



The Forensic Tradition in Milan's Civic Mortality Registers

Ann G. Carmichael
Indiana University (<carmicha@indiana.edu>)

Received: August 1, 2021
Accepted: March 1, 2022
Published: December 13, 2022

Citation: A.G. Carmichael
(2022) The Forensic Tradition in
Milan's Civic Mortality Registers.
*Jems. Special Issue: Plagues in
Early Modern Europe*. pp. 1-23.
doi: [http://dx.doi.org/10.36253/
JEMS-2279-7149-14108](http://dx.doi.org/10.36253/JEMS-2279-7149-14108)

Copyright: © 2022
A.G. Carmichael. This is
an open access, peer-
reviewed article published by
Firenze University Press ([https://
oajournals.fupress.net/index.php/
bsfm-jems](https://oajournals.fupress.net/index.php/bsfm-jems)) and distributed under
the terms of the Creative Com-
mons Attribution License, which
permits unrestricted use, distri-
bution, and reproduction in any
medium, provided the original
author and source are credited.

Data Availability Statement:
All relevant data are within the
paper and its Supporting Infor-
mation files.

Competing Interests: The
Author(s) declare(s) no conflict
of interest.

Editors: D. Pallotti, P. Pugliatti
(University of Florence)

Abstract

From the late fourteenth to the seventeenth century, many Italian cities and towns responded to recurrent plague by keeping municipal death registers. Different in content and character from the most celebrated form of early modern mortality records, the London Bills of Mortality, Italian authorities named, rather than counted, persons who died. This municipal practice illustrates the invention of secular death investigation systems in an era of recurring plague. Milan's uniquely detailed civic death registers, 1452 to 1525, display the underlying forensic character of such record-keeping, rather than the public health context in which such records have long been understood. Diagnosing the cause and manner of death, the fundamental objective of forensic medical inquiries, exposed epistemological uncertainties that academic medicine largely avoided for the entirety of the early modern era. How could one be certain that a death was caused by a particular affliction? Our death investigation practices are now far more sophisticated, but in the current, tenacious SARS-CoV-2 pandemic, we still struggle to measure and record the human costs of crisis mortality.

Keywords: *Forensic Medicine, Milan, Mortality Registers, Postmortem Diagnosis, Renaissance Italy*

The Black Death was the first in a series of massive, but poorly understood mortality crises. For at least five hundred years plague menaced Western Europe, defying human efforts to predict the timing, the extent, or the severity of any given outbreak. Built upon interventions first taken in Italian territorial states, Europeans adopted and refined an array of practices to contain plague's inter-human transmission, actions that would have been largely ineffective against a disease spread by the fleas of small mammals. But during the SARS-CoV-2 pandemic, many of these anti-contagion controls brake the spread of a novel airborne viral pathogen. Why, then, do we see perplexing resistance to more sophisticated and less intrusive versions of premodern plague protocols? Opposition to modern scientific approaches to disease containment is rather extraordinary to witness, be-

cause new therapeutic and preventive measures have made Covid-19 far less devastating than it otherwise might have been. In some places, popular resistance to public health policy has led to stunning behaviors: threats to the lives of exhausted health care workers; vilification of public scientific advisers and local public health authorities valiantly trying to communicate the life-saving value of wearing a simple mask in indoor public spaces; and determined rejection of vaccines that are far safer than any developed in the modern era to reduce infectious disease mortality and morbidity.

In this article, I will consider two record-keeping strategies that Europeans invented during the plague centuries, rather than review the usually-considered plague controls – quarantine, isolation of the ill, protective personal attire, dedicated hospital areas and personnel. When enhanced by the identification of causes of death, both naming and numbering the dead reflect, in rudimentary ways, how epidemiologists work. Even though the premodern origins of naming, counting and tracking practices in epidemics bear little direct resemblance to those used today, the earlier recording practices show us continuities in knowledge-making across the premodern/modern divide. Counting deaths and case-tracing are at the heart of how we understand and interrupt the spatial and temporal transmission of infectious diseases.

Scientists want to plan and predict, to mitigate losses wherever possible. They invite us to follow mortality rates in graphs that reflect virus transmissions that occurred weeks earlier. But tracking an epidemic by mortality alone can be surprisingly misleading, stoking fear. Also, timely and reliable data collection during an ongoing pandemic has always proved difficult. We are learning anew that mortality analysis cannot resolve one of the most basic questions about the direct human costs of Covid-19: reliable estimated death tolls (Kalinsky and Kobak 2021; Adam 2022). Among other publicly aired doubts and knowledge-fracturing discussions, epidemiologists, clinicians, and public health authorities vigorously debate who is, who is not to be included in Covid-19 death counts. Confident mathematical modeling adjusts inherent flaws in numerical data, appealing to unsettling phrases such as ‘excess mortality’ to estimate misreported and underreported deaths (Reverby 2021). Early draconian policies implemented hastily and built on flawed testing and mathematical models that greatly overestimated the lethality of the initial virus strains, which created the sense of a threat quite different from what was actually occurring. Anthropologist Carlo Caduff pointed out what was true from the outset, but largely ignored in the social-political construction of an unprecedented pandemic: ‘not everyone is at risk in the same way’ (Caduff 2020, 474). When we can finally move past the ongoing burdens of the pandemic, how should we add up the costs of this tenacious pandemic? How should we begin to re-understand causal relationships between epidemics and the structural vulnerabilities of poverty and ‘co-morbidities’? (Keller 2022, 4-8) In the SARS-CoV-2 crisis, some inherent weaknesses of the institutions used to stabilize and mitigate public fear have moved to the foreground.

1. *Milan's Books of the Dead: A Series of Death Investigations*

This case study looks at the ways in which Milan's *Libri Mortuorum* (Books of the Dead), maintained by a permanent urban health office, identified disease threats during the Sforza era (1450-1535). Two unique features of these registers stand out. First, the Milanese devised a very early medicalized system of reporting causes of death in all years with persons over three years of age at death, whether or not plague threatened the city. Milan's leading physicians routinely reported deaths and causes of death, collaborating with one another and advising the health magistracy. That office, the *Magistratura alla Sanità*, decided what actions would be taken if

a death threatened the community at large. Secondly, Milan's books were inclusive, providing the name of every urban and suburban resident. Naming each deceased person served as a paper proxy for civic belonging. The commitment to name all Milanese residents, even those who did not survive the first full hour of life, was the enduring component of the record series, lasting until the late eighteenth century. With their names together in the mortality registers, the Milanese were tacitly connected to one another. Similarly, we have seen in the Covid-19 pandemic that social media users, many with global reach, reassert the importance of seeing individual deaths (Alfieri *et al.* 2020). They offer storied tributes of loved ones that capture irreparable subtractions from the human community.

Many northern and central Italian cities kept mortality registers, all of them clearly worried about recurrent plague. These records somehow served public health objectives, but the connections were not direct. Guy Geltner's comprehensive work on medieval public health statutes shows that a robust legislative approach to urban sanitation was defended as good governance long before the Black Death. Not merely aspirational, health-related statutes were enforced, as we see in attention to medieval records of infractions, fines, and remediation (Geltner 2019). Galenic medicine also informed dietary and behavioral regimens found in plague treatises, a kind of medical advice literature to individuals and communities that thrived for centuries (Nicoud 2011). Finally, individual practitioners relating a patient's cause of death, as is clear from some of the death reports discussed later in this paper, expressly adhered to Galenic precepts.

