STIs–it may ultimately fail as a policy if the burden of regulation is widely viewed as unfairly distributed. In the case that we study, despite the success of the Contagious Disease Acts as public health measures, the acts were ultimately repealed because they were viewed as a discriminatory infringement on the liberty of women.

These findings have obvious implications for current health policy debates, ranging from those over the legalization of the sale of sex to controversy about Covid lockdowns and vaccine mandates. Our findings suggest that the ultimate success of any public health intervention will depend not only on the policy's effectiveness, but also the perceived fairness of the distribution of the costs of the intervention. The experience of the CDAs demonstrates that public health interventions that place too much of the burden on one group, even when that group is disempowered, risk igniting public resistance and ultimately facing repeal. This means that the most effective public health policy designs need to balance the effectiveness of the intervention at reducing the spread of disease or improving health with the size and distribution of the costs imposed.

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Appendix (for Online Publication only)

A Empirical setting appendix

A.1 LNA protest of 1870

Below is the text of the protest published by the LNA in the *Daily News* at the end of 1869, as quoted from Butler (1909), p. 44. Butler claims that 120 names were attached to the original protest but that the number of signatories eventually reached over two thousand, including many notable women such as Harriet Martineau and Florence Nightingale.

> We, the undersigned, enter our solemn protest against the Acts.
>
> (1) Because, involving as they do such a momentous change in the legal safeguards hitherto enjoyed by women in common with men, they have been passed not only without the knowledge of the country, but unknown in great measure to Parliament itself; and we hold that neither the Representatives of the People nor the Press fulfill the duties which are expected of them when they allow such legislation to take place without the fullest discussion.
>
> (2) Because, so far as women are concerned, they remove every guarantee of personal security which the law has established and held sacred, and put their reputation, their freedom, and their person absolutely in the power of the police.
>
> (3) Because the law is bound, in any country professing to give civil liberty to its subjects, to define clearly an offence which it punishes.
>
> (4) Because it is unjust to punish the sex who are the victims of a vice, and leave unpunished the sex who are the main cause both of the vice and its dreaded consequences; and we consider that liability to arrest, forced medical treatment, and (where this is resisted) imprisonment with hard labour, to which these Acts subject women, are punishments of the most degrading kind.
>
> (5) Because by such a system the path of evil is made more easy to our sons, and to the whole of the youth of England, inasmuch as a moral restraint is withdrawn the moment the State recognises, and provides convenience for, the practice of a vice which it thereby declares to be necessary and venial.
>
> (6) Because these measures are cruel to the women who come under their action– violating the feelings of those whose sense of shame is not wholly lost, and further brutalising even the most abandoned.

(7) Because the disease which these Acts seek to remove has never been removed by any such legislation. The advocates of the system have utterly failed to show, by statistics or otherwise, that these regulations have in any case, after several years' trial, and when applied to one sex only, diminished disease, reclaimed the fallen, or improved the general mortality of the country. WE have on the contrary the strongest evidence to show that in Paris and other continental cities, where women have long been outraged by this system, the public health and morals are worse than at home.

(8) Because the conditions of this disease in the first instance are moral not physical. The moral evil, through which the disease makes its way, separates the case entirely from that of the plague, or rather [sic] scourges, which have been placed under police control or sanitary care. We hold that we are bound, before rushing into experiments of legalising a revolting vice, to try to deal with the causes of the evil, and we dare to believe, that with wiser teaching and more capable legislation, those causes would not be beyond control.

B Data appendix

B.1 Locations covered by the CDAs

Table B1 describes the locations included in the CDAs, including details on the Act in which the location was included and the year in which enforcement actually began. Note that there may be some delay between when the Act was passed covering a location and when enforcement began. This delay was due to the need in some locations to expand hospital facilities to accommodate women who were being isolated.

The last two columns indicate whether the location is included as part of either the station-level analysis, in Section 4.1, or the county or district level analyses in Sections 3, 4.2, and 4.3. Note that the station-level analysis includes only locations with an Army barracks (our analysis using Navy data is presented separately in Appendix Section C.4) and the district and county-level analyses use data that is only available for England and Wales.

B.2 Data appendix for the station-level analysis

This appendix provides more details on the data used in the station-level analysis of STI hospitalization rates presented in Section 4.1.

Data: To assess how STI transmission changed after the CDAs were implemented, we use data on the number of hospital admissions of British soldiers due to various STIs. The data we use is contained in the *Report from the Select Committee on the Contagious Diseases*

Table B1: Locations covered by the CDAs

Location	**Country**	**Primary service**	**Authorizing act year**	**Enforcement begins**	**In stations analysis** (Army only)	**In district or county-level analysis** (Eng./Wales only)
Portsmouth	England	Both	1864	1864	Yes	Yes
Plymouth/Devpt	England	Both	1864	1865	Yes	Yes
Woolwich	England	Army	1864	1866	Yes	Yes
Greenwich***	England	Navy	1864	1870	Yes	Yes
Chatham	England	Both	1864	1865	Yes	Yes
Sheerness	England	Navy	1864	1865	Yes	Yes**
Deal****	England	Both	1864	1870	Yes	Yes
Aldershot	England	Army	1864	1867	Yes	Yes
Colchester	England	Army	1864	1869	Yes	Yes
Shorncliffe	England	Army	1864	1868	Yes	Yes
The Curragh	Ireland	Army	1864	1870	Yes	
Cork	Ireland	Army	1864	1870	Yes	
Queenstown	Ireland	Navy	1864	?		
Windsor	England	Army	1866	1868	No*	Yes
Canterbury	England	Army	1869	1870	Yes	Yes
Dover	England	Both	1869	1870	Yes	Yes
Gravesend	England	Navy	1869	1870		Yes
Maidstone	England	Army	1869	1870	Yes	Yes
Southampton	England	Navy	1869	1870		Yes
Winchester	England	Army	1869	1870	Yes	Yes

Note: *Windsor is an army station but it is excluded from the station-level analysis because of missing data. ** Sheerness is included in the station-level analysis because it is grouped with Chatham, which included an Army garrison. *** Greenwich is not listed as a separate location in the acts, but part of the district is included under Woolwich. However, enforcement in Greenwich began later than in Woolwich. **** Deal was not listed separately in the acts, but was included as part of Sheerness. For English stations, the date when enforcement begins is from The *Annual Report, for 1874, of Captain Harris, Assistant Commissioner of Police of the Metropolis, on the Operation of the Contagious Disease Acts*, 12 March 1875.

Acts published in 1881. This document contains the minutes of the Committee as they interviewed health and government officials in favor of the CDAs as well as opponents of the laws. A medical official, Inspector General Lawson, was called before the committee to provide statistics in defense of the Acts. Lawson compiled data on hospital admissions of British soldiers at stations subjected to the CDAs and those that were untreated. We digitize these statistics which are located on pages 445-455 of the report.

For hospital admissions due to gonorrhea and primary syphilis, Lawson only reported the data aggregated across all treated and untreated stations in the United Kingdom. Therefore, for these outcomes we cannot conduct a conventional difference-in-differences analysis.

However, Lawson provides station-level data for secondary syphilis hospital admissions from 1860-1878 for each station in England, Wales, Scotland, Northern Ireland, and Ireland

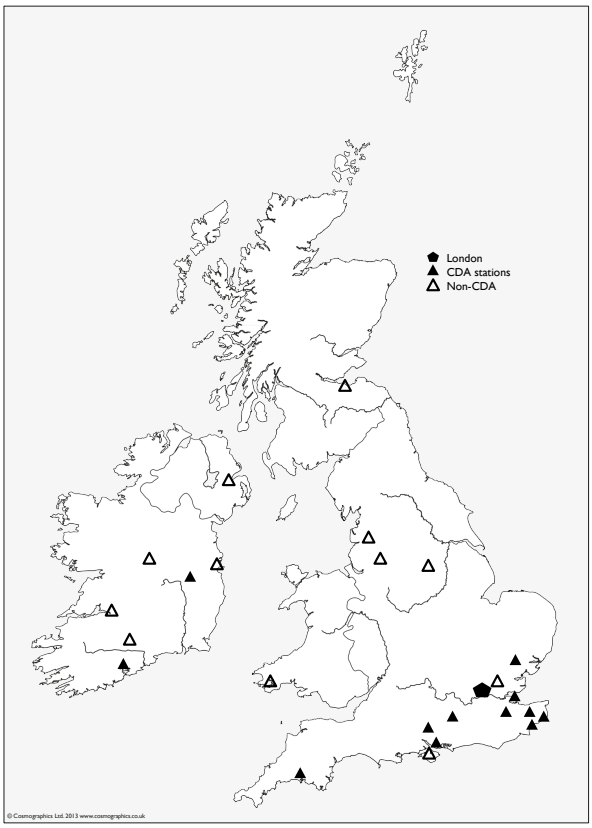
averaging at least 500 soldiers annually. This yields an annual panel with fourteen stations in subjected districts and thirteen stations not under the CDAs. Table B2 presents the stations in the data presented by Lawson as well as the country it is located in as well as its treatment status.

