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Evaluating early modern lockdowns: Household quarantine in Bristol, 1565–1604

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Abstract

We know the policy of quarantining plague victims and their families together within their households entailed considerable costs and controversy in early modern Europe. Less clear is the extent to which the authorities implemented the policy in the face of this. This paper presents a novel approach to the measurement of enforcement which relies on linking deceased individuals listed in parish registers into household groups and then measuring changes in within-household mortality between parishes and epidemics. This provides a more complete assessment of the scale of implementation than would be possible using documentary sources alone. Measuring within-household mortality allows us to understand patterns of quarantine enforcement in settlements across early modern Europe. Here the focus is restricted to three epidemics that occurred in Bristol – one of England's most populous and prosperous cities. The analysis reveals household quarantine was enforced in 1603–4 with unprecedented vigour. The effects of quarantine are particularly pronounced in the affluent parishes where elite residence was highest. Greater evidence for enforcement is explained by greater elite oversight and control, as well as their desire to protect their own households. The scale of the impact is shocking. Household quarantine could double within household mortality.

KEYWORDS
early modern Bristol, early modern England, lockdown, plague, quarantine

Plague terrified European societies for four centuries following the Black Death in 1348. Deadly and repetitive, it was a predominant cause of instability in early modern life. Of the many strategies adopted in response to plague, quarantines were the most controversial. Controls at gates and ports were resented, but attempts to isolate domestic citizens provoked the most outrage. Across much of western Europe, local authorities attempted to limit the spread of plague by locking up any suspected carriers in their own homes and supporting them financially when necessary.[1] Many contemporaries saw this as profoundly anti-Christian[2] and economically destructive.[3] Quarantined people are known to have smashed open their padlocked doors and assaulted state officials in attempts to resist incarceration.[4] Yet whilst the costs and controversy of household quarantine policies are clear, we know relatively little about the extent to which they were actually implemented. How successful were early modern states in separating suspected carriers from the healthy population? Were all areas or social groups targeted equally and were quarantines enforced in ways that reveal motivations other than the protection of public health?

As well as costly and controversial, many thought household quarantines were medically dubious. They created incentives for hiding infection, fleeing (and thus spreading disease), and crucially, they endangered healthy people who were locked up alongside the sick.[5] An anonymous London pamphleteer was speaking for contemporaries across Europe when arguing in 1665 that isolating whole households was actually counterproductive. 'Infection may have killed its thousands, but shutting up hath killed its ten thousands'.[6] Historians concur.[7] Using mortality statistics from quarantined households in Salisbury in 1604, Slack finds a dramatic increase in mortality among household members when they were 'kept in' by the authorities after one person became sick.[8] The proponents of household quarantine recognised this implicitly, but believed the damage was outweighed by the benefits of reducing the number of households infected.[9] Whether or not this was true, household quarantine had lethal consequences for healthy people who were isolated. That this was so presents an opportunity to investigate the extent to which household quarantines were implemented in cities across early modern Europe.

The greatest barrier to understanding the degree to which plague regulations were enforced is the problem of measuring changes in population behaviour. Most studies analyse enforcement using either laws and proclamations or official sources that were generated through the enforcement process.[10] Whilst valuable, laws and proclamations only reflect the intentions of the

[1] In the most advanced cities, plague victims were identified by their symptoms and were then removed to specialised plague hospitals. Henderson, 'The invisible enemy'; Slack, *Impact of plague*, chapter 8.

[2] *Salomons pest-house, or tovvre-royall*, p. 62; *Shutting up infected houses*, p. 6; Slack, *Impact of plague*, 232.

[3] *Shutting up infected houses*, p.19; Henderson, *Florence under siege*, pp. 132–3; Newman, 'Shutt up', pp. 817–18, 823.

[4] Slack, *Impact of plague*, p. 298; Tomić and Blažina, *Expelling the plague*, p. 14.

[5] *Shutting up infected houses*, pp. 9–10.

[6] *Shutting up infected houses*, pp. 9–10.

[7] Slack, *Impact of plague*, p. 320; Cipolla, *Fighting the plague*, p. 18.

[8] Slack, *Impact of plague*, p. 320.

[9] Henderson, *Florence under siege*, pp. 132–3; *Duetie of a faithfull and wise magistrate*, pp. 53–5.

[10] E.g. Newman, 'Shutt up', pp. 816–17; Wilson Bowers, *Plague and public health*, p. 57; Tomić and Blažina, *Expelling the plague*, chapters 5–6.

authorities; they do not reflect what was achieved. Aside from the issue of representativeness (official sources tend to survive for the best-administered localities), analysing official sources is problematic because the implementation process is only revealed from the perspective of the state, making it difficult to independently evaluate the state's attempts to change behaviour by preventing contact. Historians including Slack, Wrightson, and Henderson powerfully reveal independent perspectives of quarantine enforcement by analysing court depositions and private correspondences.[11] However, these sources tend to be unsystematic, prone to exaggeration and difficult to measure and compare across time and space.

I propose a new approach which relies on the patterns of mortality caused by household quarantine. This involves linking together surnames listed in burial registers during plague epidemics into household groups and then measuring the impact of quarantine through changes in the level of mortality within those households. As burial registers are the primary source, this approach allows for systematic comparisons of enforcement levels across whole cities and regions instead of being constrained by source availability to a few sub-units within these areas. The wide availability of burial data across Europe means this approach can also be used for international comparisons. I demonstrate it here using data from three epidemics that occurred over a 40-year period in early modern Bristol, one of England's most important urban centres. The same approach is also applied to data extracted from Easter tithe books that were first used by Slack to investigate social variations in plague mortality in Bristol.[12] That a national policy of household quarantine was first introduced between the second and third of the Bristol epidemics studied here provides an excellent opportunity to compare mortality patterns and assess the extent of enforcement.

In contrast to the persistent literary tradition stressing social and governmental breakdown in times of plague, historians generally stress continuities in government during post-Black Death epidemics as responses became routinised and measured.[13] Nevertheless, relatively few attempts have been made to evaluate the effectiveness of these responses. In the Italian city states, where the most work has been done, historians' evaluations of enforcement suggest considerable variation.[14] As Henderson demonstrates, the exceedingly high proportion of all deaths occurring at plague hospitals in Florence, Pistoia, and Rome during seventeenth-century epidemics suggests the authorities were very successful at identifying and removing the infected.[15] Yet in other major Italian cities, such as Venice, Prato, and Padua, enforcement could be far less effective and the same is likely to be true elsewhere on the Italian peninsula, where measures were more ad hoc.[16]

Elsewhere, the evidence is less rich, but also suggests variable degrees of enforcement. The urban authorities in some Spanish, German, and Swiss towns, as well as in Dubrovnik, invested

[11] Slack, *Impact of plague*, pp. 278–9; Wrightson, *Ralph Tailor's summer*, pp. 48–9; Eckert, *The structure of plagues*, p. 24; Calvi, *Histories of a plague year*; Parets, *Journal of the plague year*; Brockliss and Jones, *The medical world*.

[12] Slack, 'The local incidence of epidemic disease'; idem, *Impact of plague*, pp. 124–5.

[13] This literary tradition is thought to begin with Thucydides' history of the plague in Athens. Historians who stress continuities in government include: Wrightson, *Ralph Tailor's summer*, chapter 4; Slack, *Impact of plague*, chapter 10; Henderson, *Florence under siege*, chapter 4; Tomić and Blažina, *Expelling the plague*, chapters 5 and 6; MacKay, *Life in a time of pestilence*, chapter 6; Wilson Bowers, *Plague and public health*, chapter 3. Unlike for medical practitioners, the social responsibility of magistrates to stay in their posts during plague epidemics was widely accepted by the early modern period as much to ensure social order as to alleviate suffering: Wallis, 'Plagues, morality and the place of medicine'; Slack, *Impact of plague*, p. 259.

[14] Henderson, *Florence under siege*, pp. 130, 218–28; Henderson, 'The invisible enemy', p. 271; Crawshaw, *Plague hospitals*, p. *77*.

[15] Henderson, *Florence under siege*, p. 130.

[16] Henderson, 'The invisible enemy', p. 266.

heavily in ensuring plague regulations were followed, and set draconian penalties for evasion.[17] Likewise, in her study of St Martin-in-the-Fields, Westminster, Newman shows local authorities in England could raise and distribute considerable sums and manage numerous personnel in order to maintain a system of household quarantine.[18] Even so, evidence for evasion, laxity, and partial or full-scale breakdowns exists for towns across early modern Europe.[19] A number of studies also reveal instances where urban governments chose to act flexibly, allowing exemptions and commuting sentences for citizens who were caught breaking the rules.[20]

Understanding the enforcement of household quarantine is also integral to a second broad area of debate: the marginalisation, even victimisation, of poor and marginal groups in European societies. Beginning in the 1970s with the work of Pullan, historians argued that urban elites and medical authorities, concerned with increasing levels of urban poverty, came to perceive the poor and marginal as a threat to social order and as the chief sources of plague epidemics.[21] The outcome of this association was the development of plague regulations, particularly household quarantine, which were 'designed with the poor in mind', in Slack's memorable phrase.[22] A number of historians have argued plague strategies were not only developed to target the threat of the poor and marginal, but were also enforced unevenly, in ways that reflected the desire to control and discipline these groups.[23] More recently, historians such as Crawshaw have challenged this characterisation, instead framing plague quarantines as fundamentally charitable and medical institutions as designed to protect public health.[24] Newman complicates the older narrative by considering the experience of the households of middling artisans – not just the 'poor' and 'rich' – revealing the willingness of the authorities to quarantine 'respectable' families and even gentlemen.[25] By investigating variations in patterns of enforcement across society, we can learn more about whether quarantines were used principally as tools for discipline and control.

After contextualising plague regulations in England and describing the three plague epidemics studied in section I, in section II I turn to the response of the Bristol Corporation to the plague epidemic in 1603–4; the first to occur after household quarantine became mandatory in England in 1578. Section III then provides a description of the burial register data and the approach to measuring the implementation of quarantine in the parishes of Bristol using the clustering of deaths within households. Special attention is given to the parish of Christchurch for which population lists and other sources make it possible to investigate the implementation of quarantine across wealth, street and political groups. Section IV considers potential explanations for the variation in levels of enforcement that are revealed in the foregoing analysis, and section V concludes.

