The Geography of Smallpox in England before Vaccination: a Conundrum Compounded.

Abstract

Davenport, Satchall and Shaw-Taylor have presented evidence confirming the pattern of age profiles of smallpox victims in the north and south of England, as well as Scotland and Sweden. They have argued that the presence of adult smallpox burials in the south of England was the result of avoidance of the disease linked to the presence of pest houses from the late seventeenth century onwards. Evidence is presented in this paper to show that the age pattern of smallpox in the south was present as early as the sixteenth century, indicating that the age profile of the disease was associated with avoidance practices at a much earlier date. Smallpox virulence grew steadily from the sixteenth to the nineteenth century, explaining why pest houses were not used for the isolation of the disease until the end of the seventeenth century. The greater wealth and resources of the elite – royalty, the aristocracy, gentry, lawyers, and merchants – enabled these groups to flee smallpox. The royal family occupied palaces in all areas of southern England, and in annual 'progresses' took their servants and dependants into surrounding metropolitan counties. It is hypothesized that by taking their servants and dependants with them, and by attracting the support of a wide network of tradesmen, these elite groups helped create a culture of disease avoidance in a wider population. Additionally, it is argued that the greater literacy and Protestantism of London and the south was associated in metropolitan areas with an opposition to fatalistic religious resignation to disease. In Sweden it was its position as a continental power subject to frequent wars and trading activities which resulted in the importation of smallpox and the occurrence of childhood disease. However, further research is necessary before the conundrum of the age profile of smallpox before vaccination is fully resolved.

Introduction

Romola Davenport, Max Satchell and Leigh Shaw-Taylor should be commended for their research regarding the geography of smallpox in pre-vaccination England. (Davenport, Satchell and Shaw-Taylor, 2018. By compiling seven million records donated by family history and genealogical societies in electronic form, they have identified 225 burial registers from the period 1540-1799 that reported smallpox burials with some indication of age status. This compiling of digital records is likely to be the future of research for medical and demographic history, allowing detailed exploration of a number of important issues.

They have confirmed my own analysis of the distribution of smallpox burials by age in England, with child burials concentrated in the north and a mixture of adult and child burials mainly in the south. (Razzell, 2003, pp. xi-xiii; Davenport, et.al., 2018: p. 80). They have also confirmed the concentration of general inoculations in the south of England (Razzell, 2003: pp. xix, xx; Davenport et. al, 2018: p. 79).

They have concluded that "practices designed deliberately to stop the spread of smallpox (isolation of the poor in pest houses and general immunisation) explained almost all of the strong spatial patterning observed in the sample." (Davenport et. al, 2018: p. 83). There are however a number of problems with their analysis, which may be summarized as follows.

1. They concluded that "the relatively small differences in case-fatality rates by age mean that the age structure of smallpox burials provide some indication of the age profile of those infected." (Davenport et.al, 2018: p. 76) However, there is evidence that there were marked differences in the fatality of smallpox burials by age.

2. There is also evidence that the pattern of age distribution of smallpox was present in England as early as the sixteenth century, well before the use of pest houses for isolation of the disease.

3. Their analysis takes no account of the rising virulence of smallpox between the sixteenth and nineteenth centuries.

4. In the case of Sweden, there is a more plausible explanation for the concentration of smallpox amongst young children than provided by the authors.

I will discuss these issues under the above headings.

Age Related Smallpox Case-Fatality Rates.

The earliest evidence on the age related fatality of smallpox is for the rural parish of Aynho in Northamptonshire.

Table 1: A Smallpox Epidemic in Aynho, Northamptonshire, 1723-24 (Razzell, 2003: p. 153)

Ages	Cases	Burials	Percentage Fatality
Under Ten	28	4	14%
10-20	47	4	9%
20-30	25	6	24%
30+	32	11	34%

Although the number of cases is small, it suggests that there was a significant difference in the fatality of smallpox by age in this rural parish. This is confirmed by data published by the Whitehaven Dispensary at the end of the eighteenth century.

Table 2: Age Specific Case Fatality Rates of Smallpox in the Whitehaven, Cumbria Dispensary, 1783-1804 (Razzell, 2003: p. xviii)

Age Group (Years)	Number of Smallpox Cases	Number of Smallpox Deaths	Case Fatality Rate
0-2	378	139	37%
2-5	665	105	16%
5-10	308	32	10%
10+	36	3	8%

There were marked differences in smallpox mortality by age in this northern town parish, with the disease nearly four times more fatal among children under the age of two compared to children aged five to ten years. There is also evidence that there was a U-shaped pattern of case fatality between the young and old. For example, an analysis of 15,000 unvaccinated cases in London towards the end of the nineteenth century revealed the following:

Table 3: Case-Fatality Rates in the Metropolitan Boards Hospitals, 1867-72. (Smith, 1987: p. 63; Creighton, 1965, 2: p. 618)

Age	Fatalities Expressed as Percentages of Cases
Under 5	52
5-10	26
10-20	9
20-30	17
30-40	24
40-50	29
50-60	28
Over 60	20

This U-shaped pattern is confirmed by data from other countries (Razzell, 2003: p. 167), and the above evidence contradicts Davenport et.al's statement that smallpox burials reflect the incidence of the disease itself. We must therefore proceed with caution when analysing data from burial registers, which can only very broadly suggest age-patterns of the incidence of smallpox.