Nevertheless, Milan's death registers, rich in medical details that are provided in Latin by qualified practitioners, are better understood within a forensic, rather than public health, context. Determining either the cause of a death, or the individual responsible for another's death, requires investigation, which in turn proceeds from individuals and institutions possessing cultural authority to collect and interpret evidence, and to resolve disputes. Routine legal procedures of investigation and interrogation underlie the information-gathering mechanisms they use to determine circumstances of suspicious deaths – interviewing neighbors and family of the deceased, relying on notification from authorized district leaders – the wordiest individual death reports are clearly comparable to crime-assessment mechanisms. Postmortem dissections to determine the cause of death were not part of the forensic repertoire. Both elite (College of Medicine) physicians and licensed community practitioners served as expert witnesses in the assessment of causes of death, advising a governing magistracy that decided what should happen consequent to a diagnosis.

1.1 *Death Investigations, not Morbid Dissections*

Before the Black Death, morbid dissections to document the lethality of a wound or to retrieve bodily evidence of a holy person's sanctity were accepted practices in Italy by 1300. Why, then, do we not find similar postmortem dissections to verify cause-of-death, as happens in the modern era? During centuries of recurring plague in Europe, a vanishingly few victims of plague were further investigated with dissection of cadavers. Katharine Park shows that dissection of plague victims did occur during the initial wave of plague, but this mode of investigating plague deaths did not continue (2010, 293, n. 7).¹ In the later sixteenth century, human dissection became a

¹ In the eyewitness account of the Black Death Avignon, Louis Heyligen, musician and friend of Petrarch, reported that 'Anatomical examinations, in which many corpses were opened, were carried out in many Italian cities, and also, on the pope's orders, in Avignon, to discover the origins of this disease, and it was found that all those who died suddenly had infected lungs, and had been coughing up blood'; trans. by Horrox 1994, 42.

widespread practice and for a variety of medical, scientific and artistic purposes, but the use of morbid dissections as a way to understand the pathology of discrete disease threats was quite uncommon. There is no evidence for serial postmortem dissections as an epistemological approach to any disease before the seventeenth century (De Renzi 2018). The first use of morbid dissections to assist causal understanding during an epidemic occurred in eighteenth-century Rome, orchestrated by the Pope's chief physician (Donato 2016).

In claiming that the Milanese death registers were forensic in orientation, I take a broader view of forensic medicine before the modern era, by appealing to the recent historical framework of 'forensic cultures'. This analytical approach usefully widens a constrained and positivist historiographical tradition in Western history, that also depicts modern forensic medicine (also called medical jurisprudence or legal medicine) as a beneficiary of human dissection and pathological anatomy. Conventional histories of European forensic medicine also struggle to narrate the evolution of medical (rather than legal) ideas and practices of true 'forensic' medicine before routine dissection of the corpse. In so doing, the common medical meaning of 'autopsy' changes. The word *autopsia* once referred to the verification of a phenomenon or event with one's own eyes (Pomata 2005, 112-117; Hamlin 2013, 6).

Comparative study of 'forensic cultures' identifies commonalities in the practices and strategies that different societies use to stabilize communities whenever an unexplained, concerning death has occurred (Hamlin 2019). In Milan, possible deaths from plague became 'suspicious' or 'suspected', then handled much as deaths from accidents or violence had long been investigated. Elsewhere university-educated physicians were rarely involved in the diagnosis of plague. Even in Milan, the significant contributions of highly educated practitioners during plagues did not continue past the 1530s. Everywhere during the early modern era 'good enough' inspections, performed by low-status persons with presumed experience in dealing with dead bodies, relieved elite practitioners of unprotected contact with plague victims. Most surprisingly, medical texts before the 1600s devote little attention to the visible lesions that we typically associate with bubonic plague (Jones 2021).

A good early modern example of the widespread social and medical acceptance of grave-diggers and other illiterate untrained persons as 'good enough' diagnosticians in times of plague can be found in Patrick Russell's account of plague in Aleppo, 1761-1762. The author sequestered himself with other Englishmen when it became clear that the local outbreak would be significant. He then followed unfolding urban mortality as his ancestors would have done in London, by parsing Aleppo's weekly death tallies and by relying on unnamed, lower status informants – in this case, the Turkish washers of the dead. He regarded their discrete observations as a corrective to the official counts, which summed weekly losses within different faith communities. As plague ripped through the city and its hinterlands, Russell gave daily audiences from an upper-level veranda of the English factory, recommending medicines and other therapies to recovering plague patients or their servants, who gathered in the courtyard below. Russell touched or personally inspected very few patients or cadavers over the course of the epidemic. Thirty years later, he transmitted his findings as first-hand observations, augmented with extensive review of available published literature on the clinical course of plague, what passed for state-of-the-art plague research at the turn of the eighteenth century.²

Repositioning plague diagnosis as primarily forensic in character has consequences for our seeing epidemic controls in a context of law, order, and justice, rather than exclusively a matter

² Russell 1791, 50 for his decision to quarantine himself with fellow countrymen; 58 for Turkish washers of the dead as informants.

of medicine or public health. Even if not so intended, a forensic approach criminalized both plague and its victims. Plague was policed long before Foucauldian 'governmentality' because the processes used to recognize its victims evolved as part of late medieval criminal, rather than civil, law. Meanwhile, the persisting reluctance of medical authorities to use dissection routinely, or even perform postmortem inspection of intact cadavers to determine cause of death, further limited the ability of educated practitioners to assert greater experiential authority over lower status certifiers of cause of death (Siena 2020).

2. *Secular Death Reporting in Italy after the Black Death*

Both listing and counting the dead were novel secular practices invented during the centuries of recurring plagues in Western Europe. Italian registers bypassed ecclesiastical authorities who could not meet the scale of catastrophic plagues, while later English counts of urban deaths relied on ecclesiastical actors to supply death information manipulated for the purposes of secular users. The oldest surviving municipal death registers in Italy are Florentine and illustrate a manifestly bureaucratic response to the perceived abuses and extortions of gravediggers (*becchini* or *beccamorti*) during intervals of high demand for their services (Herlihy and Klapisch-Zuber 1985, 257-279). In the late 1370s, a troubled period of political and religious unrest, Florentines tasked two different agencies – one corporate and thus private (the Physicians and Spicers' Guild, or *Arte dei Medici e Speziali*), one municipal and thus public (the office of the *Grascia*, responsible for insuring city food supplies) – to monitor the gravediggers' activities. The city set maximum charges for different components of funeral and interment protocols. Neither the guild nor the *Grascia* was an ecclesiastical entity, yet both were allowed to override decisions and choices about burials that once belonged to the parish churches. The earliest death register that now survives, a parchment *Grascia morti* book from Florence, 1385, names gravediggers and the burial location used with each death even when the deceased individual was not fully identified, such as by name and status. We have no comparable guild registers before the 1450s, by which point Florentines had changed the primary objective underlying record production.

In 1415, revisions to Florentine statutes required municipal authorization for an intramural burial, overriding the prerogative (and profit source) long held by ecclesiastical actors. Registers were still compiled from gravedigger-supplied reports and were filed at the judicial offices of *Or San Michele* – thus to a communal regulatory agency. But, going forward, they provided the name and surname of the deceased, along with their quarter and parish of residence, and location of burial. In these registers, the names of the gravediggers no longer appear (Herlihy and Klapisch-Zuber 1985, 264-268). Milan's *Libri Mortuorum*, surviving from late July 1452, likewise relied on secular regulation of persons in position to observe and report individual death events, as will be described further below. In both cities, secular authorization was needed to inter a city resident in consecrated ground. In fact, the burial certificate remains a common gate-keeping document in Western culture today and has served as a check on faithlessly reported death counts, which became a widespread problem with the assessment of the spread and severity of SARS-CoV2 mortality (Sheridan 2021, Keller 2022).