[17] Tomić and Blažina, *Expelling the plague*; Eckert, *The structure of plagues*, pp. 24–34; MacKay, *Life in a time of pestilence*.

[18] Newman, 'Shutt up'. Further evidence of effective enforcement: Slack, *Impact of plague,* chapters 10 and 11; Champion, *London's dreaded visitation*, pp. 93–7.

[19] Slack, *Impact of plague*, pp. 278–9; Wrightson, *Ralph Tailor's summer*, pp. 48–9; Eckert, *Structure*, 24–34.

[20] Henderson, *Florence*, 275; Wilson Bowers, *Plague*, 13; Eckert, *The structure of plagues*, p. 27.

[21] Pullan, *Rich and poor*; idem, 'Plague and perceptions'; Henderson, J., 'Historians and plagues'; Carmichael, *Plague and the poor*, p. 125; Slack, *Impact of plague,* p. 306. Similarly, Newman argues the government had 'incorporated moral judgements about the poor and unsettled' into its quarantine policy. (Newman, 'Shutt up', p. 828.) The relationship between scapegoating, hatred, and violence towards the 'other' is an important theme in the broader historiography of pandemics. (Sontag, *Illness as metaphor*; Nelkin and Gilman, 'Placing blame'; Cohn, 'Pandemics'.)

[22] Slack, *Impact of plague*, p. 306.

[23] Slack, *Impact of plague*, pp. 306–7; Carmichael, 'Plague legislation', pp. 522–3; also, Henderson, 'Historians and plagues'.

[24] Crawshaw, 'The Renaissance invention', pp. 172–3; Newman, 'Shutt up', p. 826.

[25] Newman, 'Shutt up', pp. 816–17, 824, 827.

I | PLAGUE REGULATION IN ENGLAND

After 230 years of experimentation in English towns, household quarantine was adopted as a national strategy by the Privy Council in 1578 as the centre piece of the Elizabethan plague orders.[26] Justices of the Peace were required to oversee the parish officers on the ground and report back to the Privy Councillors at the centre. Special plague taxes were to be raised in instalments; affected households were to be quarantined; water, food, and fuel were to be provided where necessary. The orders required the 'shutting up' of all inhabitants, sick or well. Watchmen were to be stationed outside to prevent movement. Inhabitants could be released only six weeks after the last victim had recovered or died. Lest anyone should claim the policy was 'not charitable', the Privy Council was clear: the provision of 'succour and relief' during the 'tyme of their restraynt' was itself an act of Christian charity.[27] Be that as it may, it was also the fundamental condition for ensuring most 'infected' households could be kept alive whilst unable to work for at least a month and a half of isolation from the rest of their community.

The degree to which this centrally mandated policy was enforced by the governments of England's towns and cities remains unclear. Bristol was considered by contemporaries one of the 'chiefe places' in England after London and York.[28] In terms of population, it was by far the largest town in the west and the third largest in England after London and Norwich, with around 13 500 people in 1600 (see table A3, appendix 3). Bristol was a regional centre for trade and manufacturing, and was also an international port. Like most ports and large urban centres, it was characterised by profound contrasts in wealth, crowding, and housing between the wealthy centre and more peripheral impoverished parishes dominated by manufacturing and inhabited by labourers (see table A1, appendix 1).[29]

Early modern Bristol provides one of the best opportunities to study the implementation of quarantine after 1578 because of the frequency and timing of its plague epidemics. Two of these epidemics occurred directly before 1578, one in 1565 and the other in 1575. A third plague epidemic occurred in 1603–4, 25 years after the publication of the plague orders. The patterns of mortality before and after their publication can be compared for the same parishes. Before comparing the patterns of mortality within affected households, however, it is important to establish that some of the basic characteristics of these outbreaks remained constant over this 40-year period.

Contemporary references and wider historical knowledge of plague epidemics confirm all three outbreaks were caused by plague. For each, contemporary chronicles and marginal notes in burial registers show plague was identified as the cause of the epidemic. All three epidemics also display the classic characteristics of an urban plague epidemic. Figure 1 displays the overall daily mortality trends for two-year periods containing each of the three plagues.[30] The curves are smoothed

[26] Slack, *Impact of plague*, pp. 203, 206–7; Rawcliffe, *Urban bodies*, pp. 32–3; Kallioinen, 'Plagues and governments'. The Privy Council copied the policy of household quarantine from the more advanced Italian cities. Milanese plague regulations issued in 1576 and 1577 are preserved among the papers of the Clerk to the Privy Council of Elizabeth I. They bear a striking resemblance to the English plague orders published the following year. See: Basing and Rhodes, 'English plague regulations', p. 60. See *Orders, thought meete by Her Maiestie* for the full text of the plague orders.

[27] *Orders, thought meete by Her Maiestie*, items 2, 4, 5, 7, 8, and 9.

[28] Lobel, M. D., and Carus-Wilson, E. M., The Atlas of Historic Towns. Volume Two: Bristol, Cambridge, Coventry, Norwich (London, 1975), p. 15.

[29] See also Sacks, *The widening gate*, table 19.

[30] The curves represent half the parishes of Bristol and are representative of the city. This sample of parishes are at the heart of the analysis presented in this paper and will be discussed in more detail in section three.

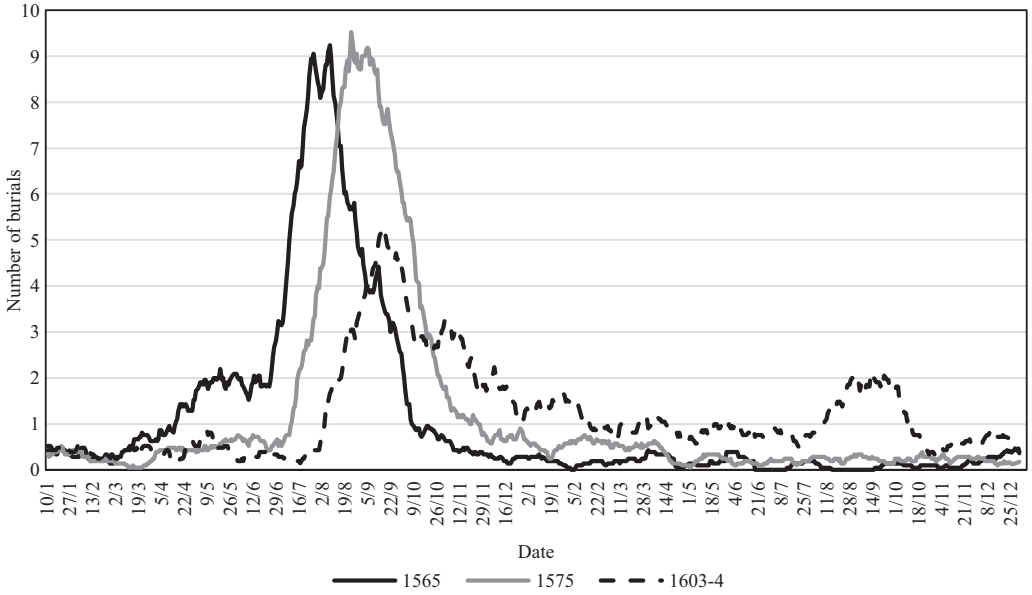

FIGURE 1 Daily burials (21-day moving average) for 2-year periods containing plague epidemics, 1565–1604.*Notes*: For all three years, these trends represent the mortality curves for the nine parishes which form the sample used in this study (figure 2 and appendix 1). *Sources*: Parochial Registers: Bristol Archives, P.Xch/R/1/a, P.St_J/R/1/a, P.St MR/R/1/2, P.St_N/R/1/b, P.St_N/R/1/c, P.St_JB/R/1/a, P.AS/R/1/a, P.St_W/R/1, P.St_T/R/1/a, P.St_S/R/1/a

using a 21-day centred moving average. The plagues of 1565 and 1575 are strikingly similar. Though mortality peaked around two weeks later in 1575, the shape of the curves and the extremity of the epidemics are almost identical: the plague erupted in early summer and peaked at around nine burials per day before declining in the autumn and ceasing with the colder winter months. In 1603–4 the plague began even later than in 1575 and then peaked in September at just over five burials per day. Whilst mortality then trailed off with the winter, it did not disappear as it had done previously, but instead festered on before erupting again in the summer of 1604, albeit with less impact than in the previous year. All three epidemics are comparable to others described as plague epidemics across early modern Europe.[31]

All three plagues were also similar in their severity. Each plague killed a similar proportion of the total population and affected children and adults in similar proportions. Contemporary chroniclers estimated the death toll from plague in 1565 and 1575 to be 2000 in both years and they estimated 2600 died of plague in 1603–4.[32] The population of Bristol grew only slightly between 1565 and 1575 from around 9000–9500; by 1603 it had risen to around 13 500 (see table A3, appendix 3). So, death rates in the first two plagues were around 20 per cent, and in the last of the three they were around 19 per cent. The plague epidemic of 1603–4 lasted longer and was less extreme at its height, but it killed a very similar proportion of the population. Relative mortality between children and adults was also remarkably similar on aggregate: 0.8 adults were buried for every child

[31] For instance, Eckert, *The structure of plagues*, p. 37.

[32] Adams, *Chronicle of Bristol*, pp. 108, 114, 178; Ricart, *The Maire of Bristowe is Kalendar,* p. 59; Hudd, 'Two Bristol calendars', pp. 134, 136, 138.

in 1565, compared with 0.63 in 1575 and 0.79 in 1603–4 (Table B1, appendix 2 provides available data on the ratio of adult to child burials). Yet even for those who were not infected, the consequences of previous epidemics must have been all too easily remembered when plague once again threatened the city.