Age Related Patterns of Smallpox Incidence in the Pre-Eighteenth Century Period.

Davenport et.al have concluded that the pattern of mixed childhood/adult smallpox burials in the south of England is the result of avoidance of the disease. They argued that "the most readily quantifiable evidence of smallpox avoidance is the use of pest houses to isolate (mainly poor) smallpox victims ... and that the preventative practices identified here do not appear to be of ancient origin, but developed over the course of the late seventeenth and eighteenth centuries." (Davenport et.al., 2018: pp. 77, 84) In support of this conclusion they present evidence to suggest that smallpox isolation houses only existed from the late seventeenth century onwards. (Davenport et.al., 2018: p. 79) Yet there is data to suggest that the age-related pattern of smallpox existed as early as the sixteenth century.

Table 4: Age of Smallpox Burial in St. Boltoph Aldgate, 1583-99 (Forbes, 1971:p. 103)

Age Group	Number of Smallpox Burials	Proportion of Total
2-6 Months	8	6.8%
7-11 Months	9	7.7%
1 Year	24	20.5%
2 Years	14	12.0%
3 Years	14	12.0%
4 Years	6	5.1%
5-6 Years	8	6.8%
7-9 Years	7	6.0%
10-14 Years	0	0%
15-19 Years	7	6.0%
20-29 Years	8	6.8%
30-39Years	7	6.0%
40-49 Years	2	1.7%
50-59 Years	2	1.7%
60-69 Years	1	0.9%
Total	117	100%

Smallpox was present in Aldgate every year in the period between 1583 and 1599 (Forbes, 1971: p. 104), and was endemic in London at this time, with the majority of burials being of children under the age of ten[1]. However, there were also a significant number of adult smallpox burials at this time, similar to what was found in London in the middle of the eighteenth century.

Table 5: Age of Burial of Smallpox Victims in London (Forbes 1971, p. 100; Razzell, 2011: p. 1316; Razzell, 2016: p. 5; Davenport, Schwarz and Boulton, 2011: p. 1295)

	0	1-4	5-9	10-19	20+	Total Number
St. Botolph Aldgate, 1583-99	14.5%	49.6%	12.8%	6.0%	17.1%	117
St. Mary Whitechapel, 1743-48	21.1%	54.7%	10.3%	2.3%	11.7%	351
St. Martins in the Fields, 1752-66	13.7%	54.5%	10.9%	4.6%	16.3%	1083
St. John, Wapping, 1763-67	19.9%	52.4%	9.0%	3.0%	15.7%	351

Additionally, a third of the fifteen smallpox burials in the parish of Bermondsey were over the age of ten in the period 1611-41.[2] This parish was on the south bank of the Thames and next to London Bridge, supporting the conclusion that a significant proportion of smallpox victims in London in the late sixteenth and early seventeenth century were adults.

I have previously presented evidence to show that the presence of adult smallpox victims was due to the migration into London of adults who had escaped the disease in its rural hinterlands, and that these adult victims largely disappeared in London as a result of general inoculations in these rural areas.[3] (Razzell, 2011; Razzell, 2016). Davenport, Satchell and Leigh-Taylor have accepted that the presence of adult smallpox victims in London was largely due to migration patterns:

> 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. McNeill [described] ... a transitional phase, where immunising diseases such as smallpox had become endemic childhood diseases amongst long-term urban residents, but remained relatively infrequent and epidemic in surrounding rural areas. In this situation adult migrants to towns were often immunologically naive, and fell victim to urban diseases upon arrival, producing bimodal patterns of smallpox infection by age ... Young adults constituted the main source of migrants to London, and the bimodal pattern of smallpox victims confirms McNeill's prediction regarding the vulnerability of rural-urban migrants.' (Davenport, Satchell and Leigh-Taylor, 2018: p. 76; Davenport, 2018: p. 3)

[1] There was a similar pattern of childhood smallpox in the parish of Allhallows in the Wall in the same period. (Allhallows in the Wall burial Register, 1878, Chiswick Press).

[2] I would like to thank Romola Davenport for sending me this information.