Defining treatment status: Table B2 describes the set of stations used in the analysis. This includes all of the stations for which complete data are available over the analysis period. Note that this is not a complete list of locations subject to the CDAs, since some locations with Navy stations were also subject to the CDAs but do not appear in the hospitalization analysis, which is based on Army data only. Figure B1 shows the locations of these stations.

Table B2: The List of Military Stations in the Analysis of Hospital Admissions for Syphilis

Station	Country	Subjected	Treatment Year
Athlone	Ireland	No	
Belfast	Northern Ireland	No	
Dublin	Ireland	No	
Edinburgh	Scotland	No	
Fermoy	Ireland	No	
Hounslow	England	No	
Isle of Wight	England	No	
Limerick	Ireland	No	
Manchester	England	No	
Pembroke Dock	Wales	No	
Preston	England	No	
Sheffield	England	No	
Aldershot	England	Yes	1867
Canterbury	England	Yes	1870
Chatham & Sheerness	England	Yes	1865
Colchester	England	Yes	1869
Cork	Ireland	Yes	1870
Curragh	Ireland	Yes	1870
Devonport & Plymouth	England	Yes	1865
Dover	England	Yes	1870
Maidstone	England	Yes	1870
Portsmouth	England	Yes	1864
Shorncliffe	England	Yes	1868
Winchester	England	Yes	1870
Woolwich	England	Yes	1866

Figure B1: Map of military stations included in the analysis in Section 4.1



Note: London is included in this figure as a point of reference, but the London station is not included in the analysis because syphilis cases at London were pooled with cases at Windsor for the first few years of the analysis. However, Hounslow, on the outskirts of London, is included in the analysis.

B.3 Treatment in the county-level and district-level analyses

This appendix provides more detail on how treatment status was assigned in the county-level analysis of brothels in Section 3 and of STI mortality in Section 4.2 as well as the district-level analysis of childless couples in Section 4.3. Note that all of these analysis focus on England and Wales exclusively, because the outcome data are not available for Scotland or Ireland.

The timing of when districts were subjected to the CDAs was taken from the *Annual Report of the Assistant Commissioner of the Police of the Metropolis Relating to the Contagious Diseases Acts* in 1881. Table B3 shows names of the treated districts as well as the dates the CDAs began operation. As amendments to the 1864 CDA were passed in 1866 and 1869, additional districts were subjected to the laws. In total, seventeen locations were treated between 1864 and 1870. For analysis conducted at the county level, Table B3 shows the counties where the subjected districts are located. In this context, a county is defined as treated in the first year the CDAs begin to operate in one of its districts. Figure B2 shows CDA districts and CDA counties in England and Wales.

Table B3: Timing of When Districts Became Subjected to the CDAs

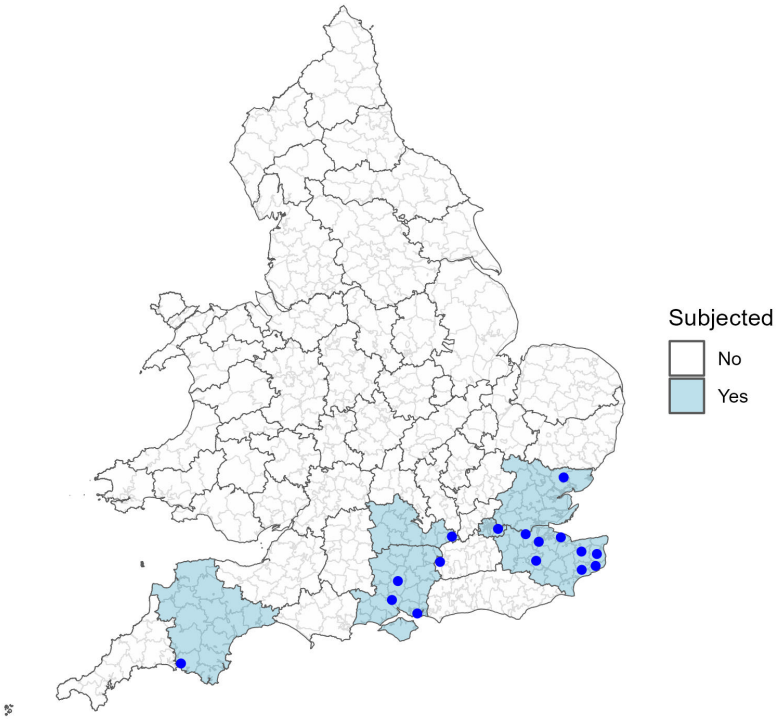
District	Year	County	District	Year	County
Portsmouth	1864-12-03	Hampshire	Greenwich	1870-01-06	London
Plymouth/Dvpt.	1865-04-01	Devonshire	Winchester	1870-01-06	Hampshire
Sheerness	1865-06-09	Kent	Dover	1870-01-19	Kent
Chatham	1865-06-12	Kent	Canterbury	1870-01-21	Kent
Woolwich	1866-11-14	London	Deal	1870-02-05	Kent
Aldershot	1867-04-12	Hampshire	Maidstone	1870-02-15	Kent
Windsor	1868-04-01	Berkshire	Gravesend	1870-02-17	Kent
Shorncliffe	1868-07-27	Kent	Southampton	1870-05-27	Hampshire
Colchester	1869-01-27	Essex			

B.4 MP fertility history data

In section 5, we use variation in whether MPs had daughters or sons to generate plausibly exogenous variation in their attitudes towards women's rights. In this appendix, we describe the process through which we reconstructed the MPs fertility histories. At the end, we provide some basic descriptive statistics on the fertility data.

The starting point for this process is the MP data compiled by Eggers and Spirling (2014) which includes MP names and, conveniently, their year of birth. For every MP, we also begin by pulling their Wikipedia page. Those exist, at varying lengths, for every MP in our set. While we find evidence of substantial inaccuracies in the Wikipedia pages, they

Figure B2: Map of Counties & Districts Subjected to the CDAs



Note: The figure shows the locations where the CDAs were implemented. The darker boundaries are the counties in England and Wales. The lighter boundaries are districts (the level of treatment assignment). The dots correspond to the treated districts that are subjected to the CDAs. The shaded counties are the six counties that contain treated districts. Data on the treated districts are from the *Annual Report of the Assistant Commissioner of the Police of the Metropolis Relating to the Contagious Diseases Acts* in 1881.

do provide useful information. In particular, they almost always provide a wife's name if the MP was married (many MPs were also married multiple times, almost always because their wife died). In some cases the Wikipedia pages also provide information on children, but as we have found that information to be inaccurate in many cases, we use it only when it can be verified from other sources. In addition, we often use information from entries in the Oxford Dictionary of National Biography, and in rarer cases, from Burke's or Debret's (which compile information on the aristocracy). We also use obituaries from the Times of London, though during this period those rarely mention children.

The main source that we use is the census microdata, accessed through Ancestry.com. For each MP, we begin by pulling the 1881 and 1871 census sheets, and then when more information is needed we search in the 1851, 1861, 1891, and 1901 censuses. In addition, once we know the MPs wife's name we may search for her separately. In some cases we will also search for children in order to verify information obtained from other sources.

To illustrate some of the issues that make this process challenging, here we will describe an example for one MP, Mr George Augustus Frederick Cavendish-Bentinck, who we know from the Eggers and Spirling data was born in 1821. Like many MPs, this one has a complicated name. In Wikipedia, he appears as George Cavendish-Bentink, and the Wikipedia entry is unusually thorough. It suggests that he had two daughters and two sons, and was married to Prudence P.

After searching for a few name combinations in the Census, we find him listed as George A. F. C. Bentinck in the 1881 census (he appears as George Cavendish-Bentinck in Wikipedia). In that census, he is enumerated on Grafton St. in London with two sons, William G.C. Bentinck (age 27) and William G.F.C. Bentinck (age 24) plus a grandson and more than a dozen servants. Finding adult children in the household is extremely common among the population we are looking at. This is a useful feature, because it means that we can often identify children in later censuses.

In the 1871 Census, we find George enumerated with his wife Prudence P.C. Bentinck, one daughter, Jessica C. Bentinck (age 18 in 1871) and William J F Bentinck (age 14). From his age and name we can conjecture that the latter is the William G.F.C. Bentinck enumerated in the 1881 census.

We cannot locate George in the 1861 census, though he does appear in the 1851 census (aged 29) enumerated with his wife Prudence and no children. If we stopped here, we might conclude that Bentinck had two sons and one daughter, though Wikipedia suggests that he in fact had two daughters.

We can, however, make further progress by searching for his wife in the Census, particularly since, having already found her once, we know here birth year and she has a less common

name. In the 1861 Census, we find Prudence enumerated in London, without George, but with a daughter, Christina (age 8) and two sons, George William (age 7) and Frederick G.W. (age 4). The sons are evidently those enumerated later, but with the ordering of their names switched. This switching is actually common; it probably results from the fact that they went by their second name since, at least according to Wikipedia, the sons shared William as a first name. The daughter is in fact the Jessica, aged 18, enumerated in the 1871 census. Her name has also been switched; in fact her name was Christina Anne Jessica Cavendish-Bentinck according to Wikipedia. Still, we are short one daughter. Also, it is unclear where George was in 1861. Perhaps he was out of the country.

