1665: London's Last Great Plague Transcript

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Plague in early modern London has been the focus of many studies, but there still remain inconsistencies and puzzling elements in an apparently widely-accepted narrative. London experienced at least six epidemics of plague between 1563 and 1665, but they occurred at quite irregular intervals and their severity varied from episode to episode and from area to area. Although the quality and healthfulness of London’s built environment almost certainly deteriorated over the period, plagues did not get successively more lethal: 1665 saw the highest death-toll, but not the highest mortality in relation to population size. After 1666, plague disappeared entirely even though the metropolis continued to grow. The identification of the disease, and its association with rats and fleas, which has held sway for the last century, has come under increasingly sceptical scrutiny. So, in the 350th anniversary of what proved to be London’s last great plague year, this lecture will consider whether we really understand the epidemic any better than those who lived through it.

Introduction

The 350th anniversary year of the last great plague of London has not seen commemorations like those for Waterloo or Agincourt, let alone Magna Carta, but it is still a worthwhile opportunity for reflection.

The story of the plague is probably very familiar to many, and there is a small library of books on the topic. The question I would like to explore tonight is, do we really understand the London plague epidemics of the 16th and 17th centuries any better than those who experienced them at first hand. I will concentrate on the plague of 1665, but the history and memory of earlier plagues are also important factors.

The reason for the question is, of course, that modern understandings and indeed diagnoses of plague have changed a lot in the last thirty years. What I learned as a student is not what I now teach my own students. Partly it’s that historians’ approaches have changed – the impact and experience of plague are now foregrounded, and critically assessed – but also it is that the epidemiological consensus of the preceding century has more or less dissolved. Where once we felt confident that we knew what the disease was, and how it spread - and were able to condescend to the ignorance of our ancestors – we are now presented with a variety of possible scenarios, arguments both destructive and constructive, and some quite acerbic exchanges between their proponents. I will come back to those issues, but I want to begin with what early modern Londoners knew or believed about plague.

Historic plague: contemporary knowledge

The fact that early modern Londoners lacked what we would consider an adequate and accurate epidemiology of plague did not mean they were lost in a fog of ignorance, helplessly groping for information and reassurance. Londoners - and others - were quite well-informed about the appearance, progress, and even the history of the disease. They were showered with advice and instruction.

The Bills of Mortality

To start with there was a regular, officially-vetted, flow of information to the public, in the form of weekly
handbills reporting the previous week’s deaths and causes of death. These documents were known as the Bills of Mortality; originating in the sixteenth century, they had become part of the pattern of London life by the early seventeenth.

The weekly Bills were a collation of information from the 120-odd individual parishes. The clerk of each parish was responsible for collecting data from his own parish and reporting it to Parish Clerks’ Hall every Tuesday. Officials put the information from all the parishes together and made up and printed the Bills; copies went first to the Mayor and Aldermen and the Privy Council on Thursday morning, before being released for public sale. The weekly Bill was a double-sided sheet, with the week number and date at the head. The face or recto contained the information on burials and plague burials by parish, organised into groups – by 1665 these were the 97 parishes within the walls, the 16 parishes outside the walls but partly or wholly within the city’s jurisdiction, a wider circle of 10-12 parishes in Middlesex and Surrey, and a cluster of five Westminster parishes.

New parishes had been added as the seventeenth century progressed, and the outer groupings somewhat reorganised, but this was the basic structure.

The reverse or verso of the Bill contained a list of deaths by cause, aggregating the figures from all parishes, though sometimes leaving in some details especially for accidents; it noted how far burials had risen or fallen since the preceding week; and it also included information on the Assize of Bread, which specified the weight of a loaf of a particular price.

Though comparatively few originals have survived, contemporary letters and diaries demonstrate their readership and use. The Bills were printed and distributed week in and week out, available both for an annual subscription of 4s., and for individual sale. They provided both a regular topic of conversation and subject for correspondence. John Chamberlain, frequent letter-writer of the late Elizabethan and early Stuart periods, often passed on information from the weekly bills to his correspondents; others enclosed copies with their letters.

However, it was during plague epidemics that the Bills gained the largest and most avid readership. The principal justification for collecting the information was to be able to detect the onset of an epidemic – a sustained rise in weekly death totals in the early summer was a pretty good indication – so that those with responsibilities could plan their strategies. But ordinary Londoners became expert at assessing the implications of the weekly Bill, especially as it charted the spread of plague from parish to parish.