II | PLAGUE, GOVERNMENT, AND REGULATION

On 23 June 1603, Ralph Hurt, Bristol's Mayor, chaired a meeting of the Aldermen and Common Council of the city to respond to the news that plague had returned to London.[33] The Council followed the precedents set during previous outbreaks and established restrictions on the flow of goods and people arriving from 'the Cyttie of London or suburbs thereof'. A certificate of health was required from any Londoner coming to Bristol 'to buye or sell any wears' or to 'lodge or make his or her aboade' and all 'wares & m[er]chandise' were to be aired near the 'Lafforde gate' – on the London road – before entry.[34] Though the minutes of the Council for the sixteenth century do not survive, the 1603 minutes suggest restriction on long-distance trade with infected settlements had been employed during previous epidemics.[35] The city-level restrictions in 1603 proved ineffective. On 18 July 1603 the plague took its first victim, in Pepper Alley by the docks in St Stephen's parish.[36]

Once plague reached Bristol, the actions of the city were, for the first time, defined by the national plague orders that had been issued in 1578. These required mayors and aldermen in any affected town in England, including Bristol, to implement household quarantine in their capacity as Justices of the Peace.[37] Taxation, corporation, and parish register sources reveal many of the Bristol aldermen and lesser Common Councillors in 1603–4 had been resident in 1575. They would have recognised their personal vulnerability as well as that of the towns: in that last epidemic, plague had killed three Aldermen and a respected preacher, John Northbrooke.[38]

On 19 July – the day after the first case was identified – the Common Council gathered to discuss the official plague response. The register shows almost full attendance: 9 of the 10 aldermen, both sheriffs, and 25 of 29 burgesses.[39] The arrival of plague did not cause a flight among the governing elite.[40] Instead, it elicited exactly the response envisaged by the Privy Council in 1578. When plague was noticed in a community, the plague orders required 'all justices… [to] assemble themselves

[33] Bristol Archives (Bristol), Common Council Proceedings, M/BCC/CCP/1/1, vol. 1, fo. 78.

[34] As in other European towns, the authorities were pragmatic in the restrictions they imposed. Only goods and people from London are mentioned by the authorities. So, presumably, trade was allowed to continue between Bristol and other settlements; Wilson Bowers, *Plague and public health*, chapter 3.

[35] After setting out the procedures for quarantining goods and people from London, the Common Council minutes read: 'as heretofore yt has bin, at the chardges of the Owners…' Bristol Archives, Common Council Proceedings, M/BCC/CCP/1/1, vol. 1, fo. 78.

[36] Adams, *Chronicle of Bristol*, p. 177.

[37] Since the charter of 1373, mayors and aldermen had functioned as justices of the peace for Bristol; Latham, *Bristol Charters*, p. 4.

[38] Adams, *Chronicle of Bristol*, p. 114.

[39] Bristol Archives, Common Council Proceedings, M/BCC/CCP/1/1, vol 1, fo. 79.

[40] Further support for this claim can be found in a surviving Easter tithe book drafted during the epidemic in 1604, which shows no sign of household heads being absent from the parish of Christchurch unless they had died during the outbreak. Bristol Archives, P.Xch/ChW/2/1–4.

together… to consult how these orders… may be put into execution'.[41] The justices were to 'chuse honest persons' to manage the raising and distributing of money from 'a generall taxation' upon 'speciall persons of wealth'.[42] The Common Council thus established a committee made up of three burgesses and a sheriff to oversee the management of the plague response.

The committee was a managerial body, not a medical one. The minutes provide no justification for why each committee member was chosen, but their backgrounds reveal no sign of any medical expertise.[43] Instead, these men were chosen for their management abilities. Three of them were merchants operating in the textile trades. They would have been used to running complex operations involving large sums of money. These skills complemented their mandated objective: to raise, hold, and distribute funds necessary to ensure households were quarantined and provided for when isolated. On each of the four occasions that money was raised during the outbreak, the minutes show it was intended for the 'keepinge', 'disposinge [arranging]', 'relyvinge', or 'mayntenence' 'of the poore Infected people … and for the keepinge of those that are Infected and that whole howsholde from goyinge abroad … vntill order be taken for there release'.[44] The committee was responsible for organising the implementation of household quarantine and financial relief across the city. It maintained its commitment throughout the epidemic.

III | IDENTIFYING HOUSEHOLD QUARANTINE

Did the Bristol authorities succeed in separating suspected carriers of plague from the healthy population in 1603–4? This section analyses patterns of mortality within household groups using data from parish burial registers.[45] If household quarantine was enforced as intended in 1603–4, mortality within affected households should be higher than it was in the plague outbreaks of 1565 and 1575, because healthy people would have been more exposed to the source of infection.[46] Moreover, quarantine would have exacerbated existing problems of domestic cleanliness by, for example, limiting the ability for airing soft furnishings. This may have led to more non-plague deaths within quarantined households as well.[47]

The ideal way to measure changes in within-household mortality would be to compare the proportion household members that died during plague outbreaks before and after 1578. However, it is almost never possible to estimate the size of the population at risk in each household where one or more household members were buried during a plague epidemic. Instead, the proportion of all burials recorded during each plague outbreak that were 'clustered' into household units

[41] *Orders, thought meete by Her Maiestie*, item 1.

[42] Ibid., items 3 and 6.

[43] Robert Aldworth (sheriff): admitted to freedom in 1584 as a merchant; John Baker: either a weaver in 1575 or unknown in 1591; John Butcher: carpenter 1590 or clothier 1593; Richard Smith: draper 1576.

[44] Bristol Archives, Common Council Proceedings, M/BCC/CCP/1/1, vol. 1, fos. 79, 81, 83, 92.

[45] Whilst parish registers do not record reliable cause of death information for everyone, the number of burials in each parish during a plague was always many multiples of their normal levels; it can be safely assumed that a very high proportion of burials were related to the plague.

[46] Newman, 'Shutt up', p. 828; Slack, *Impact of plague*, p. 320.

[47] Contemporaries certainly thought this was the case, and the London Bills of Mortality record a very large increase in non-plague burials in the 1665 plague epidemic. Though it is likely some of these burials were wrongly diagnosed, intentionally or otherwise, the increases in some disease categories may also have been the result of deteriorating household conditions due to forcible quarantine; *Shutting up infected houses*, p. 8; Champion, *London's dreaded visitation*, pp. 28–9.

can be measured. Previously, historians have measured the clustering of plague burials in this way either to uncover the social distribution of plague mortality or to determine the way plague was transmitted.[48] Slack was the first to recognise the potential for burial clustering to reflect the degree to which household quarantine was implemented, but no one has ever analysed burial clustering systematically to uncover patterns of enforcement.[49]

To measure burial clustering using parish burial registers, it is necessary to connect names of the deceased into household groups (see appendix 4 for a detailed discussion of the process). This is done in two ways. The first links individuals on the basis of only their surname. To limit false matches, the 38 common surnames are removed from all parish burial lists. This reduces the number of burials used in the analysis of clustering and assumes the true distribution mortality within common surname households is the same as the distribution of mortality for the rest of the households in the population. The approach also ignores household members who do not share the surname of the household head, such as servants and apprentices. By defining non-family household members as individuals, this depresses the parish-level clustering estimates to a different extent depending on the proportion of the population made up of non-family household members, and so should be borne in mind when interpreting the results below.

The second approach uses additional information recorded in the burial registers. In some registers and years, the parish clerks recorded the parent, or in the case of servants, the master/mistress of the deceased person who might be deemed to be the head of household. Table 2 contains an example of this practice, where the final three columns related the deceased to the head of the household in which they lived. Using individual-level tithe lists from the parish of Christchurch to check the full-household-information approach revealed 100 per cent accuracy in assigning the deceased to their households. Information regarding the household head improves over time and by 1603–4 only the parish register of St John the Baptist does not contain this information. Where both the shared surname and full-household approaches could be applied to the same register (tables 3 and 5), the results are very similar.

An example of both approaches using the information in table 2 may provide additional clarity. Table 1 contains a truncated excerpt from the burial register of the Bristol parish of Christchurch in 1575. This excerpt covers September and October 1575 – the peak months of the plague outbreak of that year. It shows the household of Humphry Andros lost four children and two servants during this plague outbreak. Both approaches use a household group threshold of three or more people. For the surname-only approach, two people – John White and Richard Gryne – are excluded from the sample because they have common surnames. Of the remaining names, there is only one group of three or more shared surnames, the Andros family. The resulting estimate of burial clustering is 50 per cent. Of the 10 in the sample, five could be linked into a shared-surname group with three or more people. Since the Christchurch register also contains additional information on the relationships between the deceased, it is also possible to calculate a full-household-information estimate, which also turns out to be 50 per cent. Of the 12 people in the full sample (no common surnames are removed using this method), 6 are recorded as relations (family or otherwise) of Humphry Andros.

[48] Several studies have measured burial clustering in a similar way; Slack, *Impact of plague*, p. 177; Champion, *London's dreaded visitation*, p. 83; Wrightson, *Ralph Tailor's summer*, pp. 39–40.

[49] Slack compared the level of clustering found in the burial records of the quarantined population in Salisbury in 1604 with those for the town. The proportion of all burials which could be linked together into groups of three or more was 42 per cent for the whole population and 61 per cent for the quarantined houses only; Slack, *Impact of plague*, pp. 177–8, 320.

TABLE 1 Excerpts from burial registers of the parish of Christchurch, 1575

Date	First name	Surname	Relation	Relation first name	Relation surname
17/9/1575	**George**	**Andros**	**Son of**	**Humphry**	**Andros**
17/9/1575	Henry	Bower	Servant of	William	Gryne
17/9/1575	**Margaret**	**Andros**	**Daughter of**	**Humphry**	**Andros**
…					
1/10/1575	**John**	**Andros**	**Son of**	**Humphry**	**Andros**
1/10/1575	**Elizabeth**	**Andros**	**Daughter of**	**Humphry**	**Andros**
1/10/1575	Joan	Pearce	Servant of	William	Yeomans
1/10/1575	Alice	Caninge	Servant of	Dorothy	Atkins
2/10/1575	William	Hardinge	Son of	John	Hardinge
3/10/1575	John	White			White
5/10/1575	Richard	Gryne	Son of	William	Gryne
5/10/1575	**Thomas**	**Tucker**	**Servant of**	**Humphry**	**Andros**
5/10/1575	**Robert**	**Andros**	**Servant of**	**Humphry**	**Andros**

Source: Bristol Archives, P.Xch/R/1/a.

One caveat is that as neither the surname-only nor the full-household-information approach can account for the size of each household 'at risk', larger household sizes in some parishes might cause higher levels of burial clustering. This is because more people would be exposed to infection once plague arrives inside the household.[50] Even so, under the assumption that average household sizes did not change dramatically within the same parish over time (and surviving population lists for Christchurch seem to confirm this) we can compare burial clustering patterns within the same parish and across each epidemic. This will still allow us to establish whether household quarantine was implemented to a greater extent in 1603–4.

