Cultures of contagion and containment? The geography of smallpox in Britain in the pre-vaccination era

Romola Davenport[1,2]

In 1794, four years before Jenner self-published his first paper on vaccination by cowpox, the eighteen year old cooper William Hart caught smallpox during a visit to his uncle to London. His autobiography recounts that upon his return to the small town of St Albans, twenty miles north of London,

> 'in a few days I sickened with the Smallpox, which I had caught in London. In this dilemma I knew not what to do, as this disease was so terrific in the Country at that time for the Cowpox [Jennerian vaccination] was then unknown. No one in the town could be found who would take me in. My master used every effort. The people where I lodged would not let me remain with them on any account. It was an old maiden woman who kept a shop and was afraid of losing her customers.... I was 20 miles from my grandfather's home, but... I dare not go there, for he had not had the disease and was terrified at the thought of the smallpox' (Hudson & Hunter, 1981: 152).

William then recalled that the town of Luton, where he had served his apprenticeship as a cooper, had been infected some time before, and he thought he knew one family where all the members had had smallpox, who might be persuaded to take him in. His employer arranged for him to travel to Luton in a one horse chaise (i.e. alone except for the driver, to avoid infecting fellow travellers). However on his arrival his friends in Luton immediately notified the Parish Officer,

> 'who would not let me remain in the town for fear of communicating the infection. As I was a Parishioner by my servitude [William had gained a legal right to welfare in Luton through his apprenticeship there] they must provide for me. They therefore sent me to the Pest house, a place provided in those days for persons who had this disease. It was but a short distance from the town... Here they provided me with two nurses (poor parish paupers) and every necessary for my recovery, and the Parish Doctor attended me... [for three weeks I] was provided with medical aid and nurses free of expense' (Hudson & Hunter, 1981: 153).

William thanked God for his luck. 'I a poor lad only 18 years and a few months old in a strange place where I knew no one, no relations, no friends, no acquaintances near me. Seized with

[1] Cambridge Group for the History of Population and Social Structure, Dept of Geography, Downing Place, Cambridge CB2 3EN.

[2] This work was funded by Leverhulme Trust award RPG-2012-803 (to R.J. Davenport) and Wellcome Trust award 103322 (to Prof. Richard Smith, University of Cambridge). The author gratefully acknowledges these funders. She also thank the following organisations and individuals for generous donations of data and advice: Lyn Boothman, Alan Clarke (www.familyhistory.northants.co.uk), Stephen Coleman, Jonathan Healey, Gill Newton, Ellen Potter, Richard Smith, Buckinghamshire Family History Society (FHS), Cambridgeshire FHS, Cumbria FHS, Derbyshire FHS, Devon FHS, Durham Records Online; Kent FHS, Lancashire Online Parish Clerks, Manchester and Lancashire FHS, Norfolk FHS, Nottinghamshire FHS, Shropshire FHS, Suffolk FHS, Wiltshire FHS.

a dreadful and oft times a fatal disease and no home to go to... obliged to be removed 10 miles when the disorder was upon me, which might have proved fatal... I got no harm. I was taken to the Pest House and provided with medical aid and nurses free of expense' (Hudson & Hunter, 1981: 153).

William Hart's account encapsulates in vivid detail a common set of responses to smallpox in southern England on the eve of the debut of Jennerian vaccination. The fear with which the disease was regarded, and the clear perception of its contagious nature, are palpable in his writing. It is also evident that although William had lived for eighteen years within about twenty miles of London, where smallpox was ever-present, he had never contracted the disease before he visited London. Many other adults in the area, including his grandfather, were similarly vulnerable. Finally, his treatment presents a curious mixture of aversion and careful nursing at communal expense.

Hart's experience stands in stark contrast to Monro's account of smallpox in mid-eighteenth century Scotland. In response to a list of questions circulated by the Parisian Faculty of Medicine, Monro responded

> "The inhabitants of Scotland generally have the small pox in their infancy or childhood; very few adults being seen here in this disease. Whether this is owing to any particular constitution of the air, or of the people, or to the disease not being so much dreaded as to cause any to fly from the place where it is, or to the great intercourse which must be among the inhabitants in the towns, of which several, nay many, families enter to their houses by one common stair, while in the villages the peasants are generally assistant to their neighbours of whose family any is sick, is not necessary to inquire.
>
> When small pox appear favourable in one child of a family, the parents generally allow commerce of their other children with the one in the disease; nay, I am assured, that in some of the remote highland parts of this country, it has been an old practice of parents whose children have not had the small pox, to watch for an opportunity of any child of their neighbours being in good mild smallpox, that they may communicate the disease to their own children by making them bedfellows to those in it, and by tying worsted threads wet with the pocky matter round their wrists." (Monro, 1765: 3-4)

Thus in mainland Scotland Monro claimed that smallpox was an endemic childhood disease, and that people did not fear and avoid it, but in fact often chose to expose their children to infection (Monro did note however that smallpox was a rare and epidemic disease of all ages in the more remote islands of Scotland, where it was occasionally introduced by sea; Monro, 1765: 8).

In a companion paper (Davenport et al., 2018) we presented evidence that these contrasting attitudes to smallpox described by Hart and Monro were mirrored in patterns of smallpox mortality in northern and southern Britain (Figure 1). Smallpox was the single most lethal disease of eighteenth century Britain, and appears to have grown in importance over the period 1650-1750 (Carmichael and Silverstein, 1987). It was endemic (ever-present) in the larger towns and cities and accounted for 10-20 percent of all burials in towns and cities in northern Britain (Mercer, 1990, chap. 3; Davenport et al., 2016). It was also a common and childhood disease in rural areas of northern England (and probably mainland Scotland: Brunton, 1990; 1992). However in southern England, outside the major cities, smallpox

remained a relatively rare and epidemic disease. This claim is based on a large-scale scoping of pre-nineteenth century English burial registers that contained information on age and smallpox burials. Burials attributed to smallpox provide a reasonable guide to the incidence of smallpox infection, because smallpox (variola major) caused death in 10-30 % of those infected, and was readily identified by contemporaries (Buchan, 1774: 161; Creighton, 1894: 530). It was virulent enough to kill adults as well as children, and therefore age at burial broadly reflects the age profile of those infected.

Because smallpox infection conferred lifelong immunity on survivors then where it was a persistent, endemic disease then it was also largely a disease of children, because most adults had already acquired immunity in childhood. This was the case in northern England: in our sample of northern settlements adults (aged 15+) comprised less than ten percent of smallpox burials in most cases (Figure 1). However in southern England smallpox remained an epidemic disease of adults as well as children, with adults accounting for 20 per cent or more of smallpox burials in almost all settlements in our sample outside Cornwall. This implied that smallpox circulated less frequently in these areas, and indeed in our sample smallpox was recorded at longer intervals in southern than in northern settlements, except in the largest cities (Davenport et al., 2018). However even in large towns where smallpox was constantly present, adults accounted for a significant proportion of smallpox victims in the south. This was because urban populations in this period were heavily dependent on rural immigration, and therefore urban populations included many adult migrants from rural areas who had not encountered smallpox in childhood. Conversely, nearly all smallpox victims in northern towns were young children (Davenport et al., 2011, 2016; 2018). The patterns in Figure 1 implied that, like Willliam Hart, many individuals in southern England survived to adulthood without ever encountering smallpox. These adults were then at high risk of smallpox when they migrated to or visited London and other centres of endemic smallpox.

Analysis of a sample of burial registers with full causes of death suggested that by the late eighteenth century smallpox may have accounted for nearly ten percent of burials in rural communities in northern England, and less than five percent in rural populations in the south, suggesting that efforts to control smallpox in southern England were relatively effective (Davenport et al., 2018).

We considered a range of possible proximate determinants of this north-south pattern. Our analyses established that, at least within our sample, there were no differences in the size or connectedness of northern and southern settlements that might have favoured more rapid circulation of disease in the north. There was also no evidence that the extent of settlement nucleation was an important influence on smallpox patterns, as previously suggested by Brunton (1992: 409) and Razzell (2003: xvi-xviii). Nor was there any evidence that immunity might have varied regionally as a consequence of pre-Jennerian vaccination with cowpox (South, 2010). Instead we concluded that smallpox was probably controlled in southern England by the avoidance and isolation of victims before the mid-eighteenth century, and that these strategies were complemented from c.1760 by occasional mass inoculation programmes (Davenport et al., 2018). We discuss these strategies below, and then address the drivers of their geographical patterning.