[3] Data compiled by Rosemary Leadbeater for Oxfordshire indicates that adult smallpox burials as a proportion of the total fell from 16.6% in 1714-38 to 15.8% in 1740-68 and 6.0% in 1770-99, probably as a result of general inoculations. (Leadbeater, 2015: pp. 49-54)

The presence of adult smallpox victims in Aldgate in the later sixteenth century suggests that a similar pattern of migration was in existence at that time, with rural southern populations experiencing the disease during adulthood. This is confirmed by evidence from a number of sources. In Shipton-under-Wychwood, Oxfordshire there were three smallpox burials in the late sixteenth and early seventeenth century: adults in both 1587 and 1616, and a 'youth' in 1624.[4] In the parish of Hadleigh in Suffolk six of the twenty-six smallpox burials in 1633 were adults – 23 per cent. In 1645 a smallpox epidemic broke out amongst adult soldiers in the garrison at Newport Pagnell in Bedfordshire. (Godber, 1969: pp. 281, 282) In Bridford, Wiltshire in 1655/56 there were four adult smallpox burials – a shepherd, a wife, a servant and an adult woman.[5] In Brenchley, Kent in 1657 all four smallpox burials were of adults.[6]

There is abundant evidence for the presence of smallpox amongst the elite population in the sixteenth and early seventeenth century. Creighton summarized the incidence of smallpox during the late sixteenth and early seventeenth century as follows:

> In 1593 we come across the first systematic English essay on the disease [of smallpox] ... by Simon Kellwaye ... 'the smalle poxe doth generally abound both in young and old people.' In 1613, the Lord Harrington ... died of the smallpox ... at which date also the Lady Burghley and two of her daughters were sick of the same disease ... All the indications, whether from letters of the time, from poems and plays, or from statistics, point to the first Stuart reigns as the period when smallpox became an alarming disease in London among adults and in the upper class .... we do know from references to smallpox in the familiar writings of the Stuart period that many of its attacks, with a high ratio of fatalities, must have happened to adults. Thus, to take the diary of John Evelyn, he himself had smallpox abroad when he was a young man, his two daughters died of it in early womanhood within a few months of each other, and the suitor for a hand of one of them died of it about the same time. Medical writings leave the same impression of smallpox attacking many after the age of childhood.' (Creighton, 1, 1965: p. 461; Creighton, 2, 1965: pp. 435, 436, 443, 444)

Most of the elite population referred to by Creighton lived in the south of England, like the children of the Reverend Ralph Josselin born in rural Essex. He had five children who had escaped smallpox until the onset of their adolescence, but all caught the disease when they moved to live in London: Tom aged fifteen in 1659; Ann aged fourteen in 1668, John aged eighteen in 1669, Elizabeth aged eighteen in 1678, and Rebecka aged seventeen in 1680. (Macfarlane, 1970: pp. 112, 118-20, 170, 234)

Deaths from smallpox were recorded frequently in the diaries and writings of the wealthy. For example, "smallpox claimed the only son of the sixth Earl of Huntingdon on 24 June 1649 ... an undistinguished nineteen-year old ..." (Anselment, 1989: pp. 72, 73) In September 1660, Henry Duke of Gloucester, fell ill aged 21 with smallpox and died on the tenth day of his illness. (Hopkins, 1983: p. 37) Princess Mary of Orange too died of smallpox at Whitehall aged 29 in the same year. (Hopkins, 1983: pp. 37, 40)

Joan Moody has collected all references to adult smallpox in Oxford in the antiquarian Anthony Wood's recollections:

> "... in 1662 'smallpox rages at New College' ... and in May [1666] 'John Fisher, A,B, of Lync. Coll. died of the small-pox being the fifth of that College that hath died of that disease this present year, eleven having been sick of it at that Coll' ... On 23rd November [1668] 'Mr Thomas Hobs B.D. fellow of Magd. Coll. Died of the small-box

[4] I would like to thank Rosemary Leadbeater for this reference.
[5] I would like to thank Barbara and colleagues at the Wiltshire Family History Society for this reference.
[6] Data was kindly provided by Romola Davenport.

> buried in the chapel. Fourteen of that house sick of the small-pox by the 6th of Dec." (Moody, 1996: pp. 39, 40)

There is no evidence of a pest house in Oxford devoted to isolating smallpox during the late seventeenth century, but the town had significant numbers of adult smallpox victims in this period.

There is limited evidence from parish registers confirming the age pattern of smallpox burials in the north of England in the seventeenth century, which is mainly for the general population. Creighton again summarized some of this: "The reference to smallpox at Aberdeen in 1610 is to a disease among children; and so also is a unique entry, opposite the year 1636, on the margin of Trinity parish, Chester': 'For this two or three years, divers children died of smallpox in Chester.'" (Creighton, 2, 1965: p. 436) The burial register of Ellastone in Staffordshire registered ten smallpox burials in 1636, and where it was possible to trace the age status of these burials, seven were young children and one was an adult servant.[7] According to the Bolton, Lancashire burial register in 1647/48, all 63 smallpox burials in the town were children; and likewise all 65 smallpox burials in 1655/56 again were children. (Bolton Burial Register) Duncan et.al carried out a reconstitution study of Penrith in Cumbria and found that the mean age of those dying from smallpox in the years 1656 and 1661 was 4.5 years. (Duncan, Scott and Duncan, 1983: p. 409) The Reverend Oliver Heywood noted in his diary for the year 1667 that of a friend's children living in Yorkshire, ten had caught but recovered from smallpox in that year. (Turner 1882: p. 237)

There is however a relative paucity of evidence from burial registers in the late sixteenth and early seventeenth centuries both in the south and north of England. This is probably because the disease was so mild in this period that clergymen and their clerks did not feel it worthwhile to notify its prevalence. As a result, further research is required to fully establish the age pattern of smallpox in the late sixteenth and early seventeenth century.

