Working Paper
438

THE INDIFFERENT MANY AND THE HOSTILE FEW: AN ASSESSMENT OF SMALLPOX VACCINATION IN THE 'MODEL NATIVE STATE' OF TRAVANCORE 1804-1941.

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ABSTRACT

Smallpox vaccination was first introduced into the erstwhile princely State of Travancore by 1804 and was touted by the ruling elites as an unmitigated public health policy success. This paper explores and interrogates the introduction, progress and achievements of vaccination in Travancore, demonstrating how vaccination had limited reach and efficacy through most of the 1800s and early 1900s. The state 'enforced' vaccination using policies and initiatives which closely followed colonial vaccination policies, largely avoiding any hint of coercion. By the 1930's, however, vaccination policy in Travancore took a far more draconian path, reflecting the increased confidence of the state. This paper also explores in detail the diverse population responses to this "quintessentially colonial" health policy.

Key words: History, public health, colonial history, health, regional history, smallpox, immunization, religion, caste.

JEL Classification: N35, I00, Y80

One of the most significant public health advances in history, smallpox vaccination was irrefutably important in the final eradication of one of the most dreaded diseases in human history. Introduced into the Indian subcontinent in 1802, vaccination remained voluntary and only partly successful through British governed India for most of the 1800s.[1] The operation would take more than 170 years to become widespread in the country and it was only in the 1970s that the WHO would declare India free of smallpox.[2]

When first introduced, the British colonial state had had great hopes of using vaccination as a tool to mitigate the smallpox mortality among the Indian population, as well as to project the policy as a symbol of the superiority of Western science and medicine. Despite this administrative interest in the policy, the efficacy and range of smallpox vaccination remained limited for most of the nineteenth century. Even after the passing of compulsory vaccination laws in British territories in India in the 1880s, vaccination had proved difficult to popularise among the general population. Standard historiography has consigned the charge for the relatively slow dissemination of vaccination in India either to the limited investments and actions of the colonial state or to the obstacles thrown up by local resistance to the operation.[3] Newer work has pointed out the important role of competing political interests, government agencies and relationships between government and the public.[4] The logistical and administrative difficulties of vaccinating among various population groups, often in remote areas, also posed

considerable roadblocks.[5] There is a wealth of scholarship on various aspects of the history of vaccination in India, but most of the work focuses on those regions directly governed by European colonial powers. We know relatively little about how vaccination was introduced, accepted and implemented in the erstwhile princely states of India, and whether the procedure was confronted by similar or unique issues in these areas.[6]

This paper attempts to fill this lacuna by exploring how smallpox vaccination was received and implemented in the state of *Thiruvamthikur* or Travancore. Vaccination was possibly the first ever large scale public health measure adopted by this state.[7] This essay will detail the varied responses to the procedure. Through these responses to vaccination and the establishment's policy rejoinders, we are also granted insight into the complicated power relationships within Travancore and how these relationships in turn affected the implementation and outcomes of what is usually interpreted as a 'colonial' health policy.

The Growth of the Travancore Vaccination Establishment

By the mid-1700s, Marthanda Varma, the king of Venad, had expanded his kingdom by killing and conquering neighbouring chiefs; carving out the kingdom of Travancore, located along the south-western coast of India.[8] This new state forged an administrative class completely loyal to the new rulers with Brahmins from Tamil Nadu and north India; further subduing powerful chiefs and interest groups.[9] By this time, this lush and resource-rich region was highly commercialized with most of the state's funds originating from state control over lucrative exports such as spices and wood.[10] By the end of the 1700s, Travancore had clashed with the powerful kingdom of Mysore, compelling a treaty of subsidiary alliance with the English East India Company in 1795 for military protection from Tipu Sultan. This treaty spelled the beginning of the end for Travancore's effective autonomy—by 1800, a British resident was stationed in Trivandrum and was given unprecedented

influence over the administration of the state. Five years on, Travancore signed another, even more enervating, treaty with the EEIC.[11] Although nominally independent, the state was effectively ruled by British interests and will.

During the 1800s, Travancore developed and consciously cultivated a reputation as a 'progressive' princely state, as did others such as Mysore.[12] Travancore in the 1860s and 1870s, for instance, would implement several reforms: in the collection of revenue, the creation of the public works department to improve local infrastructure, supported several state-aided schools and funded Christian missionaries with grants-in-aid.[13] Female education became a particular cause-celebre in Travancore.[14] Deeply influenced by the ethos of the British colonial state and desirous of proving itself 'the model native state', Travancore would also implement several public health measures that introduced Western medical practices into the state. Accordingly, the Travancore Medical Department was established in 1846 and several hospitals and dispensaries were set up across the state.[15] Among the first of these public health policies introduced by Travancore was a smallpox prophlactic—vaccination.

Smallpox had always plagued the population of densely populated south-western India. This disease was frequently identified in early administrative and colonial reports as one of the main causes of death in Travancore and neighbouring Cochin. In addition, several beliefs and practices support the conclusion that smallpox has had a long presence in Travancore. These included the conviction among Travancore's Catholics that St Sebastian guarded them against the disease and the Hindu belief that smallpox was, variously, the manifestation of or embodiment of the goddesses Mariamman, Bhagavati, Vasoorimala, Shitala and the fierce Kali.[16]

Indigenous forms of medicine, such as Ayurveda, also provided exhaustive descriptions of smallpox and smallpox-like diseases and

recommended certain curative treatments.[17] Although there is no extant evidence that indigenous practitioners performed variolation (inoculation with smallpox) in Travancore, other preventive practices were reported, including cordon-sanitaire. Anecdotal evidence suggests that smallpox- infected households were completely isolated from the surrounding community. The ill and the dying were taken care of by a designated carer—a highly valued individual who was immune to smallpox, having contracted it and survived. Since most indigenous treatments were ineffective, it was not uncommon for severe smallpox cases to be abandoned by their families. [18]

In 1802, vaccination was introduced into the subcontinent by supporters of Jenner and had been taken up with great enthusiasm by the English East India Company. Smallpox vaccination was advocated by the Company state for three reasons—one, it had the potential to protect Europeans in India from the dreaded disease. Two, it could protect the health of their primary source of revenue—the Indian population. Lastly, smallpox vaccination became part of the 'civilising mission' of the colonial state in the early 1800s. It allowed the EEIC to project an image of a benevolent colonial state which actively sought to improve the wellbeing of its Indian subjects while concomitantly promoting the putative superiority of Western science and technology. Additionally, vaccination eventually became one of the mechanisms through which the British conceptualised Indians as superstitious, ignorant, resistant to the 'scientific modernity' offered by the British and consequently requiring the guiding hand of the British.[19] It is not surprising therefore that the EEIC actively promoted smallpox vaccination in its satellite states such as Tanjore, Mysore and Travancore.[20]

The Diwan of Travancore was one of the first 'local potentates' to submit to the 'great novelty' of vaccination in 1804.[21] Aside from introducing vaccination to the ruling elites, the EEIC had also been vaccinating European and Indian army regiments (and camp followers)

stationed in areas such as Quilon by 1807. The vaccination establishment maintained in Travancore was initially supported by the Madras government, but the financial burden of the establishment was later passed to the Travancore government in 1807 through the British resident.[22] By 1810, the Madras administration actively encouraged the further dissemination of the 'vaccine disease' in Travancore by introducing it among the general population.[23]

Despite the British eagerness to introduce vaccination into Travancore, there was little diffusion of the practice beyond the court. Even among the members of the ruling elites, vaccination had not even acquired much popularity until 1811, when a young princess died of smallpox. The Queen Regent, on the urging of the court's influential European surgeon, ordered the vaccination of all non-immune members of her family. The procedure was successful and protected the ruling family from the ravages of the high mortality 1811 smallpox epidemic.[24] But vaccination still remained optional for the members of the Travancore court until 1814, when the death of a Diwan in office to smallpox urged the Queen Regent to make the operation compulsory for members of the court.[25]

By 1817, the palace doctor, Mr. Brown supervised *vasuri keerukal*, or vaccination for smallpox, among the court and in some taluks outside the capital city of Trivandrum.[26] The British resident ensured that surgeon Brown was provided with a separate allowance from the state for his vaccination duties.[27] For more than fifty years after vaccination was first introduced, all such operations in the state continued to be the direct responsibility of the Durbar Physician in Trivandrum, who oversaw the work of the Head Vaccinator and the few travelling vaccinators working under him.[28] Unlike several of the princely states in British India, Travancore's vaccination establishment would always remain administered and funded by the state itself, not by the British colonial apparatus.[29]

From mid-century onwards, there is a discernible change in state attitudes towards vaccination in Travancore. It was more actively embraced by future rulers of Travancore and British residents as an effective public health policy to protect the population against smallpox. The 1860s saw another expansion of the Travancore vaccination drive with the establishment of a separate Vaccination department, under the administration of the Superintendent of Vaccination, a Dr Pulney Andy, a British trained Indian physician, previously employed by the Madras Vaccination Department. His directive in Travancore was to disseminate the 'benefits of (Western) medicine in general and of vaccination in particular'.[30] His mandate was to supervise the work undertaken by the vaccinators and inspectors in the department, treat those of the local population who sought his assistance, in addition to suggesting general measures for the general improvement of the sanitary condition of the places he visited.[31]

The bulk of the vaccination was achieved through the efforts of the travelling vaccinators. By the end of the 1800s, the general accepted practice was for vaccinators to travel across their assigned circles and announce the efficacy and desirability of vaccination by tom-tom to individual communities. The vaccinators occasionally conducted the vaccinations in public spaces such as markets, but they also moved from house to house, offering their services to those individuals who were willing to undergo the operation. [32] Inspection of vaccination was an important part of the operation as it was necessary to confirm whether the vaccine had 'taken' successfully. Until 1890, the only vaccination inspection in Travancore was undertaken either by the vaccinators themselves or by the Superintendent of Vaccination, but from 1890 onwards, two additional inspectors were employed to improve inspection among the vaccinees.[33]

In 1895, the Superintendent of Vaccination was reassigned to the Medical Department and all responsibility for vaccination was transferred

to the Sanitary Commissioner. In the 1890s, the number of vaccinators working in Travancore was supplemented with the employment of women vaccinators as well as vaccinators belonging to specific religious and/or caste groups. Inspection of vaccinations was given greater priority with each individual vaccinator now ordered to 'periodically inspect the population registers...within their respective ranges and check and verify the entries'.[34] The offices of the Vaccination Inspectors ceased to exist and four District Sanitary Officers and the Taluk Sanitary Officer took over the responsibility for inspection in Travancore.[35] The Sanitary Department also involved medical officers and conservancy overseers in vaccination, but these medical officers would frequently be accused of not having much interest in performing vaccinations.[36]

Private individuals and groups also contributed to vaccination—medical missionaries regularly made vaccination part of their work in Travancore. The procedure was frequently conducted at the mission hospitals across Travancore. Between 1861-68, for instance, more than 11,000 people were vaccinated by Surgeon Lowe in Neyyoor. Aside from conducting vaccinations themselves, the medical missionaries also trained locals in the operation and trained vaccinators often travelled into neighbouring districts and were reported to be fairly successful. 'Native physicians' were also trained in the procedure and sent out among the local population. The work was not funded by the London Missionary Society, but by annual contributions made by the local elites and kings as well as Europeans resident in the area.[37]

Methods of Vaccination

In Travancore, as in most of nineteenth and twentieth century India, lymph extraction, preservation and vaccination methods were varied.[38] The method of vaccination initially practised in Travancore was arm-to-arm vaccination with humanised lymph. This process began with the identification of suitable vaccinifers, or human lymph carriers, who were often young children belonging to the poorest socioeconomic

groups or lower castes. These vaccinifers were inoculated with cowpox lymph and those children who developed the most 'suitable' vesicles or cicatrices travelled with the vaccinators across their circles, 'donating' lymph for all vaccinations. When a willing individual came forward to be vaccinated, the vesicle on the vaccinifer's arm was perforated, the lymph extracted and inserted into a cut made on the vaccinee's arm.