Isolation

The main means of smallpox prevention in southern England was avoidance of infected people. This included both avoidance of infected areas, such as towns, and avoidance of infected individuals. Diaries and newspaper advertisements attest that many adults would not visit towns where smallpox was known to be present. Smallpox outbreaks could cause the closure or relocation of markets, and sometimes disrupted the county court circuit when jurors and even judges refused to attend court for fear of infection (Razzell, 2003: xv-xvi; Razzell, 2011; Smith, 1987, chap. 1). Many southern towns advertised their smallpox status in order to reassure would-be visitors. These advertisements were signed by parish officials, local doctors and priests, and either proclaimed the town to be free of smallpox, or described the number infected and their whereabouts (for example 'in a secluded part of town' or 'in the pest house'). At the household level, diaries and letters sometimes describe the confinement of family members, or removal of the uninfected from households (Leadbeater, 2015: 168-70). Although medical writers were divided on the subject of the contagiousness of smallpox until the later eighteenth century, most advised avoidance of the infected.[3] Most of the popular (as opposed to medical) controversy surrounding inoculation was associated with concerns over the inadequate containment of infected patients (see next section). However the strongest evidence of the importance attached to avoidance of infection in southern England was the proliferation of eighteenth-century pest houses, such as the one William Hart was confined in.

Pest houses were very widely deployed against plague in the sixteenth and seventeenth centuries throughout England. However evidence of the use of pest houses in the eighteenth century is confined to southern England (Davenport et al., 2018). Pest houses appear to have grown in popularity from the early eighteenth century, although this may reflect in part the greater evidence base for the later eighteenth century. Although we usually lack information on the reason for their establishment, the housing of smallpox sufferers is cited in 87% (33/38) cases where a reason for establishment was given. Pest houses were usually buildings rented, bought or sometimes constructed by parish officials at local expense.[4] Smith has argued for Essex on the basis of extensive archival evidence that pest houses were initially used to isolate victims of varied social status, and only came to be reserved for the parish poor later in the eighteenth century (Smith, 1987: 149-50). They were also used to house sick strangers. Victims were nursed at parish expense, often by parish paupers who had already survived smallpox. While some parishes invested in permanent pest houses, many were ephemeral, either hastily constructed during epidemics, or rented for the purpose for the duration of the epidemic. It is possible that northern pest houses were entirely of this nature, and have escaped historical notice. Thorough searches of parish expenditure records would be required to reveal the extent of their use.[5] However our research has so far revealed not a single pest house in use in the eighteenth century in northern Britain.

[3] For early examples, see Mead (1720); Hillary (1740: 58). Buchan, in his often reprinted classic *Domestic Medicine* advised that 'it would be thought highly improper for one who had not had the smallpox to wait upon a patient in that disease' (Buchan, 1784: 119).

[4] Under the 'old' Elizabethan poor laws of England, parishes were charged with the obligation to care for their own poor (an obligation that grew to include fairly comprehensive medical care), through a progressive system of local taxation, administered by parish officials (churchwardens and overseers of the poor).

[5] Jonathan Healey found no mention of pest houses in his extensive sample of seventeenth and eighteenth centuries parish records for Lancashire, and only occasional mention of smallpox sufferers, all of whom were children (Healey, pers. comm.).

Evidence for the avoidance and isolation of smallpox victims in northern England is very limited. The few eighteenth century accounts identified relating to smallpox emphasise instead the absence of attempts to avoid infection. John Haygarth deplored the promiscuous mixing of infected children on the streets and promenades of Chester (a substantial town in the northern county of Cheshire) (Haygarth, 1793: 185, 506). He established a Smallpox Society for the prevention of the disease, and made household isolation of sufferers a central tenet of his Rules of Prevention. Poor parents with infected children were offered financial inducements to keep their patients away from other children and susceptible household members. Even with this inducement only a fraction of families adhered to his rules, and lack of funding undermined the programme. At Upton, a small village two miles from Chester, the local surgeon reported in 1777 that of 24 susceptible children all except one infected within two months: "[the epidemic] has increased in proportion to the communication which families had with each other; no care was taken to prevent the spreading, but, on the contrary, there seemed to be a general wish that all the children might have it" (quoted in Haygarth, 1784: 96).[6]

Immunisation

Before the widespread adoption of vaccination, the second means of avoiding natural smallpox was by deliberate infection with a small dose of smallpox, a procedure called inoculation or variolation. Ideally, this caused a very mild case of smallpox and conferred lifelong immunity. However inoculated individuals were infectious during the period when they had active skin lesions. This meant that inoculation was associated with both a risk to the individual, that inoculation induced a severe infection, and a risk that others who had not already had smallpox might contract a serious infection. Inoculation was introduced to England in the 1720s, although as noted earlier there may have been earlier folk practices. It was initially associated with a lengthy regime of preparation and was too costly to become popular. However safer and more streamlined methods became widespread in the 1760s, and inoculation of the poor became an affordable option for many parishes (Razzell, 2003; Smith, 1987).

Those counties where pest houses were deployed were also the first to adopt mass immunisation via inoculation (Davenport et al., 2018). Called General Inoculations, these involved the mass immunisation of all immunologically vulnerable members of a community at once. The aim was to pre-empt the possibility of the accidental spread of smallpox from inoculated individuals, by simultaneously infecting all susceptible persons. As with pest houses, the parish usually paid the costs of inoculating not only those recognised as regular paupers, but all members of the community who were deemed unable to pay (Bennett, 2012; 219; Razzell, 2003: 63-5, 115, 121; Smith, 1987: 27). In some cases at least a General Inoculation was preceded by a house-to-house census to establish the resident status and smallpox immunity status of all inhabitants (Davenport et al., 2011: 1298; Razzell, 2003: 113-20). General Inoculations are argued to have become very frequent and widespread especially

[6] Haygarth recommended the requisitioning of premises to create pest houses for smallpox sufferers, but noted that pest houses were of greatest utility in 'certain circumstances; as in situations where a few are infected, and a great number are liable to the distemper' (Haygarth, 1793: 127). His tone indicates that pest houses were not then in use in the areas to which his 'regulations' pertained.

in south-eastern England in the last three decades of the eighteenth century. Nonetheless the decision to undertake a General Inoculation was never taken lightly, and there is no evidence that it was ever used as a routine prophylactic. Rather General Inoculations were deployed only when a smallpox epidemic appeared otherwise inevitable. Where the decision-making process was well-documented it appears that parishes often resorted to the older strategy of confinement of victims in pest houses, and only resorted to a General Inoculation when this isolation proved insufficient to halt the epidemic (Crook, 2006: 76-8; Hermann, 2013: 53; Razzell, 2003: 119; Stuart. 1788: 283-4).

Historians have generally regarded inoculation as relatively unpopular in northern Britain, as well as in the larger southern cities where smallpox was endemic (Brunton, 1990; Razzell, 2003, but see also Razzell, 2011). As discussed later, this conclusion may rely too heavily on the apparent rarity of General Inoculations in northern Britain. General Inoculation only became a viable strategy from the 1760s, when smallpox was apparently already a regular childhood disease in northern populations. While in southern England occasional General Inoculations could act to shore up isolation practices of longer standing, they were only financially and logistically viable where smallpox was already a relatively rare event (May, 1997). Therefore inoculation was probably too late to influence the basic geography of smallpox mortality in Britain.

This chapter addresses the question of why communities in southern England adopted relatively successful methods of reducing smallpox mortality, and why the same was not true of northern Britain. We start with a consideration of similarly dichotomous responses to smallpox in eighteenth century Sweden and Japan, where both cultural attitudes and environmental factors have been argued to play a key role. We then consider to what extent geographical differences in responses to smallpox in eighteenth England can be explained in similar terms.