Samuel Pepys first mentions reports and rumors of plague in his 1665 diary, and notes seeing houses shut up in Drury Lane, but as the epidemic progressed he clearly read the weekly bills and often notes the figures, using them to draw conclusions about the progress of the disease.

The narrator of Daniel Defoe’s semi-fictional Journal of the Plague Year uses the weekly Bills to structure his story and shape its chronology, starting with the appearance of the disease in late 1664, and showing a keen awareness of the implications of numbers and geographical spread. Subsequently he includes quotations from the Bills in tabular form (indicating that Defoe, writing in 1720, had access to copies of the Bills from 1665). A complementary kind of publication – rushed into print to catch the market - was the commemorative or souvenir bill, carefully constructed typographically to catch the eye, with images or crosses, sustaining poetry or prayers, sometimes plague remedies, and weekly totals from earlier years for comparison. These were clearly published during rather than after the epidemic; one such (edged in black with a large black cross in the centre) was published on or just after 29 August 1665. Someone has carefully added in by hand the weekly totals for the rest of 1665 and well into 1666, suggesting a real interaction with the bill’s content.

So the Bills provided material not just for immediate information, but also for reflection. Yearly bills were compiled from the weekly totals (in format they closely resemble the weekly bill; except that they have a more structured and synthesised account of causes of death other than plague). People who bought and studied the yearly bills, presumably published in late December or January, were not seeking fresh data of immediate import but rather the means to analyse and understand the epidemic in a more holistic way.
The first and greatest exponent of the bills as a source for demographic theory was Captain John Graunt, by trade a haberdasher, who in 1662 published a treatise entitled Natural and Political Observations ... upon the Bills of Mortality. Graunt combined an historical perspective with a mathematical/actuarial approach to the numerical data, categorising and comparing, to demonstrate unsuspected truths and demolish myths. He aggregated and analysed the bills data to show annual mortality levels and change over time, the prevalence and cycles of various diseases and causes of death, the health of country and city. He pointed out that some causes of death varied little from year to year, while others swung widely. Of plague, ‘that greatest Disease, or Casualty of all’, he noted that there had been (at the time) four times of great mortality, of which (in his view) 1603 and 1625 were the most severe (he did not have figures for 1563, which we now think was probably the worst relative to London’s size). He argued that not all deaths due to plague were so reported, so the true figures might be 25-30% more than the Bills indicated. He also noted that some ‘plagues’ lasted a single year, while others dragged out over several, and that deaths attributed to fevers and similar infections increased in plague years and also in the preceding year.

Graunt’s book was popular and well-received; though only a modest tradesman, he was elected to the Royal Society on the strength of it. The book went into several editions (Pepys had the third edition, published by the Royal Society), and encouraged others to produce (or pirate) similar works. One of these was published as Reflections on the weekly Bills of Mortality ... which seems to be a pastiche of extracts from Graunt with the yearly bill for 1665 appended. More useful, certainly to posterity, was London’s dreadful Visitation, or a Collection of All the Bills of Mortality for this present year ... 1665 published in early 1666 by E Cotes, printer to the Parish Clerks.

So Londoners had regular weekly bulletins on the progress of the plague, access to information on past epidemics, and an accessible introduction to statistical demography to help them understand the data. Even though plague had been absent for some 20 years, and the last serious epidemic was nearly 30 years in the past, Londoners in 1665 were able to situate themselves in time and compare their experience with others. They knew that epidemics of varying severity had come and gone in the past, even if they did not, as we can, express the data graphically; that the geography of plague was significant; that the disease normally peaked in late summer; and that the onset of cold weather usually brought relief.

**Historic plague: responses**

But they also had an array of other sources of information, advice, and instruction.

**Measures to manage**

The city had a coherent and on its own terms rational response to plague, a kind of emergency plan activated when an epidemic seemed imminent, in the form of Plague Orders. These derived from the Privy Council and were informed by medical thinking including continental practice, but they were imposed and enforced by the city authorities.

Officials were appointed and instructed. Regulations were issued on the quarantining of infected persons and houses, and their support; on burial; the disposal of household goods; keeping the environment clean; getting rid of dangerous or disorderly elements. Even if the orders were not fully observed – as Pepys documents, both in his observations and through his own behaviour, being often out after the official curfew of 9 o’clock – they provided a framework of expectation and delineated the hierarchy of responsibility.