Although the parents and guardians were provided with a small batta as incentive to travel with the vaccinators, it was very common for vaccinators to have difficulties enticing these young carriers to travel with them. [39] If this was the case, vaccine lymph was transferred from the arm of the carrier in between glass slides for transport.[40] But lymph thus transported did not resist the humid and warm climate of this area and had higher rates of deterioration and failure—a British assistant surgeon who had worked extensively in south-western India once complained that the 'same lymph successfully used in Tanjore and Tinnevelly was soon found inefficient in Travancore and Malabar'.[41] Prevailing medical opinion therefore recommended that fresh lymph from human vaccinifers was the most successful method.[42]

The Madras Vaccine Depot is most likely to have been the initial source of vaccine virus for Travancore. Until 1889, both Travancore and the neighbouring kingdom of Cochin continued to buy their lymph from British Madras.[43] Several problems arose with imported lymph, most of the lymph deteriorated significantly by the time it reached Travancore.[44] This problem was ubiquitous in nineteenth century India, with transported lymph rendering vaccination ineffective and leading to several complaints. [45]

By the last decades of the 1800s, the British medical establishment in India was debating the use of animal (often cow or buffalo) lymph in preservative media as a viable alternative to the fiercely contested humanised lymph vaccines. While controversies over the use of calf lymph raged across India,[46] Travancore sanctioned the Central Vaccine

Depot in 1888-89 and calf lymph was first introduced in Travancore as a substitute for arm-to-arm vaccination.[47] The development of such provincial vaccine institutes that locally produced and maintained vaccines was an innovation supported by the colonial authorities., who trained the British superintendent of the Central Depot in the large-scale production of animal lymph vaccines.[48] Here, calves were inoculated with the vaccine virus and lymph from successful cases were used to prepare a paste in a preservative medium such as glycerine or lanoline.[49] The quality of the Trivandrum lymph was 'improved' by the occasional addition of animal lymph from Madras and was periodically examined at the King Institute in Guindy, Madras,[50] but by the 1930s, the purity tests were conducted at the Trivandrum Bacteriological Laboratory.[51]

Of the two types of vaccines produced by the Depot, the glycerine lymph vaccine was initially less popular among the medical establishment owing to its poorer efficiency, but was undeniably better accepted by the local population.[52] Glycerine vaccines were generally accompanied by few, if any, side effects, and the use of these vaccines sidestepped the uncomfortable associations of arm-to-arm vaccination. Animal lymph vaccines generally permitted a perceived distance from the actual source of the vaccine (which was impossible in the instance of the humanised lymph vaccines, where potential vaccinees often witnessed the transfer of bodily fluids from vaccinifers).[53] First used in 1898, the lanoline vaccines were used very sparingly and were reported by vaccinators as the most successful vaccine medium in several years.[54] But it was very unpopular among the vaccinees; vaccinations with these were reported to result in 'large vesicles and cicatrices' and marked scarring.[55] But since lanoline was also reported to maintain the virus alive for much longer, the Central Depot always maintained a supply to inoculate calves.[56] The Central Depot also manufactured few lano-glycerine vaccines, in much smaller numbers since it was unpopular among both the medical establishment and the local population.[57]

Eventually, the state had decided to abolish the process of arm-to-arm vaccination with humanised lymph in favour of the sole use of calf lymph vaccines in preservative media by 1896.[58] There was a significant increase in the absolute numbers and percentages of successful vaccine operations in the state in 1896 following the use of glycerine and lanoline vaccines.[59] Vaccination among certain resistant groups such as the Brahmins and Muslims had also increased temporarily in 1896.[60] Although the records reiterate that the eventual substitution of humanised lymph with calf lymph rendered vaccination more acceptable to some groups of the local population, it did not completely eradicate resistance or dissent, particularly among the Namboodiris, as will be discussed in a later section of this paper. Further, the ban did not put a complete end to arm-to-arm vaccination in Travancore—it would take more than three years for the state to completely eliminate the process. When the supply of lymph to any particular area was interrupted or irregular, or when the paste provided by the Central Depot in Trivandrum was proving unusable or unsuccessful, it was common for local vaccinators to continue to use arm-to-arm vaccination. [61]

The Successes (and Failures) of Vaccination in Travancore

Assessing the efficacy of the vaccination efforts in Travancore is a difficult exercise owing to patchy or non-existent reliable cause of death data for the population. Since regular vital registration only began by 1895 in select towns across Travancore, it is not possible to utilise smallpox cases and deaths as a measure of the performance of the vaccination establishment for most of the nineteenth century. Even during smallpox epidemics, the actual numbers of recorded smallpox deaths were quite insignificant, contradicting anecdotal evidence. The only other alternative is to consider the percentage of the population receiving vaccinations as a proxy for population immunity to smallpox.

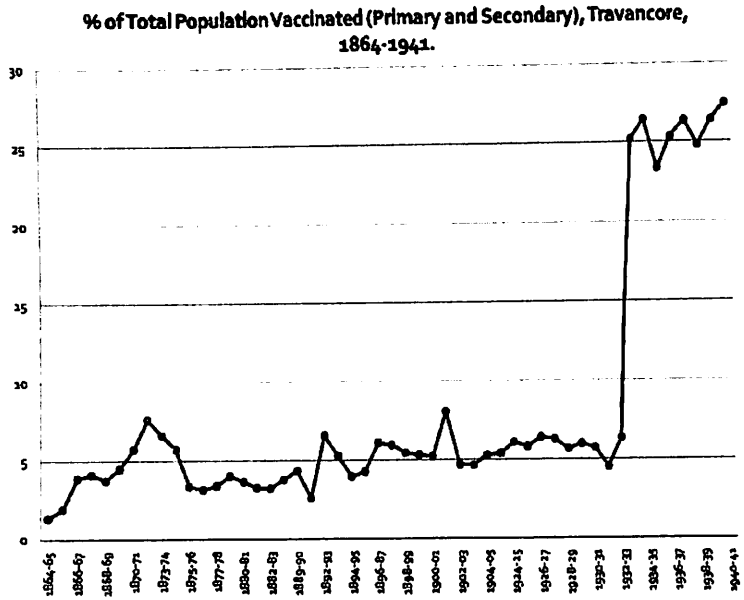
There is little information on actual numbers of vaccinations in the state for much of the first half of the 1800s. For 1831, for example,

vaccination reports issued by Madras presidency record only a total of 3222 individuals being successfully vaccinated in all of Travancore. [62] In 1844, Dr Patterson commented on the continuing wide prevalence of smallpox in Travancore and the very small proportion of the population that were actually undergoing vaccination—amounting to less than a third of the total population of the state.[63] Dr Cullen, the Durbar Physician reported in 1844 that despite the 'liberal establishments of the Sirkar', smallpox vaccination had by no means encompassed the majority of the population. In his opinion, the vaccination status of Travancore at the time was far from optimal.[64]

If we consider the percentage of the total population of Travancore who received vaccinations between 1865 and 1941, the picture is still quite dismal. If we discount years with smallpox epidemics (which are highlighted in Figure 1), less than 5 percent of the population were receiving either primary or secondary vaccinations annually until the 1900s. From the 1900s onwards, there is a slight upward trend until the 1930s. When we consider how many of these early vaccinations were likely to have been actual failures owing to deteriorated vaccines, inadequate vaccine storage facilities, poor vaccination techniques in addition to patchy follow up inspections of the vaccinated populations, the actual numbers of *successfully* vaccinated individuals are much likely to have been smaller. If we take out the revaccinated individuals, then the total number of newly vaccinated persons shrinks even further. This trend persisted well into the 1920s.

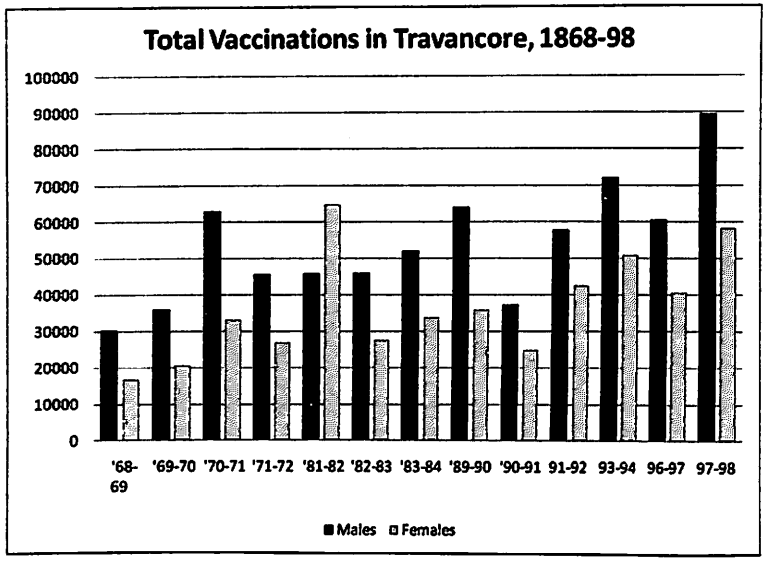
Some existing (incomplete) data on vaccinations for the period between 1868 and 1898 is presented in Figures 2, 3 and 4. The extant data suggests that the numbers of females vaccinated in Travancore were generally much lower than the numbers of males vaccinated in several of the religious and caste groups. In some groups such as the Namboodiris and Muslims, men outnumbered women in the vaccination returns by fifty percent or more.

Figure 1*



* Data is missing on vaccinations for 1872-73, 1884-1889.