Smallpox binaries in international context

The contrast presented here between northern and southern Britain resembles superficially the epidemiological patterns of smallpox in eighteenth century Sweden and Japan. Smallpox was an endemic childhood disease in Sweden in the second half of the eighteenth century. It accounted for 8.3 % of deaths nationally in the period 1774-95 (when smallpox was first reported separately from measles), and 95% of those who died were aged under ten (Sköld, 1996: 549, 580). The Swedish College of Medicine issued instructions for the isolation of those infected in the 1750s, but Sköld claimed that these instructions were ignored. Inoculation was also unpopular at least amongst the poor (Sköld, 1996: 284, 287). He summarised the attitude of the Swedes towards smallpox and smallpox prevention as fatalistic, an attitude he considered to arise both from Christian beliefs regarding acceptance of suffering, and from the cumulative effects of poverty and a severe disease environment (Sköld, 1996: 183-5; 1997). Sköld contrasted these fatalistic attitudes to smallpox outbreaks with the pro-active responses of the Saami, nomadic reindeer-herders living in the far north of Sweden. Swedish traders and hunters spread into Lappland in the eighteenth century, but smallpox was introduced only occasionally into the area throughout the century. Therefore smallpox remained a rare epidemic disease amongst the Saami, and 60 % of Saami smallpox victims were aged over ten in the period 1750-1820 (Sköld, 1997: 12). Contemporary Swedish

observers described the Saami reaction as one of flight in the face of smallpox, “not seldom leaving old people at home and infected relatives behind to their unfortunate destiny.” (Deutsch, writing in 1801, quoted in Sköld, 1997: 18). Sköld argued that the Saami belief in their active ability to evade or appease the smallpox spirit led them to take preventive evasive action. He also argued that this action was successful, and resulted in declining levels of smallpox mortality amongst the Saami even before the advent of vaccination.

Smallpox was also endemic on the main islands of Japan in the eighteenth century. Jannetta argued that smallpox was a disease of very young children not only in ports and major cities but even in the remote mountainous areas of central Japan (Jannetta, 1987: chap. 4). Smallpox ceased to be noted in official chronologies after the mid-eighteenth century, because it had become so commonplace and ‘because smallpox had a negligible effect on adult mortality, it did not disrupt the political or social structure of the population’ (Jannetta, 1987: 97). However the attitudes engendered by endemic smallpox were not fatalistic. Jannetta described the attempts of the imperial court to seclude royal children from infection, and also the more widespread practice of deliberate exposure of young children to smallpox infection, in the belief that it was less dangerous if contracted early (Jannetta, 1987: 99-100, 105).

In contrast, smallpox remained an infrequent and imported epidemic disease on the more isolated islands of the Japanese archipelago. There epidemics involved a large proportion of the population and disrupted agriculture, fishing and trade. The major responses in these areas were quarantine, isolation and flight, including abandonment of infected family members (Suzuki, 2011: 317). In 1795 when smallpox arrived on the remote island of Hachijojima the first response was to send the infected and their families away from their village. As the epidemic progressed many fled to the mountains, and a new strategy was adopted, where the first victims infected in a village were moved to villages that had already experienced the epidemic (Jannetta, 1987: 103).

In the cases of Sweden and Japan in the eighteenth century, populations that were in close or regular contact with major towns were exposed to endemic smallpox and regarded the disease as an inescapable childhood affliction, but also one without major economic consequences. Only amongst very remote groups did smallpox remain an infrequent imported disease. In this case the disease was extremely disruptive, and these groups took active and sometimes extreme steps to avoid infection. While Sköld made the argument that responses to smallpox varied between the Saami and the Swedes according to pre-existing religious attitudes, Jannetta and Suzuki attributed the differences in smallpox responses in Japan to what Suzuki described as the differing ‘epidemiological heritage’ of the main islands compared with the more remote islands; “different epidemiological profiles moulded different patterns of behaviour or even different moral standards’ (Suzuki, 2011: 317).

Slack and Dobson have proposed similar, rather epidemiologically deterministic models of responses to epidemic disease in England and New England. Slack argued that the most extreme responses were elicited by epidemics that were “novel, violent and intense, random (at least as initially perceived), and associated with other social disturbances” (Slack, 1992: 7). Familiarity on the other hand could breed contempt, and he suggested that “a developed reaction, such as a public health ‘campaign’... depends on familiarity, though not too much familiarity” (Slack, 1992: 7). Dobson suggested where occasional violent epidemics occurred against a background of relatively low mortality then this pattern could engender an obsessive

fear of death, as evident amongst the Puritan settlers of the New England colonies (Dobson, 1989: 291-2).[7]

The English case presents an unusual opportunity to evaluate the roles of cultural attitudes and 'structural' epidemiological patterns in determining responses to smallpox, because, in contrast to Sweden and Japan, two very different types of response were present in a population in which there were no strong *a priori* differences in population densities and connectedness. Southern England was at least as densely settled and well-connected as northern England in the seventeenth and early eighteenth centuries, when these responses seem to have developed. In this case the epidemiological determinism evoked by Suzuki to explain the Japanese experience cannot have been operating, at least in unalloyed form. This suggests superficially that it was differences in individual or communal responses to smallpox that determined the trajectory of each region, rather than broader environmental or economic differences.

The problem that confronts us in attempting to explain the English pattern is that most of our evidence regarding attitudes, beliefs and behaviours is restricted to the period when the pattern of northern endemic and southern epidemic smallpox was already established, probably by at least the mid-eighteenth century (Figure 1). We have relatively little regionally disaggregated evidence of attitudes towards or preventative measures against smallpox in the seventeenth century, when the disease probably began to rise in importance.[8] For instance, we don't know whether the apparent absence of pest houses and other evidence of isolation and avoidance of smallpox in northern England was a product of longstanding indifference or fatalistic attitudes towards smallpox, or whether these attitudes were a later reaction to the presence of smallpox as an apparently unavoidable childhood disease. We can however examine the extent to which the charge of fatalism occasionally levelled against northern English parents by contemporaries and historians is valid.

Fatalism reconsidered

Haygarth attributed the apparent lack of preventative measures against smallpox on the part of poorer parents in northern England to a deep-rooted fatalism (Haygarth, 1793: 185). Some historians have echoed this view, although while Razzell accepted the evidence of fatalistic attitudes in those parts of the population where smallpox was a disease of childhood, he thought that these attitudes were a consequence rather than a cause of endemic smallpox (Bennett, 2012: 215-16; Razzell, 127). Calvinist views regarding the need to submit to God's will were also evoked in opposition to inoculation, although there is little evidence that these views were widespread in England (Farr, 1977: 29-45). This contrasts with Scotland, where religious hostility has been cited as a major source of opposition to inoculation (Brunton, 1992). Brunton and Farr argued that attitudes moderated over the eighteenth century, such that by the 1790s only 7 % of all parishes surveyed in the *Statistical Account* reported popular

[7] In the case of smallpox, and probably other relatively lethal diseases, it was not simply the infrequency of the disease, or the proportion of affected, but also the age of victims, that was important in determining responses (Haygarth, 1793: 492; Razzell, 2003).

[8] Both historical and molecular-phylogenetic evidence support a relatively recent origin of the variola major strains that circulated in the twentieth century, probably in the mid or late seventeenth century (Carmichael and Silverstein, 1987: Duggan et al., 2016; Li et al., 2007).

opposition to inoculation on religious grounds, and none of the incumbents expressed support for these views (Farr, 1977: 67-8, 71). The cost of inoculation was however a major barrier to uptake in Scotland (Brunton, 1992; Farr, 1977: 69-70).

Accounts describing the perversity of northern parents in needlessly exposing their children to smallpox infection, or rejecting inoculation, often bear another interpretation, instead of ignorance or fatalism. They can instead be read as instances of parents actively seeking to control the timing of infection of their children. Monro described apparently longstanding practices akin to 'chickenpox parties' where susceptible children were exposed to another considered to have a favourable case of the disease (Monro, 1765: 3-4). This practice has also been described in Wales, and amongst families in southern England in the seventeenth century (Creighton, 1894: 471-2). Creighton stated that it was 'not unusual in England for educated persons to let smallpox go through all their children after it had attacked one of them, just as it was regarded as economy by many to have done with the measles' (Creighton, 1894: 472). He suggested that parents tried to control the age at infection, because they regarded smallpox to be more dangerous in adulthood. Mention is also often made of folk practices of 'buying the pox', referring to early possibly indigenous methods of inoculation using scabs applied to the (sometimes abraded) skin (Creighton, 1894: 471-4).[9]

Haygarth gave several examples of children who were intended to undergo inoculation, but in one case the child was taken secretly by a servant to a smallpox victim "on purpose to catch the natural infection", and in the other the mother, averse to inoculation, carried the child to an infected house nearby to be infected naturally (Haygarth, 1784: 34,36). In a village near Leeds (in the northern county of Yorkshire West Riding) the local incumbent failed to convince the population to adopt his plan for a General Inoculation, until he hit upon the argument that the parents could avoid the loss of labour during harvest time due to nursing sick children if they chose to inoculate all at once in the Spring (Lucas, 1789). In these three cases parents demonstrated a desire to control the timing of infection. However they did not prefer inoculation over natural smallpox.