However, Prudence appears again, as Prudence P Cavendish Bentinck, in the 1891 Census, though George died just before that census was taken. She is listed as a mother-in-law in the household of John Arthur James and his wife Mary V. James, age 29. This is the missing daughter, who is listed in George's Wikipedia page as Mary Venetia Cavendish Bentinck, born in 1861.

At this point, we stop our search and enter the following data for George Bentinck: 2 daughters and 2 sons born by 1881. However, it is interesting to ask: what happened to Mary V. in the earlier censuses, particularly 1871, when she would have been just 9 years old and we would have expected her to be living at home? Since we have her maiden name, we can answer this question easily. She appears in the 1871 census as a visitor in the household of Thomas Whichcote, a "Baronet and Landowner Farming 935 Acres" according to his census occupation. Perhaps Mary was friends with Whichcote's daughter Isabella, who was just a couple of years older than her. In any case, she probably had a comfortable visit given that 17 servants were also enumerated in Whichcote's household.

This example illustrates many of the issues that we run into in trying to reconstruct the fertility histories of MPs. It also shows why we have adopted a labor-intensive manual approach, and why we have confined our analysis to the 1883 vote alone. Not all MPs are so complicated, but many are. For a small fraction, it is completely impossible to reconstruct their fertility histories. This is usually either because they happen to have a particularly common name, or because they were an Irish MP and therefore were unlikely to appear in the available English, Welsh, and Scottish census data.

Table B4 presents some basic statistics based on the reconstructed fertility histories. The top two lines show that we were able to reconstruct fertility histories for around 88% of the MPs who were present for the 1883 division on the CDAs. Of those, around 73% had any children, with roughly equal numbers having daughters and sons. Note that some MPs were young and would go on to have many children later, though many had completed fertility. A number of MPs were also life-long bachelors or had marriages that produced no children.

Table B4: MP family data summary statistics

	Number	Share
MPs in the 1883 division:	294	
MPs with fertility histories:	259	0.88
Of those...		
MPs with children:	188	0.73
Number with any daughters:	160	0.62
Number with any sons:	165	0.64
Total number of children:	867	
Of those...		
Number of daughters:	446	0.51
Number of sons:	421	0.49
Avg. number of children for those with any:		4.61

In total, these MPs had 867 children by 1881, around half of which (51%) were daughters.

C Results appendix

C.1 Appendix to the analysis of the police data

Here we present some additional results on the impact of the CDAs on the market for sex. We begin with some additional descriptive data. Table C1 describes the change in the number of sex workers in each CDA district.

Figure C1 presents the distribution of sex worker ages in the first year in which the CDAs were in force in each district and the tenth year. There is clear evidence that the average age of sex workers shifted up between these two observations, consistent with a reduction in entry into sex work by younger women.

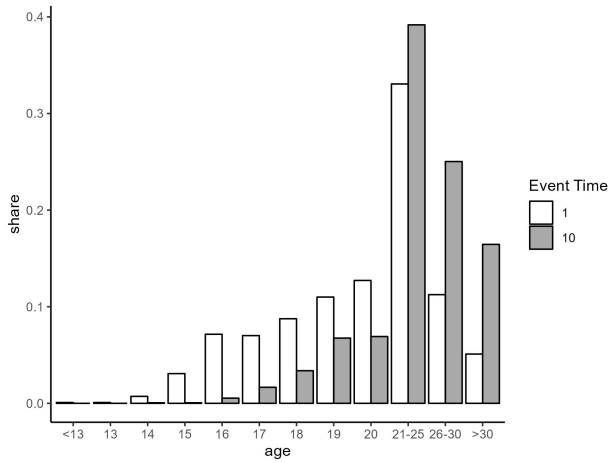
Table C1: Total Supply of Sex Workers Over Time by District

	Total Sex Workers			Percent Change	
District	$t = 0$	$t = 5$	$t = 10$	5 Years	10 Years
Aldershot	266	235	154	-11.7	-42.1
Canterbury	42	36	44	-14.3	4.8
Chatham	220	281	175	27.7	-20.5
Colchester	158	37	31	-76.6	-80.4
Deal	26	13	9	-50.0	-65.4
Plymouth/Devonport	1,770	557	442	-68.5	-75.0
Dover	92	50	34	-45.7	-63.0
Gravesend	47	33	30	-29.8	-36.2
Greenwich	151	74	98	-51.0	-35.1
Maidstone	58	19	21	-67.2	-63.8
Portsmouth	1,355	590	494	-56.5	-63.5
Sheerness	73	59	33	-19.2	-54.8
Shorncliffe	70	38	21	-45.7	-70
Southampton	154	139	104	-9.7	-32.5
Winchester	76	23	12	-69.7	-84.2
Windsor	54	24	12	-55.6	-77.8
Woolwich	240	200	152	-16.7	-36.7

Note: The table provides the supply of sex workers for each of the 17 treated locations. Columns two through four show the total registered sex workers for the year the district was treated, after 5 years, and after 10 years. Columns five and six display the percent changes in supply. The data are from the *Annual Report of the Assistant Commissioner of the Police of the Metropolis Relating to the Contagious Diseases Acts* in 1881. Appendix B.1 provides additional details.

Figure C2 plots the number of sex workers who were confined to a lock hospital for some period under the CDAs, using the police data. Note that the x-axis here is year rather than event time. The increase in hospitalizations from 1865 to 1869 is likely due to the extension of the acts to additional districts across that period. Hospitalizations peaked in 1869 and then fell. That pattern is consistent with a reduction in infection rates as well as a reduction in the number of women inspected as the CDAs reduced the number of sex workers active

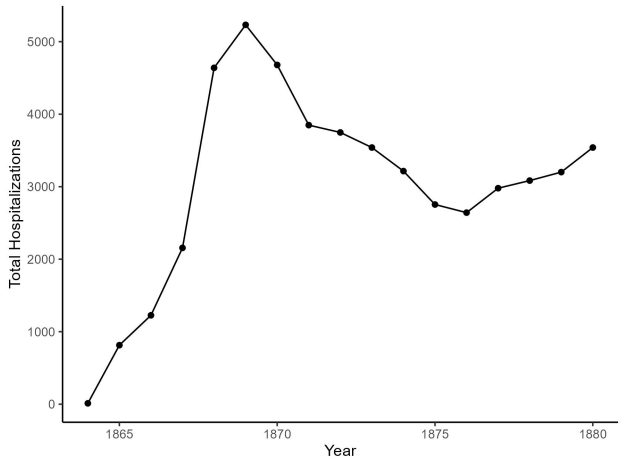
Figure C1: The Age Distribution of Sex Workers Over Time



Note: The figure shows the age distribution of registered sex workers for first year after treatment (light bars) and a decade after treatment (shaded bars). The data are from the *Annual Report of the Assistant Commissioner of the Police of the Metropolis Relating to the Contagious Diseases Acts* in 1881. Appendix B.1 provides additional details.

in the subjected districts.

Figure C2: Hospitalizations under the CDAs Over Time



Note: Data from the *Annual Report of the Assistant Commissioner of the Police of the Metropolis Relating to the Contagious Diseases Acts* in 1881. Appendix B.1 provides additional details.

C.2 Appendix to the analysis of the brothels data

Next, we present some additional results using the brothels data. Column 1 Table C2 presents the average effect corresponding to the event study in Figure 3. This implies treated counties had approximately 39 fewer brothels after the implementation of the CDAs.

Columns 2-4 present several robustness checks. First, one concern is that all treated counties are located in the southern part of England. This might raise concerns that counties in the north and in Wales are not effective control counties. Column 2 addresses this by restricting the analysis to counties in the south western, south midland, and south eastern divisions. The estimated effect is similar to the baseline specification including all counties as controls. An additional concern is that there might be spillovers from treated to nearby counties. While this is a potentially larger concern for the public health analysis later in the paper, we address this in column 3 by dropping all counties that border a county subjected to the CDAs. The estimated effect is nearly identical to the baseline specification. Lastly, London is one of the counties subjected to the CDAs. Given that it is an outlier, throughout the paper we drop London from the baseline analysis. Column 4 presents the estimated effect when London is included. The next two columns provide the estimated effects when the log of total brothels is used as the outcome variable.