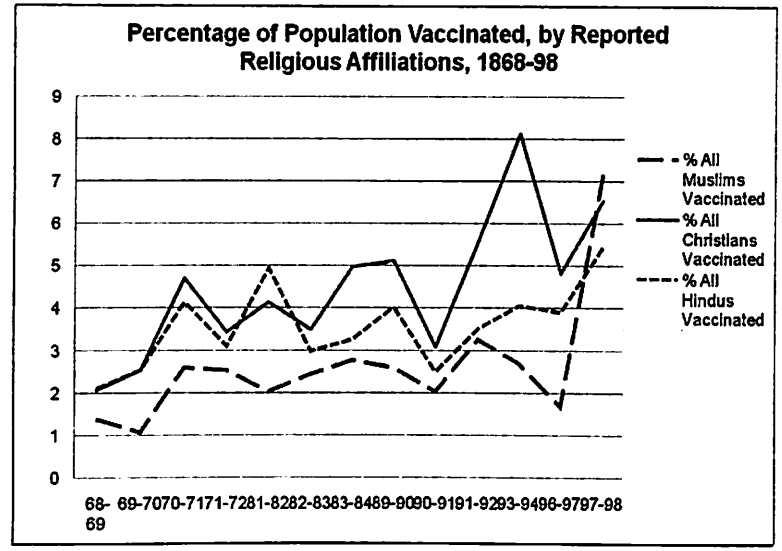
Figure 2*



* Data is missing for 73-81, 84-89, 94-97.

When we disaggregate the numbers vaccinated by sect, caste or religion, several interesting patterns emerge. For instance, it is consistently noticeable that Christians were had the highest vaccination rates (percentage of all Christians vaccinated) when compared to either Hindus or Muslims. Muslims, at the same time, had the lowest vaccination rates, at least between 1868 and 1898. One of the most striking patterns emerging from Figure 4 is that at least 50 percent of all Hindus vaccinated were reported as belonging to the category of 'Inferior Castes' (These categories are reported as they were recorded in the Travancore Administration Reports). The other major contribution to the Hindu population vaccinated were the group designated the 'Malayalee Sudras'.

Figure 3*

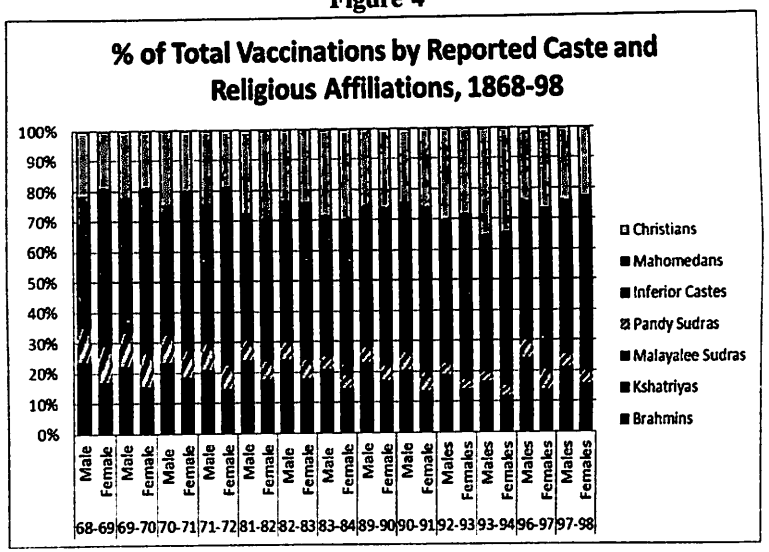


* Same as for figure 2

The conclusions we reach from this incomplete data is supported by considerable anecdotal evidence, supplementing the argument for the poor performance of vaccination in Travancore. Several

commentators and reporters had remarked on the inadequacies of vaccination in the state and neighbouring Cochin in numerous local newspaper reports in Malayalam.[65] One other fact that points towards the limited efficacy of vaccination among this population was that smallpox still maintained a fierce hold over Travancore in most of the 1800s and early 1900s. Epidemics were reported in 1871, 1874-75, 1876-77, 1881-82, 1891-92, 1900-01, 1901-02 and 1902-03.

Figure 4*



* Same as for figure 2

The geographical spread of vaccination in Travancore was also very likely to have been scattered. Both newspaper reports as well as the Travancore Administration Reports suggest that urban areas such as Trivandrum and Quilon were relatively better vaccinated than more remote rural areas. Once vaccination became part of the duties of the Town Improvement Committees, it is also likely that certain towns were better vaccinated than others.[66] Villages located near the missions and/ or medical missions were very likely to have been better served by vaccination. Some villages actually petitioned for the vaccinators to visit them; suggesting that the Church was able to render vaccination

more acceptable among the local population. The most possible mechanisms through which this occurred was by the continued association of vaccination with Western science and modernity as well as by demonstrating how smallpox could be, at least partly effective. [67]

The Inadequacies and Deficiencies of Travancore's Vaccination Establishment

From the previous section, it is evident that Travancore experienced very limited success in popularizing vaccination and providing the population immunity to smallpox. There are several institutional problems which can account for this patchy performance—they range from the itinerant vaccinators to the difficulties in managing a regular supply of effective vaccines to obtaining vaccinifers.

There is evidence to suggest that Travancore never had enough vaccinators to ensure vaccination, re-vaccination and inspection of the entire population, despite the fact that the situation in Travancore may have been much better than in neighbouring British Madras.[68] Complaints of the lack of trained vaccinators to achieve sufficient general and infantile vaccination emerged even as late as 1914. Kottayam, Haripad, Colachel, Kuzhithura, Parur, Alwaye, Mavelikkera, Vykom and Padmanabapuram Town Improvement Committees all reported that owing to the lack of vaccinators in these towns, it was very often the town conservancy officers who had to take on the job of vaccination in addition to their already onerous duties. Unsurprisingly, vaccination duties often fell by the wayside.[69]

Existing vaccinators were chronically underpaid—a fifth class vaccinator, for instance, was paid roughly 5.25 Rupees in 1873. This salary was hardly likely to attract many people; as travelling on this salary and maintaining a family would be nearly impossible.[70] Newspaper reports suggest that the vaccinators themselves faced considerable obstacles from hostile populations and local authorities to lack of

remuneration for their work, difficult climate and terrain.[71] Even the temporary absences of a few vaccinators were enough to bring down the total vaccination numbers in the state.[72] The work that was completed by some of the vaccinators was often suspect, and doctors often questioned the veracity of vaccinators' returns, suggesting that the vaccinators padded their returns in order to reach the targets assigned to them.

In the *Kerala Mitram* of March 1886, a letter from a reader complained that vaccinators employed in the Chengannoor and Tiruvalla districts were not performing the duties for which they were paid.[73] Other complaints contended that vaccinators tended to restrict their work to easily accessible and largely urban areas and that if they did travel, they tended to do so only for the travel batta.[74] More newspaper report s asserted that despite the expanding vaccination establishment, vaccinators rarely vaccinated the numbers prescribed to them; and 'rarely visited the interior of the district, and consequently the people of these parts are unable to get vaccinated, though they may be willing to be so.' The same report points out that vaccination inspectors were equally lax in their duties; restricting themselves to 'those towns and places where carriages can be taken'.[75]

One of the most pressing problems that plagued nineteenth century vaccination programmes was maintaining a regular supply of viable vaccine lymph. While the state was still using humanised lymph, it was often difficult, if not impossible, to find vaccinifers willing to be inoculated with the virus or to travel with them to often remote areas. This was particularly true during epidemic years, when vaccinifers were very reluctant to smallpox-affected areas.[76] Several problems also attended the workings of the Central Depot in Trivandrum. For instance, vaccine production in the early years was very much a trial and error process. Although increasing numbers of calves were inoculated during the early 1890s, several of these operation failed to produce viable

vaccines. [77] Through most of the 1890s, the Vaccine Depot also found it very difficult to procure calves for the express purpose of inoculation; a scarcity attributed to the 'traditional reverence for the cow and her calf'.[78] What vaccines were produced locally were also damaged by skyrocketing temperatures, inadequate storage facilities and poor lymph. Once the use of glycerine vaccines became more common, transporting vaccines across the state remained difficult. The usual methods of storing the vaccine lymph were to pack it in ice, which the Sanitary Commissioner would report, was far from satisfactory. The tremendous heat of Travancore summers often resulted in the deterioration of the vaccines. It would take until the 1930s for Travancore to install refrigerators to store lymph, raising serious questions about the efficacy of much of the vaccination conducted in the more distant parts of the state. [79]

Since the likelihood of an unsuccessful vaccination was therefore usually quite high, given the general unfamiliarity with vaccination methods, the difficulties in transporting good lymph and in maintaining viable vaccines in the heat and humidity of Travancore's climate, regular inspection of completed vaccinations was a necessary component to a successful vaccination drive.[80] But such inspections were often a major problem for Travancore's vaccination establishment. For most of the nineteenth century, therefore, there had been no way for Travancore's vaccinators to ensure whether the procedure was successful even if she/ he had been able to vaccinate most of the residents in a particular area. Often the vaccinators were only able to return once in three months to a village where vaccinations had been conducted. After 1890, either a vaccinator or an inspector was able to visit a village at least once a month, ensuring that some of the cases were tracked and confirmed.[81] But vaccinations were often performed in public areas such as markets and such vaccinations were very hard to verify, as people travelled to market areas from great distances and would not necessarily be at the market the next time the vaccinator visited. The Sanitary Department

tried to phase out this procedure by trying to ensure that sanitary officers were also present with the vaccinators.[82] However, the increasing burden of duties placed upon the sanitary officers, particularly during epidemics, fairs and festivals, made this policy difficult to implement. The Sanitary Department had noted that both vaccination and verification numbers tended to nosedive when the sanitary officers were occupied with other duties.[83] Even in the 1970s, a WHO report would point out that one of the most striking flaws in the vaccination system of the state of Kerala is the lack of supervision of field vaccinators; which tended to turn out confusing reports and results.[84]

Travancore's vaccination drive, unlike most of India, was entirely funded by local money. While this is unusual for the time, part of the reason why the vaccination drive experienced a distinct lack of success was partly the consequence of insufficient financial investment into the program. Although the state made several public declarations about their commitment to vaccination, vaccination traditionally did not receive the investment required to make it most effective, despite the fact that health expenditure was not inconsiderable in general. Often government money was diverted to other areas deemed more important—for example, expenditure on education and major infrastructure such as railways often preceded expenditure on sanitation and health measures in the princely states of both Travancore and Cochin.[85]

One of the most important impediments to vaccination was the fact that Travancore's public health system was still embryonic. As a result, the focus of Travancore's vaccinators was frequently diverted towards other public health duties. When smallpox epidemics started in certain *taluks*, it was common for vaccinators from non-epidemic *taluks* to work in the epidemic-prone regions. But, during smallpox epidemics began to affect certain *taluks*, it was also common to appropriate other employees of the Sanitary Department like compounders and apothecaries to assist with vaccination.[86] Vaccination in the non-

epidemic regions would suffer, leaving the population vulnerable to smallpox in the following year. When other diseases became epidemic in a district, or when fairs or festivals came around, available vaccinators were usually deflected into focusing on other duties. [87] These practices would disrupt the process of vaccination, re-vaccination and inspection across the state.