In addition to the Plague Orders, the Mayor and Aldermen meeting through the summer issued a stream of
other precepts, concerning the expansion of accommodation at the Pest-house, the appointment of physicians and surgeons, the closure of Grammar and other schools (especially dancing and fencing schools), the provision of further burial space as the city’s churchyards filled up.

Civic leaders, for the most part, stayed at their posts, and social order was largely maintained. The smaller cogs in the machine got on with their work. Local systems continued to work remarkably well, even if under increasing strain as the scale of the epidemic rose and human and financial resources were more and more stretched.

The Plague Orders and the Corporation’s other activities give us a good idea of official thinking about the epidemiology of the disease. It is clear that they believed that infection was passed from person to person, and that those who had had contact with the diseased (or with the dead) could themselves infect others either before or without succumbing to the disease themselves. Quarantining the sick or potentially sick was therefore vital. Assemblies of people, whether for burials or more secular enjoyments, were dangerous and must be curbed. The clothing and bedding of the sick were a lingering potential source of infection and must be treated with care or preferably destroyed; certainly they must not be allowed to circulate as before. Dirt and rubbish in the streets, cats and dogs, beggars and disorderly behaviour, were all seen as likely sources of infection, requiring to be cleansed or controlled.

Medical responses

It is not easy to characterise how Londoners in general perceived the plague in medical terms because there were so many different schools of thought, embracing a variety of diagnoses and treatments. By 1665 the traditional, Galenic, humoural understanding of disease favoured by the College of Physicians had come under sustained attack from the newer ‘Chemical’, Paracelsian and Helmontian physicians. Proponents of one or other school of thought confidently promoted their own view and attacked their rivals. Galenic physicians largely saw the problem as one of internal balance and resistance to disease, so that purging and bloodletting played an important role in treatment, while Chemical practitioners sought cures in nature and treated patients with minerals and metals. London also had a large number of non-professional practitioners, empirics, wise women, herbalists, practicing more traditional medicine. London apothecaries stocked an enormous range of substances and remedies.

Plague books and pamphlets comprised a large subsection of medical publishing, especially in plague years; Londoners could choose from a wide range of publications in many formats and price levels, with a similarly wide range of theoretical and practical approaches. It is not clear that having such a variety of conflicting views to choose between was necessarily reassuring, but it cannot be said that Londoners were short of information. I cannot run through all the publications even of 1665, but a short account of two or three will give a flavour of what was being offered.

A modest offering from the traditional Galenic camp was the anonymous Directions for the prevention and cure of the plague, Fitted for the Poorer sort, a short six-page pamphlet, offering homely advice on diet (‘abstain from the boiled herbs of Colliflowers, Cabbage, Coleworts, Spinage, and Beets’) and some inexpensive remedies drawn from the Galenic pharmacopoeia. Although not an official publication, it has some sense of speaking for authority, as its instructions and advice are very much in line with the plague orders (several of its recommendations are actually mandated there) and with civic regulations for the behaviour of the poor.

One of many professional medics to seize the opportunity offered by the epidemic was Gideon Harvey, a naturalized Dutchman, trained at Leiden and claiming the degree of MD. He published his Discourse of the Plague probably in July or early August 1665. At that point, in his view, the pestilence had reached its second stage, the augment, when deaths and sources of infection were increasing, but not yet its third stage, the State, ‘at which time people dye thickest’, which might be expected at the end of August or in September (and the Bills bear out this proposition).

Harvey believed the disease was bred in the earth and exhaled into the air as ‘flaming Arsenical corpuscles’.
These might infect directly, or gather and multiply in what he called ‘Pestilential Seminaries’ or seedbeds. He offered a range of advice, from prevention and preservation (through avoidance of excess and dangerous encounters), to prophylactics if exposed to infection (bloodletting or purging, and antidotes made of various ingredients including sulphur, antimony, and camphor). An infected person should be treated with sudorific (sweat-inducing) compounds, and restored with cordials and juleps. His approach thus combined both Galenic or humoural analysis and treatment with more chemical remedies (sulphur and metals being favoured by the chemical physicians).