Of the 18 parishes of early modern Bristol, 9 have burial registers which survive for all three outbreaks in good condition. Figure 2 is a map of Bristol showing the parishes for which registers survive as cross-hatched. Contemporary baptism levels and the population estimates using the 1696 marriage duty assessment imply the sample represents around 55 per cent of Bristol's population.[51] As well as containing a high proportion of Bristol's population, the parish sample is also geographically comprehensive. The sample parishes cover the centre, periphery, and riverside districts of Bristol and display a very similar level of wealth to the general population. On average the buildings in the sample contained 4.19 hearths, whereas the average Bristol building had 3.96 hearths (see table A1, appendix 1). The sample is, therefore, suitable for studying the extent to which household quarantine was implemented in 1603–4 across this large and diverse city.

[50] Whilst Schofield argues there would be no association between household size and probability of infection in epidemics caused by bubonic plague, the evidence from the famous outbreak at Eyam in 1666 suggests such an association does exist; see Schofield, 'Anatomy of an epidemic', p. 104; Whittles and Didelot, 'Epidemiological analysis of the Eyam plague', pp. 5–6.

[51] The second column of table A1, appendix 1 contains late seventeenth-century population estimates for each parish.

FIGURE 2 Burial register survival by parish. *Notes*: SW = St Werburgh; SE = St Ewen; AS = All Saints; Xch = Christchurch. I would like to thank Professor Roger Leech and Penny Copeland for supplying the parish-level shape files for Bristol [Colour figure can be viewed at wileyonlinelibrary.com]

IV | THE EFFECT OF HOUSEHOLD QUARANTINE IN BRISTOL

In 1603–4 the level of burial clustering was substantially higher than it had been in the plagues of the later sixteenth century, suggesting a radical disjuncture in the level of enforcement. In tables 2 and 4 the parish burial samples for 1565 and 1575 have been combined to produce a single 'pre-1578' burial clustering estimate. This is partly for convenience and partly to smooth out the volatile estimates for the smaller parishes of St Werburgh and All Saints.[52] Taking a simple average of the

[52] Separate estimates for both epidemics are available in appendix 4. They confirm trends discussed here.

TABLE 2 Burial clustering levels in 1565 and 1575 (combined) and 1603–4

Parish name	Total burials		Surname clusters		Full-household clusters	
	1565 and 1575	1603–4	1565, 1575	1603–4	1565, 1575	1603–4
St Werburgh	23	42	12%	49%	15%	40%
All Saints	24	15	27%	60%	42%	60%
Christchurch	99	73	35%	72%	29%	58%
St Nicholas	137	169	27%	19%	N/A	27%
St Thomas	203	221	30%	50%	N/A	55%
St John the Baptist	77	114	25%	54%	N/A	N/A
St Stephen	172	236	32%	37%	N/A	41%
St James	170	335	26%	30%	N/A	29%
St Mary Redcliffe	203	288	29%	35%	26%	35%
Sample Av.			27%	45%	28%	43%

Note: N/A is used for cases where the registers do not allow for this type of analysis.
Source: Parochial registers: Bristol Archives, P.Xch/R/1/a, P.St_J/R/1/a, P.St MR/R/1/2, P.St_N/R/1/b, P.St_N/R/1/c, P.St_JB/R/1/a, P.AS/R/1/a, P.St_W/R/1, P.St_T/R/1/a, P.St_S/R/1/a.

TABLE 3 Comparable clustering estimates from other English studies, 1579–1666

Place	Parish	Year	Burial clustering
Norwich	St Peter Mancroft	1579	42%
Bristol	St Philip and St Jacob	1603–4	57%
Salisbury	3 ancient parishes	1604	42%
Colyton		1645–6	52%
Eyam		1666	72%
Braintree		1666	63%
London sample	Eight parishes from across city	1666	32%

Sources: Slack, *Impact of plague*, p. 177; Champion, *London's dreaded visitation*, p. 83; Schofield, 'Anatomy of an epidemic', p. 106; Bradley, 'The most famous of all English plagues', p. 92.

surname clustering estimates reveals a substantial increase after 1578 (final row of table 3). In 1603–4 an average of 45 per cent of burials occurred in household groups sized three or more, whereas before 1578 this figure was only 27 per cent. Mortality within affected households was substantially higher after the publication of the plague orders.

The final two columns of table 2 show an increase in burial clustering in cases where the parish registers provide additional information about the household head. In most cases, the estimates are very similar to the ones produced using only shared surnames. The one exception is Christchurch, but fortunately the full-household information is provided in all plague years for this parish. In the few cases where household head information is provided for earlier epidemics, the results are also very comparable to the shared-surname approach. Overall, the 'full-household' estimates confirm the evidence of a significant impact of quarantine in the post-1578 epidemic.[53]

[53] It is very unlikely the change in clustering in 1603–4 was the result of acquired immunity within the population after 1575. If this had been the case, clustering should be higher in 1575 compared with 1565. Appendix 4 shows this did not happen.

The clustering estimates for Bristol in 1603–4 are very comparable to those found in other early modern English populations. Table 3 contains results from other studies that define clustering in the same way. In 1603–4, burial clustering in Bristol was comparable to the levels recorded in studies of other English towns, except for London in 1666. The comparison with the evidence from Salisbury and Braintree is especially noteworthy because detailed evidence recording the relief paid to households who were quarantined survives for these outbreaks.[54] The comparable levels of clustering in Bristol in 1603–4 and the other epidemics in table 3 suggest household quarantine was widely adopted in epidemics across early modern England after 1578.

The levels of clustering in the pre-1578 epidemics was much more comparable to London in 1666, when household quarantine is known to have collapsed, than those found in Bristol in 1603–4.[55] For a cross section of London parishes, Champion found 32 per cent of all burials could be attributed to household groups of size three or greater.[56] Using shared surnames, the estimates for Bristol in 1565 and 1575 range from 0 per cent to 39 per cent with a median of 28 per cent ($n = 18$). The full-household approach confirms the low estimates are not the result of ignoring non-family household members. The median for the sixteenth-century plagues is 24 per cent ($n = 8$), and though in one instance (All Saints, 1565) clustering was significantly higher (59 per cent), in all other cases clustering was the same or lower than in London in 1666.[57] In 1603–4, clustering in Bristol had increased in most parishes so that only two continued to be comparable to London.

The similarity between clustering in sixteenth-century Bristol and London in 1666 suggests household quarantine was not applied rigorously before 1603. No study has ever produced estimates of burial clustering for an epidemic where we know quarantine was not enforced at all.[58] The loss of city records mean that we cannot be sure that no household isolation was in place in sixteenth-century Bristol either: there is some evidence from other communities of experiments with isolation before the national policy was launched.[59] However, the similarity to the rates of clustering in London in 1666 suggest that any local initiatives in the sixteenth century were limited. The clustering estimates for 1565 and 1575 can, therefore, be interpreted as upper bound estimates of clustering in plague epidemics where the population was not subjected to household quarantine.

Whilst the consequences of quarantine are visible almost everywhere in Bristol, there are significant variations between parishes. Table 4 presents the absolute difference between the pre- and post-1578 clustering estimates in table 2. The parishes in table 4 are ranked according to the size of the absolute increase in burial clustering, with the full-household linkage estimates being given precedence where they can be calculated for all three epidemics. The top five parishes display the most significant increases in burial clustering. Both the surname only and the full-household estimates are around twice as high in 1603–4 compared with the pre-1578 outbreaks. The estimated effects of quarantine appear more modest in the parishes of St Mary Redcliffe, St Stephen, and St James using the shared-surname approach, and this is confirmed in the case of St Mary's when using household head information. Only the parish of St Nicholas shows a decline in the level of clustering in 1603–4.

[54] Slack, *Impact of plague*, pp. 177–8.

[55] For evidence of breakdown in London: Slack, *Impact of plague*, p. 282.

[56] Champion, *London's dreaded visitation*, p. 83.

[57] For separate estimates for the 1565 and 1575 outbreaks in Bristol, see table A1, appendix 1.

[58] This point was ignored by Schofield so his attempt to reveal the vector responsible for that epidemic using levels of clustering should be treated with some suspicion; Schofield, 'Anatomy of an epidemic', p. 102.

[59] Slack, *Impact of plague*, pp. 201–8.

TABLE 4 Absolute difference in clustering levels for both approaches

Parish	Hearths/entry 1662	Absolute difference (1565 and 1575 versus 1603–4)	
		Surname only	Full household
Christchurch	4.6	37%	29%
St Werburgh	5	28%	25%
All Saints	4.6	33%	18%
St John the Baptist	4.1	29%	N/A
St Thomas	4.3	20%	N/A
St Mary Redcliffe	3.4	6%	9%
St Stephen	3.6	5%	N/A
St James	3.6	4%	N/A
St Nicholas	4.5	−8%	N/A

Note: N/A is used for cases where the registers do not allow for this type of analysis.
Source: Hearths per entry: Leech et al., *Bristol hearth tax, 1662–1673*, pp. 344–5; Parochial registers: Bristol Archives, P.Xch/R/1/a, P.St_J/R/1/a, P.St MR/R/1/2, P.St_N/R/1/b, P.St_N/R/1/c, P.St_JB/R/1/a, P.AS/R/1/a, P.St_W/R/1, P.St_T/R/1/a, P.St_S/R/1/a.

The parishes that saw the greatest increase in clustering in 1603–4 were also the most affluent parts of the city. In the areas that were more peripheral – both geographically and socially – the change was much more modest. Table 4 contains data on the average number of hearths per entry for buildings recorded in each parish in the 1662 hearth tax assessments. The parishes which saw the largest increases in clustering were all located in the prosperous centre or along the riverside: buildings in the top five parishes of table 4 had an average of 4.5 hearths. In contrast, the parishes that saw less dramatic increases in clustering contained more moderate-sized properties with an average of 3.5 hearths and were located on the periphery of the town.

The contrast between clustering of deaths in rich and poor parts of Bristol raises the important question of how quarantine was enforced at the level of the household. Was quarantine implemented to the same extent across social groups in parishes where evidence of clustering is strong?