During the 1430 epidemic in Florence, records also reported causes of individual deaths (Herlihy and Klapisch-Zuber 1985, 258-259). Causes of death had a more direct connection to epidemic mitigation. Such practices had commonalities with the mechanisms we use today: epidemic assessments require reliable determination of the precise location and causes of death to enable case tracing. Evidence for tracing the contacts of a plague is found earliest in 1468,

detailed in daily letters to the duke of Milan, rather than in the register.³ We have no comparable evidence to show that the early Florentine registers were used to track disease spread person-to-person or place-to-place. The surviving Milanese registers include two bound books (from 1485 and 1523) that separately recorded new household cases of plague together with specific socio-geographical information to locate the affected household. Those who identified a new case were not the persons tasked with implementing any decision that the *Sanità* took subsequently (Carmichael 2022 forthcoming).

England did not have the kind of medical infrastructure ubiquitous across northern and central Italian cities and towns before the Black Death.⁴ In London, causal assessments of individual deaths date from the 1560s or 1570s, when we have our earliest evidence of searchers involved in identifying London's plague dead.⁵ The premodern record series most familiar today, the London *Bills of Mortality*, was entirely secular but derived from ecclesiastical record-keeping that originated with the Protestant Reformation. Vital registration (births, marriages, deaths) reflected an expectation that parish priests or clerks should keep records at parish-level, each a community of faithful Anglicans. Protestant but non-Anglican Dissenters, Catholics and Jews were thus not included in the records of parish clerks from which the *Bills* were later assembled.

The *Bills* became a commercially successful venture after 1603, when the guild first printed numerical summaries of deaths from each individual parish in weekly tabular arrays. Those who purchased the *Bills* were tacitly invited to compare counts by parish, shown on one side of each *Bill*, or by causes of death, tallied on the other side. The format of the broadsheets suggested to subscribers that there were patterns in mortality that could be seen only in the aggregate. Like death statistics today, the *Bills* were retrospective, offering calculated measures of lives lost across the city overall. Obviously, many London deaths were not reported, much as happens today in countries without full registration of all persons (Szreter and Breckenridge 2012). The primary information that parish clerks submitted was summarized in the *Bills* – deaths and causes of death – but relied on the largely invisible, poorly compensated labor of often illiterate women: the searchers. They were pressed into a kind of service that persons knowledgeable in medicine would not perform. The *Bills*, in other words, presented a composite summary of deaths in parish registers, a two-step approach to tracking crisis mortality still in use. The novel Italian municipal records captured a commune's losses one-by-one, just as individual parishes recorded the deaths of parishioners.

Rarely concerned with the original purposes of counting deaths, today historical demographers and historical epidemiologists often consider London's later *Bills of Mortality* as the first significant contribution to a modern approach to epidemic analysis and understanding (Cipolla 1978, 543-548; Rothman, 1996, 37-39). Yet the *Bills* never provided individualized demographic information about those who died, detail equally essential to modern epidemiology. Whether naming or numbering, the processes through which governing authorities deal with deaths were and are highly political; all societies determine who counts and who is counted, which deaths matter (Wernimont 2018, 1-8 and 22-33). The seventeenth-century *Bills* were 'mediated', transforming one kind of evidence, urban deaths, into a kind of bookkeeping that

³ Carmichael 1991; Nicoud 2014, 392-409, engaging with the same records. The formal register for 1468 no longer survives.

⁴ Most Mediterranean cities implemented systems of publicly funded physicians and surgeons, called *condotti*, surviving in villages and small towns as large municipalities became capital cities of territorial states. *Condotti* provided gratis medical care to the poor and fee-constrained services to the prosperous; see Naso 1990.

⁵ Robertson 1996, 329; and on earlier court interest in London plague deaths, Slack 1985, 148.

offered readers a template for retrospective epidemiological speculation and business planning (Slauter, 2011; Wernimont 2018, 22-29). Generating considerable discussion in taverns and other public venues, the guild-published *Bills* spawned both direct commercial competitors and popular treatises on their contents, best known today from the works of John Graunt (1663) and Sir William Petty (1683). We could add Daniel Defoe's 1720 *Journal of the Plague Year* as well: imaginatively using half-century-old weekly death counts to recreate a sense of being in the middle of the plague. The earliest medical and scientific uses of death data to resolve issues of public policy or therapeutics appeared later, with the Royal Society's investigations comparing the risk of death from smallpox inoculation to that from community-acquired infection (Rusnock 2002, 49-55). From the outset, however, *Bills* and life tables derived from them 'appear to master the overwhelming magnitudes of plague deaths' (Wernimont 2018, 41). In so doing, they reassured entrepreneurs and travelers in an era of early capitalism.

2.1 *Distinctive Aspects of Medieval Forensic Cultures*

Beginning c. 1200, the Church and Italian city states adopted ancient Roman law, a change that permitted expert witnesses to testify at court, though they typically submitted a written *consilium*, or counsel, for the judge's consideration. Paid to testify, experts could support one of the adversaries at trial, or they could be remunerated for public service to the commune. Our earliest documentation of forensic medical testimony in the case of violent deaths dates from later thirteenth-century Bologna (Butler 2015; De Ceglia 2020). English *inquisitiones post mortem* differed significantly, and did not involve medical experts until the nineteenth century. The history of forensic medicine's long delay as a medical specialty is often attributed to English Common Law (Watson 2011, 15-22). During the thirteenth century, English coroners (or crown's men) operated as state agents. Initially, they worked with local sheriffs to resolve matters of crime and property connected to 'bodies found dead'. Following English common law, coroners assembled juries of 'peers', who then decided trials solely on the basis of eyewitness testimony. In other words, medically informed experts had no formal role before coroner juries unless they were themselves eyewitnesses to a crime, dispute, or circumstances that directly impinged on an unexplained death.

Only in areas following Roman law did physicians and surgeons with specialized knowledge of the body assist courts in matters of justice. They also had a wider mandate than that of coroners, addressing problems that both civil and criminal courts could consider. Thus, they might provide pertinent expert testimony on questions of an individual's identity, on a person's mental competency or ability to interact safely within the community, whether an infant was born alive, whether a healer had caused the death of a patient, whether a marriage could be dissolved on the basis of a man's impotence or a woman's infidelity, as well as what person could be held responsible for a death or injury that is seen as 'unnatural' or threatening to the community at large (Watson 2011; Hamlin 2013).

Understandably, historians of forensic medicine see differing legal systems as the driver of different death investigation systems.⁶ But is what happens in a courtroom the essence of a death investigation system? Historian of science Christopher Hamlin and colleagues offer instead the model of 'forensic cultures', seeing legal systems as only one institutional component of

⁶ Butler 2015, 11: 'The close cooperation between the state and the medical profession in criminal investigation laid the groundwork for the growing field of Western forensic medicine'.

forensic practice (Hamlin and Burney 2019). A cultural framework identifies commonalities, rather than contrasts, to compare how societies assign authority in dealing with criminal or other socially worrisome behavior. Heresy, sorcery, and a wide variety of cultural responses to threats and disasters of all sorts can thus sit alongside discussion of modern ‘technologies’ of witnessing, testifying, and judging. The use of a cultural framework makes it possible to think in new ways about the history of plague identification during the premodern era, thus before pathological anatomy or the germ theory of disease became tools of medicalized investigation to determine individual causes of death. Standard histories of forensic medicine in Continental legal traditions include a few exhaustively researched episodes that predate the earliest treatises of forensic medicine that were published in the late sixteenth and early seventeenth centuries. Neither English common law nor any system based on Roman-canon procedural law spoke to the investigation of deaths from a feared disease, which involved establishing matters of fact that carried judicial consequences (Crawford 1994; Watson 2011).⁷ All societies establish who has the power and authority to determine threats to the group, who can decide matters of fact, what testimony is relevant, how dangerous events should be mitigated.