Also published during the plague of 1665 (‘these contagious times’) was George Thomson’s Loimologia, for the most part a sustained critique of Galenic theory, practice, and practitioners, especially blood-letting and purging, and also the notion of astrological influence. Described as an ‘ingenious and Industrious Iatrochemist’, and a follower of ‘heroick Helmont’, Thomson nevertheless shared the view that plague was airborne, a ‘venenous Gas, or subtle poyson’, either generated within or penetrating from without. He argued that disease attacked the vital spirit or Archeus, which should therefore be fortified mentally and morally against such an assault. The present plague was a new disease, closely related to scurvy; it should be treated simply with ‘Scorbutical Remedies mixt with anti-pestilential and Alexipharmacal’ medicines. Like many authors he included a puff for his own products, recommending his own Tinctura Polyacaea and his powder Pulvis Pestifugus.

Thomson was a prolific and polemic writer, following up Loimologia with Loimotomia the following year, again challenging the Galenists and asserting the superiority of his diagnosis and remedies.

Thomson argued that plague was a new, perhaps compound disease, but much of the medical literature on plague was a simple rehash of material printed in earlier epidemic years. It could be that older works had a tried-and-tested appeal in the flux of competing offerings. Many of the most popular remedy collections, reprinted at intervals through the sixteenth and seventeenth centuries, included a section on plague which changed little from one edition to the next. At least nine editions of A rich storehouse or treasury for the diseased …. set forth for the benefit and comfort of the poorer sort of people, that are not of abilitie to goe to the Physicians, were published between 1596 and 1650. Broadly Galenic in approach, it offered 805 remedies arranged alphabetically by complaint, from Aches to Worms, with a large section on plague, both preservatives and cures.

The moral response

Focusing on medical remedies alone does not do justice to the range of reactions to plague. For most people, there was a moral or divine first cause for the epidemic, however the disease was itself propagated. Here there was perhaps more uniformity of approach and response: if the plague was a visitation of divine displeasure, the remedy must be repentance and reform. The Crown and the City Corporation ordered fasts, prayers, and sermons, as well as a clamp-down on loci of morally dubious activities such as playhouses and alehouses. There was no necessary clash between religious and medical responses: Defoe’s narrator argues that the plague was ‘[not] at all the less a judgment for its being under the Conduct of humane Causes and Effects’ [p. 153]. The printer Cotes stated that his motive for collecting all the 1665 bills and reprinting them as London’s dreadful visitation was so that the information they contained might prompt Londoners to repentance. And there was an outpouring of printed prayers, sermons and polemics, hyping up the terror, perhaps, but also confidently prescribing the remedy. A frequent characteristic of such literature, indeed, is its use of the terminology of medicine (pestilence, antidote, remedy, cure, heavenly physician, and so on), as for example in the Christian’s Refuge (published in July 1665), a hybrid of medical and spiritual information.

Modern and historic plague: historiography and controversy

It is easy for the modern reader to condescend to the apparently muddled thinking of seventeenth-century Londoners and their ascription of plague to multiple causes – whether divine, astrological, environmental, internal or external factors - and for the last century or more that is exactly what both scientists and historians have been doing. Confident in our superior modern understanding of disease, we have selectively read the historical evidence, dismissed complicating data, and imposed what I am now sure is an erroneous diagnosis on the
plagues of the fourteenth to seventeenth centuries. The story of this misdiagnosis and its long persistence, as well as its damaging impact on both medical science and historical research, is well told by Sam Cohn, in The Black Death transformed (2002). His focus is on the plague of 1348 and subsequent medieval outbreaks, but his argument holds good for the plagues of the sixteenth and seventeenth centuries.

Soon after the identification of the bacillus Yersinia pestis as the cause of the plague present in 19th-century India and China, the so-called third pandemic, scientists and historians alike seemingly concluded that this was the same disease and hence the same agent that affected medieval and early modern Europe. I do not think it can even be called an hypothesis, as it was never subjected to testing; it was just assumed. Though the parallel between the two pandemics was far from close, this assumption took root, and was not disturbed even when research gradually pieced together the complex epidemiology of bubonic plague, with its close dependence on rats and fleas.