An answer can be provided by using rare tithe lists for the parish of Christchurch, which contain the names and addresses of householders, as well as tithe payment values for household heads.[60] Easter tithe payments in urban parishes were levied on personal profits from crafts and trade.[61] To the extent that assessments of profits were accurate, tithe payments will reflect the distribution of income within the parish. The names in the tithe lists have also been connected to those recorded in the parish registers and freemen have been identified from among the male household heads using the Bristol burgess books.[62]

Table 5 shows household quarantine was implemented in 1603–4 to the same extent irrespective of income when income and enforcement are investigated using the same burial clustering comparisons as above. The Easter tithe books of 1575 and 1601 provide information on the income level of household heads. The first two rows of table 5 divide the households of Christchurch at the median tithe payment which in both years was 12 pence. The absolute level of burial clustering

[60] Four Easter books survive: 1575, 1576, 1601, and 1604. This analysis uses those from 1575 and 1601. Bristol Archives, P.Xch/ChW/2/1–4.

[61] Wright, 'Easter books', p. 31.

[62] Christchurch's Easter tithe books were first used by Slack in his study of plague mortality patterns in Bristol.

TABLE 5 Burial clustering comparisons for Christchurch social groups, 1575 versus 1603–4

Christchurch social groups	Communicants per household 1575 and 1601	No. burials		Burials in groups of 2+ (%)	
		1575	1603–4	1575	1603–4
<12 pence	2.43	33	33	58%	85%
12+ pence	4.81	46	32	67%	94%
Back streets	2.51	33	43	58%	86%
Main streets	4.71	46	22	67%	95%
Non-burgher	3.42	49	31	57%	84%
Burgher	4.40	30	34	73%	94%
Parish total	3.80	79	65	63%	89%

Note: Communicants were generally over the age of 16. Children are, therefore, missing from communicant calculations. Because the Easter books provide additional certainty about the validity of household linkage, the threshold for burial clustering was reduced to two or more burials per household. *Source*: Easter books: Bristol Archives, P.Xch/ChW/2/1-4; burials: Bristol Archives, P.Xch/R/1/a.

was higher for more affluent households in 1575 (67 per cent versus 58 per cent). This is because their average household size was larger (4.8 versus 2.43 communicants per household), and so more people within their households were at risk once one person became sick. The same pattern emerges in 1603–4, but for both groups the level of burial clustering increased substantially. The absolute difference in burial clustering levels is almost identical: clustering increases by 27 percentage points for households occupying both halves of the income distribution. There is no sign the rules were relaxed for households with higher levels of income.

Using the locational information provided in the Easter books reveals no difference in the degree of enforcement by street. When investigating the impact of plague on different social groups in Christchurch, Slack found mortality to be higher on the back streets of the parish, especially in 1603–4.[63] My results confirm this, as is suggested by the much larger absolute number of burials which were attributable to the back streets in the later outbreak. Yet, table 5 shows quarantine is just as visible in both street types in the parish. Higher mortality did not prevent parish officials from quarantining households on the back streets to the same extent as on the main thoroughfares.

By linking the names of household heads to the entry lists of burghers for the town, it is also possible to investigate whether a household's political status determined whether they would be quarantined. Grants of freedom reflect the degree to which a household was included in the social and political institutions of Bristol.[64] Freedom, or burgher status, was a prerequisite to joining a guild. Offices in urban government were also only open to burghers, though for most, this meant parish rather than town government. Thus, it was from the burgher community that the parish officials – churchwardens, constables, overseers, etc. – who were responsible for managing enforcement were drawn.

[63] Slack distinguished between the large and generally affluent households living on the main thoroughfares (Wine Street and Broad Street) and the poor, labouring households living on the crowded alleys behind (Tower Lane and the Pithay). Even so, 24 per cent of householders on the back streets paid tithes above the median level and 18 per cent on the main streets paid tithes below the median. The information on occupation and household structure recorded in the Easter books and parish registers also depict a varied pattern of residence. (Slack, *Impact of plague*, pp. 123–6.)

[64] M. Williams, 'Bristol Burgesses', excerpted in Bristol & Avon Family History Society, 'Bristol Burgesses', https://bafhs.org.uk/resources/burgesses/ [Accessed: 21.06.2022].

The results in table 5 suggest the enforcement of quarantine was not determined by the level of political privileges held by a household. Burial clustering increased markedly for burghers and non-burgher households alike. The absolute difference in clustering levels was 27 percentage points for non-burghers and 21 percentage points for burghers. Whilst this was slightly lower for the burgher group, this is explained by their particularly high level of clustering in 1575 – there was less room for the levels to increase for this group since the maximum level is 100 per cent.[65]

These measures of socio-economic status complement, but do not replicate each other, in finding no socially determined differences in the degree to which household quarantine was observed in the parish of Christchurch in 1603–4. Those inhabiting the more affluent streets and households may have witnessed lower mortality, but they were not shown greater discretion by the officers responsible for enforcement, even though these officers would often have been their friends, neighbours, customers, and colleagues.

The division of Christchurch householders into two groups based on affluence, political inclusion, and location obscures potential differences between the mass of the population and the tiny fraction of elite households. In fact, only one such household experienced mortality during the outbreak in 1603–4, but it was one of the wealthiest and most influential in the parish. The household of the alderman and mercer William Yate are recorded in both the 1575 and 1601 Easter books. His Easter tithe payments were among the highest in the parish in both years.[66] His will reveals that he lived in a large property on the south side of Wine Street at the easterly end that was also occupied by his son, Henry. William Yate had dynastic ambitions. He hoped God would call his son Henry to the office of 'Sherriff of Bristow and likewise his son John after him'.[67] The Common Council proceedings record him as present in both June and July 1603 when the plague response was agreed.[68] The minutes show that in July, he contributed the mandatory 20 shillings plus an additional £5 to the plague fund.[69] Yate was an archetypal urban elite: a wealthy merchant with considerable political power and experience occupying a large house on a prominent street in the town.

The experiences of his household during the plagues of 1575 and 1603–4 were typical of his neighbours. In the earlier plague, the Yate household experienced one death, that of a servant called Thomas Gryne. In 1603–4 the effects were considerably more devastating. Both William and his wife, Margaret, along with a grandchild, Andrew, and a servant of their son, Henry, died between August and November 1603. Unlike in 1575, the death of one household member was only the start of a tragic autumn for the Yate household. No one was immune from the quarantine regulations in Christchurch, not even the household of a man responsible for implementing them.

V | EXPLAINING UNEVEN ENFORCEMENT

Why did the central, affluent parishes experience greater levels of enforcement than the poorer, more peripheral ones? The minutes of the Common Council proceedings describe a centrally

[65] The similar patterns are partially explained by the overlap in these groups of households. For instance, wealthier households were more likely to be burgher households. Yet in 1603–4 one third of poorer households were headed by burghers and one third of wealthy households were not headed by burghers.

[66] 60 pence in 1575 and 72 pence in 1601.

[67] TNA, PROB 11/104/107, will of William Yate, Alderman of Christchurch Bristol, Gloucestershire, proved 18 May 1604. My thanks to Josh Allen for his transcript of William Yate's will.

[68] Bristol Archives, Common Council Proceedings, M/BCC/CCP/1/1, vol. 1, fos. 78–9.

[69] Ibid., fo. 79.

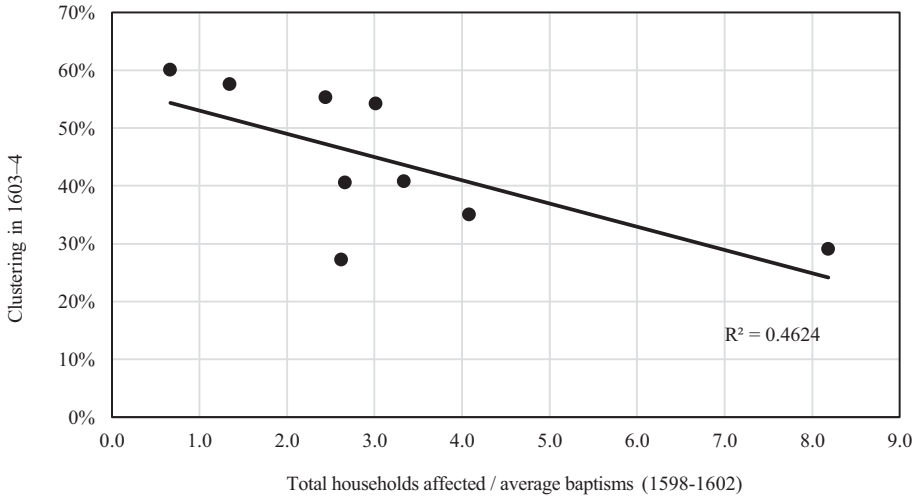

FIGURE 3 Proportion of households infected versus clustering by parish, 1603–4. *Notes*: Total households are calculated using full-household information apart from in the case of St John the Baptist, for which I had to rely on the surname-only approach (see appendix 4, table A4). The *R*-squared in this figure is not sensitive to the inclusion of the far-right data point which represents the St James parish. If St James is removed the *R*-squared falls only slightly from 0.4624 to 0.438. *Source*: Parochial registers: Bristol Archives, P.Xch/R/1/a, P.St_J/R/1/a, P.St MR/R/1/2, P.St_N/R/1/b, P.St_N/R/1/c, P.St_JB/R/1/a, P.AS/R/1/a, P.St_W/R/1, P.St_T/R/1/a, P.St_S/R/1/a

administered system where funds were redistributed according to the requirements of the parishes.[70] They also reveal a continued commitment to supporting the operation of quarantine throughout the epidemic.[71] How do these observations fit with the clustering evidence which reveals the unevenness of enforcement, and a bias towards affluent areas?

Variation in the degree of enforcement across parishes could be associated with the proportion of households affected. Under the system envisioned by the plague orders, every newly infected household had to be identified, locked up, and guarded. The spread of plague thus increased the administrative and practical challenges of enforcement. Furthermore, since no members were permitted to leave, entire quarantined households were reliant on savings or the parish to provide food and fuel.[72] Whilst some households could support themselves, these were always a minority.[73] The greater the proportion of households infected, the greater the burden on the parish, and the greater the chance of the system of quarantine becoming unsustainable.