With the establishment of the Town Improvement Committees, several state roles in public health and sanitation were decentralized, including the responsibility for vaccination. This also resulted in significant fracturing of policies and approaches to vaccination, in spite of supervision from Trivandrum. Some municipalities would attempt more coercive methods, but with little general success or approval from Trivandrum. For instance in 1922, the town of Quilon would require that smallpox vaccination for all infants aged between 6 months and 10 years be conducted at certain designated vaccination stations set up across the town. The vaccinators would be present at these stations at certain fixed times every week and all unvaccinated children were required to be brought to these stations.[88] Quilon would also end house-to-house vaccination for adults. However, these policies raised some controversy among the Travancore medical administration. The Assistant Sanitary Commissioner would remark that such compulsions to vaccination would only end in reductions in total numbers vaccinated as people would develop an antipathy to the procedure.

Resistance, Apathy and Inaccessibility

The progress of vaccination in the nineteenth and early twentieth century through most of the world was far from smooth and was marked by numerous obstacles, including a highly voluble and visible anti-vaccination discourse across the world.[89] In colonial India, the procedure was resisted on the grounds that vaccination represented the imposition of an essentially alien system of medicine and/or that it sought to replace the indigenous preventive practiced in north and east India—variolation.

Opposition was also based on perceptions of caste, 'purity', religion and social acceptability. Objections to vaccination were also based on medical grounds and to the idea that children were to be used to store and transport vaccine lymph.

Local agency in determining the fate of vaccination across the state is not to be underestimated. As in much of British governed India, population response to vaccination in Travancore was quite diverse, and predicated on religious beliefs, social norms, perceived threats to health and suspicions over state intentions. Of the several secular objections to this method of vaccination, the most ubiquitous accompanied the practice of arm-to-arm vaccination, which was the norm in Travancore for most of the 1800s. An impression prevailed among the population that inoculation with lymph drawn from the vaccinifer's hand and then injected into an un-vaccinated individual's body would have the unintentional effect of spreading those diseases from which the carrier was already suffering.[90] As in several other parts of the India, people displayed an aversion to the transfer of bodily fluids from another person into their own. Even if they had no real objection to the procedure itself, several castes had an intense dislike and suspicion of lymph being extracted from their cicatrices.[91] It was also believed that vaccination was the direct cause of diseases such as fever.[92] Certain groups such as the fishing community, for example, held firm beliefs regarding the origins and treatment of smallpox which coloured their perspective of vaccination. In a letter to the Chief Secretary of the Travancore Government, the President of the Colachel Town Improvement Committee commented that this community was mistrustful of and resistant to the operation.[93]

Several Hindus in the state believed that smallpox was a 'special manifestation of the power of their (Hindu) deities'; and any attempt to control the course of the disease was considered an 'impious interference'.[94] In Cochin, Day would observe that the association of

smallpox with the goddess Kali, and propitiations of the goddess which included the decapitation of a cock were considered far more effective (and accompanied by less risk of offending the powerful goddess of smallpox) than vaccination.[95] Others in Travancore feared vaccination because of its associations with Europeans and Christianity, and believed it to be a 'manoeuvre to inveigle them into Christianity.'[96]

One community that mounted a very visible and voluble resistance to vaccination was the influential Namboodiri community. Relatively few of the Namboodiri s, especially the adults, were protected by the vaccinations, leaving the population generally vulnerable to smallpox epidemics.[97] The Namboodiri opposition to vaccination was not, however, based on an aversion to offending powerful deities, but was predicated on the use of humanised lymph and arm-to-arm vaccination. This practice affronted this community's rigid ideas of caste, bodily purity and ritual pollution, particularly since the vaccinifers were mostly young children belonging to the 'lower castes', and therefore the transfer of fluids from them was considered deeply polluting. Although vaccination numbers among the Namboodiris rose after the introduction of calf lymph, this community remained very voluble in their resistance to vaccination and continued to mount campaigns against the policy. The *Namboothiri Yogakshema Sabha* even passed an official resolution opposing vaccination against smallpox in 1909.[98] This resistance was not, however, absolute; some members of this community were willing to risk the procedure during severe smallpox epidemics.[99]

Little is written in the records about the nature of the response of Muslim communities to this operation. Vaccination statistics do, however, suggest that Muslims had almost consistently lower vaccination rates than other communities. Some local authorities had mentioned that Muslim communities often refused vaccination : 'The Mahomedan community in particular is reluctant through religious superstition...'[100] There may have been several reasons for this. We can speculate, based

on religious objections to vaccination in other Muslim communities, on the potential sources of this resistance. First, several have contended that the intervention of vaccination was a direct interference with the complete submission to Allah, which was required of all devout Muslims. Another thread of resistance was possibly grounded on the fact that vaccination necessitated the intermingling of Muslim and non-Muslim blood—the insertion of non-Muslim blood into Muslim bodies. Other lines of opposition were grounded on the fact that vaccination was not mentioned in the Koran and it should not therefore be practiced among Muslims. [101]

Among the itinerant hill tribes of Travancore, who were a traditionally marginalised community often underserved by public services, vaccination proved particularly difficult to introduce and often aroused fierce, even violent, resistance. Contemporary medical officers considered this population 'peculiarly subject to smallpox' due to their 'mode of life and want of protection'.[102] When the Medical Subordinate stationed in the Cardamom Hills initially attempted to vaccinate those hill tribes living close to his quarters, he did experience some preliminary success in persuading some individuals to the operation. When he moved further into the hills, looking for more prospective vaccinees among the tribes, he was confronted with desertions, threats of violence and outright hostility:

> the people (were) so averse that they not only deserted their villages and flew into the jungles, but in a few cases where they remained, they threatened to maltreat him should be persevere in attempting to vaccinate them.[103]

A highly mobile and transient population, the hill tribes tended to live in small villages at great distances from each other; which could only be reached after long and difficult journeys through dense jungle. The vaccinators, who were usually recruited from among the lowlands, had to trek several days along difficult and unfamiliar terrain to get from

one highland village to another. When the vaccinators did reach the villages, they found that the hill tribes had retreated forewarned; often along paths which were unknown to the vaccinators.[104] These 'low country' vaccinators were also deeply hesitant to travel to the hills, aware both that they would face indifference and animosity from the people and worst of all, that they would have to confront the highly debilitating hill fever which could lay low even the acclimatized people of the hill tribes. In later years, the Durbar Physician reported that 20-30 vaccinations a month was a 'reasonable achievement' for the hill tribes and even suggests that the limited resources of the state would be better employed in other areas more receptive to vaccination.[105]

Subjecting young infants and children to alien medical technology such as vaccination provoked particular animosity among the local population. Ironically, infants and young children would have been at the highest risks of smallpox morbidity and mortality in any unvaccinated population. The vaccination of this population was therefore of particular importance to the success of any smallpox eradication programme. The Travancore administration and medical establishment compared annual numbers of infants vaccinated with the numbers of births recorded through vital registration in order to estimate the smallpox-vulnerable population of young children in the population. They used this information and other estimates from the vaccination department to maintain an official register of 'unprotected' children. Knowledge of the actual numbers of vulnerable unvaccinated children most often proved futile, for vaccinators working in their circles would frequently find unprotected children 'absent from home' and were consequently unable to vaccinate, inspect or complete the course of vaccinations.[106]

Such passive resistance to the vaccination of children, in particular, was frequently reported by local administrators. For instance, the fishing community along the Colachel coast hid their children from vaccinators, believing that if their children were infected with the disease, a bath in

sea water was more effective than risking vaccination.[107] Similarly the President of the Haripad TIC lamented the low turnout for infant vaccinations, attributing it to 'the ignorance of the masses. They are very reluctant to get their infants vaccinated for fear of fever.' [108] The Muslim and Hindu communities in particular had religious grounds for objecting to the vaccination of their children, while the Christians 'do come forward without grumbling'.[109]

He goes on to complain that 'Even if the vaccinator manages to vaccinate a child, parents try every means at their disposal by squeezing the part, wiping out the lymph so as to abort the vaccine'. This is very likely to unwittingly increase the risks of inadvertent inoculation of both the child and the parent who came into contact with the site of vaccination, as well as the risks of several other complications for the child.[110] Among these complications, the most likely would have been the transmission of the vaccinia virus to other parts of the vaccine recipients' body.[111] Such adverse effects would have compounded the existing fears over vaccination.

Extending vaccination among the female population threw up several roadblocks to the state, as already illustrated previously. But it would be premature to construe this as the result of 'resistance' to vaccination. What may instead explain this gender pattern to vaccination is the accessibility, or more accurately, the inaccessibility, of certain women to the largely male vaccinators.[112] Males would have moved more freely in the public spaces of Travancore, such as markets, schools and public thoroughfare and vaccinators would therefore have had easier access to their bodies. Women on the other hand, lived mostly in the deeply private spaces of their households, where the vaccinators were rarely given ingress.[113] Vaccination among women belonging to certain communities would have been further impeded by the fact that their families would have vociferously objected to permitting them into the sight of a male stranger, let alone subject the women to the intimacies

entailing vaccination. [114] Namboodiri women, for instance, were the *Antarjanam*—they were supposed to be completely isolated from the external world and physically shielded from other eyes even when moving out of the seclusion of their homes.[115] It is highly unlikely that this community would have permitted the mostly male, often non-Brahmin, vaccinators access to the *Antarjanam.* Similar patterns of seclusion and isolation existed among Muslim households. Low vaccination numbers for these communities can also be explained by a general distrust of, and subsequent limited access to, Western medicine in general. Many decades following the advent of Western medicine into the state, Namboodiri and Muslim women were conspicuous in their limited use of public health facilities intended solely for females such as maternity hospitals.[116]

Several groups within Travancore evinced another reaction entirely to vaccination and submitted to the operation. For instance, the 'Inferior Castes' appear to have been vaccinated in fairly large numbers, compared to other Hindu castes/groups. This suggests that this population group utilised Western medical services, including vaccination, even more so than other so-called higher castes/groups. The Christian population was also generally more accepting of vaccination than other population groups, even when it came to vaccinating infants and children. [117] However even among this religious group, there is some evidence to suggest that early failures and complications of vaccination were very likely to have negatively influenced the community's perceptions. During epidemics, for instance, the very real failure of Western medicine to treat smallpox often led people back to more traditional methods of treatment, including prayer and offerings to temples.[118] Christians, along with Nairs, found that the introduction of Western medicine into Travancore, including smallpox vaccination, offered them immense opportunities for economic and social advancement. Several vaccinators working in Travancore, male and female, came from both these communities.