As the character of modern plague was more clearly established, the increasingly glaring discrepancies between its behaviour and that of the historic plagues should have provoked thought and revision, but instead, historic accounts were cherry-picked for supporting evidence, or dismissed out of hand. The silence of medieval and early modern commentators on the subject of rats and fleas was seen as a failure of observation or reporting on their part, not as undermining the identification. If there was any problem with divergent seasonality or case-fatality between historic and modern plagues, it could be answered by adducing variants of plague – pneumonic and septicemic – to square the story. This identification captured the popular imagination as well as the academic and held firm for some decades; certainly when I was a student in the 1970s, there seemed to be no question about it. When Graham Twigg, originally a zoologist, challenged the narrative in 1986 on the initial grounds that there were not enough rats in fourteenth-century Britain to act as an effective vector for an epidemic that spread so fast and killed so many, his work was dismissed or sidelined by many.

Over the next three decades, however, the consensus did begin to crumble. The problems with attributing historic plague – infectious among humans, fast-moving, frequently fatal, summer-seasonal – to the same agent as modern plague, which is none of those things, have been more widely acknowledged. More attention – and respect - has been paid to the historic evidence of incidence, spread, fatality, and some obvious conclusions about infectiousness and incubation periods have been drawn. Bold new theories have been proposed, suggesting that historic plague was due to an unknown hemorrhagic fever, or to a cocktail of concurrent diseases that may or may not have included Yersinia pestis. New vectors, such as the louse rather than the rat-flea, have been suggested. But the adherence to older theories remains strong, even emotional, and academic passions can rage high. Recent archaeological discovery of Yersinia pestis DNA in plague or plague-era cemeteries in France and England has been claimed to vindicate the older view, but it is far from conclusive that the strains of Yersinia pestis so far identified could have caused, let alone necessarily did cause, the medieval and early modern epidemics. Even if Yersinia pestis can claim the credit, so to speak, it is undeniable that its expression and action in historic plagues was very different from in modern ones.

So where are we now? We thought we knew, after the 1890s, what historic plague was; some still think they know, though they do not all think the same thing; I think we do not know, any more than our ancestors, what the disease that last raged in London 350 years ago actually was. And if one thing is clear from the historical and scientific debate, it is that we should be very cautious about extrapolating from untested assumptions about the disease, and very aware of how presumptions and preconceptions might be affecting our ability to examine and interpret the evidence.

But I also think that the disease's identity is not the most important question, certainly for historians. Of course, accurate identification of the disease would allow us to say whether the measures – social or medical – invoked by governments to control the outbreak were likely to be effective or not. It might allow us to understand the fluctuations and irregular recurrences of the plague better, and to explain why it disappeared after 1665. We could perhaps more definitively say whether quarantine, and shutting-up of houses, was the bad idea that many at the time thought it was. But none of the treatments available at the time could have cured a bacterial or viral disease; only the patient’s own resistance could do that, and that would be true whatever the pathogen. Likewise the focus on avoidance, prevention, and keeping up strength and spirits, was good advice regardless of the actual nature of the disease.

The important question, in my view, is not what disease it was, but how it impacted on contemporaries – what it meant for them, how they reacted, how the experience of plague affected the character and development of
In this area we are better informed than our ancestors, in the sense that we can gather together information from diverse sources that wasn’t in the public domain at the time. As well as the Bills of Mortality and associated writings generally available in 1665, we can read Pepys’s private, ciphered diary and those of other contemporaries; collect together scattered correspondence and business papers; inspect the minutes of the Court of Aldermen; study tax returns; examine the parish registers and records then kept under lock and key in 100 separate parish vestries. We can access works published at the time but in short print runs, and scholarly works written afterwards from first-hand experience such as Thomson’s Loimotomia (published in 1666), and Dr Nathaniel Hodges’ Lomologia, a detailed account of the 1665 plague published in Latin in 1671 and in English translation in 1720; or the apothecary William Boghurst’s MS treatise ‘Loimographia’ (which simply means a scientific description or writing about plague), written in 1665 but not edited and published until the 19th century. Defoe’s Journal of the Plague Year was not written and published till 1722. Of course much has been lost – most printed ephemera simply disappears; some parish records were destroyed in the Fire the following year; letters and diaries have been discarded over time. But we are in a better position to identify and access what has survived – even to trace dispersed items in library catalogues and archives all over the world. We can share our interpretations with others and test our arguments in informed debate.

Historic plague: a Londoner’s experience

So I want to conclude with a vignette of London in 1665, and the experience of one particular individual from this area of London.