Figure 3 provides some support for this explanation. It suggests parishes with greater proportions of households affected also witnessed the lowest levels of clustering, and thus the lowest levels of enforcement. The *x*-axis of figure 3 represents the total number of households affected by the epidemic, scaled by the average number of pre-plague baptisms. Average baptisms are used as a proxy for relative population size. The *y*-axis represents the level of clustering in 1603–4. Figure 3

[70] Ibid., fo. 83.

[71] They were still raising additional finance for the 'keepinge in' of the 'visited' in January 1605; ibid., fos. 78–9, 81, 83, 92.

[72] The provision of relief by the parish was always the largest single contributor to the expense of enforcing quarantine; Champion, *London's dreaded visitation*, p. 76.

[73] In St Martin-in-the-Fields, Westminster, in 1636, 84 per cent of quarantined individuals could not meet their living costs during their period of isolation; Newman, 'Shutt up', p. 817.

reveals a clear negative association between levels of clustering and the extent of infection: the parishes where a greater number of households were affected witnessed lower levels of clustering in 1603–4.[74]

Yet figure 3 reveals nothing about the direction of causation between the proportion of households infected and the level of enforcement. More households infected would have meant more strain on the quarantine system, but greater enforcement may also have reduced the proportion of households infected. The association in figure 3 could suggest either direction of causation.[75] The relationship could also have operated in both directions simultaneously. Whilst it is plausible that the extent of infection affected enforcement, this cannot be disentangled from the potential consequences of quarantine for the spread of plague.

As well as variations in the parish level administrative burden, differences in the ease of political oversight may also have affected enforcement. It is surely not a coincidence that the areas where the effects of quarantine are most obvious are also the areas where most of the elite resided. In the mid-seventeenth century, double the proportion of common councillors and aldermen lived in the central parishes as lived in the peripheral ones.[76] Of the 12 aldermen present in the Council in 1603, none baptised their children or owned property in the peripheral parishes for which data survive, whereas 7 were active in the central districts and a further 5 in the riverside districts. Moreover, the size of the central parishes must have made implementation easier there. All five of the parishes which experienced considerable increases in burial clustering in 1603–4 could fit comfortably within the boundaries of the largely suburban parish of St Mary Redcliffe.[77] The size and political connections of the central parishes would have improved the ability for the elite to monitor the implementation process, thus ensuring the plague orders were followed.

Whilst the effectiveness of governance must have been crucial, the degree of enforcement was also determined by the financial resources at the town's disposal.[78] As Slack argues, 'The enforcement of household quarantine [nationally] … depended both on the extent of infection and on the amount of money available to pay for it'.[79] The total expected revenue from plague rates ordered by the Bristol Common Council was at least £566.15 in 1603–4.[80] The Councillors themselves were expected to raise £158 and the rest was to come from four plague levies on all burgesses who were assessed for the national lay subsidies.[81] Since the rate for the first of these is unknown (it was left

[74] This relationship between the proportion of households affected and the level of clustering is not straightforwardly mechanical. The clustering formula (per cent of total *burials* in groups of 3+) is not determined by the *proportion of households in a parish* that are affected. It is theoretically possible for clustering to be 100 per cent with only 1 household affected, or with a high proportion of households affected, so long as three or more people in each household die of the disease.

[75] If quarantine reduced the spread between households, there must also have been some inter-parish restriction on movement to prevent reimportation from non-enforcing parishes. Whilst there is no evidence of this from Bristol, elsewhere in England parishioners did restrict entry from outside; Slack, *Impact of plague*, pp. 271, 288.

[76] Table A1, appendix 1 reproduces the distribution of current and previous aldermen and common councillors of Bristol during the period of the hearth tax (1662–72).

[77] I am grateful to Matthew Kilner for providing me with this information.

[78] The 1373 charter granted separate county status to Bristol and, therefore, reduced the ability for the Bristol JPs (aldermen) to raise funds from the surrounding county as was done for more integrated towns; Lobel and Carus-Wilson, Atlas, p. 1; Slack, *Impact of plague*, p. 267.

[79] Slack, *Impact of plague*, p. 279.

[80] Bristol Archives, Common Council Proceedings, M/BCC/CCP/1/1, vol. 1, fos. 79, 81, 83, 92.

[81] This was calculated using Slack's figures for the 1597 lay subsidy assessment; Slack, 'The local incidence of epidemic disease', p. 53.

to the 'good discreation' of the plague committee), the £566.15 figure is an underestimate.[82] Still, it is high considering a plague assessment for maintaining quarantine in the more populous town of Norwich during the same epidemic was set at less than £300.[83]

The loss of the account books used by the Bristol plague committee in 1603–4 means we cannot know how much of the levies were paid, though threats of imprisonment must have persuaded many to pay up eventually.[84] We also cannot know how much additional revenue was generated through loans or donations made by individual elites, the church, or other corporate towns as was often the case elsewhere.[85] Yet it seems unlikely the Council raised enough to ensure the system of quarantine and relief could be maintained across the city. On the basis of the known costs of enforcement in other English towns, it is hard to imagine the total bill for full enforcement in Bristol coming to less than £3000.[86] Even if donations and gifts doubled the revenue raised through taxation, the Council would still have faced a considerable shortfall.

Whilst it is unlikely the Common Council raised sufficient funds to ensure the quarantine was enforced everywhere, it still had the power to determine which parishes should receive the money that was collected. The Common Council minutes describe a centralised system of resource distribution.[87] Nevertheless, the greater evidence for enforcement in the central, affluent parishes suggests it was here that the Council directed most of its resources. Several factors might explain this choice, but it surely mattered that these were the areas where the councillors and most of the subsidy men resided. Perhaps, as well as being the areas where they could exert control, the Bristol elite also favoured their own parishes to protect themselves and their families.

VI | CONCLUSION

The enforcement of household quarantine in Bristol in 1603–4 was unprecedented in the city's history. When plague threatened in 1603, the authorities persisted with their traditional strategy of restricting movement from infected settlements. When it reached Bristol, however, they responded by enforcing household isolation for the first time, and with considerable vigour. Despite the potential controversy and the considerable expense, the Bristol authorities met with substantial success in separating suspected carriers of infection from the wider community. We know this because their efforts caused a distinctive shift in the pattern of mortality: burials were much more tightly clustered into household groups in 1603–4 than they had been in the plagues of 1565 and 1575. Whilst the policy of isolation may have had a long history when used against other diseases and in other localities, the publication of the plague orders in 1578 clearly caused a disjuncture in the history of plague responses in Bristol.

Contemporaries and historians agree that household quarantine would increase the mortality risks for healthy people inside quarantined households. Yet, the scale of the impact, revealed here

[82] Bristol Archives, Common Council Proceedings, M/BCC/CCP/1/1, vol. 1, folio. 79

[83] Norwich is a good comparison because Norwich also had county status, meaning it was harder for their JPs to assess their hinterlands in times of plague; Slack, *Impact of plague*, p. 281.

[84] Bristol Archives, Common Council Proceedings, M/BCC/CCP/1/1, vol. 1, fos. 79, 81, 83, 92.

[85] Wrightson, *Ralph Tailor's summer*, p. 47; Slack, *Impact of plague*, pp. 279–82; Henderson, *Florence under siege*, p. 144.

[86] There were around 1500 affected households in the whole town. I have found three estimates of the total cost of implementing quarantine and relief across a whole community. The figures imply a cost somewhere between £3000 and £5300; Newman, 'Shutt up', pp. 817–18; Slack, *Impact of plague*, p. 280; Wiltshire and Swindon archives (Chippenham), G23/1/112.

[87] Bristol Archives, Common Council Proceedings, M/BCC/CCP/1/1, vol. 1, fo. 83.

for the first time, is still shocking. Where implemented most forcefully, household quarantine doubled the proportion of burials occurring in groups of three or more. Equally surprising are the very low levels of clustering that were witnessed in the pre-1578 plagues in Bristol. Almost all previous estimates of plague mortality within infected households have resembled those found in the wealthy, central, and riverside parishes of Bristol in 1603–4. These results have previously been interpreted in light of the rat flea theory of plague transmission: high burial clustering was a consequence of the uneven distribution of rats' nests across households, endangering some more than their neighbours.[88] Slack described this pattern as 'one of [plague's] most conspicuous distinguishing features in early modern England'.[89] The results of this study – the first to analyse within-household mortality before 1578 – suggest high burial clustering in other epidemics was actually the consequence of household quarantine, and not the presence of rats' nests. In fact, the agreement between clustering in the pre-1578 Bristol epidemics and clustering during the influenza outbreak of the 1550s – the consequence of direct human to human transmission – suggests plague may have been transmitted between humans as well without the involvement of rat fleas.[90]

Though the effects of quarantine are visible in almost all parishes in Bristol in 1603–4, they are most clear in the affluent, central, and riverside parishes of the town. The authorities came closest to meeting their objective of separating suspected carriers from the healthy in these areas. This is unexpected given the emphasis of some studies on the links between the development and enforcement of quarantine and the desire to discipline and control the poor and marginal who were more common in the peripheral areas. The degree of enforcement was correlated with patterns of elite residence, and thus political oversight, parish size, and the greater potential for effective enforcement. It is likely the pressure caused by high proportions of infected households also mattered, but it is difficult to separate this from the potential consequences of quarantine itself for reducing the number of households affected. The minutes of the Common Council reveal the funds used to enforce implementation were raised and distributed at the centre, not in the individual parishes as they were in other towns, particularly London. The greater evidence for enforcement in the areas where the elite resided is evidence of their greater ability to exercise power in these areas and, perhaps, their desire to ensure the town's resources were used to protect their own households.

At the level of the parish, the bias is towards the most affluent areas, not towards the poorest. But it could still be that the marginalised were treated more harshly within parishes where enforcement was high. The micro-evidence from the central, affluent parish of Christchurch suggests the authorities were more concerned to prevent the spread of infection than target certain social groups. There is no evidence of a bias in the enforcement of household quarantine in the parish of Christchurch. Neither income, street, nor political status determined the degree to which households were quarantined. This supports recent scholarship which argues the development and enforcement of quarantine and relief were motivated by a desire to reduce infections and not discipline or control.[91]

By revealing the extent and intensity of implementation, especially in parishes like Christchurch, this paper raises important questions about those who managed and operated this system on behalf of the state. For, whilst the aldermen and common councillors oversaw the

[88] Schofield, 'Anatomy of an epidemic', p. 102; idem, 'Last visitation of the plague', p. 616.