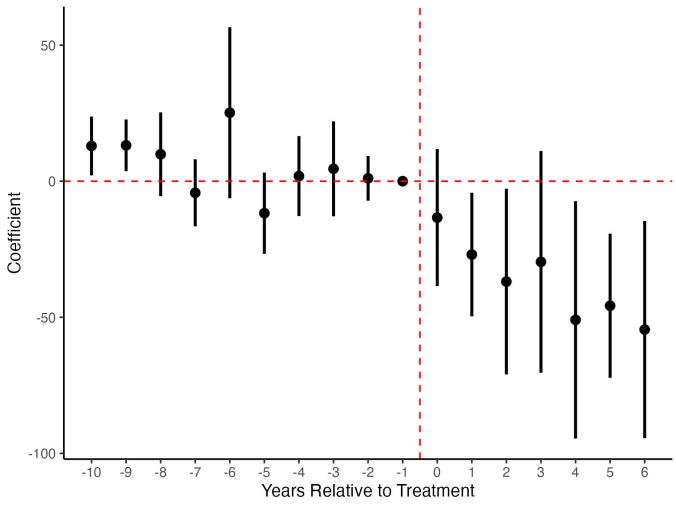
Table C2: The Effect of the CDAs on the Number of Brothels

Dep Var:	$brothels_{ct}$	$brothels_{ct}$	$brothels_{ct}$	$brothels_{ct}$	$\log(brothels_{ct})$	$\log(brothels_{ct})$
Spec.:	Baseline	Southern	No Nearby	With London	Baseline	With London
	(1)	(2)	(3)	(4)	(5)	(6)
ATT	-38.677***	-42.010***	-38.012***	-50.547***	-0.163	-0.136
	(11.845)	(13.334)	(12.747)	(14.010)	(0.124)	(0.105)
Obs.	689	221	533	701	612	624
Mean DV	104.556	66.814	119.692	125.568	3.717	3.783

Note: *** p<0.01, ** p<0.05, * p<0.1. The table provides the average of the dynamic treatment effects from estimating equation (1) using the method from Callaway and Sant'Anna (2021). The county of London is excluded from the analysis unless stated otherwise. In column 1, the outcome is the number of brothels at the county-level. Column 2 restricts to counties in the south western, south midland, or south eastern registration areas. Column 3 removes counties that border treated counties. Column 4 includes London in the analysis. Column 5 contains the results when the log of total brothels is the outcome variable. Column 6 uses log of total brothels as the outcome and includes London in the analysis. Standard errors clustered at the county-level are in parentheses.

Next, Figure C3 presents results based on a two-way fixed effects specification instead of the estimation method of Callaway and Sant'Anna (2021). As these results show, our findings are even stronger if we take this alternative approach.

Figure C3: Two Way Fixed Effect Analysis of the Brothels Data



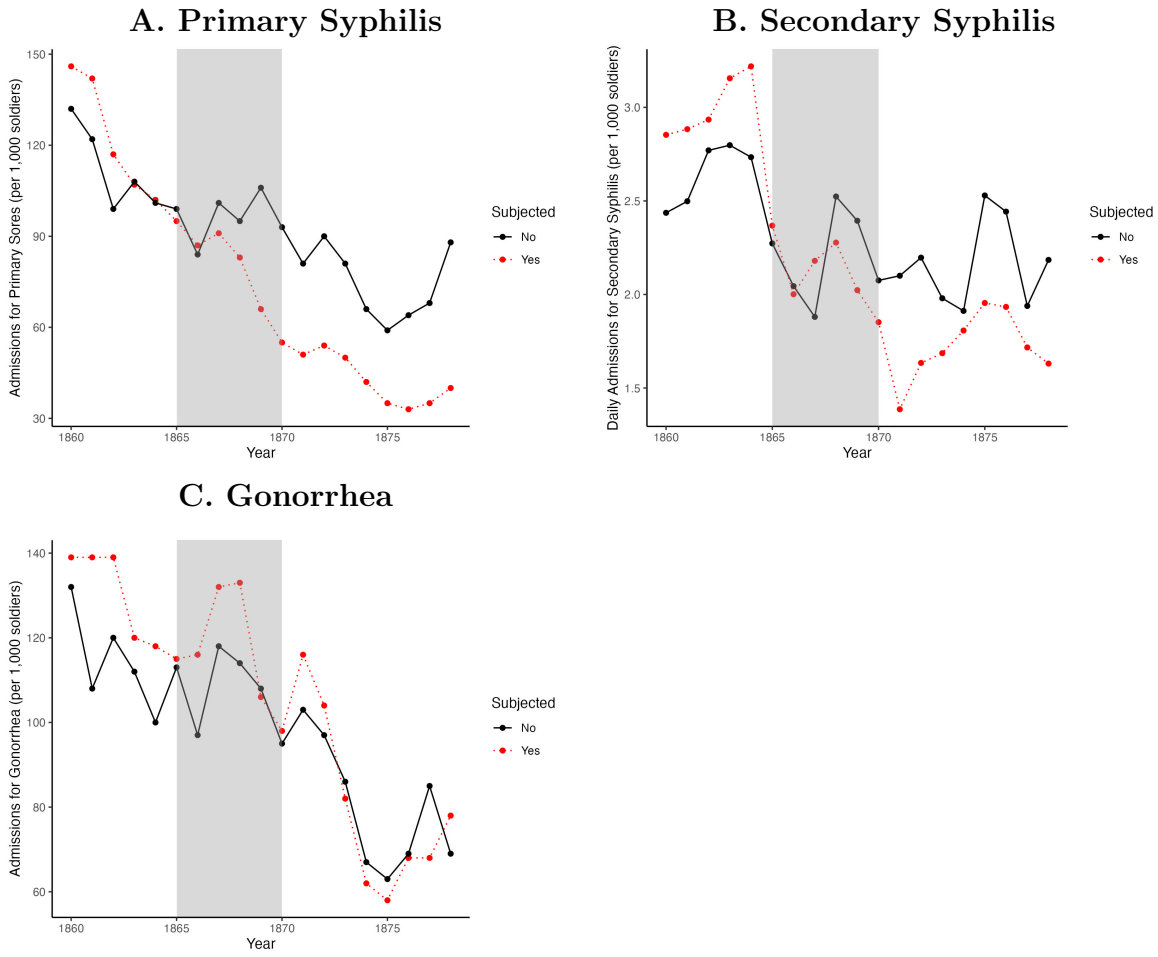
Note: The figure shows the estimated coefficients and 95% confidence intervals for β_s in Eq. 1 estimated using two-way fixed effects, i.e., including a full set of county and year fixed effects. The x-axis is in event time relative to the year in which the CDAs became active in any district within the county. The vertical line corresponds to the year of treatment. Standard errors are clustered at the county-level. The County of London is excluded from the analysis.

C.3 Appendix to the analysis of STI rates among soldiers

This section presents additional results related to the analysis in Section 4.1. Figure C4 looks at the raw trends in three aggregated STI series reported for treated and untreated stations (note that for only one of these, secondary syphilis infections, do we have the data broken down by station). The top panel shows average daily hospitalizations per 1,000 soldiers for primary syphilis sores in treated vs. non-treated stations in the U.K. before and after the CDAs came into operation. We can see that both treated and control locations had similar levels and trends in the period leading up to the introduction of the CDAs. Starting during the period in which the CDAs were introduced–between 1865 and 1870, indicated by the shaded region in the graph–the two groups of stations diverge and the treated stations show substantially lower hospital admission rates. A similar pattern is visible in the middle graph, which focuses on daily admissions for secondary syphilis, a later stage of the disease that typically arrives several months after the primary syphilis sores disappear. The bottom graph shows the pattern for gonorrhea. For this disease, stations subject to the CDA had on average higher rates in the period before the CDAs came into operation. After the CDAs were operating, this difference disappears and the two groups exhibit similar rates of gonorrhea hospitalization. Thus, all three of these figures provide suggestive evidence that the introduction of the CDAs reduced STI rates in treated stations relative to those not

treated.

Figure C4: STI Hospitalizations at CDA vs. non-CDA Military Stations



Note: Panel A shows the annual hospital admissions for primary syphilis per 1,000 soldiers. Panel B displays the daily average number of soldiers hospitalized for secondary syphilis per 1,000 soldiers. Panel C reports the annual hospital admissions for gonorrhea per 1,000 soldiers. All graphs report the aggregated values for subjected and untreated districts. The shaded region corresponds to the period in which the CDAs were being implemented (see Table B3). The data are from the *Report from the Select Committee on the Contagious Disease Acts, 28 July 1881* p. 445-455. Appendix B.2 provides additional details.

Next, Table C3 presents the average treatment effects across the treatment period. The first column uses a specification that corresponds to the one used in the event study in Figure 4. These results imply an approximately 45% reduction in the syphilis hospitalization rate. Columns 2 and 3 present two robustness checks. First, Column 2 shows that the effect is robust to using the hospitalization rate in levels as the outcome instead of logs. In terms of magnitude, the results in Column 2 suggest a decrease in the syphilis hospitalization rate of around 33 percent. That is smaller than the results implied by Column 1, but still in the same general range. Lastly, some of the military stations used in the analysis are located in

Ireland, Northern Ireland, and Scotland. Column 3 restricts the analysis to military stations in England and Wales which is the region used in other analyses in the paper. The average effect is nearly identical to the baseline specification in Column 1.

Table C3: The Effect of the CDAs on Hospital Admissions for Secondary Syphilis

Dep Var:	$\log(rate_{dt})$	$rate_{dt}$	$\log(rate_{dt})$
Spec.:	Baseline	Levels	England & Wales
	(1)	(2)	(3)
ATT	-0.463***	-9.848***	-0.451**
	(0.167)	(3.512)	(0.228)
Observations	475	475	361
Mean Dep. Var.	3.248	29.479	3.276

Note: *** p<0.01, ** p<0.05, * p<0.1. The table provides the average of the dynamic treatment effects from estimating equation (1) using the method from Callaway and Sant'Anna (2021). In column 1, the outcome is the log of the syphilis hospitalization rate, defined as the number of annual hospitalizations from secondary syphilis per 1,000 soldiers. In column 2, the outcome is the syphilis hospitalization rate in levels. In column 3, the outcome is the log of the syphilis hospitalization rate and the sample is restricted to military stations in England and Wales. Standard errors clustered at the station-level are in parentheses.