The evidence of an apparent desire to control the timing of infection is at first sight inconsistent with the alleged rejection of inoculation in the north, since inoculation offered an obvious means of controlling timing. However this apparent paradox may reflect an under-assessment of the extent of inoculation in northern England, and also our lack of understanding regarding the 'calculus of risk' that northern parents were employing.

The popularity of inoculation is most evident in southern England in the spectacle of universal communal immunisation, something apparently completely absent in the north. However a number of northern towns introduced large-scale inoculation programmes in the late eighteenth century, including both mass inoculations and regular free inoculation of the poor via charitable dispensaries (Bennett, 2012; May, 1997). These were not universal in the sense of seeking to inoculate all vulnerable inhabitants. This was impossible in large towns, and the ever-present risk of infection, together with high birth rates and immigration, would have

[9] These practices also suggest a widespread popular appreciation of the contagious nature of smallpox, that was not regionally distinctive. Smallpox only came to be fairly unanimously accepted as contagious by medical writers in the second half of the eighteenth century (Erickson, 2013). The development of medical theories regarding smallpox contagion seems to have lagged behind the practical implementation of policies designed to stop or control smallpox contagion.

required annual immunisation campaigns. Instead, inoculation programmes were targeted at young children of the poor. The safer, quicker methods of inoculation introduced from the 1760s were however too late to change the already established patterns of smallpox. The lack of General Inoculations was a feature common to both northern England and larger urban centres. In both cases smallpox was already endemic, and therefore the logic of the General Inoculation did not hold.

It is also possible that inoculation was regarded as more dangerous in northern compared with southern England. The reluctance with which General Inoculations were held in southern England suggests that mass inoculation was viewed as an unpalatable option throughout England. It appears to have been viewed not only as expensive, but dangerous. Between epidemics many southern towns attempted to ban the practice of inoculation, to prevent accidental infections. The intense mathematical controversy that surrounded the calculation of the relative risks of inoculation and natural smallpox indicates the difficulties contemporaries experienced in evaluating the safety of inoculation (Rusnock, 2009: chap. 2-4).

One difficulty in assessing the safety of inoculation was, as Razzell has argued, was that inoculation was often deployed during an epidemic, and many of those inoculated may already have unwittingly contracted natural smallpox before inoculation. If they died of smallpox then their deaths were attributed to inoculation rather than natural smallpox, and this increased the perception of the dangers of inoculation. This phenomenon was more likely to occur where natural smallpox infection was common, as in northern England. The perception of the dangers of inoculation may have therefore have been more acute in the north. In this case the fact that smallpox was virtually inevitable may still not have persuaded parents to use inoculation, since, as one woman put it, “Four of my children have already died of the common small-pox; and, if my only remaining child should die by inoculation, I could never forgive myself” (Haygarth, 1793: 482).

The most telling evidence that parents in areas of endemic smallpox were not simply inured to high childhood mortality is the apparently rapid uptake of vaccination in areas where inoculation had gained the least foothold. Vaccination was adopted with the greatest enthusiasm, at least initially, in large urban centres, in Scotland, and in northern English towns (Brunton, 1990: 193, 198; Brunton, 1992: 425; Pickstone, 1985: 34; Razzell, 2003: 128).[10] Within a decade of Jenner’s discovery smallpox mortality had plummeted in Britain, and the effect was most marked in northern towns (Davenport et al., 2016). Conversely, where inoculation had been popular in the eighteenth century then the progress of vaccination was generally more hesitant, and there was considerable competition between the two forms of immunisation (Smith, 1987: chap. 5). This pattern of rapid adoption of vaccination in urban populations and northern Britain is inconsistent with a fatalistic acceptance of high child mortality or divine will. Rather vaccination provided the opportunity to control the timing of infection *and* to dramatically reduce the risk of smallpox, factors that appear to have been key in determining individual attitudes to inoculation.

[10] May (1997: 305) attributes the success of vaccination in populous towns to its popularity with the campaigners who had been responsible for charitable inoculation programmes in urban areas, as a more effective means of achieving their goal of smallpox eradication. Nonetheless, vaccination faced far less popular opposition in northern towns than in the south.

Community-level responses to smallpox

The charge of fatalism or indifference was levelled at individuals who failed to have their children inoculated or otherwise to shield them from infection. However the actions we have identified as key to the prevention of smallpox transmission in southern England were enacted collectively at the level of the parish. While the wealthy could segregate infected household members, for poorer families living in very crowded conditions, isolation of the sick in their own homes was difficult. Here the provision of public isolation facilities, in the form of a temporary or permanent pest house, made it possible to remove infected members from the household, and increased the chances that the infection did not spread. Strangers could also be isolated to prevent spread. It is very likely that it was necessary to supplement individual isolation measures with the safety net of a communal facility to make isolation work as a preventative strategy. Similarly, private inoculation protected the individual, bur carried the risk of accidental infection for those who could not afford or feared inoculation for themselves. Only where mass simultaneous inoculation was conducted could inoculation function to prevent an epidemic.

These communal responses (pest houses and General Inoculations) were however expensive, and the costs were borne in most cases by the local unit of welfare, the parish. The widespread willingness of local taxpayers to pay for the protection of the poor was striking, in southern England. In the north on the contrary the evidence indicates that where mass partial or general Inoculations were conducted they were paid for by philanthropic individuals or charitable foundations (including dispensaries). However the apparent generosity of many southern parishes must be set against the potential costs of inaction against smallpox.

While the more affluent inhabitants of parishes in southern England were in a position to protect themselves from smallpox, they could not easily avoid the financial consequences of the economic dislocation caused by epidemics, if traders and buyers shunned the local market. They were also liable for a second type of cost associated especially with adult smallpox victims, that was borne by the local community as a consequence of the legal obligation to provide medical and financial assistance to the poor. The English poor laws stipulated that each parish was responsible for the maintenance of the 'impotent' poor, those too sick or disabled to work, or who were unable to provide sufficiently for their dependents. To support their poor inhabitants, parishes were required to raise a local tax on those inhabitants deemed able to pay, the system to be administered by Officers of the Poor and churchwardens chosen annually by the ratepayers. The costs of a smallpox outbreak could be considerable. The parish could be required to pay for the costs of nursing, which was often, as in William Hart's case, provided by other parish paupers in the Pest house. The parish was also required to cover the costs of pauper burials, and to provide for the families of sick or dead breadwinners, where other support was inadequate. Families who were not usually eligible could be driven by smallpox to resort to parish support. Razzell has argued persuasively that the willingness of many southern parishes to pay the often substantial costs of mass inoculations of the poor was driven mainly by the desire to avoid the even higher costs of a natural smallpox outbreak (Razzell, 2003; Smith, 1987: chap. 1). Thus parishes often bore the costs of inoculating not only those normally deemed paupers in receipt of support, but any

inhabitants deemed too poor to pay for their own inoculation.[11] A similar consideration applied to pest houses, as the celebrated inoculator Thomas Dimsdale noted:

> "In the most considerable towns in England, the inhabitants having experienced great injury to their trade, and the loss of many lives by this disease [smallpox] becoming universal, have at public expense, provided a house (and in some cases more than one) which is called the Pest-house, situated at a convenient distance from the town, and alone, to which all the poor who fall ill are removed as soon as discovered to have the Small Pox. Nurses and medical help are afforded; due care is taken to bury the dead privately, and to give such as recover proper airings until they may be in a state to return home without danger of infecting others..... Hertford, Ware, Hitchin, Bishop Stortford, Baldock, Stevenage, and Hatfield, which are considerable market-towns on our side of the country, have each one of these pest-houses, and the general benefit derived from them is so apparent, that even parochial parsimony approves, and allows the expense." (Dimsdale, 1778: 79-80)

A key question is whether these policies, of isolation in pest houses, and later mass inoculation, were viewed by the objects of these policies as a boon or an imposition. There are very few examples of force being used to compel either inoculation or confinement for smallpox (in contrast to plague) (Bennett, 2012). A rather anomalous example is that of Elizabeth Butler, who was expeditiously evicted from her parish of residence in Warwickshire to the parish where she had legal settlement, when her son developed smallpox. In the legal case that followed, her parish of settlement, Wormleighton, protested the barbarous manner of her removal, and also the risk these actions constituted to Wormleighton, where 'there were not ten people... who had had the Small Pox' (Vialls, 1998: 256-8). In the Sussex town of Lewes in 1794 smallpox was detected first in the house of George Apted. The parents of the infected children refused to remove them to the pest house, and a town meeting agreed to block up the entries of the alleys instead. Finding however that smallpox continued to spread, and that the growing number of families infected continued to refuse to move to the pest house, the town resolved to conduct a general inoculation. That is, parish officials did not feel able to compel the infected families to move so were forced to take other forms of preventive action (Crook, 2006: 76-8). Inoculation was often banned by towns in inter-epidemic periods, and attempts were made to prosecute inoculators for exposing others to the risk of smallpox. However the first successful prosecutions for exposing others to the risk of smallpox only occurred after the introduction of vaccination (Maule & Selwyn, 1817: 73-77). Smallpox control remained a matter for local not state intervention.