[89] Slack, *Impact of plague*, p. 178; Slack is quoted in Champion, *London's dreaded visitation*, p. 82 and in Wrightson, *Ralph Tailor's summer*, pp. 38–9. The point originates with Schofield, 'Anatomy of an epidemic, p. 102.

[90] Slack, *Impact of plague*, p. 177.

[91] Crawshaw, *Plague hospitals*; eadem, 'The Renaissance invention', pp. 172-–3; Newman, 'Shutt up', p. 826.

plague response, it was the officials in the parishes who coordinated the many activities required by the plague orders. Parish offices were staffed by voluntary officials with no formal training who were drawn from the middling and elite classes. After 1578, they were responsible for enforcing the system of quarantine and relief within their own communities. Understanding the tensions created when ordinary people locked up their friends, neighbours, customers, and colleagues is a potentially rich area of historical study that has never been investigated.

Even so, there must have been widespread support for household quarantine in the areas where it was enforced. Hindle argues the plague orders were supported only by enforcing magistrates and were inconsistent with the aspirations of the wider populace.[92] Yet, as Braddick shows, the enforcement of social policies presupposes broader coalitions of shared interest among parish officers capable of exercising considerable discretion.[93] Many parish officers and members of the wider public must, therefore, have supported the enforcement of quarantine in Bristol in 1603–4.[94]

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REFERENCES

Adams, W. *Adams's Chronicle of Bristol*, F. Fox, ed. (Bristol, 1910).

Basing, P. and Rhodes, D. E., 'English plague regulations and Italian models: printed and manuscript items in the Yelverton collection', *The British Library Journal*, 23 (1997), pp. 60–7.

Braddick, M. J., *State formation in early modern England, c. 1550–1700* (Cambridge, 2000).

Bradley, L., 'The most famous of all English plagues: a detailed analysis of the plague at Eyam 1665–6', in *The plague reconsidered:* a *new look at its origins and effects in 16th and 17th century England* (Matlock, 1977), pp. 63–94.

Brockliss, L. W. B and Jones, C., *The medical world of early modern France* (Oxford, 1997).

Calvi, G., *Histories of a plague year. The social and the imaginary in Baroque Florence*, trans. D. Biocca and B. T. Ragan, Jr (Oxford, 1989).

Carmichael, A. G., 'Plague legislation in the Italian Renaissance', *Bulletin of the History of Medicine*, 57 (1983), pp. 508–25.

Carmichael, A. G., *Plague and the poor in Renaissance Florence* (Cambridge, 1986).

Champion, J. A. L., *London's dreaded visitation: the social geography of the Great Plague in 1665* (1995).

Cipolla, C., *Fighting the plague in seventeenth-century Italy* (Madison, Wis., 1980).

Cohn, S. K., 'Pandemics: waves of disease, waves of hate from the Plague of Athens to A.I.D.S', *Historical Research*, 85 (2012), pp. 535–55.

Crawshaw, J. S., 'The Renaissance invention of quarantine', in L. Clark and C. Rawcliffe, eds., *The fifteenth century XII: society in an age of plague* (Woodbridge, 2013), pp.161–73.

Crawshaw, J. S., *Plague hospitals: public health for the city in early modern Venice* (Farnham, 2012).

Eckert, E. A., *The structure of plagues and pestilences in early modern Europe: Central Europe, 1560–1640* (Basel, 1996).

Henderson, J., 'Historians and plagues in pre-industrial Italy over the *longue durée*', *History and Philosophy of the Life Sciences*, 25 (2003), pp. 481–99.

Henderson, J., *Florence under siege: Surviving plague in an early modern city* (New Haven, Conn., 2019).

[92] Hindle, *The state and social change*, p. 170.

[93] Braddick, *State formation*, pp. 129–32.

[94] Slack makes a similar point here: Slack, 'Perceptions of plague', p. 147.

Henderson, J., 'The invisible enemy: Fighting the plague in early modern Italy', *Centaurus*, 62 (2020), pp. 263–74.
Hindle, S., *The state and social change in early modern England, c.1550–1640* (Basingstoke, 1999).
Hoskins, W. G., 'English provincial towns in the early sixteenth century', *Transactions of the Royal Historical Society*, 6 (1956), pp. 1–19.
Hudd, A. E., 'Two Bristol calendars', *Transactions of the Bristol and Gloucestershire Archaeological Society*, 19 (1894), pp. 105–41.
Kallioinen, M., 'Plagues and governments: the prevention of plague epidemics in early modern Finland', *Scandinavian Journal of History*, 31 (2006), pp. 35–51.
Latham, R. C., ed., *Bristol charters, 1506–1899* (Bristol, 1947)
Lattimer, J., *The annals of Bristol in the seventeenth century* (Bristol, 1900).
Leech, R., Barry, J., Brown, A., Ferguson, C., and Parkinson, E., eds., Bristol hearth tax*, 1662–1673* British Record Society, vol. 135, Hearth tax series, vol. XI, (2018).
Lobel, M. D., and Carus-Wilson, E. M., *The Atlas of Historic Towns*. Volume Two: Bristol, Cambridge, Coventry, Norwich (London, 1975)
MacKay, R., *Life in a time of pestilence: the Great Castilian plague of 1596–1601* (Cambridge, 2019).
Nelkin, D. and Gilman, S. L., 'Placing blame for devastating disease', *Social Research*, 55 (1988), pp. 361–78.
Newman, K. L. S., 'Shutt up: bubonic plague and quarantine in early modern England', *Journal of Social History*, 45 (2012), pp. 809–34.
Orders, thought meete by Her Maiestie, and her priuie Councell, to be executed throughout the counties of this realme, in such townes, villages, and other places, as are, or may be hereafter infected with the plague, for the stay of further increase of the same (London, 1578?). https://wellcomecollection.org/works/c3h938yb (accessed 19 May 2022).
Parets, M., *Journal of the plague year: the diary of the Barcelona tanner, Miquel Parets, 1651, J. S. A. Amelang*, trans. and ed. (New York, 1991).
Pullan, B., *Rich and poor in Renaissance Venice: the social institutions of a Catholic state, to 1620* (Oxford, 1971).
Pullan, B., 'Plague and perceptions of the poor in early modern Italy', in T. Ranger and P. Slack, eds., *Epidemics and ideas: essays on the historical perception of pestilence* (Cambridge, 1992), pp. 101–23.
Rawcliffe, C., *Urban bodies: communal health in late medieval towns and cities* (Woodbridge, 2013)
Ricart, R., *The Maire of Bristowe is* Kalendar, ed. L. T. Smith (Westminster, 1872).
Russell, J. C., *British medieval population* (Albuquerque, 1948)
Sacks, D. H., *The widening gate: Bristol and the Atlantic economy, 1450–1700* (Berkeley, 1991).
Salomons pest-house, or tovvre-royall (1630). Early English Books Online, https://quod.lib.umich.edu/e/eebo2/A69170.0001.001/1:1?rgn=div1;view=fulltext (accessed 28 Feb 2022).
Schofield, R., 'An anatomy of an epidemic: Colyton, November 1645 to November 1646', in *The plague reconsidered:* a *new look at its origins and effects in 16th and 17th century England* (Matlock, 1977), pp. 95–126.
Schofield, R., 'The last visitation of the plague in Sweden: the case of Bräkne-Hoby in 1710–11', *Economic History Review*, 69 (2016), pp. 600–26.
Shutting up infected houses as it is practised in England soberly debated (1665), Early English Books Online, https://quod.lib.umich.edu/cgi/t/text/text-idx?c=eebo;idno=A60176.0001.001 (accessed 28 Feb 2022).
Slack, P., *The impact of plague in Tudor and Stuart England* (1985).
Slack, P., 'The local incidence of epidemic disease: the case of Bristol 1540–1650', in *The plague reconsidered:* a *new look at its origins and effects in 16th and 17th century England* (Matlock, 1977), pp. 49–62.
Slack, P., 'Perceptions of plague in eighteenth-century Europe', *Economic History Review*, 75 (2022), pp. 138–56.
Sontag, S., *Illness as metaphor* (1979).
Tomic, Z. B., and Blazina, V., *Expelling the plague: the Health Office and the implementation of quarantine in Dubrovnik, 1377–1533* (Montreal, 2015).
von Ewich, *Duetie of a faithfull and wise magistrate, in preseruing and deliuering of the eommon[sic] wealth from infection, in the time of the plague or pestilence: two bookes*, trans. J. Stockwood (1583). https://quod.lib.umich.edu/e/eebo/A00472.0001.001/1:1?rgn=div1;view=fulltext (accessed 28 Feb 2022).
Wallis, P., 'Plagues, morality and the place of medicine in early modern England', *English Historical Review*, 121 (2006), pp. 1–24.
Whittles, L. K., and Didelot, X., 'Epidemiological analysis of the Eyam plague outbreak of 1665–1666', *Proceedings of the Royal Society B*, 283 (2016), pp. 1–9.

Williams, M., 'Bristol burgesses: freedom of the city', *Journal of the Bristol & Avon Family History Society*, 82 (1995), p. 11.
Wilson Bowers, K., *Plague and public health in early modern Seville* (Woodbridge, 2013).
Wright, S. J., 'Easter books and parish rate books: a new source for the urban historian', *Urban History*, 12 (1985), pp. 30–45.
Wrightson, K., *Ralph Tailor's summer: a scrivener, his city and the plague* (New Haven, Conn., 2011).