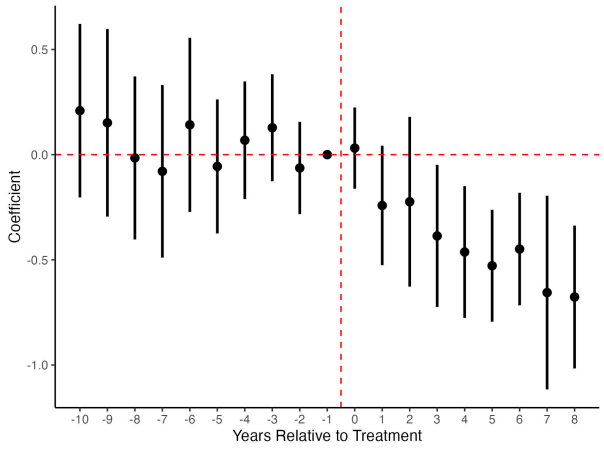
Figure C5 presents event study results corresponding to those presented in Figure 4 in the main text, but using a two-way fixed effects approach in place of the method from Callaway and Sant'Anna (2021). It is clear that the two-way fixed effects approach generates results that are similar to those obtained from the approach from Callaway and Sant'Anna (2021) but with generally smaller standard errors. Thus, our results appear to be fairly robust to the choice of estimation method.

C.4 Appendix analyzing STI rates among Navy sailors

This section analyzes how STI hospitalization rates changed among sailors in the Navy after the CDAs were implemented. Our primary analysis in section 4.1 focused on hospitalizations among soldiers because Parliament compiled more systematic data on hospital admissions from STIs in Army stations. However, Parliament did conduct a smaller analysis on how hospital admissions changed in Navy ports located in districts subjected to the CDAs.[48] The Parliamentary report contains hospitalizations of soldiers at the ship-level from 1860 to 1875 for ships stationed in five ports located in districts subjected to the CDAs and

[48]The Parliamentary report containing the data on hospitalization rates among sailors is titled, *Return Of Number Of Cases Of Venereal Diseases in H.M. Ships and Vessels Stationed at Home Ports, at which Contagious Diseases Acts have been in Operation, 1860-75.*

Figure C5: Two Way Fixed Effect Analysis of the Hospitalizations Data



Note: The figure shows the estimated coefficients and 95% confidence intervals for β_s in equation (1) estimated using a two-way fixed effects approach, i.e., including a full set of county and year fixed effects. The outcome variable is the station-level hospitalization rate of soldiers from secondary syphilis. The x-axis is in event time relative to the year in which the CDAs became active in the district where the station was located. The vertical line corresponds to the year of treatment. Standard errors are clustered by station.

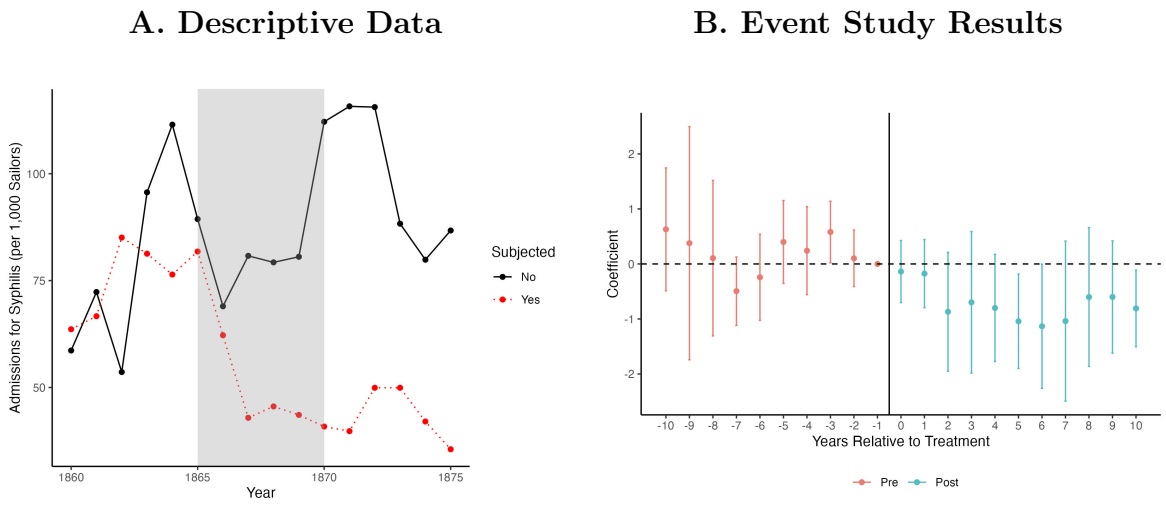
five ports in untreated districts. The report lists the number of STI hospitalizations from syphilis and gonorrhea of sailors in each ship, the total number of sailors on the ship, and the length of the year the ship was stationed at the port.

To analyze how hospitalizations changed among sailors, we use the same empirical strategy used to analyze soldiers in section 4.1 with a few exceptions given differences in how the data are reported. We estimate equation (1) where treatment status is defined when the district containing the port becomes subjected to the CDAs. In cases where there are multiple ships per port we aggregate the data to the port-level. In contrast to the Army data, this data combines primary and secondary syphilis in some years. Therefore, the outcome variable is the log of the total syphilis hospitalization rate, defined as the sum of primary and secondary syphilis hospitalizations relative to 1,000 sailors. Lastly, the report does not report hospitalization rates in every year from 1860-75 for every port. For example, Dartmouth, which was in a subjected district, does not report data until 1863. Given the small number of ports and pre-period years in the data, we allow for an unbalanced panel.

Panel A of Figure C6 displays the syphilis hospitalization rates in ports in subjected and untreated districts. During the period before treatment hospital admissions in the two groups trend similar, although noisily. As the CDAs are implemented hospitalizations in the subjected ports declines relative to untreated ports. Panel B of Figure C6 displays the corresponding event study plot when we estimate equation (1) using the estimator in

Callaway and Sant'Anna (2021) where the log syphilis hospitalization rate is the outcome. Although noisy, before treatment there is no clear trend in the estimated effects. After treatment, the estimated dynamic treatment effects become consistently negative suggesting a reduction in syphilis hospitalizations. The average effect corresponds approximately a 72% decline in the syphilis hospitalization rate.

Figure C6: The Effect of the CDAs on Hospital Admissions from Syphilis among Navy Sailors



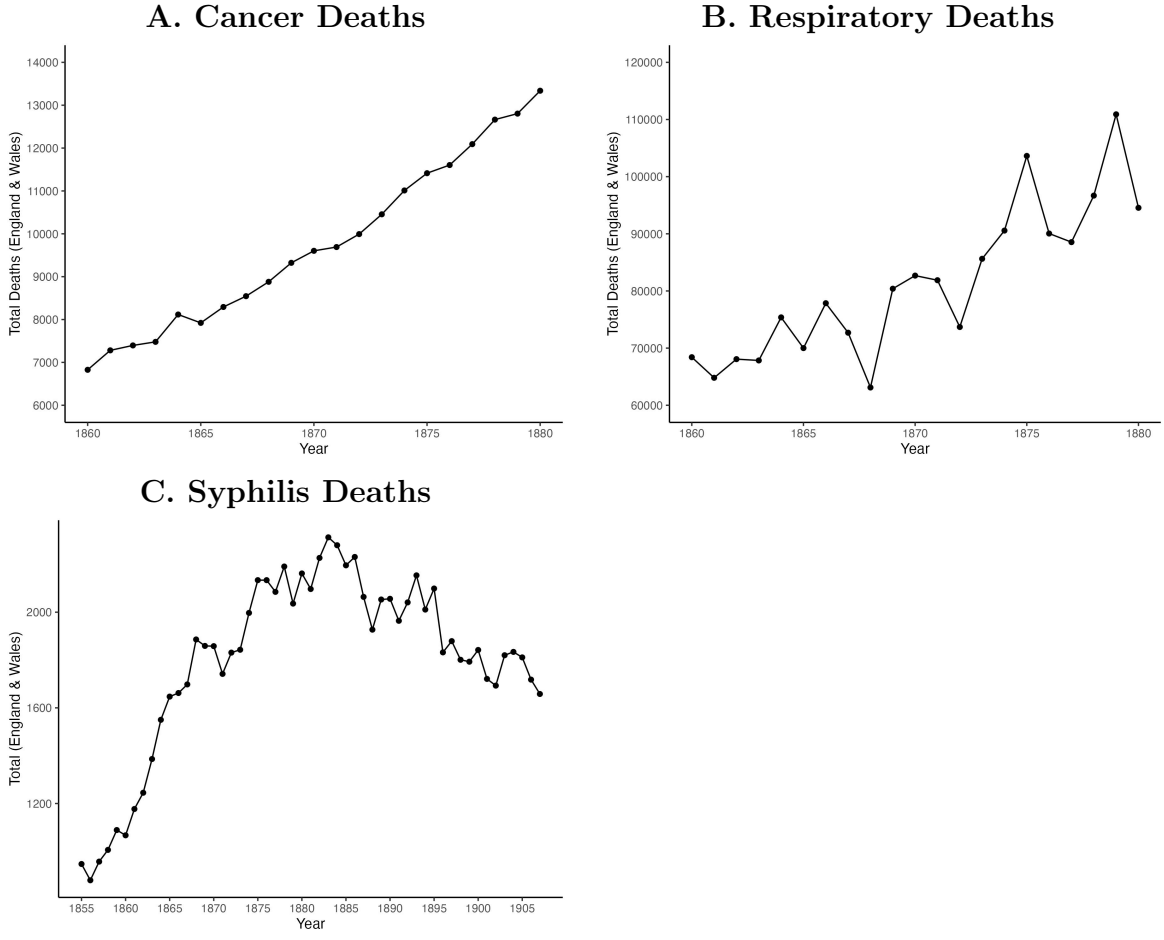
Note: The figure on the left displays the syphilis hospitalization rate, defined as the number of hospitalizations from syphilis per 1,000 sailors, for ports in treated and untreated districts over time. The shaded region corresponds to the period in which the CDAs were being implemented (see Table B3). The figure on the right shows the estimated coefficients and 95% confidence intervals for β_s in equation (1) estimated using the method from Callaway and Sant'Anna (2021) applied to the log syphilis hospitalization rate at the port-level. Standard errors are clustered at the port-level.