Case Fatality of Smallpox in the Period between the Sixteenth and Nineteenth Centuries.

Many contemporaries noted the increasing virulence of smallpox between the early seventeenth and late nineteenth centuries (Carmichael, A.G. and Silverstein, A.M., 1987), and there is biological evidence for a surge of virulence in the sixteenth century. (Duggan et al., 2016) In 1641, Sherwood claimed that smallpox had become "more malignant than any that have reigned in my remembrance." (Sherwood, 1641: p. 9) Miller summarized the history of the increasing virulence of the disease as follows:

> It was not until the seventeenth century... [that smallpox] begin to figure as a major hazard arousing dread and anxiety ... It was originally associated with the measles by Arabic writers, a union which continued as late as the seventeenth century ... (Miller, 1957: p. 29)

This conclusion is supported by contemporary writings:

> Dr Tobias Whitaker [one of the king's physicians] who had attended the Court in it exile ... On his return to London in 1660, he seemed to find as great a change in smallpox as in the disposition of the people towards the monarchy. His statement as to the change for the worse that had come over smallpox within his memory.... 'This disease of smallpox', he proceeds, 'was antiently and generally in the common place of *petit* and *puerile,* and the cure of no moment ... ... for hundreds of years ... hath been as commonly cured as it hapned ...' (Creighton, 1965, 2: pp. 439, 440)

[7] I would like to thank Owen Gower of the Jenner Museum for providing the data on which this conclusion is based.

"An anonymous publication of 1663 was called *Hactenus inaudita,* the increasing mortality of smallpox being the hitherto unheard-of thing." (Miller, 1957: 30) Marchmont Needham in 1665 ... "pointed out that the smallpox and measles had been very gentle until about forty years earlier ..." (Miller, 1957: p. 30)

Lettsom, writing later in 1805 stated that "I think, from my own experience, that the malignity [of smallpox] even in London is augmenting. When I practised here, 35 years ago, one in ten was the calculation; but I think one in six is now a fair proportion." (Razzell, 2003: p. 179) And in the late nineteenth century McVail concluded through a detailed examination of the sources that:

> . . . natural smallpox gradually became throughout the eighteenth century, and up to the epidemic of 1870-73, a more virulent and fatal disease, its maximum fatality being on a large basis of facts 45 per cent ...' (Razzell, 2003: p. 169)

The literary evidence on the increasing fatality of smallpox is supported by the statistical evidence from the Bills of Mortality and other evidence.

Table 6: Smallpox Burials in London, 1574-1759.[8] (Creighton, 1965, 2: pp. 436, 456, 461, 531; Razzell 2003, p. 169)

Period	Proportion of Smallpox to Total Burials
1574-98	1.6%
1629-36	2.8%
1661-79	5.3%
1680-99	6.3%
1700-19	7.0%
1720-39	7.9%
1740-59	8.5%

This table shows a steady and overall a linear increase in virulence of smallpox between 1574 and 1759. Smallpox was more fatal than suggested by this table. Smallpox burials as a proportion of baptisms in London in 1740-59 was 13.5% (Razzell, 2003: p. 198), and as the disease was endemic in the city, this is a more reliable way to assess overall fatality.

As inoculation began to be practised in London after the middle of the eighteenth century, it is no longer appropriate to express smallpox burials as a proportion of total burials as a measure of case-fatality. A more accurate measure is to be found in the statistics of the London Smallpox Hospital:

Table 7: Case-Fatality Rate of Smallpox in the London Smallpox Hospital. (Razzell, 2003: p. 176)

Period	Number of Cases	Case Fatality Rate
1746-63	6456	26%
1776-1800	7017	32%
1836-51	2654	38%

There was a steady increase in fatality in the period 1746-1851, which continued until the end of the nineteenth century. Data for six towns for the period 1887-93 showed that 42.7 per cent

[8] The figures for 1629-1759 are taken from the Bills of Mortality; the figure for 1574-98 is from the parish of Aldgate.

of all unvaccinated children died from the disease. (Razzell, 2003: p. 177) The increasing virulence of smallpox is important because the earlier milder forms led to a greater acceptance of the disease. Monro described apparently longstanding practices in Scotland akin to 'chickenpox parties' where susceptible children were exposed to another child considered to have a favourable case of the disease. (Monro, 1765: p. 3). This practice has also been described in Wales, and amongst families in southern England in the seventeenth century. (Creighton, 2, 1965: pp. 471-2). A similar experience occurred in Diss, Norfolk in 1784: "In March last, the smallpox broke out in this town; it was of so favourable a kind, that the sick did not confine themselves to their houses; by means of which the disease was communicated to several families ..." (Razzell, 2003: p. 118)

The Avoidance of Smallpox in the Pre-Vaccination Period

The use of pest houses to isolate smallpox cases since the late seventeenth century was probably the result of the increasing virulence of the disease. Avoidance of smallpox had certainly existed at an earlier period, particularly amongst the wealthy, who had the resources to enable this. This was part of a general pattern of avoidance of infectious diseases which occurred at least as early as the sixteenth century.