Cripplegate in 1665

We are in the old suburbs of the city, just outside the wall, as you can see from inside the Museum itself. Part of the Museum is in the parish of St Botolph Aldersgate, which stretches along Aldersgate Street; the 18th-century church of St Botolph, which you may have passed on your way in, stands on the site of the medieval church. Part of the Museum also lies in the parish of St Giles Cripplegate, to the east; the church in front of the Barbican, though damaged and repaired, still has much of its medieval and early modern fabric. The parish of St Giles is a huge one, extending well beyond the city boundary towards Islington, and including at this date what was to become the parish of St Luke Old Street.

In 1665, St Giles Cripplegate saw some of the worst mortality in the metropolis. This was not merely a function of its size and population; it also had one of the worst mortality rates per household. Its population on the eve of the plague could have been 25,000; in the year 1665 there were 8,069 deaths, of which 4,838 were attributed to plague. The first plague deaths in the parish occurred in early June, nearly a month after the first plague deaths in the northwestern parishes, but they rose rapidly in July and peaked in late August. The worst week for plague deaths was the one ending on 29 August, when 842 people died, 602 of them of plague. Deaths declined through September in this parish (though not in all parishes). In the week ending 3 October, 196 deaths were reported, 151 of plague. Single figures for plague deaths were only reached in late November. In January 1666 the vestry, noting the effects of the huge mortality on burial space, began to look for ground for a new churchyard.

Richard Smyth

One inhabitant of the parish who has left some record of his experience was Richard Smyth, a retired law-officer of the City, living in White’s Alley in Little Moorfields. In 1665 he was 75, a recent widower, and probably living with his widowed daughter and perhaps also his widowed sister-in-law.
In his retirement he devoted his time to scholarship and book-collecting. He was a friend and admirer of John Graunt, and owned a copy of his Natural and Political Observations; he may also have collected printed weekly Bills of Mortality. He had an extensive library with a large section of medical works in Latin and English, and a number of manuscripts likewise. His view of plague – he had lived through the major plague of 1625 and a slightly lesser one in 1636 - is illuminated by the fact that at some date probably around 1665 he copied out by hand the sixteenth-century plague treatises of Andreus a Lacuna of Segovia and of Leonhard Fuchs of Tubingen, both of them largely Galenic in diagnosis and advice. And in October 1665, as the plague was fading from this parish, he translated two sixteenth-century plague tracts from Latin into English, the sermons of Gabriel Biel on the question whether it was lawful (morally or otherwise) to flee the plague and a tract by Ludovicus Berus on the same.

Although his own household was not touched by the plague, the epidemic had a major impact on his social circle. For most of his adult life he had kept a running catalogue or memorandum of deaths of people he knew or knew of. In the early 1660s he was recording some 30-40 deaths a year; in 1665 this swelled to 169. A hundred and four of these he reported to have died of plague; two were suspected but not reported; some of the remainder may also have been of plague, but he does not say so. The first plague death he records is that of his niece Elizabeth Houlker, at her sister Mary Harby's in White Cross Street in this parish, on 3 July. Two weeks later, on 16 July, he notes the deaths from plague of Mary Harby's child and its nurse; Mary's husband William died of plague on 9 August, but she herself survived. Smyth's former maidservant Nell Hutchins died, as did her sister (who died at the pesthouse) and her mother and stepfather. Smyth's sister-in-law's sister died, and the daughter and brother of his old friend Mrs Muschamp in Shoreditch. Smyth's neighbour Mr Ward passed on news of the death of his own brother and his five children. Smyth recorded the deaths of acquaintances across the city, especially people associated with the book trade and the law, but many were close at hand: one of the churchwardens of Cripplegate parish; the parish clerk's wife; Mrs Durant his pew-fellow. Several deaths occurred in White's Alley, where Smyth lived, and in neighbouring Gun Alley and Tenter Alley. The last plague death he notes was in January 1666, that of Mr Ford, grocer in Coleman Street by London Wall.

Smyth's experience in 1665 is a reminder that the big story of the plague is made up of thousands of little stories, some of which can still be recaptured. As an historian of early modern London, it is these human stories that interest me, names as well as numbers; individuals set against the backdrop of a calamity, an overwhelming trauma so great it is hard for us to imagine.

Further reading

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