2.2 *Who Determined Most Causes of Death in London and in Milan?*

Recent research sheds new light on the routine activities of London’s female parish searchers, on whose humble shoulders the entire London system of death reporting, including the London *Bills of Mortality*, rested well into the nineteenth century.⁸ Before 1700 or so, we know little of the individual identities of these women, but their poorly compensated labor depended on their being known to contemporaries. However, they were able to enter freely the houses of fellow Londoners, assess cause of death, and often perform other intimate services surrounding death, such as preparing a body for burial. As Kevin Siena summarizes, ‘the state ... vest[ed] them with forms of authority not typically afforded such lowly people and certainly not women’ (2020, 168). Searchers did not count deaths, but they could testify in court to perimortem events, a role traditionally reserved to coroners (Siena 2011).

In the 1600s, the word *catelano* was a local Milanese term for a medically trained official who routinely certified cause of death,⁹ but appears much earlier in Milan’s *Libri Mortuorum*. From the early 1450s to the great mortality crisis of the mid-1520s, the death of any person not in the ongoing care of a College of Medicine practitioner required cause-of-death assessments by an authorized city *catelano*. In contrast with London ‘searchers’, this person was a salaried public official and was aided in crisis years by a ducally appointed *phisicus epidemie*, typically a surgeon. Both men worked primarily for the Health Office, relieving Milan’s privileged group of practitioners from direct responsibility for diagnosing new and suspected cases of plague. Because evidence for the Milanese official’s local sobriquet is elusive in published documents, Table 1 identifies physicians and surgeons before 1525 who reported in the *Libri*

⁷ Butler 2015, 63, noting the disproportionate risk of death from plague that later medieval coroners carried; 137-138, on the necessity for coroners and their juries to examine dead bodies, even sit in the same room with them as a trial proceeded; 179-184 on the ‘shadowy presence of a medical practitioner’ in identifying a death caused by plague. The crown had no interest in mobilizing the coroner system to track the ongoing disruption that plague caused to towns and cities.

⁸ Siena 2020; and, working with better documentation on the searchers found in early nineteenth-century records, see Henry 2016.

⁹ Tedeschi 1899, 74, claims without specific documentation, that the surgeon of the (late-seventeenth-century) *Tribunale della Sanità* was called the *catelano*; Vaglianti 2013, 45-46, believes the term originated around 1400.

Mortuorum, men who were at least once referred to with the term *catelano*.¹⁰ There are quite a few other ‘high certifiers’ of cause of death in Sforza-era Milan, persons who submitted the greatest number of cause-of-death reports in all years.¹¹ All such public physicians held posts that came with salary or other benefits, a feature of the newly medicalized hospital system of Sforza Milan. Roman law further protected salaried public physicians from the breaches of contract, mistaken diagnosis or malpractice claims that community and elite physicians could face (Pomata 1998, 37-49).

	<i>Name of physician or surgeon</i>	<i>Active years</i>	<i>Number of death reports</i>
served as <i>catelano</i>	Giovanni Catelano, or simply ‘Catelano’	1452-1495	46,183
	Dionigi of Nuremberg, also called Dionigi	1478-1503	5266
	Cristoforo Tisine Catelano, or Giovanni Cristoforo Tisine	1515-1516	912
	Domenico del Botto, also called Domenico Brisiensis and ‘Domenico Catelano’	1514-1525	3127
cited as working for <i>Sanità</i>	Giovanni Pirovano, called ‘Scanzete’, <i>phisicus epidemie</i>	1452-1477	750
	Guglielmo Ciciliano, assisted during the plague of 1485	1477-1504	190 (150 of which in 1485)
	Bernardo Calvi, called ‘ <i>medicus Offitii Sanitatis Mediolani</i> ’	1508-1513	2606
	Antonio Gatti, in 1513-1514 called ‘don Antonio’	1513-1525	8304

Table 1 – Sforza Health Office Physicians and Surgeons Cited in Extant Records, 1452-1525

The *Libri Mortuorum* show that Milan’s university-educated physicians and surgeons participated in the community-wide identification of plague victims up to the 1530s, although their exposure to presumptive plague victims was minimized. At the time the *Sanità* was created, statutes required heads of household to report illnesses and deaths to parish elders unless that

¹⁰ Dionigi of Nuremberg, although never called a *catelano* in the extant *Libri Mortuorum*, is included in the list of *catelani* because he was so described in his testamentary bequest to the *Fabbrica del Duomo*: see Bertoglio 2021, 192-193. See note 59 below for the formal report of Master Dionigi’s death.

¹¹ On the term ‘high certifiers’ see Prior and Bloor 1993, 364.

family member was already in the care of a College physician (Albini 1982, 89-95 and 160).¹² Surgeons were obligated to bring in a College physician in consultation after treating a patient for four days; practitioners in the elite College of Medicine refused to see any patient during that four-day onset of an acute illness.¹³ Proximity to a plague victim was deemed risky, particularly heightened when examining the bodies of the recently deceased or even patients *in extremis*. Therefore, by the early modern era, most cities established plague-time protocols, appointing persons to perform this screening task even when there was no medical consensus about which visible lesions were certain signs of plague (Jones 2021). In particular, sixteenth-century Venetian legislation references the services of a similar roving postmortem diagnostician.¹⁴

In a ‘forensic culture’ framework, Milan’s *catelano* is similar to the medieval English coroner. In both regions, society transferred legitimacy and authority to particular persons who were not to be held personally responsible for their assessments. Today we would characterize a medical expert authorized to adjudicate the cause and manner of deaths as a medical examiner rather than a coroner, which position still operates within the UK and in some areas of the United States. Until the mid-twentieth century, many US coroners did not possess any medical education at all, much less had specialized training in forensic pathology. Some today are elected to the position of coroner, and a few notoriously collaborate with police rather than medical authorities in deciding which deaths require investigation (Hanzlick 2007, 35-40).¹⁵

3. *Milan’s Libri Mortuorum*

Milan’s system of death investigation and registration was originally implemented as part of a duchy-wide plague warning system (Albini 1982, 23-27; Nicoud 2014, 384-390). During the plague of 1399-1401, Duke Giangaleazzo Visconti did not hold legal authority to specify how plague surveillance would be conducted in Milan and its suburbs, so he created a ducal ‘Special Commissioner’ to coordinate city-measures with those areas of the duchy that he could control. Parish-level civic officials, the *anziani* (elders), reported acute illnesses and deaths to a staffed, center-city office.¹⁶ No mere clerks, these *anziani* were typically scions of prominent Milanese family clans, as well as powerful linchpins of an older neighborhood judicial organization.¹⁷ Heads of household were required to report to this parish or district *anziano* any death within

¹² I discuss the format of Sforza-era death reports and general Health Office functioning in my ‘Registering deaths and causes of death in late medieval Milan’ (Carmichael 2017).

¹³ *Statuta* 1517, ch. 25, *Statutum de observandis tempore pestis*. College physicians could not even inspect a patient’s urine until four days after the onset of illness and were threatened a fifteen-day isolation period for violating this policy: ‘*Tempore pestifero collegiati non tangant infirmos nisi elapsa quarta die a visitatione aut urinarum inspectione; quod si observaverint non possint detineri in domo nisi per quindecim dies ad plus arbitrio solum collegii*’ (During seasons of pestilence, collegians are not to touch the sick until the fourth day has passed from the visitation or inspection of the urine; if they fail to observe [these protocols], they can be held in household detention for up to fifteen days, at the discretion of the College).

¹⁴ My thanks here to Richard Tait of Monash University, Melbourne, for sharing his unpublished research on Venetian physicians. I cite, but was not able to access his source: Vanzan Marchini 1998, 361.

¹⁵ Listing Covid-19 on a death certificate as a cause of death has become a contested political act in the US, echoing long-ago problems with the compilation of mortality registers or counts.

¹⁶ Jurist and ducal counselor Johannes de Roxellis was initially appointed in 1399, as *commissares specialiter ellectus pro conservatione sanitatis civitatis nostre Mediolani*. See Albini 1982, 57-62, and 88-89.