The extent to which compulsion was used in General Inoculations remains unclear. Razzell considered it the norm, citing an anecdote regarding the parish of Weston, where 'No circumstance whatsoever was permitted to exempt the inhabitants [from the General Inoculation of 1788]' (Cowper, quoted in Razzell, 2003: 76, also 92). Bennett however points out that even in workhouses inoculation could be refused (Bennett, 2012: 217). Overt examples of compulsion used against smallpox sufferers may be rare because they were not necessary. Where residence in a pest house was a necessary condition of parish-provided nursing and support, then those, like William Hart, without the means to support themselves

[11] The wider eligibility afforded by the parish to smallpox victims is evident in a number of court rulings regarding eligibility to vote. While receipt of parish relief usually disqualified men from voting, parish-provided nursing for smallpox, isolation and inoculation were not considered to confer pauper status.

during illness would have had little choice but to comply with parish authorities. A similar logic may have applied to any inhabitants of the parish who thought they might be liable to depend on the parish for support at some point in the life course. In Witham (Essex), Smith suggested that inoculation was a condition of residence for non-immune immigrants (Smith, 1987: 66).

If the use of pest houses and mass inoculations was sustained in southern England by the alignment of communal and individual self-interest, the obvious question is why this apparently did not occur elsewhere. In northern parishes smallpox was a childhood disease by the mid-eighteenth century, and therefore outbreaks of the disease did not have economic consequences: markets remained open, and adults were unaffected, except by the inconvenience of nursing and burying sick children. This situation was also true of London and the largest towns in southern England. In this situation the costs of smallpox epidemics were relatively slight. However the evolution of this state of affairs remains obscure. The pattern was apparently established by the mid-eighteenth century, and therefore was not a product of mass inoculations, which only became popular after c.1760. If preventive measures were important in establishing north-south patterns of smallpox mortality, then it is likely that isolation and avoidance were the main mechanisms.

The preventive interventions of parish officials in southern parishes were predicated on assumptions about the communicability of smallpox, and about the desirability of evading or minimising the effects of infection. We have argued that these assumptions were probably widespread in England in the eighteenth century, and differences in attitudes to disease cannot account for the differences between north and south. Instead we suggest that the main difference between northern and southern England with respect to smallpox was the extent to which parochial policies were able to influence the outcome of smallpox epidemics. This depended in turn on what the parish could afford or was willing to do, and how many people were actually eligible for parish assistance. Brunton argued that only southern parishes adopted General Inoculations because they were more affluent than northern parishes and so could afford to (Brunton, 1990). A similar logic can probably be applied to parish-sponsored nursing in pest houses. Longstanding geographical patterns of poor law expenditure support this claim (Figure 2). Southern parishes spent far more per capita on support of the poor than their northern counterparts. While detailed evidence is rather patchy, it appears that medical expenditure on paupers was lower in the north, and few parishes employed surgeons/apothecaries on annual contracts, in contrast to parishes in southern England.

However it is also the case that the cost of living was also higher in the south, and southern parishes generally had more paupers. Once poor law spending is calculated per capita *pauper*, then the geographical differences are persistent, but less extreme (Figure 3). Therefore one of the largest differences with respect to welfare costs between north and south was in the proportion of the population that was pauper (Figure 4). The geography of paupers reflects very closely the age patterns of smallpox mortality, with high numbers of paupers (and adult victims) in the south, the west midlands, and parts of Lincolnshire, and very low levels in Lancashire and the rest of the northern counties. Shaw-Taylor has demonstrated that this geographical pattern corresponds very closely with the distribution of landless day labourers, who worked on relatively large capitalist farms and who were most at risk of pauperisation (Shaw-Taylor, 2005; 2012).

Our working hypothesis is that it was differences in the willingness or capacity of parishes to expend money on preventive measures, and possibly regional differences in expectations

regarding the ubiquity and levels of relief, that drove the long-run development of smallpox patterns in England. These factors probably operated via three mechanisms. First, where a relatively high proportion of the parish population could expect poor relief when ill with smallpox, then uncontrolled epidemics were extremely costly to the parish, especially where adults were a high proportion of victims. This created a strong incentive for such parishes to adopt preventive measures with relatively universal application. Second, the capacity of parishes to enforce preventive measures may have depended to some extent on their hold over parishioners. Where there was widespread expectation of occasional or permanent parish relief, then compliance with policies related to isolation or inoculation may have been successfully linked to other benefits of parochial membership. Third, where those eligible or potentially eligible for poor relief were numerous then any policies directed at the control of smallpox via public measures such as pest houses or mass inoculation would influence a higher proportion of the vulnerable, and would therefore be more effective in halting disease transmission. This hypothesis could be tested by more extensive archival searches of late seventeenth century poor law records especially for northern England for evidence of the numbers claiming assistance for smallpox, and for evidence of preventative measures. At present the poor law records especially of the southeast of England have been much more thoroughly researched than those of northern England or the Midlands. Comparison with Scotland, where there was no comparable poor law provision, would also be very illuminating.[12], although the much . It is worth noting in this regard that inoculation was generally more popular in the more remote parts of Scotland where smallpox was a rare epidemic disease.

Finally, it is worth noting that the argument produced here is not an environmentally deterministic one. Rural parishes in southern England were on average wealthier than rural parishes in most of northern England as a consequence of longstanding advantages of soil, climate and topography. They therefore had greater potential to raise the taxes required for preventive measures. However the local institutions that enacted these measures were historically and culturally specific. It was fortuitous, or the outcome of remote factors, that the rise of smallpox as a health threat in the seventeenth century coincided with the development of a welfare system that capable, at least in southern England, of mitigating its worst effects.

Conclusions

We have argued here that the key factors that impeded smallpox transmission in southern England were communal behaviours, of isolation and later immunisation, enacted via parochial poor law authorities, that amplified and bolstered individual measures to avoid smallpox. We speculated that the shorter reach of the poor law in northern England (and the southwest) limited the effectiveness of such strategies in these areas, and led to the development of a different set of responses in the face of the endemic childhood patterns of smallpox that emerged.

[12] Communal inoculations, paid for by the more affluent members of the parish, were reported especially in the more remote insular parishes of Scotland in the 1790s, where smallpox was a rare epidemic disease. However these parishes may have been protected chiefly by their isolation rather than by regular use of preventive measures.

Critically, it appears that local scale, patchily adopted initiatives against smallpox were sufficient to give rise to large-scale regional patterns, without any obvious coordination between the units. Some parishes shared pest houses, but there is no evidence of orchestrated efforts to control the regional spread of smallpox (Smith, 1987). Nonetheless where enough parishes practiced isolation and inoculation then these probably acted to create a buffer that interrupted disease circulation and protected neighbouring parishes that did not adopt such measures. Conversely, where individual parishes took strong preventive measures, but were surrounded by neighbours that did not, then these preventive measures were probably inadequate, and excessively costly, in the face of very frequent introduction of smallpox from surrounding populations.