Resistance and acceptance of vaccination among the local population was hardly a static unchanging entity. It was likely to have waxed and waned with the epidemic cycles of smallpox. In 1881-2, the numbers of Hindu females vaccinated overtook the numbers of Hindu males vaccinated in Travancore, suggesting that the epidemic motivated several females to submit to the operation (see Figure 4). In other epidemic years such as 1893-4 and 1901-02, for example, the vaccinators had little trouble finding subjects of all ages.[119] But, as the Superintendent of Vaccination complained, this apparent willingness was only due to the violence of the epidemic itself, as people had 'yet to be educated to appreciate the benefits of this prophylactic'.[120] Several parallels exist for this response: in early twentieth century New York, where reluctance to undergo vaccination usually evaporated during smallpox epidemics when people would wait in line to be vaccinated.[121] Time appeared to contribute to decreasing resistance more than any other factor—in the Neyyoor Mission Hospital, for instance, vaccination was refused by several who saw it as a proselytising measure. But decades after the first vaccination at the Mission, the operation gained wider acceptance among the Christian and non-Christian population. [122]

Between the Carrot and the Stick: Inducements and Incentives to Vaccination

Travancore's vaccination policies were shaped and negotiated at the intersect between the government's desire to universalize smallpox vaccination and the demands and needs of various local groups and communities. Despite the depth of population resistance to vaccination in Travancore, the official wisdom among the upper echelons of Travancore's administration was that the initial population resistance to smallpox vaccination would be overcome by the royal family's unequivocal acceptance and advocacy of the operation. Any opposition was usually dismissed as neither particularly serious nor insurmountable obstacles.[123] The population who opposed vaccination was projected

by the government as a very small percentage of the urban population and could be 'persuaded' to accept the procedure. In fact, the Sanitary Commissioner once warned that the Travancore Government should be very cautious about using coercive methods.[124]

In marked contrast, several among the lower ranks of Travancore's administrative and medical establishment were of the unshaken opinion that the only path to universal vaccination was compulsory and legally enforceable vaccination. Several in the Travancore state apparatus argued vociferously for compulsory and legally enforceable vaccination.[125] The reality of vaccinating in Travancore had several medical and municipal authorities expressing their concern that vulnerable groups such as infants and young children were largely unprotected and that nothing short of legally enforced vaccination would compel parents to overcome their abiding fears of the procedure and permit the vaccination of their children.[126] Further support for compulsory vaccination came from occasionally from sources such as the Durbar Physician and the Sanitary Commissioner for Travancore who would urge that vaccination be made compulsory and enforced with punitive legal measures. In spite of this dissension in the ranks, Travancore continued to prefer using incentive and enticements to increase vaccination numbers, often following the British policies implemented in Crown-administered territories.

In other princely states such as the kingdoms of Banaras, Balrampur and Tehri, the British had attempted to popularize vaccination by persuading Indian elites, their courts, families and dependants to the operation. These elites were in turn, intended to convince the general population of the advantages to vaccination. This was not a universally successful stratagem—in some western Indian princely states, for instance, the rulers proved quite recalcitrant to introducing vaccination.[127] In Travancore, however, there appears to have been little difficulty in convincing the rulers to introduce vaccination into

their territories.[128] This could partly be the consequence of the increasing acceptance of and interest in Western medicine among Travancore's ruling elites. Accordingly, all through the nineteenth century, the court of Travancore had made its support of vaccination explicitly clear through public statements and by ensuring that all members of the court were themselves protected by this procedure. The most important of these was the 1865 speech given by then king Ayiliyam Thirunal, upon the inauguration of the Civil Hospital in Trivandrum.

He drew a clear link between smallpox vaccination and the 'charitable' role of the state of Travancore with its vaunted reputation as *Dharma Raj*. No more substantial charity could exist, he emphasised, than the provision of means for the relief or mitigation of sickness and diseases among his subjects. [129] He outlined the specific benefits of vaccination, urging his audience to take the operation if they had not:

> I hope I am not too sanguine in expecting to see before many years elapse, if not the disappearance, the considerable diminution, of the source of smallpox in this country. It has been repeatedly proved that this is a thoroughly preventable disease. I take this opportunity earnestly to impress this fact on the minds of all my native subjects, and urge them to seek for themselves, and their children, for their friends, and for their servants, the great protection of vaccination. They will see the strength of my conviction in the fact that there is no member of my Own family that has not had this protection conferred at an early age.[130]

Despite such overt public support provided by Travancore, the vaccination statistics and the frequent smallpox epidemics both suggest that such promotions did not have the desired effect of increasing vaccination numbers. Even in the face of this, the state displayed a particular hesitation to any measures that were remotely compulsive or forceful or punitive, preferring to utilise incentives similar to those employed by the British in their territories.[131] One such incentive was

offering free medical care in addition to the vaccination. Vaccinators were instructed in the treatment of common diseases in order to make the operation more palatable to the local population. By the 1890s, they were regularly carrying and dispensing medicines and treatment for common diseases such as cholera, diarrhoea, fevers and dysentery among them when travelling to their allotted regions.[132] Information on the procedure, instructions, treatment and its efficacy was disseminated through pamphlets printed in Tamil and Malayalam, which were distributed among the early vaccinators and among some of the local population.[133]

Travancore instituted some community specific measures to increase vaccination numbers. One, as mentioned earlier was the employment of vaccinators from individual communities—for instance, in 1866-67, Travancore had specifically targeted the Pulayar community and around 2000 persons belonging to this group were vaccinated.[134] In 1870, Travancore approved the appointment of two Pulayar men as 5th class vaccinators to work among the under-served and traditionally isolated hill tribes as well as the 'untouchables'.[135] These young men were vetted and trained by Christian missionaries.[136]

Travancore had always expressed significant concern over the under-utilisation of vaccination by the elite and politically powerful Namboodiris, but the recruitment of Namboodiri and Muslim vaccinators would take another fifteen years.[137] Some of these vaccinators were very successful, with the Namboodiri vaccinator undertook 1800 operations in a single year, of which 304 were among the Brahmin community.[138] Suggestions were put forth to hire female vaccinators as early as the 1860s, but it would take more than three decades to enforce. By 1897-98, the Sanitary Department had six permanent female vaccinators. By the end of the 1890s, increasing numbers of female vaccinators, under the strict supervision of *taluk* vaccinators, worked in Travancore among women and children. They were largely drawn from

the Christian and Nair communities.[139] Some of these female vaccinators were reported as very successful—take for example, the case of the Christian vaccinator Miriam, who in 1896-97 accounted for nearly one third of all vaccinations performed by the female vaccinators in the state.[140]

In the 1860s, the Madras government had begun suggesting that vaccination be used as a necessary requirement for the access to and use of government services, funds and employment, including institutions such as government schools.[141] With a proclamation in 1879-80, Travancore duplicated this policy and vaccination became an essential criterion for the admission to state schools. Incoming candidates were required to produce a medical certificate indicating they had been vaccinated for smallpox. Vaccination also became an essential criterion for the student to remain in the school.[142] By the beginning of the 1900s, attempts were regularly made to vaccinate children on the premises of the Sirkar and aided schools.[143] Although most of the students at the government schools are likely to have belonged to the higher castes, those children in state-aided schools run by Christian missionaries were likely to have belonged to the lower castes—suggesting that more children among these groups were exposed to vaccination. Several of the vaccinators also utilised the school as a space to verify and repeat vaccination among children.[144] By 1901, 800 out of 809 students at the Maharaja's High School, belonging to both the Namboodiri and lower castes, had been vaccinated.[145]

Education thus supplemented the vaccination drive in Travancore through two mechanisms: one, it increased acceptance of and enthusiasm for the operation among those of the local population who were exposed to Western education and ideas in schools. Two, increasing attendance in schools provided a relatively unregulated space where the state could practise interventions such as vaccination without as much opposition as it faced in spaces such as marketplaces and households. In schools,

the fears and suspicions of parents and guardians need not interfere with the state's imposition of it's will on the bodies of children. State funded and aided schools were also used to assess the vulnerable population of unvaccinated children.[146] However, state vaccination activities in schools would have reached only a limited number of children. The very threat of vaccination may well have deterred several parents from accessing elementary education in Travancore, in addition to which several of the children were often absent during the visits of the vaccinators.[147]

With the 1879-80 official proclamation, Travancore had also decreed vaccination for smallpox a necessary condition of public service or use of public services and monies. The procedure therefore became compulsory for all public servants, patients using government or aided hospitals or dependent on state charities as well as inmates in state jails.[148] No individual was to enter public service, without producing a certificate of having been vaccinated in the past five years. Within three months of the proclamation, all public servants in all grades of service were expected, as a necessary condition of employment, to be vaccinated if they could not provide a vaccination. From 1911, all public servants were further ordered to be re-vaccinated every 5 years as long as they were in service. [149] Rules for the vaccination of public servants and others were published periodically. [150] In addition, all the *Vakils* (lawyers) practicing under *sunnads* in courts as well as convicts and prisoners in the jails of Travancore were compelled to be vaccinated. By 1892, the state was also vaccinating under-trial prisoners within the system.[151]

Although the general tone of this 1879-80 proclamation was forceful, and it utilized the threat of dismissal from work/school to impose vaccination, the proclamation stopped short of penalties enforceable by law. As this declaration points out, many countries made vaccination compulsory and lack of compliance was punishable by law; Travancore was not willing to use such measures— 'if We do not

have recourse to such penal measures in Our territories, it is from a reluctance to use the machinery of the law, when, as We feel assured, there will be a voluntary submission to the operation, on Our wishes for the good of our people being made known to them in this manner'.[152]

This firm stance against compulsory vaccination is very likely the result of British influence and pressure. The colonial establishment had always had a strong aversion to using legal compulsion to enforce vaccination in their own territories. And as long as the British influence over Travancore remained powerful, their ideas of how the vaccination drive should be implemented were also dominant in the discourse. In the years that the British colonial state had the most influence over Travancore and other princely states, the vaccination policies of the state closely mirrored those employed in the British territories. As soon as the British hand in Travancore's administration became weaker, the state would swiftly become far more draconian public health policies.