> Henry VIII 'was so terrified of a sickness that plagued 16th century England that he travelled around the country to avoid it ... During certain periods the king would sleep in a different house every night to avoid outbreaks of plague and an illness known as the sweating sickness.' (*The Times*, Friday April 26th 2019: p. 11)

He "was particularly paranoiac about bubonic plague. When his court went on progress, messengers were sent ahead to check whether towns en route were infected. At Windsor and Calais, the sick were dragged out of their houses and left to die in the fields." (Hutchinson, 2014)

Henry caught smallpox aged 22 in 1514 (Creighton, Vol. 1, 1965: p. 456) but his fear of the disease was so great that in 1518 he "and his court were forced to leave Wallingford in Berkshire because of smallpox in that area." (Hopkins, 1983: p. 31; Creighton, Vol. 1, 1965: p. 456) Queen Elizabeth was prevented from staying at Burghley House in 1565 because of the presence of smallpox, even though she had previously been attacked by the disease aged 29, along with her Maid-in-Waiting Lady Mary Sidney, in October 1562. (Jenner Museum Archive, Reference Bekm/19; Behbehani, 1925**:** p. 5).

Creighton summarized how fear of the disease led to such avoidance in the early seventeenth century:

> Several letters relating to a fatal case of smallpox in June [1628] in the house of Sir John Coke in the city (Garlick Hill) bear witness to the dread of contagion through all that circle of society. One of the letters may be cited: "It pleased God to visit Mrs Elleys (Coke's stepdaughter) with such a disease that neither she nor any other of her nearest and dearest friends durst come near her unless they would hazard their own health. The children and almost all our family were sent to Tottenham before she fell sick with us of the smallpox ... twelve days or thereabouts.' ... [She] died the next morning at five o'clock, being buried the same night at ten, with only Sir Robert Lee and his lady of her kindred at the funeral." The letter proceeds: "God knows we have been sequestered from many of our friends' company, who came not near us or fear of infection, and indeed were very circumspect, careful, and unwilling that any should come to us to impair their health."(Creighton, 1965, 2: pp. 435, 436)

In 1634 Katherine Oxiden living in Kent revealed her fears about contact with a family she was staying with. She wrote to a friend:

> I desire that you will doe mee the favefor to let me have a Chamber more for a time too lay a sick boddi in if i should have visited with the smale pox for it is so rife that I looke evri day, when one of us shale have it ... for tis at Browses and wee fetch water and bake together an when we whash we have noe remedie but too come together if they will intrud them selfes in to the kitchen ... (Gardiner, 1933: p. 94)

Another member of the family wrote to a friend in 1641 that as a result of his son's smallpox "that if you thinke I may danger any at your meeting, upon notice given I shall refraine coming." (Gardiner, 1933: p. 216) In the previous year, the Venetian Ambassador's representative reported that as a result of the ambassador's son dying of smallpox it was necessary for "all this household abstaining from communicating with the Court and with all others, as this disease is considered on a par with the plague, since it attacks every age ..." (Calendar of State Papers Venetian, 25, 1642: p. 99)

A similar fear of infection is reflected in the writings of Jane Austen over one hundred-and-fifty years later. She wrote in *Sense and Sensibility:* "the word infection ... gave instant alarm to Mrs Palmer on her baby's account ... and confirming Charlotte's fears and caution, urged the necessity of her immediate removal of her infant." (Austen, 1994: p. 186)

Parishes attempted to isolate smallpox cases from the beginning of the eighteenth century onwards, but this was not always successful. A detailed example of this is what occurred in the town of Lewes in Sussex in 1794.

> On Monday 4th of January, it was represented to the Chief Officers of the Borough that the Small Pox was at that time at its full height in the House of George Apted, in St. Mary's Lane . . . he was determined they [his family] should all remain where they were. The Constables then resorted to the early Measures they saw within their Power; they caused a high wood Fence to be erected around his Door, and placed a Watch both by Night and Day, to prevent the infected Family from mixing any more with other Persons in the Neighbourhood. On Friday the 10th at Six in the Evening, another Meeting on the same Business was called by the Constables. At this second Meeting (which entirely filled the Town Hall) it appeared that the Disorder further manifested itself in the families of several other Persons within the said St. Mary's Lane, and that each of them refused to remove, the Determination of this Meeting was to block up the infected Lane at both Ends . . . Several of the Heads of infected Families having, in the Hall (at a meeting on Saturday, 11th), refused to remove their Children etc or to suffer them to be removed, a General Inoculation was by some thought advisable; it was therefore deemed proper to request the Constables again to adjourn the Meeting to the next Evening (Sunday) and to give the most public Notice by Hand Bills and by Proclamation at the several Parish Churches that the Question of the Necessity of a General Inoculation would on that Evening, be discussed and determined . . . It was afterwards resolved that in the Consequence of the Opinions given to the Faculty, a General Inoculation does not at present appear necessary. On Monday, the 13th every Gentleman of the Faculty within the Borough with one of the Constables visited the infected Families, and finding the Disorder much wider spread than they had expected, they desired the Constables again to call a Meeting of the Inhabitants which was very numerously and respectably attended – at this Meeting it was determined that a General Inoculation being an Evil much less dreaded than a General Infection, in the Natural Way, which was very likely to take Place within this Town & Neighbourhood, it was solemnly put and carried that 'Circumstances as are at present are, a GENERAL INOCULATION ought to be adopted within the Borough: The Inoculation accordingly commenced the next Day ...' (Razzell, 2003: pp. 115-117)