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APPENDIXES

APPENDIX 1: CHARACTERISTICS OF BRISTOL PARISHES

TABLE A1 Location, Population, and Wealth of Bristol Parishes

District	Parish	Population (1696 marriage duty)	Hearths/entry 1662	Political elite (later 17th century)
Centre	**St Werburgh**	**291**	**5.00**	**13**
Centre	**All Saints**	**278**	**4.60**	**7**
Centre	**Christchurch**	**710**	**4.60**	**8**
Riverside	**St Nicholas**	**1256**	**4.50**	**23**
Riverside	St Leonard	315	4.50	5
Periphery	St Augustine	1610	4.50	3
Riverside	**St Thomas**	**1544**	**4.30**	**14**
Centre	**St John the Baptist**	**906**	**4.10**	**10**
Castle Precincts	Castle	1376	3.90	3
Centre	St Ewen	155	3.80	4
Centre	St Peter	995	3.70	8
Riverside	**St Stephen**	**1800**	**3.60**	**6**
Periphery	**St James**	**2885**	**3.60**	**3**
Periphery	St Michael	984	3.40	10
Periphery	**St Mary Redcliffe**	**1534**	**3.40**	**6**
Periphery	Temple	1593	3.40	5
Periphery	St Philip & St Jacob	1576	3.30	1
Centre	St Mary le Port	404	3.00	6
Population Total		20 212	3.96	135
Sample total		11 204	4.19	90

Note: Political elite = Aldermen and Common Councillors. *Source*: Leech et al., *Bristol hearth tax, 1662–73*, pp. 344–5. The rows in bold are those for which parish registers survive for all three outbreaks.

APPENDIX 2: MORTALITY BY AGE GROUP IN FOUR BRISTOL PARISHES, 1565 TO 1603–4

TABLE A2 Ratio of adult-to-child burials in four parishes with sufficient data, 1565 to 1603–4

Parish	Plague year	Total burials	Adults	Children	Adults/children
All Saints	1565	32	26	6	4.33
All Saints	1575	16	13	3	4.33
All Saints	1603–4	15	5	10	0.50
St Werburgh	1565	32	9	23	0.39
St Werburgh	1575	14	10	4	2.50
St Werburgh	1603–4	42	12	30	0.40
Christchurch	1565	97	66	31	2.13
Christchurch	1575	100	49	51	0.96
Christchurch	1603–4	73	30	43	0.70
St Mary Redcliffe	1565	202	60	142	0.42
St Mary Redcliffe	1575	203	57	146	0.39
St Mary Redcliffe	1603–4	288	138	150	0.92
Total	1565	363	161	202	0.80
Total	1575	333	129	204	0.63
Total	1603–4	418	185	233	0.79

Source: Parochial registers: Bristol Archives, P.Xch/R/1/a, P.St MR/R/1/2, P.AS/R/1/a, P.St_W/R/1.

APPENDIX 3: CALCULATING THE POPULATION SIZE OF BRISTOL, 1560–1602

To calculate the total population at risk in Bristol at the start of each plague epidemic, the average crude birth rate in the parish of Christchurch is applied to average baptisms recorded in all available parish registers. Then a multiplier that accounts for the proportion of the town's population which is missing from the sample is applied. The calculations are described in the table above.

TABLE A3 Components of population size calculations, 1560-1602

	1560–4	1570–4	1598–1602
Christchurch crude birth rate	3.23/1000	3.23/1000	3.23/1000
Annual baptisms (5-year average)	132	181	255
Estimated sample population	4080	5604	7882
1545 chantry return multiplier	2.00	1.64	1.64
1696 marriage duty multiplier	2.38	1.79	1.79
Estimated total population min.	8161	9186	12 922
Estimated total population max.	9715	10 007	14 076
Average population estimate	**8938**	**9597**	**13 499**

Source: Easter books: Bristol Archives, P.Xch/ChW/2/1-4; parochial registers: Bristol Archives, P.Xch/R/1/a, P.St_J/R/1/a, P.St MR/R/1/2, P.St_N/R/1/b, P.St_N/R/1/c, P.St_JB/R/1/a, P.AS/R/1/a, P.St_W/R/1, P.St_T/R/1/a, P.St_S/R/1/a; chantry returns: Russell, *British medieval population*, p. 285, Hoskins, 'English provincial towns', p. 5; marriage duty: Leech et al., *Bristol hearth tax, 1662–1673*, pp. 344–5.

Two birth rates for Christchurch are averaged to limit the effect of short-term variations. The population of the parish in 1575 and 1602 were reconstituted by linking the communicants listed in the Easter tithe books to the parish registers of baptism and burial. The average number baptisms occurring in the five years ending in the Easter book year is divided by the reconstituted population. The same average fertility rate is used to calculate the population before each outbreak.

The crude fertility rate for Christchurch is then used to estimate the population size of the parishes for which average baptisms can be calculated from the parish registers. For 1575 and 1603–4, the sample parishes are the nine featured in this study plus St Ewen's. For 1565, the sample is smaller because the baptism registers for St Steven and St John the Baptist do not survive.

Two benchmarks are used to inflate the resulting estimates so that they represent the whole population of Bristol. The 1545 chantry returns show the number of housing people (adult householders) by parish. The 1696 marriage duty assessments provide an estimate of the population by parish. A multiplier can be calculated using both sources that allows for the baptism sample population to be inflated to account for the parishes for which registers are missing. In the table above the population estimates derived using both multipliers are shown, as well as the average of the two. As the parish sample represents a diminishing proportion of the population over time, the true population was probably lower than the average in 1565 and higher by 1603.

These estimates for 1565 and 1575 are very close to previous estimates based on the 1523–7 subsidy assessments and the 1545 chantry returns, both of which suggest Bristol had a population of between 9500 and 10 500 in this period.[95] However, the estimate of the population in 1603 is higher than Slack's estimate of around 12 000.[96] Slack's figure represents the city's population as recorded in a census of 1607 – directly after the epidemic – and makes no adjustment for the loss of life during the outbreak.[97] Adding the total death toll of 2600 to the post-epidemic population size estimate leads to a pre-plague population size of 14 600.[98] This is too high because the city's population would have grown between the end of 1604 and 1607 owing to in-migration. The estimate presented here implies population growth of around 1100 people (8 per cent) in two years.

APPENDIX 4: FULL DATA ON BURIAL CLUSTERING IN 9 BRISTOL PARISHES, 1565-1604

To address the problem of overmatching individuals with common surnames, a list of common surnames was created using all registers which contained the names of household heads. If two or more households within the same register shared a surname it was added to the list. This list reveals little that would surprise anyone with a knowledge of English surnames. The frequency of surnames like 'Williams', 'Welsh', and 'Hewes' could be interpreted as evidence of the many Welsh people who lived in early modern Bristol.

The next step was to remove all individuals with any surname on the list from the 27 plague burial samples. The list contains the 38 common surnames out of a total of approximately 560

[95] Russell, *British medieval population*, p. 285; Hoskins, 'English provincial towns', p. 5.

[96] Slack, 'The local incidence of epidemic disease', p. 51.

[97] Lattimer, *The annals of Bristol*, p. 34.

[98] For references for estimates of plague mortality for the whole town, see footnote 33.

TABLE A4 Total burials in each of the 27 samples (burials included in surname-only samples in brackets), 1565–1604

Parish	1565	1575	1603–4
All Saints	32 (28)	16 (13)	15 (15)
St Werburgh	32 (22)	14 (11)	42 (35)
Christchurch	97 (76)	100 (83)	73 (60)
St John the Baptist	93 (85)	60 (46)	114 (96)
St Thomas	226 (194)	180 (138)	221 (158)
St Mary Redcliffe	202 (176)	203 (163)	288 (204)
St Stephen	170 (147)	173 (147)	236 (168)
St James	184 (138)	156 (124)	335 (237)
St Nicholas	129 (92)	145 (106)	169 (134)
Total	1165	1047	1493

Source: Parochial registers: Bristol Archives, P.Xch/R/1/a, P.St_J/R/1/a, P.St MR/R/1/2, P.St_N/R/1/b, P.St_N/R/1/c, P.St_JB/R/1/a, P.AS/R/1/a, P.St_W/R/1, P.St_T/R/1/a, P.St_S/R/1/a.

TABLE A5 Surname-only clustering results for all parish samples, 1565–1604

Parish	1565	1575	1603–4	Pre-1578	Absolute difference
Christchurch	18%	24%	72%	35%	37%
All Saints	39%	0%	60%	27%	33%
St John the Baptist	20%	28%	54%	25%	29%
St Werburgh	18%	0%	49%	12%	28%
St Thomas	28%	34%	50%	30%	20%
St Mary Redcliffe	27%	31%	35%	29%	6%
St Stephen	33%	31%	37%	32%	5%
St James	33%	31%	37%	26%	4%
St Nicholas	26%	28%	19%	27%	-8%

Source: Parochial registers: Bristol Archives, P.Xch/R/1/a, P.St_J/R/1/a, P.St MR/R/1/2, P.St_N/R/1/b, P.St_N/R/1/c, P.St_JB/R/1/a, P.AS/R/1/a, P.St_W/R/1, P.St_T/R/1/a, P.St_S/R/1/a.

unique names present across all 27 samples.[99] This means common surnames represent about 7 per cent of the total surnames, though they are associated with 809 burials (22 per cent) across all parishes and epidemics. The removal of these people will not bias the results if the true distribution of surname clusters among households with common surnames is the same as that for the rest of the population.

In the best cases, the register also contains additional information that allows us to relate an individual to their household. So, it is possible to create a second set of estimates of clustering which utilise all this information. These estimates can be used to check the accuracy of the surname-only approach. A comparison of the two reveals a relatively consistent set of estimates (tables A4, A5, A6).

[99] It is difficult to ascertain the exact figure because many surnames have multiple variants, but 560 is my best estimate. This is for all 27 samples combined.

TABLE A6 Full-household linkage results for all parish samples, 1565–1604

Parish	1565	1575	1603–4	Pre-1578	Absolute difference
Christchurch	33%	26%	58%	29%	29%
St Werburgh	22%	0%	40%	15%	25%
All Saints	59%	0%	60%	42%	18%
St Mary Redcliffe	21%	30%	35%	26%	9%
St Thomas	N/A	N/A	55%	N/A	N/A
St Stephen	N/A	N/A	41%	N/A	N/A
St James	N/A	N/A	29%	N/A	N/A
St Nicholas	N/A	N/A	27%	N/A	N/A
St John the Baptist	N/A	N/A	N/A	N/A	N/A

Note: N/A is used for cases where the registers do not allow for this type of analysis.
Source: Parochial registers: Bristol Archives, P.Xch/R/1/a, P.St_J/R/1/a, P.St MR/R/1/2, P.St_N/R/1/b, P.St_N/R/1/c, P.St_JB/R/1/a, P.AS/R/1/a, P.St_W/R/1, P.St_T/R/1/a, P.St_S/R/1/a.