C.5 Appendix to the analysis of STI mortality

This appendix presents some additional results related to our analysis of mortality patterns among the general population. Figure C7 plots the total number of deaths in England and Wales from three causes of deaths used in the empirical analysis. Panel A and B plot total deaths from cancer and respiratory-related diseases, respectively. These are the causes of deaths used as placebos in the empirical analysis. Respiratory deaths combine several causes of death reported in the *Registrar General* annual reports: laryngitis, bronchitis, pleurisy, pneumonia, asthma, and diseases of lungs. Panel C plots total deaths from syphilis which is the main outcome of interest used to assess how the CDAs affect public health and STI transmission.

Figure C8 presents event study results looking at the two placebo causes of death that we examine, respiratory mortality and cancer. These figures show no evidence of differential

Figure C7: Total Deaths by Cause in England & Wales Over Time

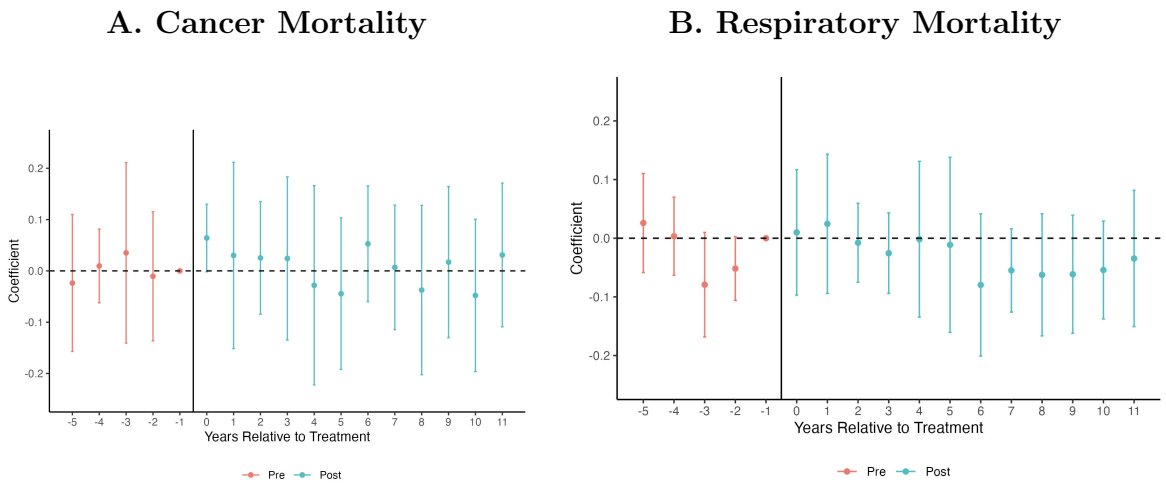


Note: This figure displays total number of deaths from specific causes over time in England and Wales. Panel (A) plots cancer deaths, panel (B) plots total respiratory deaths, and panel (C) plots total syphilis deaths. All data are collected from the annual *Registrar General* reports.

mortality patterns in treated locations corresponding to either the introduction or the repeal of the CDAs. This provides further support for the argument that our main syphilis results are unlikely to be driven by other underlying factors causing mortality patterns to differ in treated vs. control counties around the time that the CDAs were introduced.

Table C4 presents regression results analogous to Table 1 where the outcome is the mortality rate instead of the log mortality rate. Across different specifications, the implementation of the CDAs reduces the syphilis mortality rate by between 1.5 and 2 deaths per 100,000 people. The mean number of deaths across different samples is approximately 5.5 to 6 deaths per 100,000 people. The magnitude of the results where the outcome variable is the mortality rate in levels is qualitatively similar to the results using the log mortality rate in Table 1.

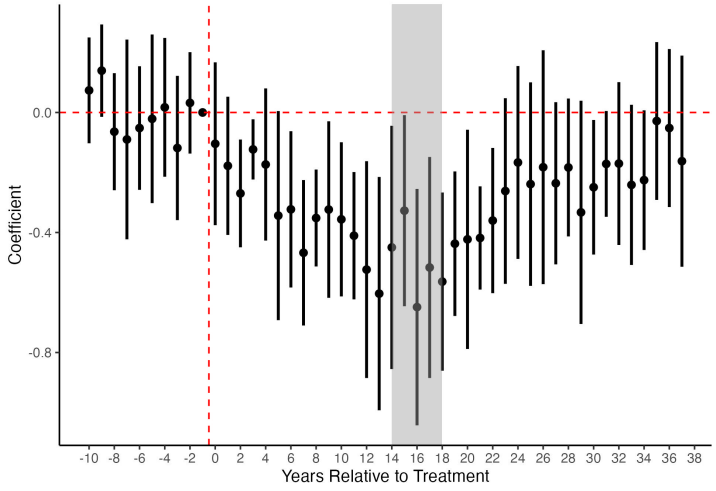
Figure C8: The Effect of the CDAs on Cancer and Respiratory Mortality



Note: The figure shows the estimated coefficients and 95% confidence intervals for β_s in Eq. 1 estimated using the method from Callaway and Sant'Anna (2021) applied to the log county-level mortality rate. Panel A displays the event study where the outcome is the log mortality rate from cancer and panel B shows the event study for the mortality rate due to respiratory-related causes. The x-axis is in event time relative to the year in which the CDAs became active in any district within the county. We estimate β_s for years in event time in which all treated counties have data available. The vertical line corresponds to the year of treatment. Standard errors are clustered at the county-level.

Figure C9 presents event study results corresponding to those presented in Figure 6 in the main text, but using a two-way fixed effects approach in place of the method from Callaway and Sant'Anna (2021). These results are very similar to those obtained using the approach from Callaway and Sant'Anna (2021) and presented in the main text.

Figure C9: Two Way Fixed Effect Analysis of Syphilis Mortality



Note: The figure shows the estimated coefficients and 95% confidence intervals for β_s in Eq. 1 estimated using a two-way fixed effects approach, i.e., including a full set of county and year fixed effects. The outcome variable is the log county-level mortality rate from syphilis. The x-axis is in event time relative to the year in which the CDAs became active in any district within the county. The vertical line corresponds to the year of treatment. The shaded region corresponds to the years in event time when the law was suspended. While suspension occurs in 1883 for all counties, this occurs in different years of event time because of staggered treatment timing. Standard errors are clustered at the county-level. London is excluded from the analysis.

Table C4: The Effect of the CDAs on County-Level Syphilis Mortality Rates

	Dep Var: $rate_{ct}$				
Spec.:	Pre-Suspension	Full Period	London	Southern	No Nearby
	(1)	(2)	(3)	(4)	(5)
ATT	-1.920***	-1.792**	-1.741***	-1.573**	-2.086***
	(0.522)	(0.716)	(0.470)	(0.758)	(0.538)
Observations	1,232	2,288	1,260	504	896
Mean Dep. Var.	5.846	5.625	5.986	5.655	6.081

Note: *** p<0.01, ** p<0.05, * p<0.1. Each column provides the average of the dynamic treatment effects from estimating Eq. 1 using the method from Callaway and Sant'Anna (2021) for different types of mortality. In all specifications, the outcome is the mortality rate, calculated as the number of deaths per 100,000 people. Data are annual at the county-level. The county of Greater London is excluded unless stated otherwise. The first column presents the results for syphilis restricting the sample prior to 1883 when the CDAs are suspended. The second column presents the results for syphilis using the full sample from 1855-1906. The third row presents the estimate when the Greater London county is added to the analysis and restricting to pre-suspension. The fourth column restricts the analysis to counties in the south-western, south midland, or south-eastern registration areas pre-suspension. The fifth column removes counties that border treated counties and restricts to pre-suspension. Standard errors are clustered at the county-level.

C.6 Appendix to the analysis of childless couples

Table C5 presents some additional results looking at the impact of the CDAs on the rate of childless couples. These results use the district-level analysis specification in Eq. 2. The first three columns look at how the results change if we expand our sample to include couples where the wife's age was between 25 and 45 years old. The next three columns look at how the results are affected by including London in the analysis. Both sets of results are very similar to those presented in the main text.