A similar situation had occurred in Brighton in 1786, when "it also appearing Impossible to Prevent the Infection from Becoming General" a resort to general inoculation took place. (Razzell, 2003: p. 119) This illustrates the difficulty in compelling families to abide by compulsory isolation, and the subsequent resort to a general inoculation to deal with this difficulty. At about the same time, Haygarth attempted to set up a system of isolation in the city of Chester, but this failed as even though his charity offered financial inducements to the poor, they continued to associate with other vulnerable families. (May, 1997: pp. 303, 304)

The History of Smallpox in Sweden.

Davenport, Satchell and Shaw-Taylor have pointed out that smallpox was a young child's disease in Sweden, even though its "population densities were low and settlement pattern dispersed." (Davenport et.al., 2018: p. 75). However, Sweden's geographical location as a continental power had a significant impact on its disease environment.

Sweden was involved in multiple wars with its continental neighbours in the eighteenth century, with Russia, Denmark-Norway, Saxony, the Polish-Lithuanian Commonwealth, Prussia and Hanover. As the *Oxford Companion to Military Histo*ry has pointed out "warfare and disease have always gone hand in hand. Disease affects armies, and armies spread disease."[9] (Holmes, 2001: p. 563) Conscription was compulsory in Sweden, and it organized its army so that "every ten farmsteads were supposed to provide for a fully equipped soldier, including a horse if he was a cavalryman or dragoon ... This system was also used for the navy in coastal areas." (Holmes, 2001: p. 197)

Utterstrom and Lilja provided a summary of the history of infection in Sweden in the eighteenth century as follows:

> The first epidemic of smallpox known to have occurred in Sweden broke out in Malmo in 1736 ... In that year and several following years, wave after wave of epidemics, probably originating on the Continent, passed across the Northern countries ... The wars then in progress – the Swedo-Russian war of 1741-43 coinciding with the War of Austrian Succession (1740-48) on the Continent – helped spread the epidemics ... the increase in the death-rate in Sweden in 1736 and the following years was principally due to various epidemic diseases which appear to have been offshoots of the severe epidemics raging on the Continent ... new pestilences were now introduced by the returning troops – a fact confirmed by county medical officers ...Waves of epidemics passed over Sweden from infected Europe, both from the east and from the west ... The towns around the Gulf of Bothnia were hit by the Russian attacks in the 1710s during the great Nordic war. Several of them were more or less burned down, a few of them several times. (Utterstrom, 1954: pp. 121, 126, 127**;** Lilja, 1994: p. 294)

Skold has provided a focussed discussion of the history of smallpox in Sweden as follows:

> Sweden belonged to an international regime of infection epidemics. Southern Sweden was affected by transmission from Denmark and Germany. The port towns were infected by sailors from other countries. The epidemic which started in Gothenberg in 1823 had its origin in a ship from Amsterdam arriving in May. Smallpox spread to the neighbouring counties of Alvsborg and Skaraborg and when an infected prisoner was sent to Stockholm in November soldiers were infected and the disease spread all over the capital. Stockholm could also expect smallpox to come with travellers from Aland, and island between Finland and Sweden. The western counties north of Halland were reached by smallpox epidemics originating from Norway and northern Sweden

[9] Haygarth pointed out that soldiers were responsible for spreading smallpox in late eighteenth century Chester. (Haygarth, 1784: pp. 188, 189) Similarly Mayhew has referred to at least three epidemics in the sixteenth century were triggered in Rye by returning soldiers from France.' (Mayhew, 1986: p. 160)

suffered several epidemics which came from Finland during the eighteenth and nineteenth centuries. The northern counties of Sweden occasionally reported transmission of smallpox from Russia.' (Skold, 1996: p. 145)

Growing trade with its continental neighbours also exposed Sweden to infection. Increasing population in the small towns of the north and west characterized a period of urban growth, which began around 1750 in response to shifts in Swedish trade patterns from the Baltic to the North Atlantic. Swedish urbanization partly resulted from connections with the European continent. Sweden was part of the European world economy, and the numerous links between Sweden and her continental neighbours created an interdependency that deeply affected and formed the Swedish urban system. (Wikipedia, *History of Sweden*: p. 306; Lilja, 1994: p. 306)

Finland was a part of Sweden in the eighteenth century, and its disease environment was strongly affected by its Russian neighbour: "Russia was the main reservoir of smallpox virus insofar as Finland is concerned ...The reports of the Finnish medical authorities often describe the transmission of smallpox infection in great detail, and they clearly show how important Russia was as a source of the virus. Infection was carried, for example, by the Russian military ..." (Pitkanen K.J., Mielke, J.H. and Jorde, L.B.., 1989: pp. 105, 106).