¹⁷ On the long association of *anziani* with death denunciations to public authorities, see Vaglienti 2013, 38-44. The enduring importance of the *Anziani* is also documented in Visconti 1911, 277-279.

their residence, just as they would have done in with crime reporting. In the criminal justice system of the medieval commune, *anziani* reported to an itinerant *podestà* (mayor), who served for a limited term of office and brought his own policing staff and expert justices in criminal law. Municipal courts supported commercial and artisan interests by providing impartial resolution of violence between aristocratic clans.¹⁸ Milan's later plague reporting thus mirrored lines of authority on which most cities and towns of northern and central Italy had relied upon for over a century. Early forensic medicine in medieval Italy asserted the criminal court's power and authority to decide responsibility for lethal wounds. In any wound investigation, physicians only advised the court.

When Francesco Sforza established his *Magistratura alla Sanità* in the early 1450s, he adopted the Visconti framework underlying death reporting.¹⁹ Francesco Sforza secured broad public support of his right to rule through the creation of a new locally-controlled office, by reorganizing the city's charitable relief in ways that wrested resources from ecclesiastical coffers. He subsequently expanded medicalized gratis care by building a great urban hospital, the *Ospedale Maggiore*. The Health Office explicitly relied on the collaborative efforts of local neighborhood authorities and a salaried medical and clerical staff that Sforza provided. Sforza's master plan at once prioritized the wellbeing of Milan's laboring population, shifted a feared task, the confirmation of a death from plague, to salaried civil servants, and gave allowed the office the power of judicial review.²⁰ The Health Office personnel possessed legal authority, diagnosis of plague carried consequences to those in the entire affected household, including quarantining the household or evicting them all to an extramural campground or hospital area.

3.1 *Death Investigations in Milan's Libri Mortuorum*

Today we see medically informed causes of death as the most unusual and potentially informative aspect of the Milanese mortality records and have thus generated scholarly interest. Statistical-analytical tools now buoy a longstanding hope for some reliable way to aggregate and understand some of these diagnoses – always given in medical Latin during the Sforza era – within a modern disease classification system. Doing so might offer us more than speculative understanding of health and disease in premodern cities.²¹ Rendering such evidence into machine-readable 'data' could have a considerable payoff in our collective understanding of urban morbidity and mortality across the early modern era if limited to broad disease categories analyzed by age, season, or geographical location. Many reported causes were quite general, confirming mostly that the cause of a particular death excluded plague; for example, the causes of old age, fever, and long

¹⁸ On the *podestaria* and new inquisitorial proceedings in the late thirteenth century, see Vallerani 2012, 44-65; Gamberini 2018, 44-46.

¹⁹ I expand on this argument in my forthcoming, 2022, 'The Legal Foundations of Post-mortem Diagnosis in Later Medieval Milan'. On the Visconti organization in times of plague see Pasi Testa 1976; Albini 1982, 86. On Francesco Sforza's explicit construction of his new Health Office, the *Sanità*, as an institution linked to the public good, see Vaglianti 2020.

²⁰ On Sforza health reforms see Vaglianti 2020. The 1541 'New Constitutions' of Spanish emperor Charles V, replaced the older with a new 'Office of the Health Prefects of the Dominion of Milan' (*Officio Praefectorum Sanitatis Dominii Mediolanensis*). A subset of the larger committee, the *Tribunale della Sanità*, held broad judicial discretion, including the right to impose corporeal, even capital, punishment, and to seize property and goods of those who violated Health Office mandates; see Visconti 1911, 281-282.

²¹ Biganzoli *et al.* 2021, who discuss some of the problems one encounters in machine-coding diagnoses provided in the late fifteenth century.

illness, were common – as, indeed, they still are (Zanetti 1976, 834-835; Cohn and Alfani 2007). But, before the early modern era, Milan's premodern death registrations often provide more information than is found in comparable mortality registers, making difficult a simple recoding of medical particulars in the records. As discussed a bit further below, practitioners struggled to align Galenic diagnosis of illness process with diagnosis of cause(s) of death, a non-Galenic task. There was a significant reduction in diagnostic context over the centuries of Spanish control of Milan, as elite physicians became involved largely at a managerial level. The *Sanità* meanwhile created a task-specific position with specified daily hours of operation: the notary in charge of maintaining the books of the dead (Visconti 1911, 284).

Because plague was the primary concern for secularizing death investigations, the Sforza-era record set is especially informative about the postmortem appearances of possible plague victims. But the Milanese continued the habit of assessing cause of death in non-plague years as well, including the forensic requirement for quite specific corporeal evidence. Both plague and non-plague reports often detailed a sequence of symptoms and medical problems preceding death. Visible body swellings (*bubo, glandula, tumore, apostema, even dragonzello*) were often specified in number, if multiple, and the anatomical location of the swelling, including the side of the body; similarly, the side of the body affected by pleurisy, breast cancer, ulcers and fistulae, or the location and lethality of particular wounds appears. Localizing lesions visible on the body of the deceased was not gratuitous. Such detail was clearly important in the medico-legal context, as the very language of each recorded death captures. The word *Iudicio* (in the judgment of) appears before the name of the person or persons who testified to cause(s) of death.

While the evidence about plague deaths does not fully conform to protocols used in making a clinical diagnosis of bubonic plague in today's medical system, the locations of acute swellings correspond to lymph nodes characteristically inflamed with *Yersinia pestis* infection. The bodily location and extent of a rash, on the other hand, was not typically an element of premodern plague diagnostics, even when a diagnosis of plague was based on a rash or lividity. Here, too, the information is not unproblematically translated: the distribution and the physiological character of a rash are at the heart of modern physical diagnosis of exanthems. Master Giovanni Catelano, during the late fifteenth century, counted and localized plague eschars (*carbone, carbunculi*), then noted whether a lesion was on the same side and area of the body as the swelling. Correlating the plague pustule to a localized (lymphatic) swelling is evidence about plague explicable in today's clinical terms, but this association could not be formulated as a causal relationship in the early modern era, for it had no theoretical foundation in Galenic medicine.²² In a judicial setting, eyewitness evidence offered actionable testimony.

3.2 'Signs' or 'Indicia'?

Year after year the *Sanità* had to determine which deaths, among a chronically elevated number of urban and suburban deaths, were alarming. From 1476 to 1486, during an especially punishing decade of famine, pestilence and plague, two Health Office practitioners frequently worked as a team to make empirical postmortem observations. Consider Giovanni Catelano's report, corroborated with Master Dionigi of 'Norembergo', ducal appointee to the office in 1478.²³ The report of Monday 16 November 1478 read:

²² In the *Libri Mortuorum*, noting the affected side of a body was usual when reporting bubonic swellings or lethal wounds, and sometimes stipulated in deaths attributed to breast cancer or pleurisy.

²³ Dionigi's predecessor as *phiscus epidemie*, Master Giovanni Pirovano, nicknamed 'Scanzete', died 17 November 1477.

Ambroxius de Marliano dicarum dugantis, 36, a die Mercurii citra infermus. Et hoc mane, hora prima diei, inventus est mortuus cum carbone sub mento versus mandibularum sinistrem partis inferiorem. Et cum duobus alteris, uno in pulso eidem partis et altero in radice colli, partis opposite, iudicio magistrorum catelani et dyonisii. (Archivio di Stato, Milano, *Atti di Governo, Fondo Popolazione, parte antica, cartella 78*, 16 November 1478).²⁴

Postmortem localization of wounds visible solely by inspection of an intact cadaver carried the specificity of eyewitness testimony that courts required. Differentiating right from left buboes or other swellings is not an aspect of the medical literature on plague.²⁵ In legal arenas, *autopsia*, the act of witnessing, offered partial proof. Physicians meanwhile called the outward, visible manifestation of pathological processes that could not be directly investigated in a living patient, the 'signs' pointing to one or another underlying cause. In a court setting, bodily signs could be interpreted as *indicia*, the physical, material evidence related to any criminal accusation.²⁶ Even with numerous lacunae in available Sforza-era registers, we find evidence of death investigation procedures threading through individual death reports, atypically enhanced by the expertise of qualified medical and surgical experts, but in its contours traditional and juridical. It was based on postmortem inspection of the cadavers of persons suspected of dying from plague, which is the literal translation of autopsy (Hanzlick 2007, 7-10).