The role of the English state with respect to smallpox was entirely passive before the mid-nineteenth century, in contrast to its roles in combating plague and cholera. In the sixteenth and seventeenth centuries the state repeatedly issued Plague Orders dictating the boarding up of victims and their households, and from the 1630s, the use of pest houses to isolate the infected. International quarantines were eventually enforced, that Slack argues were decisive in eliminating plague from Britain (Slack, 1985). In the nineteenth century quarantine was again tardily imposed to prevent cholera, and a central Board of Health constituted to coordinate the activities of local boards during epidemics (Morris, 1976; Durey, 1979). However despite the enormous mortality attributed to smallpox across the eighteenth century, smallpox was left entirely to local management. Only in the mid-nineteenth century was legislative action taken, first to ban inoculation in 1840, and then in a series of stuttering attempts to impose compulsory vaccination from 1853. The unwillingness of the state to intervene in what were essentially domestic diseases such as smallpox, typhus and typhoid has probably contributed to a general under-appreciation of the extent and importance of public health initiatives in the long period between the disappearance of plague and the arrival of cholera. Mortality declined markedly especially in urban centres over the period c.1750 – 1820, but the drivers of this decline remain very poorly understood. The sources for the study of local preventative health measures are hard-won compared with parliamentary reports, and the emergent properties of small-scale uncoordinated activities may be subtle to detect. Nonetheless in the case of smallpox at least there is good reason to think that local public health interventions in the form of isolation and mass immunisation were capable of profoundly influencing epidemiological patterns of disease, even before the dramatic effects of vaccination. Pest houses were used for the isolation of sufferers from a range of conditions that were considered infectious, and future work will consider the roles of isolation practices in the control of outbreaks of ‘fevers’, in particular typhus. More broadly, this work emphasises the contribution of the poor laws to public health and standards of living in the widest sense.

REFERENCES

Bennett, M. ‘Inoculation of the poor against smallpox in eighteenth century England’, in A. Scott, *Experiences of poverty in late medieval and early modern England and France,* Farnham: Ashgate: 199 – 226.

Buchan, W. 1774. *Domestic medicine*, 2nd American edn, Philapdelphia.

Brunton, D. 1990. *Pox Britannica: smallpox inoculation in Britain, 1721-1830*, unpub. Ph.D. thesis, University of Pennsylvania.

Brunton, D. 1992. 'Smallpox inoculation and demographic trends in eighteenth-century Scotland', *Medical History*, 36(4): 403-29.

Carmichael, A.G. and Silverstein, A.M. (1987) 'Smallpox in Europe before the seventeenth century: virulent killer or benign disease?', *Journal of the History of Medicine and Allied Sciences*, 42: 147-168.

Creighton, C., *A history of epidemics in Britain*, vol. II (Cambridge, 1894).

Crook, D. 2006. *Defying the demon. Smallpox in Sussex*. Lewes: Dale House Press.

Davenport, R.J., J.P. Boulton and L. Schwarz. 2011. 'The decline of adult smallpox in eighteenth-century London', *Economic History Review* 64(4): 1289-1314.

Davenport, R.J., J.P. Boulton and L. Schwarz. 2016. 'Urban inoculation and the decline of smallpox in eighteenth-century cities – a reply to Razzell', *Economic History Review*, 69(1): 188-214.

Davenport, R.J., Satchell, M. & Shaw-Taylor, L. 2018. 'The geography of smallpox in England before vaccination: a conundrum resolved', *Social Science and Medicine* (in press).

Dimsdale, T. 1778. *Observations on the introduction to the plan of the dispensary for general inoculation*. London.

Dobson, M.J. 1997. *Contours of Death and Disease in Early Modern England.* Cambridge: Cambridge University Press.

Dobson, M.J. 1989. 'Mortality gradients and disease exchanges: comparisons from old England and colonial America', *Social History of Medicine*, 2: 259-97.

Duggan, A.T., Perdomo, M.F., Piombino-Mascall, D., Marciniak, S. Poinar, D, Emery, M.V. et al. 2016. '17th century variola virus reveals the recent history of smallpox', *Current Biology*, 26: 1-6.

Durey, M. 1979. *The return of the plague: British society and the cholera 1831-2.* Dublin: Gill and MacMillan.

Farr, A.D. 1977. *Medical developments and religious belief, with special reference to Europe in the 18th and 19th centuries.* Unpubl. Ph.D. dissertation, Open University.

Fenner,F., Henderson, D.A., Arita, I., Ježek, Z. & Ladnyi, I.D. 1988. *Smallpox and its eradication*. Geneva: World Health Organisation.

Haygarth, J. 1793. *Sketch of a plan to exterminate the casual small-pox from Great Britain; and to introduce general inoculation*. London.

Haygarth, J. 1784. *An inquiry how to prevent the small-pox. And proceedings of a society for promoting general inoculation at stated periods, and preventing the natural small-pox, in Chester*. Chester.

Henderson, D.A. 2009. *Smallpox: the death of a disease*, New York: Prometheus Books.

Hermann, C. 2013 'Caring for the sick and poor in eighteenth-century Royston', in S. King & G. Gear (eds.) *A caring county? Social welfare in Hertfordshire from 1600.* Hatfield: University of Hertfordshire Press: 45-68.

Hudson, P. & Hunter, L. (1981) 'The autobiography of William Hart, Cooper, 1776-1857: a respectable artisan in the Industrial Revolution', *London Journal*, 7(2): 144-60.

Jannetta, A.B. 1987. *Epidemics and mortality in early modern Japan*, Princeton, Princeton University Press.

Jenner, E.A. 1798. 'An inquiry into the causes and effects of the variole vaccine, or cowpox'.

Landers, J. 1993. *Death and the metropolis: studies in the demographic history of London, 1670–1830,* Cambridge: Cambridge University Press.

Leadbeater, R.A. 2015. *Experiencing smallpox in eighteenth-century England*. PhD dissertation, Oxford Brookes University.

Li, Y., Carroll, D.S., Gardner, S.N., Walsh, M.C., Vitalis, E.A. and Damon I.K. 2007. 'On the origins of smallpox: correlating variola phylogenics with historical smallpox records', *Proceedings of the National Academy of Sciences*, 104(40): 15787-92

Lucas, J. 1789. 'Remarks on febrile contagion', *London Medical Journal*, X: 260-76

Maule, G. & Selwyn, W. 1817. *Reports of cases argued and determined in the Court of King's Bench,* vol. IV. London: Butterworth & Son.

May, M. 1997. 'Inoculating the urban poor in the late eighteenth century', *British Journal for the History of Science*, 30(3): 291-305

Mead, R. 1720. *A discourse on the plague.*

Mercer, A. 1990. *Disease, mortality and population in transition*. Leicester.

Monro, A. 1765. *An account of the inoculation of small pox in Scotland.* Edinburgh.

Morris, R.J. 1976. *Cholera 1832*. London: Croom Helm.

Razzell, P. 2003. *The conquest of smallpox: the impact of inoculation on smallpox mortality in eighteenth century Britain* (2nd edn). Caliban Books.

Rusnock, A.A. 2009. *Vital accounts: quantifying health and population in eighteenth-century England and France*. Cambridge: Cambridge University Press.

Shaw-Taylor, L. (2005) 'Family farms and capitalist farms in mid-nineteenth century England', *Agricultural History Review*, 53: 158-91.

Shaw-Taylor, L. (2012) 'The rise of agrarian capitalism and the decline of family farming in England', *Economic History Review*, 65: 26-60.

Sköld, P. 1996. *The two faces of smallpox: a disease and its prevention in eighteenth and nineteenth century Sweden*. Report No. 12, Demographic Database Umeå: UmU Tryckeri.

Sköld, P. 1996. 'Escape from catastrophe: the Saami's experience with smallpox in eighteenth- and early-nineteenth-century Sweden', *Social Science History*, 21(1): 1-25.

Slack, P. 1992. 'Introduction' in T. Ranger & P. Slack (eds.) *Epidemics and ideas: essays on the historical perception of pestilence*. Cambridge: Cambridge University Press.

Slack, P. 1985. *The impact of plague in Tudor and Stuart England*. London: RKP.

Smith, J.R. 1987. *The speckled monster: smallpox in England, 1670-1970, with particular reference to Essex*, Chelmsford: Essex Record Office.

Stuart, W. 1788. 'Letter', *Gentleman's Magazine*, 53, vol. 1, part 4: 283-4.

Suzuki, A. 2011. 'Smallpox and the epidemiological heritage of modern Japan: towards a total history', *Medical History*, 55: 313-18.

Thomas, E.G. 1980. 'The old poor law and medicine', *Medical History*, 24: 1-19.

Vialls, C.M. 1998. *The laws of settlement: their impact on the poor inhabitants of the Daventry area of Northamptonshire, 1750-1834*. Unpubl. Ph.D. thesis, University of Leicester.