Conclusion

The evidence presented in this paper confirms Davenport et.al.'s emphasis on avoidance as an explanation of the presence of adult smallpox burials in the south of England. However, this evidence throws doubt on the hypothesis that the age pattern of smallpox in England, Scotland and Sweden was the result of isolation practices introduced at the end of the seventeenth century. The pattern of adult/child smallpox burials in the south of England, and the burial of young children suffering from smallpox in the north appears to have been present as early as the sixteenth century, long before the use of pest houses for isolation of smallpox cases. It is probable that pest houses began to be used for the isolation of smallpox in the late seventeenth century as a result of the increasing virulence of the disease.

In the case of Sweden, its position as a continental power affected its disease environment, with frequent wars and trade flows leading to the importation of smallpox infection.

However, the conundrum remains inasmuch as no satisfactory explanation of the geographical age pattern of smallpox in England currently exists. One clue for its solution lies in evidence of the influence of elite social groups on the avoidance of the disease. Royalty, aristocracy, the gentry and the wealthy in general all appear to have fled from the disease when it occurred, largely because they had the resources to do so. They invariably took their servants with them, along with accompanying tradesmen, creating a culture of disease avoidance in a wide circle of the general population. At a later date these elite groups were the first to adopt inoculation (Razzell, 2003: p. 72; Brunton 1990: p. 230), and the Royal Family had sponsored trials of inoculation which influenced the aristocracy and other elite groups to adopt the practice. This suggests that status, education and knowledge was a key component in the reaction to smallpox.

The south of England was much wealthier than the north, documented by Davenport, Satchell and Shaw-Taylor in their paper. (Davenport et.al., 2018: p. 78) According to Davenport "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." (Davenport, 2018: p. 14)

We have seen earlier how Henry VIII was forced to leave Wallingford Castle because of the presence of smallpox, and how Elizabeth I kept away from Burghley House because of

the presence of smallpox. There were more than forty palaces and houses owned by Henry VIII, virtually all of them located in the south of England. (Phillips, 2001: p. 8), providing a focus for a culture of disease avoidance. This was not always successful of course, but it is one of the reasons why smallpox afflicted adults as well as children in the south of England. One very detailed account of a royal progress is that made by Henry VIII and Queen Anne in 1535.They made visits to 'evangelical' gentry in the south-west of England in support of the Protestant reformation. The counties visited were in Berkshire, Oxfordshire, Gloucestershire, Wiltshire, Hampshire, Dorset, West Sussex, Surrey, and back to Windsor. The places and houses visited were as follows: Easthamstead, Elvetham, Baring House, The Vyne, Old Alresford, Bishops Waltham, Southampton. Portsmouth, Portchester, Salisbury, Winchester, Hurtsbourne Priors, Thruxton, Wolfhall, Bromham, Little Sodbury, Iron Acton, Thornbury, Berkeley Castle, Gloucester, Tewksbury, Sudeley Castle, Langley, Oxford, Abingdon, Ewelme, Reading. They had intended to visit Bristol but avoided the town on account of the presence of plague. (Starkey, 1991: pp. 118, 121) These places were a mix of urban and rural areas, houses occupied by wealthy families with royal influence, and providing a focus for a culture of disease avoidance.

Although Edward VI, Queen Mary and Elizabeth I did not build new palaces, a number of stately homes – prodigy houses – were built in their honour, and again mainly located in the south and used for annual 'summer progresses' lasting about two months during the sixteenth century. (Phillips, 2001: pp. 8, 9, 91, 113) According to one study, "in the course of her long reign she [Elizabeth I] covered a good deal of southern England, sometimes staying within the Home Counties but often travelling as far as Southampton, Bristol, Worcester, Warwick and Stafford ... she never went to the south west or further north than Stafford."(Dovey, 1996: p. xv) She undertook these progresses 'almost every year' between the beginning of her reign in 1558 and the end of the 1570s, as well as the last four years of her reign. (Dovey, 1996: p. xv)

She took with her whole court, including her privy council, her courtiers and servants, and her retinue consisted of about a thousand people and more. (The Elizabethan Court, Encyclopedia.com: 1) They were preceded or accompanied by an immense baggage train, between 200 or 300 carts, carrying everything necessary for the queen, the court and the council. (Dovey, 1996: p. 3)

According to one account, "The Queen went from house to house in the Home Counties sometimes staying in a palace of her own but more often in the houses of her subjects from national figures to local gentlemen ... The ministers and courtiers who travelled with her were lodged in other houses in the neighbourhood ... The rest of the officials and their servants put up wherever they could, in inns or even in tents ... when stationary the whole train was scattered over a considerable distance." (Dovey, 1996: 3) Another account describes how "one brief stay in Cambridge saw a different department billeted in every college of the university, and a stay at a small residence like Sir William Peter's Ingatestone Hall [in Essex] was a nightmare, not only for the host, but also for the officers, who might find their establishment scattered across miles of countryside, in a dozen different towns and villages."(Loades, 1992: p. 41)