By the 1920s, vaccination would become compulsory for all infants and children aged between 6 months and 10 years in the municipal towns, but was not necessary in the rural areas. IN the same decade, primary vaccination was also made compulsory in all th municipal towns, except for Trivandrum. These measures would not however compare to the all-encompassing nature of public health reforms passed through in the 1930s and 1940s. By February 1932, Travancore informed its population that vaccination was compulsory and moreover, that resisting the operation was illegal. Temporary rules were passed by the Government rendering vaccination compulsory in both municipal and rural areas.[153] Re-vaccination was also made compulsory.[154] This was the real beginning of the vaccination drive in Travancore and the state witnessed vaccination on a scale that the state had not seen before. The Government claimed that nearly a fourth of the entire population of the state were vaccinated in that single year and that more than forty percent of the population were protected through

vaccinations by the end of 1932. Three years later, Travancore's Sanitary Commissioner claimed that more than 73 percent of the population were protected against smallpox.[155]

This unaccustomed administrative fervour is in part the consequence of the fear aroused by the smallpox epidemic that had ravaged the state in ME 1106 (1931-32). Smallpox deaths had risen to nearly twice the previous year's (which was already high). This epidemic had spread across the municipal towns to the rural areas. Of the municipal towns, key areas such as Alapuzha and Trivandrum were the cities that suffered the most. But earlier epidemics had come and gone, without arousing the state to this level of action. Possible explanations may be sought in the change in the relationship between the colonial British state and Travancore.[156]

That vaccination progressed much faster after the 1930s is not surprising: these are the decades when Travancore becomes generally far more draconian in public health measures. With the Public Health Act of 1941, for instance, the state recognised that the current state of affairs in Travancore was not optimal when it came to managing infectious disease epidemics, maintaining public sanitation and hygiene. [157] In fact the state was effectively toothless, despite some public health related provisions in the Municipal Act, the Village Panchayat Act, the Village Unions Act and the Epidemic Diseases Act. With this Act, Travancore attempts to draws a line in the sand. The state recognized the importance of extending public health measures to regions outside the purview of the Municipal Committee, particularly when it came to epidemic and endemic diseases. There was a necessity, the state contended, for a unified Public Health Act, which was applicable in every corner of Travancore. [158]

The Act designated certain diseases as 'infectious' and others 'notified infectious diseases', with smallpox included in both categories. It became compulsory for all manner of medical practitioners (Western and indigenous) to notify the state of any diagnosed cases of smallpox,

in addition to other diseases. Failures on the part of the individual or the medical establishment not to give notification regarding the existence of diseases such as smallpox were punishable with a fine of five to ten rupees. Exposing other people to infection was punishable with fines between fifty and twenty five rupees. State actors were provided with significant and hitherto unknown power; for instance, they now were authorized to enter infected households and 'take preventive measures', which included vaccination.[159] In the event of an outbreak of an infectious disease such as smallpox, the state was now empowered to declare the affected areas 'visited or threatened with an outbreak of a notified disease' and to make vaccinations or inoculations compulsory for all sections of the population.[160] The Act also proscribed and restricted the participation of individuals infected with either 'infectious' or 'notified infectious' diseases such as smallpox in several aspects of public life—such as the use of public conveyances by infected persons and the use of facilities such as public libraries. Public magistrates were empowered to forbid public assemblies larger than fifty persons when epidemics threatened or prevailed.[161] Travancore also attempted to ensure that those of its subjects who were traveling to locations within British India were protected by vaccination. The state frequently passed on quarantine warnings issued by other states such as Ceylon and the Federated Malay States and the Straits Settlements issued due to the risk of diseases such as smallpox, arriving with passengers from Bombay and Bengal on to the population here, warning them to get vaccinated prior to their travel to the first stated states, to 'avoid possible delay and inconvenience'. They would suggest that the travelers get vaccinated not less than 12 days before and not more than 3 years prior to their date of arrival in their destination; or demonstrate the signs of previous infection'.[162]

But despite such unprecedented powers, the Public Health Act created some room for negotiation for those still dissenting to vaccination on any grounds. It suggested that 'any person who, or a

child in whose care, is sought to be vaccinated or inoculated...declares before a Magistrate specially empowered by Our Government in this behald that as a result of careful inquiry into the subject, he believes that suich vaccination or inoculation will be injurious to his health or the health of the child, as the case may be, the Magistrate may, after giving notice to the Health Officer, and hearing any representations made by him or on his behalf, exempt such person or child from vacination or incoulation, on condition of the person aforesaid undertaking to subject himself and the members of his family to isolation'.[163] The Act did provide for the imposition of fines and imprisonment if the individual/s concerned breached the isolation arrangement.

By 1955, the Travancore-Cochin Public Health Act had more extensive vaccination measures. All unprotected individuals and all parents/guardians of unvaccinated children aged less than 3 months who had resided for at least one month within the limits of any of the rural panchayats were to ensure vaccination and revaccinations at the Vaccination Depot or from any vaccinator working in the area. If such vaccination was not performed, or if any areas were threatened or infected with smallpox, the state was provided with more encompassing powers. Notice was issued to the unprotected individuals and Health Officers or Executive Authorities were authorised to 'direct every person or child in the said area who has no visible mark of smallpox or is unable to produce satisfactory evidence of successful vaccination or re-vaccination carried out within four years, to be vaccinated forthwith'.[164] Vaccination could be avoided if the 'unprotected person or child is not in a fit state of health'—vaccinators would then provide a certificate of 'postponement of vaccination' for a three months at the most, but could be extended.[165] If the authorities suspected that a member of a household was unvaccinated, they could present a notice which required that the unprotected individual/child be present in the house for vaccination at the stated time for vaccination, inspection or re-vaccination. Breach of

any of these regulations was punishable by fines of 100 rupees or imprisonment of three months.[166]

The 'Progressive' State and the Health Policies: The Case of Travancore

This paper is equally an exploration into the functioning of the 'princely' state under colonial rule as it is a study of medical history. It interrogates the motives behind, efficacy and contributions of the vaccination establishment set up by the 'progressive' state of Travancore. While there have been explorations into the achievements of these monarchies in education, public health policy in Travancore remains fertile territory for the interested scholar.[167]

Ideologically, vaccination possessed as much value to Travancore as it did to the British. Vaccination granted Travancore the unique opportunity to communicate to the British their willingness to toe the colonial line and disseminate a quintessentially colonial medical technology. By the 1880s, vaccination in state discourse had been transformed into a much vaunted and very public success story of the *Dharma Raj*'s efforts to introduce the benefits of Western medicine to the general population. However the truth was that vaccination in Travancore was a failed project for most of the period under consideration. An assessment of vaccination statistics revealed instead that the operation was actually able to reach only a small percentage of the population for much of the 1800s and the first three decades of the 1900s. Vaccination of young children and females proved very difficult for the establishment, as did the vaccination of groups with specific caste/religious affiliations. The slow uptake of smallpox vaccination, once introduced, was the complex result of numerous technical concerns, a state reluctance to make compulsory vaccination enforceable by law, the deficiencies of the extant vaccination establishment, a nascent state apparatus for the implementation of public health policy and population response to the operation.

Recruiting a steady flow of willing vaccinifers and later, procuring healthy calves to harvest lymph in addition to the climatic conditions of this region all contributed to the challenges of maintaining a regular supply of effective vaccines across the state. Additionally, Travancore's public health system was embryonic and constantly evolving, and was never extensive enough to ensure the surveillance, vaccination, re-vaccination and inspection of the entire population, even as late as the 1920s.

Travancore was a state riven by notoriously divisive and rigid caste and religious boundaries, and the imposition of the often controversial policy of vaccination produced responses that reflected these divisions—ranging from violent hostility to sustained passive resistance to an occasionally conditional acceptance. Several groups continued to adhere to their individual/group beliefs of disease causation and treatment and 'resisted' vaccination, notably several fishing communities and the hill tribes. As interesting as the assessment of 'resistance' to vaccination are the patterns of 'acceptance' of vaccination—notably the so-called 'Inferior Castes' and Christians, who were vaccinated in large numbers relative to other groups. Vaccination may have acquired some 'modernising' connotations for these groups and these groups may have used vaccination to underline their willingness to embrace 'modernity' as represented by Western medicine in general and vaccination in particular. Public health policies such as vaccination also offered the Christians and Nairs opportunities for employment within the increasingly 'modern' state. The range of population reactions to vaccination also illustrates the importance of such response to the fate of public health policies and finds reflections in the fate of current immunisation programs in parts of the state of Kerala.

Technological change in the late 1800s resulted in some variations in group response to vaccination—for instance, vaccination rates did

increase slightly among the Brahmins rose after the banning of arm-to-arm vaccination in Travancore. Overall, however, statistics indicated that vaccination rates remained very low in the state even after the change from arm-to-arm vaccination to animal lymph vaccines. This technological change in vaccines did not therefore render vaccination more 'effective, less coercive and painful, and... culturally more acceptable'.[168]

In an effort to popularise the operation, Travancore put the royal seal of legitimacy on vaccination, in the hope that all sections of the population would be reassured and submit to vaccination. A toothless system of incentives was pursued to improve vaccination numbers, with little success. This marked disinclination to use 'force' was a consequence of both the distinct colonial influence over this nominally independent state as well as the limited 'infrastructural power'. As the infrastructural power of Travancore grew and colonial influence waned, the state became increasingly confident. It granted itself and its actors hitherto unprecedented powers in the arena of public health, supported with legislation and the judicial system. There was a marked increase in vaccination numbers at around the same time, suggesting that these policies were effective. But it would dangerous to construe the increase in vaccination simply as the consequence of increasing state confidence and power. It is also necessary to consider the potential contributions of civic society to increased state vaccination activities. As Desai pointed out, Travancore was uniquely responsive to social protest, due in large part to its essential 'weakness' as a state. The rising 'infrastructural power' had resulted in the expanding influence of civil society over the state as well as increasingly authoritarian state actions in society.[169] This suggests that civil society may well have had a significant part to play in increasing the demand for and improving the response to important public health policies such as vaccination. However, this argument cannot be explored in any detail within the limits of this essay.

Appendix

a. The Epidemiology and Clinical Course of Smallpox

Currently eradicated from its natural human reservoir, smallpox is caused by two variants of the Orthopoxvirus *variola*, *V. major* and *V. minor*. Smallpox is usually transmitted from person to person by infected aerosols and air droplets spread through face to face contact with an infected individual after the onset of fever and coughing. Close contact with contaminated clothes, bedding and linens can also transmit smallpox, although the risks of infection are considerably lower.[170]

Around 12 days after initial exposure, the patient develops high fever, malaise, vomiting, headache, abdominal pain and backache. Two to three days later, the fever subsides and the patient begins to feel somewhat better. The characteristic rash then emerges on the face, hands and forearms, progressing to the trunk and extremities. These lesions develop into pustules which dry into scabs and fall off after 3-4 weeks. Survivors of smallpox were inevitably left with pitted lesions (often the worst on the face), blindness, maimed limbs and blanket immunity to future infections.