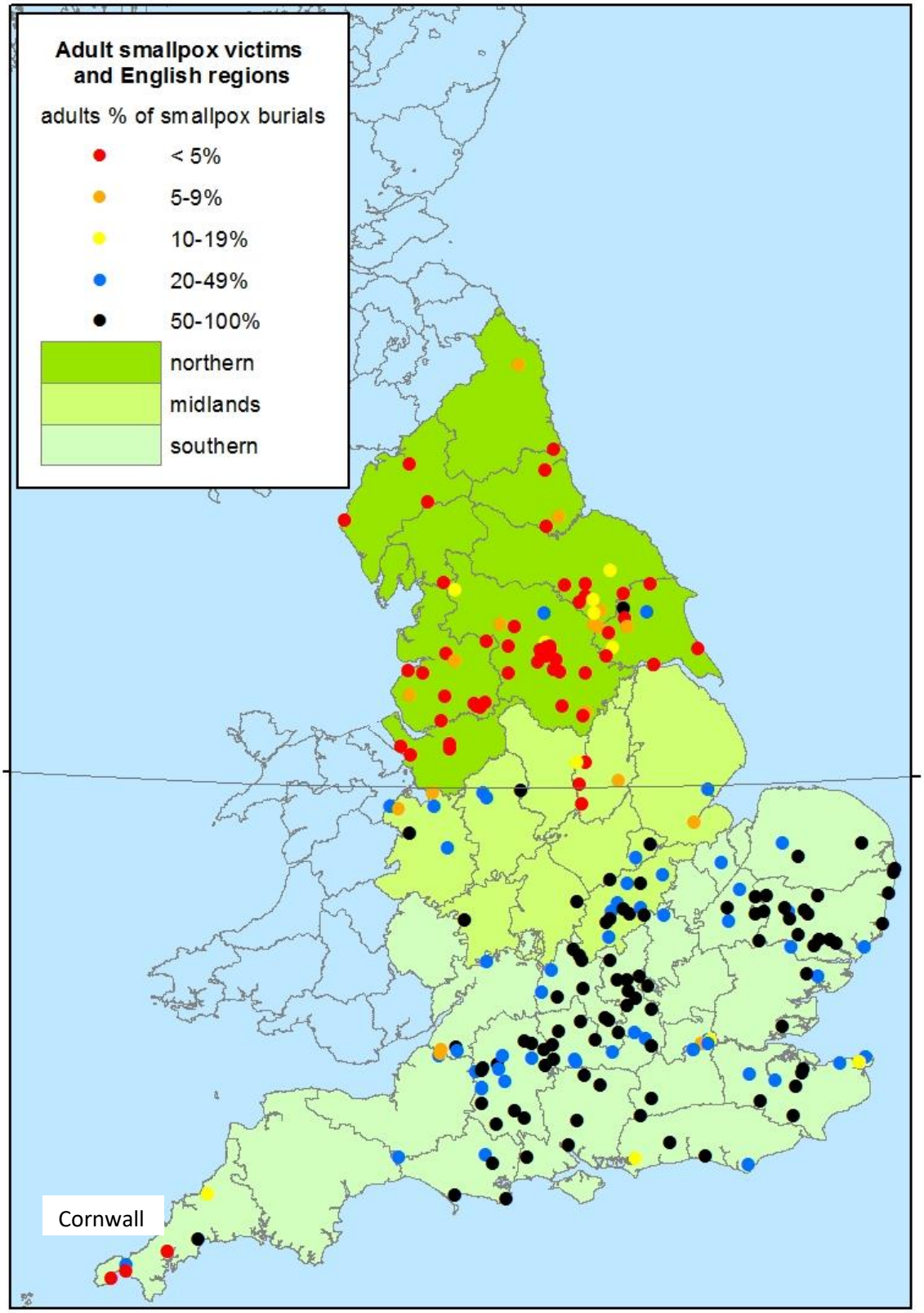

Figure 1. Percentage of smallpox burials aged 15+ or adult by parish or town, 1700-1799, and traditional English regions.
Notes: the line of latitude marked is 53' 00". Divisions represent county borders.

Sources: electronic records donated by Buckinghamshire Family History Society, Cambridgeshire Family History Society, Cumbria Family History Society; Durham Records Online, Lancashire Online Parish Clerks, Manchester and Lancashire Family History Society, Northamptonshire Family History, Nottinghamshire Family History Society, Suffolk Family History Society, Wharfedale Family History Society, Wiltshire Family History Society. Smallpox burials were extracted from *Berkshire Burials* (11th edn, Berkshire Family History Society), *Hampshire Genealogical Society burial index* (HCD011, Hampshire Genealogical Society), *Bristol diocese burial registers* vol. 3, 1754-1812 (Bristol and Avon Family History Society), *Rutland Parish Registers compilation DVD* and *Leicestershire Parish Registers CD31* (Leicestershire and Rutland Family History Society); Razzell, P. (2003) *The conquest of smallpox*, 2nd edn. (Caliban Books), pp. xi-xiii.

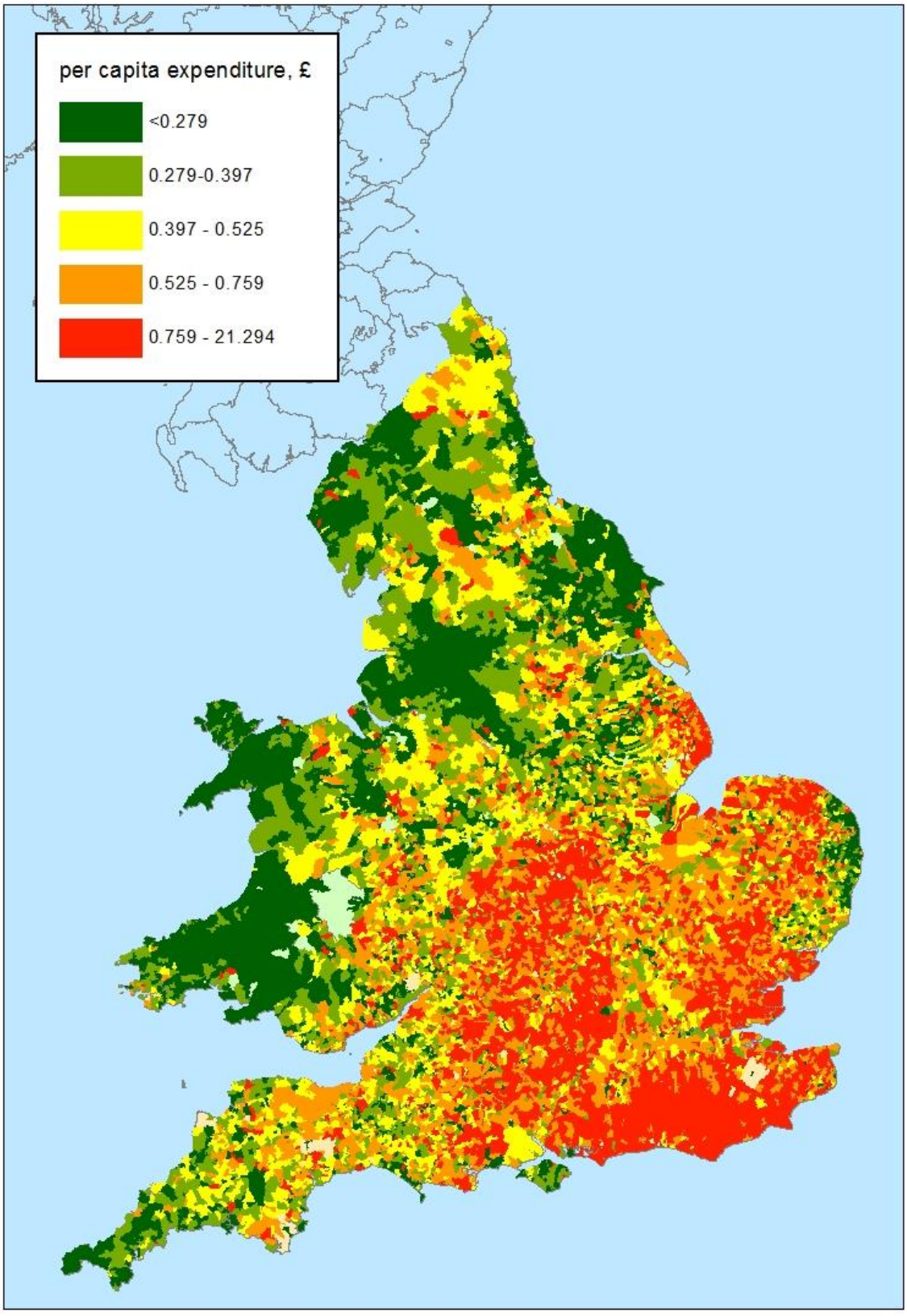

Figure 2. Per capita poor law expenditure by parish, 1803.
Source: Parliamentary Papers, *Abstract of the answers and returns made pursuant to Act 43 Geo. 3, relative to the expense and maintenance of the poor in England* (1803-04).