The court went to great lengths to avoid infection. For example, one gentleman usher was sent away for twelve days on full pay because someone had died of the plague on his premises. (Dovey, 1996: pp. 10, 11) Elizabeth's court shared in the European enlightenment's interest in science and new ways of thinking. Its influence was a result of its wealth and was disseminated not only by its presence in a wide range of geographical locations in the south, but the large number of servants and others living among the general population. The influence of royalty and the aristocracy is illustrated by the attraction of the spa at Chalybeate Spring in Tunbridge Wells. According to the plaque celebrating the Spring in Tunbridge

Wells, "Dudley Lord North, a young nobleman discovered the spring in c1606 and taking the waters soon became fashionable. By 1619 'the Wells' had become a popular meeting place for royalty and the aristocracy. By 1676, a flourishing village had grown up around the Spring, with a number of London shopkeepers taking residence along the Upper Walks for the summer season."[10]

Additionally, Parliament, the City of London, the Inns of Court, and the great trading companies concentrated the wealth of England in London and the south of England, providing the means to flee from smallpox when it appeared in these areas.

The age pattern of smallpox in the south and north of England broadly reflects the distribution of support for Parliament in English civil war during 1642-43. (Rank, S.M., Online) This partly reflected strong regional differences in religious affiliation in England as early as the sixteenth century. The Pilgrimage of Grace was a popular uprising that took place in northern England in 1536/37, protesting against the abolition of Catholic ritual, which occurred in Yorkshire, Cumberland, Northumberland, Lincolnshire and Lancashire. (Dodds, 1915; Davies, 1968) Likewise, the northern rebellion of 1569 was associated with the defence of Catholicism in most areas of northern England. (Kesselring, 2007) By contrast, London and the metropolitan counties had developed a significant Protestant culture by the sixteenth and seventeenth centuries. As the puritan Richard Baxter wrote in the middle of the seventeenth century, "I did not believe there was in all the World such a city [as London] for piety, Sobriety and Temperance." (Baxter, 1696, Part 3: p. 17)

The support for Parliament was heavily influenced by the City of London (Pennington, 1968: p. 66, Fisher 1968: pp. 77, 83; Wharton, 1642: Online) which created significant trade and cultural links with city's hinterland. Many of the citizens of London sponsored lectureships in their home parishes (Hill, 1963: p. 95), helping to generate a metropolitan culture in these areas. Richard Baxter wrote about the civil war that "On the Parliament's side were ... the greatest part of Tradesmen ... [and] the reasons which the Party themselves gave was, Because (they say) the Tradesmen have a Correspondency with London, and so are grown to be far more Intelligent sort of Men ..." (Baxter, 1696: p. 30)

London was more literate than elsewhere, with 78 per cent being able to sign subscriptions to the Protestation Covenant in 1642 compared to 30 per cent for the rest of the country. (Cressy, 1980: p. 72) There is also evidence that the elite population in the north were significantly less literate than those in the south. According to Lawrence Stone "in a remote area like Northumberland as late as the 1560s, 92 out of 146 leading gentry were still unable to sign their names, and the M.P. for Berwick was in the same predicament." (Stone, 1965: p. 676) Blood feuds had still lingered in the north of England and Scotland in the sixteenth century (Stone, 1965: p. 228), suggesting that there were significant differences in the culture of the south and north, including amongst their elite populations.

Puritanism was a religion that emphasized "the tremendous responsibility of the individual conscience rather than on outward observance and institutional religion." (Woolrych, 1968: p. 87) Because of their suspicion of ritual and the importance they attached to rationality, the puritans played a major role in the establishment of the Royal Society (Merton, 1957: pp. 584, 585). One of its founding members was the eminent physician Thomas Sydenham, who had strong puritan sympathies and had fought in Cromwell's army during the civil war. (Merton, 1938: p. 24)

Social status, education and knowledge played a role in the reaction to smallpox, including the reduction of opposition to inoculation on religious grounds. (Razzell, 2003: p. 70; Brunton, 1990: p. 230) The royal family had sponsored some of the first inoculations carried out in England (Creighton, Vol. 2, 1965: pp. 468, 469), and knowledge of the nature of

[10] Plaque at the Chalybeate Spring in Tunbridge Wells.

smallpox was influenced by education. This was certainly the case in Finland: “Even during the late nineteenth and early twentieth centuries, the common people often did not realize that smallpox could spread by face-to-face contact. Consequently they did not avoid contact with smallpox patients.” (Pitkanen et.al., 1989: p. 108)

It is probable that the metropolitan culture of the south created a greater awareness of the dangers of disease, and that royalty, the aristocracy, the gentry and the wealthy fleeing smallpox influenced the population living in these southern counties. However, this can only be a provisional hypothesis requiring further detailed research before a solution to the conundrum of the geography of smallpox in England can be fully established.

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