In fatal cases, death typically occurs between the tenth and the sixteenth day of illness. Unvaccinated individuals have a smallpox mortality rate of 50 percent. Most deaths occurred during the second week of illness.[171] In vaccine modified smallpox infections, the immunization reduces disease mortality to 10 percent.[172] There is still no effective specific medical therapy and treatment for smallpox. Young children, older age groups, pregnant women and nutritionally or immuno-compromised persons tend to have higher rates of smallpox morbidity and mortality.[173] Another important risk factor for smallpox mortality, particularly in a historical context, is environmental sanitation. The simple use of soap and water to keep smallpox lesions clean can ward off infections and reduce case fatality ratios.[174]

Five to ten percent of naturally occurring smallpox also took more serious forms. The 'confluent' form of smallpox presented with coalescing lesions all over the body. In the 'flat' or malignant form, which accounted for five to ten percent of all cases in the Indian subcontinent, the disease manifested with soft flat velvety vesicles and massive exfoliation. In the haemorrhagic form, which occurred in about two percent of cases mostly among adults, extensive life-threatening haemorrhage occurred into the skin, mucous membranes and gastrointestinal tract. [175] In all three of these forms, case fatality rates approach 100 percent.

In nineteenth century India, smallpox periodically flared into epidemics in endemic areas and was responsible for the scarring, blindness and maiming of thousands in addition to significant overall mortality and morbidity. With an estimated case fatality ratio ranging between 20 and 50 percent (even among populations which had been partially vaccinated), this dread disease imposed an estimated average annual death toll of 100,000 cases in India.[176]

b. Smallpox Vaccination, Acquired Immunity and Side Effects

Although first practised systematically by Jenner in 1798, it would take until 1802 for the virus to arrive in India. [177] Generally, the procedure of vaccination generally involved cleaning and incising (often two or more) scratches on the forearm of the vaccinee with a lancet. The vaccine, often in liquid or paste form, was then dropped over the scratches and left to dry for a while. The vaccinees were instructed not to wash, touch or scratch the site of vaccination. In a day's time, the vaccination site usually swelled and in a weeks time a pustule formed over the scratches, which fell off in ten days, leaving an unmistakable scar. Ideally, first time vaccinees should return 6 to 8 days after the procedure for an assessment of this reaction by a medical professional who could verify that the vaccine had 'taken'. This last stage of verification was as important as the vaccination itself, for it was a useful measure of both

the success of the operation and eventual immunity.[178] Secondary vaccinations were also necessary to boost the effects and immunity provided by the primary vaccination. A successful individual vaccination thus necessitated the continued supply of active lymph, a receptive population as well as repeated access to vaccinated individuals in order to inspect, verify and repeat the vaccinations.

However, even a single successful primary vaccination has the potential to protect against smallpox. Recent studies suggest that even seventy years after the primary vaccination, more than 75 percent of the vaccinees were still protected against severe or lethal disease.[179] Although this protection does diminish with time, necessitating revaccinations, a single vaccination still had the capacity to result in better disease outcomes and lower case fatality ratios in those who become infected several years after initial vaccination.[180]

Smallpox vaccination is not without its side effects—the risks of such side effects tended to vary, depending on age groups and whether it was a primary or secondary vaccination. Children aged less than three years of age and pregnant women are susceptible to higher risks of complications as are primary vaccinees. Some of the more serious include encephalitis or post-vaccinal central nervous system involvement (the symptoms can include meningeal signs, ataxia, muscular weakness, paralysis, lethargy, coma or convulsions); vaccinia necrosum or progressive vaccinia with tissue death at the site of vaccination sometimes accompanied by further lesions on other parts of the body; eczema vaccinatum with the generalized spread of vaccinial lesions in a person who has eczema or a past history of eczema; generalised vaccinia lesions and accidental infection of other sites of the body with vaccinia such as the mouth.[181] Of these complications, post-vaccinal encephalitis and vaccinia necrosum have the highest case fatality risks.[182] Both the *variola* and *vaccinia* viruses are capable of causing severe eye disease and blindness.[183]

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Notes

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4 Sanjoy Bhattacharya, Mark Harrison, and Michael Worboys, *Fractured States: Smallpox, Public Health and Vaccination Policy in British India, 1800–1947* (New Delhi: Orient Longman, 2005). This comprehensive work threw light on the complexities of the vaccination process, policy and its implementation across colonial and post-colonial India, highlighting the particular agency possessed by British and Indian administrators at the local levels and the effects of this agency on the eventual outcomes of vaccination. Although this book is a very detailed and comprehensive study of smallpox vaccination in British India, it does only cover those territories directly administered by the British.

5 *Ibid.*

6 Biswamoy Pati, *Situating Social History: Orissa*, 1800-1947 New Delhi: Orient Blackswan, pp.21-22. Pati does mention, rather tantalizingly, that vaccination in the princely states of Orissa proceeded far more efficiently than in British-governed Orissa. However, there is little else offered about the introduction, reception and reaction to vaccination in these princely states.

7 T.K. Vellu Pillai. *The Travancore State Manual Volume III*, 606.

8 A. Sreedhara Menon, *A Survey of Kerala History* (Kottayam, 1967); K. M. Panikkar, *A History of Kerala 1498–1801* (Annamalainagar, 1960).

9 Barbara Ramusack, *The New Cambridge History of India: Indian Princely States*, (Cambridge: Cambridge University Press, 2003), p.56.

10 Susan Bayly, 'Hindu Kingship and the Origin of Community: Religion, State and Society in Kerala, 1750–1850', *MAS* 18 (1984), pp. 186–202.

11 *Ibid.*

12 Ramusack, *The New Cambridge History of India*, p.174.

13 *Ibid.*

14 *Ibid*, p.144.

15 T.K. Vellu Pillai. *The Travancore State Manual Volume III*, p. 606.

16 *South Asian Folklore: An Encyclopedia* ed. Margaret A Mills, Peter J Claus and Sarah Diamond (London: Routledge, 2003) 423.534, Corinne G. Dempsey, *Kerala Christian Sainthood: Collisions of Culture and Worldview in South India* (Oxford: Oxford University Press, 2001), 94-95; L. A. Krishna Iyer, *The Travancore Tribes and Castes, Vol III.* p.147. Certain groups, such as the Muthuvans, worshipped Mariamman to protect them against smallpox. To this day, Mariamman shrines survive in the old Fort area of Trivandrum. In the Coimbatore district of Travancore, there is still a temple dedicated to the smallpox goddess Shitala—continuous worship at this temple for eight weeks was considered to cure the blindness left behind in smallpox survivors. The *Mutiyettu*, a ritual dance offering to Bhagavati common in central Travancore, was frequently performed as a cure for outbreaks of postulant fevers such as smallpox and chickenpox.

17 *Letters from Malabar*, 138-9; Bhagwan Dash, Lalitesh Kashyap, *Diagnosis and Treatment of Diseases in Ayurveda*, p.199. Such treatments restricted the patients' exposure to cool air, water or cooling foods and advocated the consumption of 'heating foods'.

18 S. Pulney Andy, 'On the use of Margosa in Treating Smallpox', *Pharmaceutical Journal and Transactions, Second Series*, 9(1867-68):391-92.

19 Brimnes, 'The Sympathising Heart and the Healing Hand', in *Europe's Civilising Mission*, ed. Fischer and Mann.

20 Tamil Nadu State Archives (Hereafter TNSA), Judicial Department Proceedings (hereafter JDP) Volume 52, 1810, Letter from Medical Board to the Governor in Council, Fort St George, 8 June 1810, p. 2290; *Ibid*, Minutes of the Government, Fort St George, 1 June p.2307; 'Vaccine Inoculation', *Philosophical Magazine*, 22(1895), 280-1.

21 James Anderson, *Correspondence for the Extermination of Small-pox* (Francis Lawrance, Madras, 1804).

22 TNSA, JDP, Volume 31, 1807, Letter from the Superintendent of Vaccination to the Governor in Council, 1 October, 1807, p.5603; *Ibid*, Letter from Governor in Council (Judicial Department) to the Superintendent of Vaccination, 2 December 1807, p.5608).

23 *Ibid*, JDP Volume 52, 1810, Letter from Medical Board to the Governor in Council, Fort St George, 8 June 1810, p. 2290; *Ibid*, Minutes of the Government, Fort St George, 1 June p.2307.

24 Walter Hamilton, *A Geographical, Statistical and Historical Description of Hindoostan and the Adjacent Countries, Vol II*,(London: John Murray, 1820), 318-9.

25 Menon, *A History of Travancore from the Earliest Times*, 468.

26 Kerala State Archives, (Hereafter KSA), *Neettu*, issued from the Diwan's Office to the Diwan Peishkar Venkatraman, 3 Ezhavam, 992 ME. A *Neettu* is the Travancore equivalent of a Government Order.

27 KSA, *Neettu* 217, *Neettu* issued from the Diwan Peishkar' s Office, 3 Edavam, 994 ME.

28 V.Nagam Aiya, *The Travancore State Manual, Volume II*, p.524.

29 Bhattacharya, Harrison and Worboys, *Fractured States*, pp.31-32.

30 Aiya, *Travancore State Manual, Volume II*, p.524.

31 TKVP, *Travancore State Manual, Volume II*, 525.

32 TAR, 1896-98, p.142.

33 TAR, 1893-93, p.124.

34 V. Nagam Aiya, *Travancore State Manual, Volume II*, p.500.

35 TAR, 1896-98, p.141.

36 TAR, 1896-97, p. 142.

37 Samuel Mateer, *The Land of Charity: A Descriptive Account of Travancore and its People*. 311.

38 Bhattacharya, Harrison, and Worboys, *Fractured States*, p.178.

39 KSA, Cover Files, Bundle No 42, File No 16152, 1866. Letter from Dr S Pulney Andy to The Physician to His Highness, the Maharajah of Travancore, 22 March 1866.

40 TAR, 1893-94, p.126-7.

41 Dr Cleveland, 'Sketch of Malabar', *Madras Quarterly Journal of Medical Sciences*, 4(1856), p.231.

42 KSA, Cover Files, Bundle No 42, File No 16152, 1866. Letter from Dr S Pulney Andy to the Physician to His Highness, the Maharajah of Travancore, 22 March 1866.

43 The Cochin State Manual, 1911, p.285.

44 TAR, 1897-98, p.117; Report on the Administration of Cochin, 1897-98, p.98.

45 Sanjoy Bhattacharya, 'Re-devising Jennerian Vaccines'.

46 Harrison, *Public Health in British India*, 84-86.

47 TAR, 1928-29, p.185; KSA, Cover Files, Bundle No 42, File No 16152, 1866. Letter from the Physician to His Highness, the Maharajah of Travancore to Dr S. Pulney Andy, 28 March 1866. The inspiration for a local vaccine Depot was by no means new; Andy's suggestion for an independent vaccine depot in Trivandrum was not taken up by the Travancore administration in 1866.