Table C5: Robustness results for childless couples analysis

Dep. Var.:	Share of childless couples					
Spec.:	Couples with wives aged 25-45			Including London (wives aged 25-40)		
	(1)	(2)	(3)	(4)	(5)	(6)
CDA Dist	-0.0149***	-0.0124**	-0.0112**	-0.0133***	-0.0116**	-0.0116**
x Post	(0.00469)	(0.00559)	(0.00500)	(0.00469)	(0.00556)	(0.00512)
CDA County		-0.00304			-0.00210	
x Post		(0.00357)			(0.00356)	
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes		Yes	Yes	
County-yr FE			Yes			Yes
Observations	1,645	1,645	1,640	1,645	1,645	1,640
R-squared	0.143	0.144	0.773	0.160	0.160	0.767

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered by district.

Next, we consider an alternative approach to analyzing the rate of childless couples that focuses on households, rather than districts, as the unit of observation. The advantage of this approach is that it allows us to include household-level controls as well as to study whether rates of childlessness are also affected by parents' birth locations. However, because the outcome variable is an indicator, the estimated coefficients are less straightforward to interpret. The household-level linear probability model is:

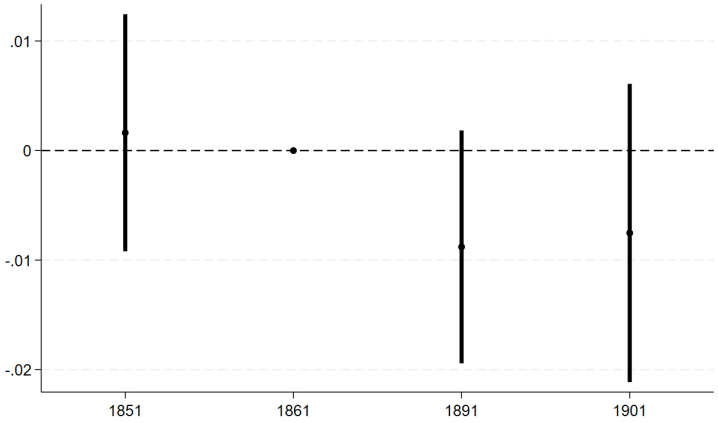
$$\begin{aligned} CHILDLESS_{hit} &= \beta(CDA_i * POST_t) + \eta^F(birthCDA_i^F * POST_t) \\ &+ \eta^M(birthCDA_i^M * POST_t) + X_{hit}\Lambda + \gamma_i + \eta_t + \epsilon_{hit} \end{aligned} \tag{3}$$

where $CHILDLESS_{hit}$ is an indicator for whether household h in district i in census year t is childless, $birthCDA_i^F$ and $birthCDA_i^M$ are indicators for whether the father or mother

was born in a county with a CDA district (district of birth is not observed), X_{hit} is a set of household-level controls, and the other variables are defined as above. As in the district-level results, we cluster standard errors at the district level and exclude London, though we have verified that our findings are not sensitive to these choices.

Figure C10 presents some event study results based on the specification in Eq. 3 but replacing $POST_t$ with a set of year indicator variables. The results show no evidence of differential pre-trends between treatment and control locations, while we see a fairly substantial drop in the estimated coefficients in the post-treatment period.

Figure C10: Event study for the household-level analysis of childless couples



Note: The figure shows the estimated coefficients and 95% confidence intervals for coefficients estimated using Eq. 3 but replacing $POST_t$ with a set of year indicator variables. Data cover all couples in England and Wales where the wife's age at the time of the census is in [25-40]. N = 5,586,446. Standard errors are clustered by registration district. The regression includes district and year fixed effects as well as controls for wife's age and husband's age. Districts in the county of London are excluded from the analysis.

Table C6 presents household-level results based on Eq. 3. Column 1 presents results corresponding to Column 1 in Table 3 in the main text. The estimated coefficient in these linear probability regressions reflects the impact of being resident in a CDA district in the post-CDA period on childlessness. As in the main results, we observe a negative and economically significant relationship between residence in a CDA district and childlessness, though the results are not significant at traditional confidence levels (they are significant at the 85% confidence level). The difference between these estimates and the district-level results in the main text appears to be due to the different weighting implicit in the linear probability model, which treats individuals rather than districts as the unit of observation.

The addition of controls for the ages of the wife and the husband, in Column 2, has almost no impact on the results. Columns 3 and 4 look for evidence of spillovers, either

within the county or to bordering districts. Consistent with the results obtained in the main text, neither of these show any evidence of substantial spillovers to nearby districts.

In Columns 5 and 6, we look at the impact of either the wife or the husband being born in a CDA county (note that birth district is not available in the data). In these specifications, we include county-year fixed effects, which means that the effect of wife's and husband's birth county is identified by those who moved across counties. We can see that being born in a CDA county is associated with a reduction in childlessness in the post-CDA period, consistent with an effect of the CDAs operating through exposure earlier in life. In these specifications, the coefficient on being resident in a CDA district (top row) indicates a somewhat larger and more statistically significant (90% confidence level) negative impact of the CDAs on the rate of childlessness.

Overall, while not quite as strong as the district-level regressions presented in the main text, the household level regressions in Table C6 confirm the same basic relationships. Moreover, these results also show that being born in a CDA county was associated with reduced rates of childlessness in the post-CDA period.

Table C6: Household-level analysis of childless couples

	Dep. Var.: Indicator for childless couple					
	(1)	(2)	(3)	(4)	(5)	(6)
CDA x POST	-0.00860	-0.00883	-0.00889	-0.00889	-0.0110*	-0.0107*
	(0.00605)	(0.00595)	(0.00571)	(0.00609)	(0.00586)	(0.00627)
Treated county x Post			6.32e-05			
			(0.00517)			
Nearby x POST				-0.00105		0.000892
				(0.00553)		(0.00429)
Wife born CDA county x Post					-0.00576***	-0.00577***
					(0.00220)	(0.00219)
Husband born CDA county x Post					-0.00571***	-0.00572***
					(0.00174)	(0.00174)
Husband's age		-0.00170***	-0.00170***	-0.00170***	-0.00170***	-0.00170***
		(9.49e-05)	(9.51e-05)	(9.50e-05)	(9.48e-05)	(9.48e-05)
Wife's age		-0.00452***	-0.00452***	-0.00452***	-0.00451***	-0.00451***
		(0.000130)	(0.000130)	(0.000130)	(0.000131)	(0.000131)
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes		
County-yr FE					Yes	Yes
Observations	5,590,177	5,586,446	5,586,446	5,586,446	5,586,446	5,586,446
R-squared	0.004	0.011	0.011	0.011	0.012	0.012

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered by district. Based on couples where the wife's age is between 25 and 40. London is excluded from the analysis. Based on specification in Eq. 3.

C.7 Text analysis appendix

This appendix provides additional details and results related to the text analysis presented in Section 5.1. It is useful to begin by summarizing the data. Our main analysis uses speeches from the debate over the elimination of compulsory inspection as part of the CDAs, which took place on April 20, 1883. Just over 44,000 words were spoken in the debate by 15 MPs, though some of these made only very short interjections. Our analysis focuses on the 12 MPs who made substantial speeches (over 1,000 words). Of these, 5 spoke in favor of the resolution and 7 against. The longest speech, by the leading opponent of the bill, the Liberal George Osborne Morgan, was 10,934 words.

We begin our analysis by giving ChatGPT the following background prompt:

> I need to summarize the key arguments from different speakers in a debate over a resolution against the Contagious Disease Acts the 19th century UK Parliament. I will provide the text of each speech. I would like you to summarize the key arguments for or against the bill.

We then feed in each of the speeches and ask the engine to summarize them. We start with speeches in favor of the resolution. We preface each speech with the following prompt:

> Please summarize the key arguments in this speech by one MP in favor [against] of the resolution:

followed by the speech. Because of length constraints, we have split up the longest speech, by George Osborne Morgan, into three parts. The other long speech, by James Stansfeld in his introduction of the bill, is also broken into three parts due to interruptions.

In the second step, once all of the speeches in favor of the resolution have been summarized, we ask the engine to produce a summary of the summaries using the following prompt:

> Based on the analysis of the speeches above, can you summarize the moral, ethical, or legal arguments in favor of the resolution?

Here is the summary generated by this prompt for the speeches in favor of the bill:

Based on the analysis of the speeches in favor of the resolution to disapprove of the compulsory examination of women under the Contagious Diseases Acts, here are the summarized moral, ethical, and legal arguments:

Moral and Ethical Arguments:

Injustice and Inequality: *The Acts are seen as fundamentally immoral due to the unequal treatment of men and women involved in prostitution. The speeches highlight the disparity in consequences, where women are cast away while men face little to no repercussions.*

Violation of Rights: *There is a strong moral objection to the compulsory examination of women, viewing it as an invasion of their bodily autonomy and a violation of their rights.*

Dehumanization and Stigmatization: *The Acts are criticized for dehumanizing and stigmatizing women involved in prostitution, marking them with a sign of the State and condemning them to continued suffering.*

Legal Arguments:

Constitutional Rights: *There are concerns about the Acts constituting an invasion of constitutional rights, departing from ordinary legal practices, and the need for clear evidence of their beneficial effects to justify such departures.*

Recognition of Prostitution: *The Acts are seen as involving the State's recognition of prostitution as a necessity, which is viewed as legally and morally unacceptable.*

Questionable Effectiveness: *There are doubts about the hygienic benefits claimed by the Acts, with historical evidence suggesting that stringent regulations do not always lead to a reduction in disease rates.*

Overall, the arguments in favor of the resolution emphasize the moral injustice, ethical violations of bodily autonomy, and legal concerns regarding the unequal treatment of women, questionable effectiveness of the Acts, and the problematic recognition of prostitution as a sanctioned necessity.