Autopsy as used today carries the assumption of an anatomical dissection. However, Park has shown compelling evidence of the practice of postmortem dissection decades before the Black Death, with further evidence that families believed dissection of a deceased loved one could provide useful medical knowledge, benefiting future sufferers. For over two centuries, morbid dissections were not only not taboo, but were also used to retrieve hidden signs (or evidence) of a holy woman's sanctity. Yet, despite the various uses of later medieval dissection – punitive dismemberment, evisceration or embalming to preserve a body, or anatomical study – up to the mid-sixteenth century there are only a handful of instances where postmortem dissection was used to identify the specific internal organ or structure that plague affected, thus as a way to understand hidden disease processes. Park cites several attempts during the Black Death to understand plague's bodily effects through dissection of victims; similar investigations occurred in Avignon (Park 2010, 293, n. 7).²⁷ By the fifteenth century, prominent persons also contracted with an anatomist or physician to conduct a private postmortem dissection, sometimes express-

²⁴ (Ambrogio Marliano, said to be one of the Duganti, 36 years old, fell ill on last Wednesday. And this morning at daybreak he was found dead with an eschar [*carbone*] under his chin near the lower left mandible. He had two other such [eschars, considered to be 'plague pustules'], one on the pulse of this same side and the other at the base of the neck on the opposite side. In the judgment of masters Catelano and Dionigi). Every entry also supplies geographical information (sector of the city, parish church), important but not salient to the argument of this paper. Subsequent references to this archival resource will be abbreviated: ASMi, *Pop. p.a., c.*, then the year and date. The death report of Master Dionigi provides a heart-felt tribute to his long, dedicated service to the office: 21 March 1504 (ASMi, *Pop. p.a., c.* 80): 'Laboriosus et praticus vir Magister Dyonisius de Loremergo qui per civitate per utilis hinc retro fuit et homo anserus, ex pleuresi et febre malla in 14a, non suspectis, annorum 80, iudicio Magistri Ludovici Venturelli', in the parish of Sant'Ambrosino in Solariolo, porta Ticinese district.

²⁵ Personal communication, Lori Jones.

²⁶ By the mid-thirteenth century *indicia* were a component of written briefs that an accuser's notary provided the court before the judge launched his investigation. As Massimo Vallerani shows, 'the [notarial] arrangement of a "writing of the crime" is therefore a capital event in medieval judicial practice' (see 2012, 128-132; quote on 129).

²⁷ In the eyewitness account of the Black Death Avignon, Louis Heyligen, musician and friend of Petrarch, reported that 'Anatomical examinations, in which many corpses were opened, were carried out in many Italian cities, and also, on the pope's orders, in Avignon, to discover the origins of this disease, and it was found that all those who died suddenly had infected lungs, and had been coughing up blood'; trans. by Horrox 1994, 44.

ing the hope that future sufferers would benefit from greater medical knowledge opening a body provided (Park 1994). We know in retrospect, of course, that dissection of plague victims would have provided little information useful to either clinical or public health management of epidemics. Plague control was not achieved by waiting for medical men to dissect a body and debate their findings.²⁸ Instead, the point here is that before the seventeenth and eighteenth century performing serial dissections of the supposed victims of any specific affliction was not used to aid clinical understanding.²⁹

3.3 *Examples of Forensic Postmortem Investigations in Milan's Libri Mortuorum*

An unusually detailed entry from early January 1524 illustrates several of the recurring components of Milan's death investigation system. The specific medical content of the report is fully consistent with the process-oriented objectives of Galenic pathophysiology, which dominated learned medical theory and practice throughout the medieval and early modern eras, but the underlying information-gathering process resembles instead a criminal investigation.³⁰ Thus, the family and neighbors of a sixty-year-old farrier or blacksmith named Bernardo of 'Subcornibus' claimed that he had suffered an injury to his entire right torso, 'both in the ribs and in the anterior part'. By Santo Stefano's day (26 December), Bernardo's injured side was swollen and he struggled with 'intense pain and strenuous coughing, with intolerable difficulty breathing'.³¹ He also had a high fever and abundant, blood-tinged urine. Increasingly, he could not sleep, but he had neither vomiting, nor headache, nor disorientation. The pivotal change in his condition correlated with the lunar calendar, or so the death report stated.³² With Bernardo's supposed convalescence the swelling in his chest subsided and 'matter' now collected in his *axilla*. Most Galenists would have interpreted this sequence of events as the body's healing response to one or more putrefied humors. Bernardo's mental state also improved. Was this, then, a case of plague?

²⁸ On the fear associated with inspecting cadavers of possible plague victims, see Siena 2011 and 2020.

²⁹ Summarizing the epistemological shift in medical uses of morbid dissections, a shift taking place across the early modern era, see De Renzi *et al.* (2018). On the earliest novel use of multiple morbid dissections to understand the pathological effects of an epidemic disease, see Donato 2016.

³⁰ Demaitre (2013) provides a clear explanation of practical medieval medical thinking related to disease and diagnosis. His treatment of the confusing literature on the classification of fevers demystifies many of the causal diagnoses one finds in the Milanese registers.

³¹ ASMi, *Pop. p.a., c.* 87, 9 January 1524. Using a microfilm copy, I am not completely confident with my transcription of some parts of this text: 'Bernardus meneschalchus de Subcornibus, 60, per 40a dies conquastabatur de latere toto destro, ac costali, in parte anteriori cum tussi ed difficultate hanelitus, tandem die S. Stefani devenit ad Inflationem totius lateris cum dolore intentissimo et tussi mayori ac difficultate hanelitus intolerabili cum magna febre et urinis grossis et rubeis aliquali in processu devenit ad magnam rubedinem loci inflati cum magna instantia vigiliarum sine vomitu ac dolore capitis sine alienatione -- adveniente vero motu lunari remota est, quasi in totum inflatio pectus et fecit collectione in sub assella eiusdem lateris cum apparitione duorum carbuncullorum et tunc cepit domire, febris quasi in totum remota fuit bene se habebat de oblavones et confortabatur mente. Quibus sic michi ab astanentibus naratis mi si cirugicus monitum primo 2º [secondo] magistrum Antonium Vestrum medicum cum cirugico ssto. [suprascripto] qui diligentissime totum corpus inspectus Et nichil alius Invenirunt tandem decessit die sabati 9a Januarii 15a sue egritudinis mayoris et computavit quare me rimito iuditio medicorum nostrorum ibi astantium mea tantum sententiae est ut per aliquos dies sequestrentur, iudicio Mri. Gasparris Coyri'.

³² Though not specified in this case record, physicians regarded such change in a patient's clinical status a *crisis*, which referred to the moment at which the patient began to deteriorate and die, or instead began to recover (Demaitre 2013, 49). Interestingly, in medical pedagogy, this moment in clinical care was likened to a judge's verdict, or a 'judgment' (*iudicio*), but here it was the patient's body and the physician's care that determined the outcome. On the importance of astrological medicine in court culture see Azzolini 2013.

Some of these details were conveyed to the reporting physician by two practitioners who saw Bernardo at different points in his illness: one was a Health Office doctor, 'our' Master Antonio, the other an unnamed surgeon. Master Antonio Gatti served as Milan's *catelano*. The community physician claimed that Bernardo was recovering,³³ but then he died on Saturday 9 January 1524, contrary to their expectations, and so the office sent Gatti to inspect Bernardo's entire body postmortem. Master Gasparo Corio, the elite (College of Medicine) Milanese physician who also attested these events, added that he had talked with some colleagues who worked in the Porta Romana district, a populous area of Milan surrounding the Ospedale Maggiore.³⁴ Gasparo Corio did not fully accept a diagnosis that cleared the farrier from all suspicion of plague. Suspecting that the wounding event did not lead directly to the patient's demise, he allowed no more than fifteen days from the onset of the fever that led to Bernardo's death, and thus recommended that the household be quarantined for an unspecified number of days.