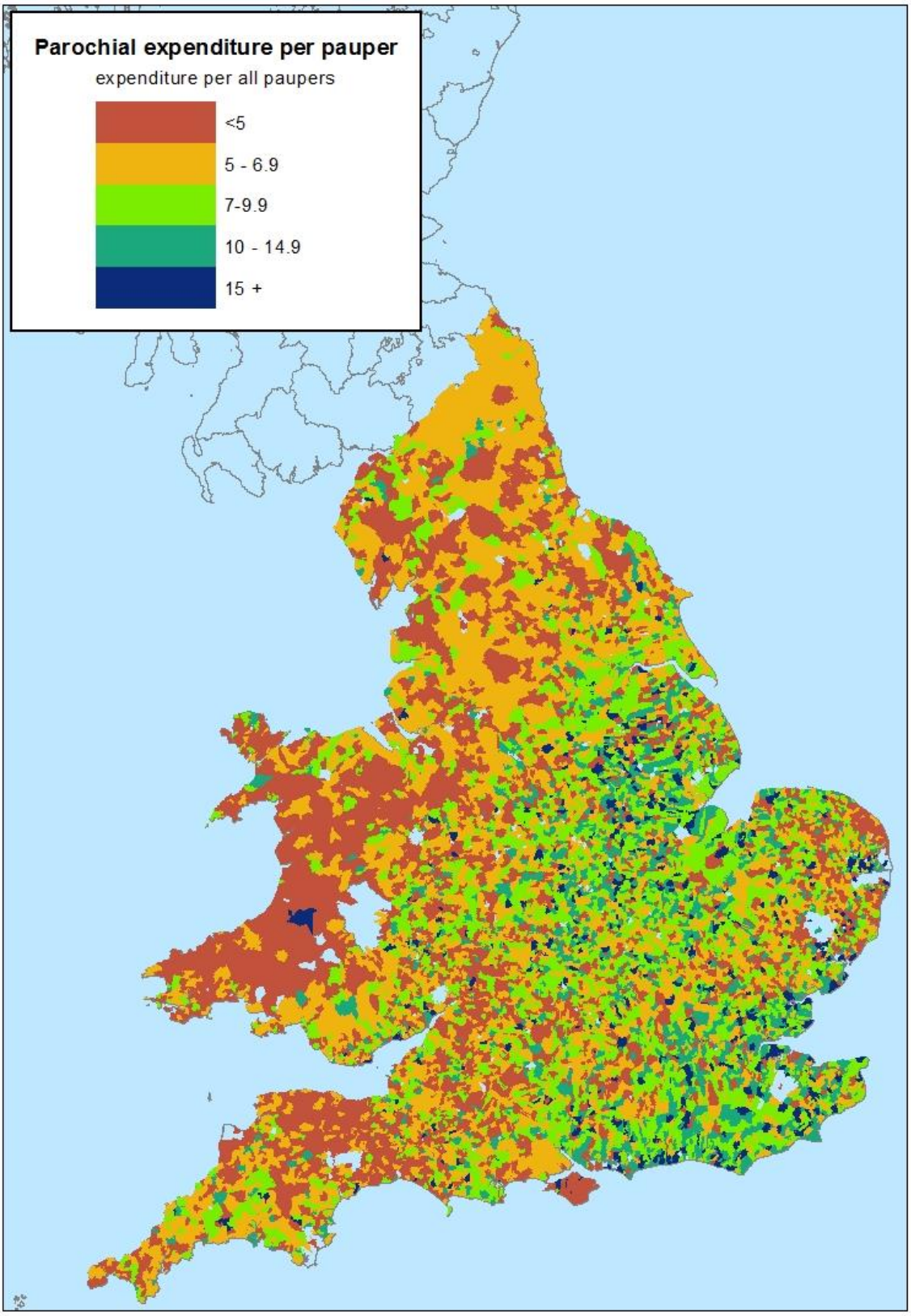

Figure 3. Poor law expenditure (£) per pauper, by parish, 1803.
Notes: Paupers were broadly defined here to include both those recorded as in receipt of constant payments (in workhouses and in their own homes), and in receipt of occasional payments.

Source: Parliamentary Papers, *Abstract of the answers and returns made pursuant to Act 43 Geo. 3, relative to the expense and maintenance of the poor in England* (1803-04).

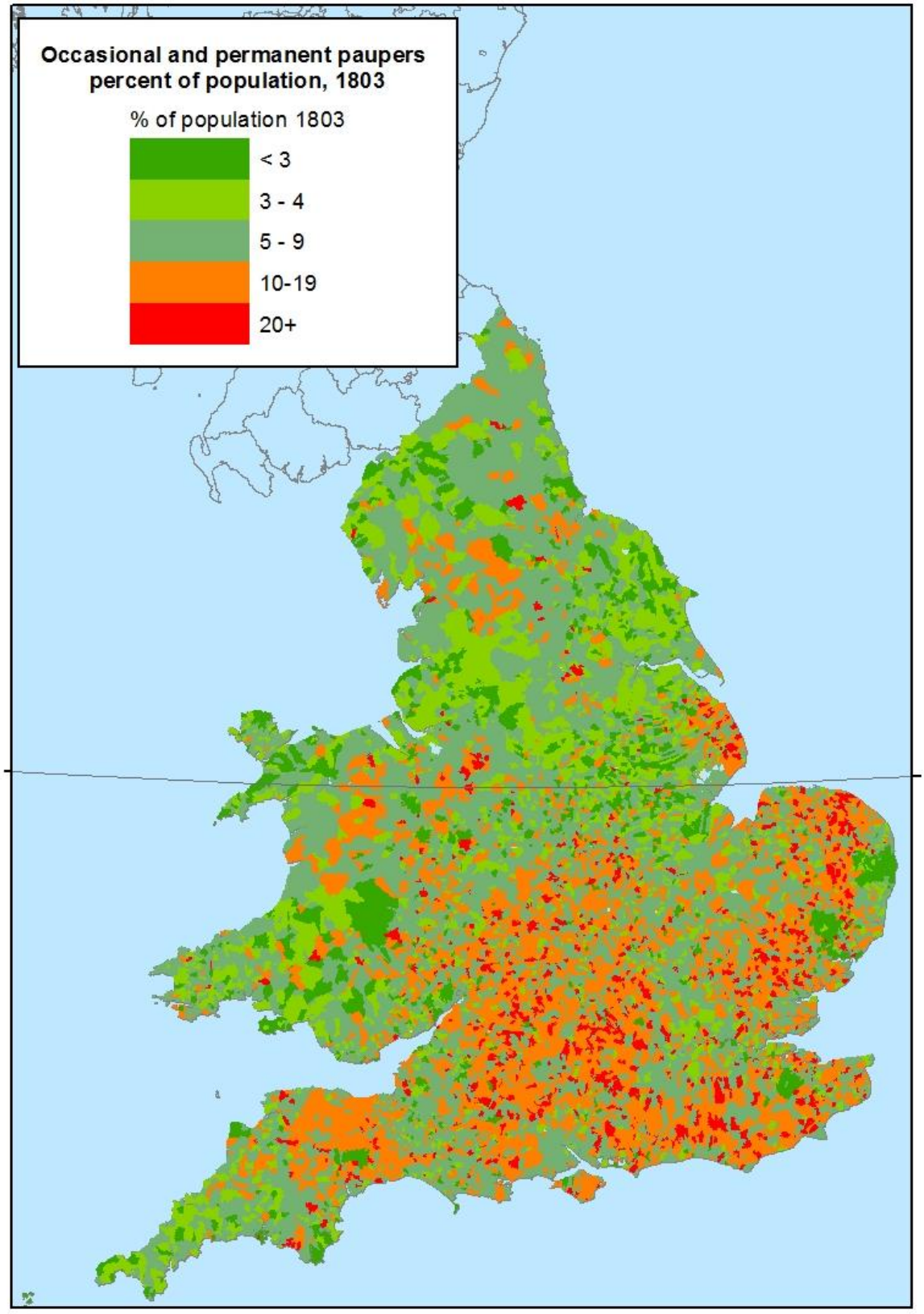

Figure 4. Paupers per capita population of parish, 1803.

Notes: see Figure 5.

Source: Parliamentary Papers, *Abstract of the answers and returns made pursuant to Act 43 Geo. 3, relative to the expense and maintenance of the poor in England* (1803-04).