It is notable that we ask the engine to focus on the moral, ethical, or legal arguments in this prompt. This is done to focus attention on the core arguments about the bill, rather than more pedantic debates over procedures (specifically, over the fact that the government refused to take a position on the resolution) or the analysis used in the Committee Report that proceeded the bill. However, for completeness, we also asked a follow-up question about these other issues:

> Based on the analysis of the speeches above, can you summarize the other arguments in favor of the resolution?

Here is the results produced by ChatGPT in response to that follow-up question:

Certainly! In addition to the moral, ethical, and legal arguments in favor of the resolution to disapprove of the compulsory examination of women under the Contagious Diseases Acts, there are several other key arguments presented:

1. Historical Context: *The Acts are criticized for their historical context, with references to the state of affairs before the Acts were passed. This includes the existence of Lock Wards at seaports, which were always full, indicating that the problem of disease was not effectively addressed. There is a mention of the failure of a Bill introduced in 1872, which aimed to repeal the Acts but did not pass due to parliamentary constraints. This history is used to argue that the Acts have been contentious and not universally effective.*

2. Comparison of Systems: *A comparison is made between the compulsory system under the Acts and a proposed voluntary system. It is argued that relying on a voluntary system entirely might have been more effective and satisfactory. The speaker suggests that a voluntary system could have been more capable of expansion and applied to every town or district without the controversy and indignation caused by the compulsory Acts.*

3. Practical Concerns: *The practical consequences of the Acts are discussed, including their impact on order in the streets. It is argued that the Acts do not necessarily contribute to street order and morality, as claimed by some supporters. The issue of rescue and rehabilitation of women involved in prostitution is brought up, with the assertion that good people would still enter voluntary Lock Wards to help these women without the need for compulsory examination and registration.*

4. Assessment of Results: *There is a mixed assessment of the results of the Acts. While some argue that the Acts have led to a reduction in disease rates, others are skeptical about their effectiveness, especially in comparison to voluntary systems. The claim is made that the Acts have resulted in a decrease in juvenile prostitution, particularly in certain towns like Portsmouth and Devonport, although this is not necessarily attributed directly to the compulsory examination.*

Overall, these additional arguments in favor of the resolution highlight the historical context of the Acts, the comparison with a proposed voluntary system, practical concerns about street order and rescue efforts, and a mixed assessment of the results achieved by the Acts.

Using the same procedure applied to speeches by opponents of the CDAs, we also asked ChatGPT to summarize the arguments made by opponents of the resolution (i.e., supporters of the CDAs). Here is the engine's response:

Based on the analysis of the speeches against the resolution:

Moral and Ethical Arguments Against the Resolution:

Effectiveness and Support: *MPs argued that the Contagious Diseases Acts (CD Acts) were effective and had strong public support in the areas where they were enforced.*

Public Morality: *They contended that the Acts were not detrimental to public morality, as evidenced by the lack of remonstrances and strong support from local communities.*

Protection of Women: *The MPs argued that the Acts were not unjust or harmful to women, citing the commitment of local clergy and others to support the Acts.*

Liberty of the Subject: *They questioned whether the liberty of the subject was genuinely at risk, suggesting that personal liberty was not infringed upon by these Acts.*

Government's Responsibility: *Criticism was directed at the Government's lack of clear stance and guidance on such an important moral and ethical issue.*

Consequences of Repeal: *There was concern about the potential consequences of repealing the Acts, especially without a clear alternative proposed by the Government.*

Legal Arguments Against the Resolution:

Practical Experience: *MPs argued that those living in districts where the Acts were enforced had practical experience that should inform the decision.*

Lack of Governmental Clarity: *They criticized the Government's lack of clarity and unity in presenting their position on the Acts, especially considering the significant legal and moral implications.*

Government's Obligation: *MPs questioned the Government's obligation to have a clear stance on issues of public morality and personal liberty, suggesting that these should not be "open questions" for the Government.*

Need for Government Guidance: *They emphasized the need for guidance from the Government before making a decision on such an important and impactful resolution.*

Overall, the moral, ethical, and legal arguments against the resolution focused on the effectiveness and support of the CD Acts, the protection of public morality, the lack of harm to women, the liberty of individuals, the Government's responsibility to provide guidance, and the potential consequences of repealing the Acts without a clear alternative.

Finally, to provide a more concise summary of these points we use the following prompt:

Can you summarize, in 3-4 bullet points, the key arguments for and against the resolution?

The results generated by this prompt are presented in the main text.

C.8 Multinomial logit analysis of MP voting patterns

One potential concern with our main analysis of MP voting patterns in Table 5 is that we only observe votes for a subset of MPs because it was common for many MPs not to vote in divisions during the nineteenth century. Thus, the analysis in that table helps us understand the motivations behind the votes of those MPs who were present for the division on the CDAs, but not what caused MPs to show up to the division in the first place. In this appendix, we expand our analysis to encompass MP's decision about whether or not to be present for the division using a multinomial logit analysis framework.

Our analysis begins with the universe of MPs who were in office during both the vote to eliminate compulsion in the CDAs, in April of 1883, and the women's suffrage vote in July 1883. We identify these MPs using Craig (1977) and Walker (1978).

We think of these MPs as having three options in the 1883 division eliminating compulsion from the CDAs: they could show up and vote in favor of eliminating compulsion, they could show up and vote against eliminating compulsion, or they could choose not to show up to the division. The latter choice may be due in part to external factors that demand the time of MPs, a lack of interest, or a strategic decision to avoid having to cast a vote on such a divisive issue.

Treating not voting as the reference category, in Table C7 below we analyze how MP's decisions were influenced by their stance on women's rights, as reflected in their choice to show up for the women's suffrage vote and their vote on that issue, as well as other influences such as their party, their age, and their views on compulsory vaccination (a reflection of support for compulsory public health legislation).

These results show that conservatives were more likely to show up and vote in support of the CDAs and less likely to show up to vote against the CDAs than MPs from other parties (mainly liberals). The same is true for MPs from CDA districts. MPs who showed up for the suffrage vote were slightly more likely to show up for the CDA vote, a finding that likely reflects both the connection between these issues as well as the fact that some MPs were unlikely to show up for any divisions for a variety of reasons. However, MPs that had voted in favor of women's suffrage were much more likely–by a factor of 2.8-3.3–to show up *and* vote in favor of eliminating compulsion. In contrast, MPs who showed up and voted against women's suffrage were somewhat more likely to also vote against eliminating compulsion from the CDAs, though that connection is not as strong. As in our main results, MP age has only a weak effect. MPs who voted on compulsory vaccination were also more likely to

show up for the CDA vote, but the direction of their vote on compulsory vaccination does not appear to be a strong predictor of their vote in the CDA division.

Table C7: Multinomial logit analysis of MP voting decisions

Multinomial logit regressions – relative risk ratios			
	(1)	(2)	(3)
Reference category: Does not vote			
Outcome 1: Vote against eliminating compulsion			
Conservative	3.035698***	3.238979***	3.671247***
	(.7268779)	(.7886694)	(.9559656)
CDA district	2.679943*	2.727785*	2.737457*
	(1.056802)	(1.08329)	(1.095338)
Suffrage voter – Yes	1.02653	1.085198	1.02342
	(.3978432)	(.423172)	(.4000205)
Suffrage voter – No	1.509217	1.476216	1.441136
	(.3943323)	(.3896987)	(.3811472)
MP age		.9768137*	.9767712*
		(.0097968)	(.0098494)
Compulsory vaccine voter – Yes			2.115674
			(.8381854)
Compulsory vaccine voter – No			1.103294
			(.3947901)
Outcome 2: Vote in favor of eliminating compulsion			
Conservative	.1590105***	.1605154***	.1881841***
	(.0472165)	(.047695)	(.0576464)
CDA district	1.67e-07	4.45e-07	4.53e-07
	(.000122)	(.0001978)	(.0002029)
Suffrage voter – Yes	3.300774***	3.297756***	2.885836***
	(.8156079)	(.8177779)	(.7345737)
Suffrage voter – No	.9542125	.9388655	.8726953
	(.2738373)	(.2694548)	(.2550699)
MP age		.996226	.9963962
		(.0081167)	(.008296)
Compulsory vaccine voter – Yes			2.477392***
			(.6404565)
Compulsory vaccine voter – No			1.312083
			(.540736)
N	645	642	642

Note: *** p<0.01, ** p<0.05, * p<0.1. Multinomial logit regressions.