Rather than parse further the specific medical-diagnostic content of the case, I redirect attention to the information-gathering process itself, in this case for a death that occurred during the winter lull after two years of plague in the city. Master Gasparo's opinion of the case was based on review of the man's clinical history and interviews with family and neighbors. The blacksmith's initial injury and eventual death required the attention of three practitioners. Only the prominently named physician had authority to file a report with the *Sanità*. It is likely that at the time Master Gasparo was serving a four-month term of office as the College of Medicine's appointed deputy to the Health Office and in that capacity performed the medical investigation needed for the office to determine the fate of Bernardo's household survivors.

Although the working papers of the Health Office were consumed in a fire on New Year's Eve, 1502-1503, we know that every four months the College of Medicine elected two deputies to serve at the office. It is likely that their duties included reviewing reported causes of death: '*Statutum de duobus prefectis sanitatis per collegium elligendis. Singulis quattuor mensibus habeat plenam auctoritatem collegium elligendi duos collegiatos qui sedeant deputati ad officium sanitatis Mediolani habeantque omnimodam potestatem auctoritatem & baliam agenda praecipienda et scrutiniandi sicut habent alii praefecti dicti offitii sanitates*' (*Statuta* 1517, ch. 34).³⁵ We see hints of the process in the death report on thirty-year-old Bernardino Castello of September 13, 1523, also reported by the *Sanità*'s Antonio Gatti, and appearing in an anomalous register. This other book from 1523 recorded only newly-identified plague cases, almost certainly to facilitate case-tracing beyond the household: 'Bernardino Castello ... was ill for four days from continuous fever and headache, by report, and he had black, pestilential measles'.³⁶ The

³³ Community physician is a useful term created by Di Giammatteo and Mendelsohn 2020, to categorize practitioners who were not members of the College of Medicine.

³⁴ 'Dominus Magister Gaspar Corius' was listed among 65 members of the College of Physicians, in its printed statutes: *Statuta* 1517, page facing the incipit.

³⁵ (A Statute concerning the election of two prefects of health by the College. Every four months the College shall have full authority to elect two collegians to sit as deputies to the Health Office in Milan, and shall have full authority and assistance of care to command and scrutinize the agenda just as do other officials of the said Health Office).

³⁶ In the extant registers up to 1525 there are two such bound registers, both recording interim reports of newly infected households – 1523 and 1485. In both books, case reports provide more geographical detail to localize the residence; both include plague victims who were not dead at the time of diagnosis and indeed may have survived infection. Thus, Tuesday 2 June 1523, 'Elisabeta de Vertua, an[norum] 14, infirmatur a die herii ex febre continua vomitu dolore capitis ex relatu et cum duobus glandulis in Inguine destro de pestiferis. Iudicio Ma[gist]ri Antonii'. (Elisabeta of Vertua, 14 years old, fell ill yesterday reportedly with continuous fever, vomiting, and headache, and with two *glandulis* (swellings) in the right groin, pestiferous in the judgment of Master Antonio). Notice of Elisabeta's death does not appear in the official death register.

judgment in the official annual death register for 1523 instead began with Master Gasparo's judgment, which claims that 'from the urines and from the report of bystanders, he had been suffering with a fever and some bad "accidents", dying on the thirteenth day of his illness. To me this case is suspect, thus I judge with the *medico ordinario*'. Gatti's report then followed. Finally, yet another College physician, Tommaso Moroni, testified: 'I diligently inspected the man's cadaver and found no sign apparent to my eyes. I attest that where he was said to have been phlebotomized was neither a phlebotomy [wound] nor other pestiferous accident. Better to treat this case as suspect than as pestilential in any case'.³⁷

The verification of a postmortem plague diagnosis could require a review committee's judgment, with some physicians testifying to their direct actions and interventions. As we see in the following report, a testimonial that one had seen the victim's body postmortem transformed the medical assessment into an eyewitness account, which carried greater evidentiary weight in Roman law:

Petrus de Oltolina an[norum] 50 repertus mortuus in /blank space/ ex morbillis nigris et violaceis et glandula in Inguine sinistro de pestiferis. Iudicio M[agist]ri Antonii Gatti (ASMi, *Pop., p.a., c.* 87, 24 January 1523)³⁸

Acting as a court, the *Sanità* exercised judicial authority to isolate persons residing in a plague victim's household or to send all of them outside the city to large open-air isolation zones with tents and hastily constructed huts for 'suspect' cases. Aristocratic households and the physicians serving them could face stark choices, as we see with the death of a fifteen-year-old retainer of the nobleman Ludovico Applano, ill only four days. The youth was not even named, and the certifier of cause of death was likely related to the head of household: Collegian Jerome Applano. Master Jerome claimed that the teenager died from a bad regimen, exacerbated by strenuous labors and exertions. He also testified that postmortem there was no external sign of plague, therefore it was not possible to say that he was infected by plague.

Other evidence of forensic processes becomes visible when deaths that were anomalous in some way prompted a fuller investigative report. Thus, a community physician active in private practice from 1512 to 1525 (Gasparo Comite, not Gasparo Corio) testified to a report sent from outside Milan. The reverend lord priest, Andrea Valeris died, 'annorum 70 vel circa prepositus ecclesie ambrosi mayoris mediolani Rectorque ecclesie sancti petri in Caminadella mediolani pluribusque benefitijs Laureatus habitans in Canonica Sancti Ambrosii qui Laboravit podagra ex omni Iunctuarum debilitate et dolore sed et varijs febribus non suspectus et asmate non suspecte. Iudicio Magistri gasparris de comite'.³⁹ Had the prelate not been a man of high

³⁷ ASMi, *Pop., p.a., c.* 87, 13 September 1523: 'Bernardinus de Castello, an. 30, ex urinis et relatione astantium percipere potui laborabat febre continua cum aliquibus accidentibus malis, decessit in tertia decima. Michi videtur suspectus quare iudicio ut videatur, iudico medico ordinario. Iudicio Magistri Gasparris Coyri ¶ S[upra]s[crip]tus repertus mortuus in 4a, ex 101, 820 ex relatu et cum 703 de pestiferis, iudicio Mri Antonii. ¶ Inspecto diligenter Cadavere ssto. et nullo signo apparente sub oculis meis et atro. quod ubi flobotomandus erat non fuit flobotomatus nec aliud accidens pestiferus habuit ex rellatu potius advertendum censeo, quam quod pestifer sit oio. caxus iudicio Magistri Thome Moroni'. On *accidentia*, a common Galenic term for concomitant or accompanying pathological events (what we would call symptoms) see Demaitre 2013, 43 and 64.

³⁸ (Pietro Oltolina, 50 years old, was found dead in /blank/ from black and purple measles, with a *glandula* [swelling] in his left groin, pestilential. In the judgment of Master Antonio Gatti. I saw the cadaver of the above-mentioned Pietro Oltolina and [affirm] that signs and a death from plague were found, and I saw this in the presence of the criminal court justices and Dom Bartolomeo Fugerio, *phisicus*. [Iudicio] Master Baptista Marchisi).