48 TAR, 1897-98, p.117; TAR, 1896-97, 143, Report on the Administration of Cochin, 1897-98, p.98.

49 Proceedings of the Sanitary Commissioner, Travancore, No 1311, 31 October, 1913; TAR, 1893-94, p.126-7.

50 TAR, 1927-28, p.168.

51 TAR, 1932-33, p.190.

52 TAR, 1893-94, p.126; Sergei Nikolaevich Shchelkunov, Svetlana S. Marennikova and Richard W. Moyer, *Orthopoxviruses Pathogenic for Humans*, p.65. Glycerine vaccines were purported to preserve inoculation material and decrease bacterial contamination, but had a short shelf life and often responded poorly to temperature changes.

53 TAR, 1898-99, p.92.

54 *Ibid*; TAR, 1900-01, p.51; TAR, 1893-94, p.126.

55 TAR, 1900-01, p.51; TAR, 1893-94, p.126.

56 TAR, 1893-94, p.126.

57 TAR, 1901-02, p.43.

58 Nagam Aiya, *The Travancore State Manual, Volume II*, p.523.

59 TAR, 1896-97, p. 143.

60 *Ibid.*, p. 144.

61 TKVP, *The Travancore State Manual, Vol III*, 680; TAR, 1897-98, p. 117.

62 'General Return of Persons Successfully Vaccinated at the Presidency and Subordinate Stations during the Year 1831', *The Fort St George Gazette*, 1832, p. 286.

63 Cover Files, Bundle 19, SL 286, File No 15766, 1844. Letter from W. Cullen , Resident to the Diwan of Travancore, 15 May 1844. This estimate is most likely to be very wide off the mark—later more reliable statistics indicate less than 10 percent of the population were ever vaccinated even as late as the 1890s.

64 Cover Files, Bundle 19, SL 286, File No 15766, 1844. Letter from W. Cullen, Resident to the Diwan of Travancore, 15th May 1844.

65 TNSA, NNPR, 1893, *Kerala Patrika*, March 4, 1893; *Ibid*, NNPR, 1886, *Kerala Mitram*; *Ibid*, 1893, *Malayalam Manorama*, 27 March, 1893; *Ibid*, 1889, *Kerala Sanchari*, April 3, 1889, p.76; *Ibid*, May 8, 1889, p.95; *Ibid*, 1907, *Kerala Sanchari*, January 9, 1907, p.11; *Ibid*, 1893, *Kerala Sanchari*, January 18, 1893.

66 Until 1894, the sanitation and conservancy of the urban and rural areas in Travancore were attended to by the local revenue and magisterial officers. After 1894, the urban areas of Trivandrum, Nagercoil, Quilon, Alleppey and Kottayam were placed under Town Improvement Committees, who often possessed a great deal of autonomy.

67 'Report of Dr Lowe, Medical Missionary in Travancore to the London Missionary Society', in the *Scottish Congregational Magazine*, Vol XVII, Edinburgh, 1866, pp. 25-27.

68 TAR, 1898, p.93.In 1898, the Dewan Subramaniam Iyer would report that the number of vaccinators in the state 'per 100,000 of the population is greater than in the Madras presidency in the proportion of 3.1 to 2.2.'

69 KSA, General Section Files, Bundle Number 126, SL No 2504, File No VII-13/1, 1089 ME. Review of Vaccination Work in the State, First Quarter, 1089 ME.

70 KSA, Cover Files, Bundle No. 42, File No 16152, Letter from Dr Pulney Andy to the Superintendent General of Vaccination, Travancore, 2 May 1873.

71 TNSA, NNPR, 1889, *Kerala Sanchari*, April 3, 1889, p.76; *Ibid*, May 8, 1889, p.95; NNPR, 1907, *Kerala Sanchari*, January 9, 1907, p.11; NNPR, 1893, *Kerala Sanchari*, January 18, 1893.

72 TAR, 1898, 93.

73 TNSA, NNPR, 1886, *Kerala Mitram*.

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76 TAR, 1893-94, p.126.

77 Proceedings of the Sanitary Commissioner, Travancore, No 1311, 31 October, 1913; TAR, 1893-94, p.126-7.

78 TAR, 1898-99, 94

79 TAR, 1899-1900, p.90; TAR, 1930-31, p. 182.

80 KSA, Cover Files, Nineteenth Administration Report of the Sanitary Department, 1089 ME.

81 TAR, 1897-98, p. 116. The appointment of Inspecting officers was initially resisted by the Sanitary Commissioner, who protested that supervision would demoralize the vaccination department.

82 KSA, Cover Files, Nineteenth Administration Report of the Sanitary Department, 1089 ME.

83 KSA, General Section Files, Bundle 126, SL No 2505, File VII-13/2, 1089 ME.

84 Dr Joseph Zacharias, 'Problems of Smallpox Diagnosis', WHO Inter-Country Seminar on Surveillance in Smallpox Eradication, New Delhi, 30 October-2 November 1972. http://whqlibdoc.who.int/smallpox/SE_WP_72.17.pdf

85 Report on the Administration of Cochin, 1075 ME, 41.

86 TAR, 1893-94 , p.134.

87 *Ibid.*, p. 127.

88 Interestingly, this was the policy eventually followed by the state of Travancore-Cochin, as per the Vaccination Rules for Rural Areas.

89 Nadja Durbach, *Bodily Matters: The Anti-Vaccination Movement in England, 1853-1907* Durham, NC: Duke University Press, 2005; Alison Bashford and Claire Hooker, *Contagion: Historical and Cultural Studies*. London: Routledge,; Marie Clark Nelson and John Rogers, 'The Right to Die? Anti-Vaccination Activity and the 1874 Smallpox Epidemic in Stockholm', *Social History of Medicine*, 1992, 369-89. In Britain, America and mainland Europe, this resistance was built on several foundations: that vaccination was ineffective at best and dangerous at worst; that it was a means that transmitted or promoted disease rather than prevented it and that the state imposition of vaccination was a tyrannical violation of individual liberties.

90 TKVP, *The Travancore State Manual, Vol II*, 525-6; TAR, 1888-89, p. 132.

91 *Report on Vaccination in the Madras Presidency, 1858,* p.12.

92 KSA, General Section Files, Bundle 126, SL No 2508, File VII-13/4, 1089 ME. Letter from the President TIC, Haripad to the Chief Secretary of Government, Trivandrum 6-11-1914.

93 *Ibid.*

94 TKVP, *Travancore State Manual, Volume II*, 506-7.

95 Francis Day, *The Land of the Perumauls, or Cochin: Its Past and Present,* 147.

96 Geoffrey Oddie, *Religious Conversion Movements in South Asia*, p.91. This was the observation made by Lowe, who managed the Neyyoor Mission Hospital and its vaccination efforts.

97 TKVP, *Travancore State Manual, Volume II*, 506-7.

98 http://www.namboothiri.com/articles/yogakshemasabha.htm

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100 KSA, General Section Files, Bundle 126, SL No 2508, File VII-13/4, 1089 ME, Letter from the President TIC, Haripad to the Chief Secretary of Government, Trivandrum 6-11-1914.

101 Laverne Kuhnke, *Lives at Risk: Public Health in Nineteenth Century Egypt* (Berkeley: University of California Press, 1990).

102 TAR, 1869-70, pp.109-118.

103 *Ibid.*

104 *Ibid.*

105 *Ibid.*

106 KSA, Proceedings of the Sanitary Commissioner, Travancore, No 1311, 31 October, 1913.

107 KSA, General Section Files, Bundle 126, SL No 2508, File VII-13/4, 1089 ME. Letter from the President TIC, Haripad to the Chief Secretary of Government, Trivandrum 6-11-1914.

108 *Ibid.*

109 *Ibid.*

110 Tomas J Aragon, Skylar Ulrich, Susan Fernyak and George W Rutherford, 'Risks of Serious Complications and Deaths from Smallpox Vaccination: A Systematic Review of the United States Experience, 1963-68' *BMC Public Health*, 2003, 3, 26 The fears of fever were not ungrounded: the risk of contracting post-vaccinal encephalitis has been recently reported as highest among infants aged <1 year.

111 CDC, Smallpox Fact Sheet: The Live Virus Smallpox Vaccine, http://www.bt.cdc.gov/agent/smallpox/vaccination/live-virus.asp

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115 J. Devika, *Engendering Individuals: The Language of Re-forming in Early Twentieth Century Keralam* (New Delhi: Orient Longman, 2007), 111-72.

116 TAR, 1925-26, p.125.

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118 Oddie, *Religious Conversion Movements in South Asia*, p.91.

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120 TAR, 1893-94, p.123-4.

121 James Colgrove, 'Between Persuasion and Compulsion: Smallpox Control in Brooklyn and New York, 1894-1900',*Bulletin of the History of Medicine*, 2004, 78:349-78.

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127 David Arnold. 'Smallpox and Colonial Medicine in Nineteenth Century India', in *Institutions and Ideologies: A SOAS Reader,* ed. David Arnold and Peter Robb, pp. 201-245.

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130 *Ibid.*

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133 KSA, Cover Files, B-19, 15966, Letter from W. Cullen , Resident to the Dewan of Travancore, 15th May 1844.

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135 M. Kabir and T.N.Krishnan, 'Social Intermediations and the Health Transition: the Case of Kerala', CDS Working Paper No. 251.

136 KSA, Cover Files, Bundle No 55, SL 836, File Number 25767, 1870.

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141 TNSA, Proceedings of the Public Department, 10 February 1863, No. 37-38, p.845.

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143 Report on the Administration of Cochin, 1075 ME, 43.

144 KSA, General Section Files, Bundle 126, SL No 2508, File VII-13/4, 1089 ME.

145 TAR, 1901-02.

146 Report on the Administration of Cochin, 1074 ME, 66.

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153 TAR, 1932-33; Travancore Gazette, 1 March 1932, 'Travancore Government Notification R. Dis. No. 200/32/LGB of 23 February, 1932', pp. 735-36.

154 TAR, 1932-33, p.183.

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157 'Part II: Legislative Department, R.O.C No. 286 of 41', The Travancore Government Gazette, Vol LXXVIII, No 30, 11 March 1941, 28 Kumbham 1116, pp. 189-224.

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159 *Ibid.*, p.221.

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161 *Ibid.*

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177 Peter Razzell, Edward Jenner's Cowpox Vaccine: The History of a Medical Myth (Firle, England: Caliban Books, 1977); Derrick Baxby, "Inoculation and Vaccination: Smallpox, Cowpox, and Vaccinia," Med. Hist., 1965, 9: 383–85; Baxby, *Jenner's Smallpox Vaccine: The Riddle of Vaccinia Virus and its Origin* (London: Heinemann Educational, 1981). The exact live virus that was used to vaccinate against smallpox since the beginning of the nineteenth century has been questioned by several authors. While some argued that early vaccination was actually an attenuated version of the *Variola* virus, others suggest through analyses of twentieth century strains of vaccines that available vaccines were actually *vaccinia* virus. This virus was distinct from both smallpox and cowpox and postulated to be related to horsepox.

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