³⁹ (aged seventy years or thereabouts, provost of Sant'Ambrogio of Milan and rector of Milan's San Pietro in Caminadella, as well as holding many other benefices related to the canonry of Sant'Ambrogio, labored from *podagra* that involved all of his joints, with debility and pain in his stomach and various non-suspect fevers, and non-suspect asthma).

social status, the cause might have been summarized with 'old age' and/or 'long ill'. We have no way to know whether the reporting physician had attended the clergyman at any point, nor why he presented a storied list of ailments.⁴⁰ The death of a less prominent older man, a greengrocer named Bartolomeo, supposedly ninety years old, was attributed to senility, but carried no medical certification of the cause. Because his death occurred in an epidemic year, which always enhanced general alarm, the record added 'fuit infirmus per tres ebdomodas et plus. Iudicio anziani et aliorum vicinorum' (ASMi, *Pop.*, *p.a.*, c. 80, 8 June 1504).⁴¹ The Health Office confirmed the length of time an individual had suffered even when he was not under medical care and did not have the certifying diagnosis of a physician or surgeon.

These cases from the years leading to the catastrophic plague of 1524 reflect a Health Office operating smoothly, following customs that had not been disrupted by decades of foreign occupation of the city. Enduring bureaucracies provide social and cultural stability, and thus rely on the fidelity of those working for a given agency. It is therefore useful to look at reports from an earlier era, generated across another decade of crises that could have undermined Sforza governance: a ducal assassination, protracted famine, military campaigns, and another catastrophic wave of plague, 1483-1486. Death registers during that time were compiled by Health Office clerks from the equivalent of rough drafts, and in the early years, entries were copied verbatim into daily updates dispatched to the duke of Milan, his main chancery, or the city's primary governing body.⁴²

The following complicated report illustrates how the Health Office did not merely accept the reported cause of fifty-year-old Juliano da Ripa's death even when the report was made by a prominent member of the city's College of Medicine.

Julianus de Ripa, cuius iudicium habeticus d. Capitaneius factum per egregium doctorem Magistri Nicholaum de Arsago quod tale est: decessit suprascriptus febre tertiane simplici cum malo regimine vite sine relations vicinorum cuius urinas vidit et eum tetigi suprascriptus. Tale iudicium est perplexum et dubium cum ex simili febre simplici interpolatam in septimam periodis ut plurimum ad bonum terminate tam presto pauci moriantur nisi rex maligna lateat est videre si illud inordinatum regimen quod relatione vicinorum fertur sit suficiens ad hoc faciendum. (ASMi, *Pop.*, *p.a.*, c. 75, 7 August 1479)⁴³

Two features of this report reveal other aspects of investigation procedure. First, the Health Office's principal medical examiner, Master Giovanni Catelano, himself a member of the College of Medicine, had the authority to question his colleague's diagnosis and/or judgment, prompting further discussion about Juliano da Ripa's actual cause of death. Second, the record drew attention to an anomalous pathway in death reporting. Here Master Nicolò made a report to (or responded to a request from) the city's chief of police rather than directly submitting his assessment of the death to the *Sanità*, as was usual and proper. Thus, we see Nicolò's defensive testimony about his

⁴⁰ ASMi, *Pop.*, *p. a. c.* 85, 17 November 1517.

⁴¹ (he was sick for three weeks or more, in the judgment of the *anziano* and other neighbors).

⁴² On duplicate daily death notifications during the plague of 1485, see Carmichael 2017, 218-224.

⁴³ (you have the judgment [*iudicium*] from the lord *Capitano* [*del popolo*], the commune of Milan's law enforcement executive] made by the prestigious doctor Master Nicolò Arsago, which is this: the above man 'died of a simple tertian fever, [exacerbated by] a bad regimen, according to the neighbors. I [Nicolò] saw his urines and touched him.' This judgment is perplexing and doubtful, because similar interpolated fevers reach a conclusion by the seventh day, and most end well. Few die, except when some malign [event] occurs. [We must determine] whether the inordinate regimen reported by neighbors was sufficient to cause this death. In the judgment of Catelano). The 'interpolated' fevers are a broad category of non-continuous fevers that Galenic physicians parsed routinely; see Demaitre 2013, 39-41.

own actions – essentially saying, ‘I not only performed a urinalysis, I saw this man and touched him’. When Milan’s forensic culture became fully established and traditional, these defensive practices were still important, but were rarely invoked in a report of non-plague deaths.

A death notice the week before this report offered an even clearer physician testimonial to something else at issue in many of the worrisome cases – the length of time the deceased had been ill. On Thursday 1 August 1479, we find the reported death of Master Gabriele Paveris, seventy years old, filed by community physician Francesco Busti. ‘Magister Gabriel de Paveris, annorum 70, infirmabatur iam mensis, agitur quando ego visitabam quadam febricula levi, cum magna debilitate stomaci; egritudine non suspecta. Quem intellexi postea decisse: nescio si alia postea passus sit. Hoc rogat. scribo, iudicio Magistri Francisci de busti. Suprascriptus Mr Gabriel preceptor poetice et oratorie artis decessit apostemate stomaci, cum febre permixta et emoroydali fluxu, iudicio chatelani’ (ASMi, *Pop.*, p.a., c. XX, Thursday 1 August 1479).⁴⁴

3.4 *Dying in a Plague, not of the Plague*

Primarily this essay is concerned with the social processes and learned traditions that one Renaissance metropolis re-fashioned to stabilize and reassure a population under considerable, sometimes extreme, existential threat of epidemic outbreaks, imposing order when religious authorities buckled. Milan’s records suggest that deaths investigated and reported in civic registers reflect a juridical or forensic context, even though the content of the records draws upon contemporary state-of-the-art medical understanding provided by able and highly educated practitioners. At this point, I want to return briefly to the topic raised at the paper’s outset, on naming and counting deaths.

How do premodern death records resonate with public debates about the severity and extent of SARS-CoV2 losses? Biologically *Yersinia pestis* and Covid-19 are quite dissimilar human pathogens, with greatly different outcomes in an untreated population: plague infection carries a higher likelihood of death than does SARS-CoV2 infection. Statistically, older adults and those with underlying health challenges are far more likely to suffer severe covid infection, those who, in Richard Keller’s formulation, have ‘structural vulnerabilities’, many of which reflect health patterns in marginalized subpopulations. Covid-19 demands that we address devastating inequalities, creating risks that are not equally shared (Caduff 2020; Keller 2022). The objective of public health and medical experts, with their unwavering support of vaccines and barrier technologies, is to protect persons at highest risk of death from Covid. The political and economic urgency instead is to move past a state of crisis, to define a ‘new normal’ if need be, to declare the pandemic’s endemicity.

Recurring plagues in Western Europe seem a striking contrast to the ongoing pandemic, in part because we do not examine the ‘co-morbidities’ and structural vulnerabilities in early modern plagues. From the time of the Black Death, the trope of plague mortality was its proclivity to kill indiscriminately. Flight was the only rational response. Most historians further assume that deaths during a plague were primarily caused by plague. Re-understanding the causes of both

⁴⁴ (He [master Gabriele] fell ill over a month ago when I [last] visited him. He had a certain *febricula* (little fever) with considerable stomach debility, a non-suspect illness. I understand that he later died, but do not know if he suffered other things after [my visit]. I am writing this at request). The diagnostic report was confirmed, again by Catelano, the primary medical examiner for the *Sanità*, adding further detail from which we can infer the interview of persons close to the deceased. (The above master Gabriele was a preceptor in the arts of poetry and oratory. He died of a stomach *aposteme*, with fever complicated with hemorrhoidal flux, in the judgment of Catelano).

individual and crisis-context mortality in the past are enormous and unwieldy topics, tangential to the primary argument I make here. But during decades when elite Milanese physicians were active participants in diagnosing causes of death among urban residents, they provided narratives about the sequence of afflictions that led to a person's death far more than we might expect if plague alone drove investigations (Cohn and Alfani 2007, 178-181).⁴⁵ Careful attention to the sequence of morbid events prior to death can be found in non-plague years. Thus, in 1475, 'Magdalena uxor Andree de pirovano annorum xxxij cum maxima difficultate peperit filium mortuum et Incensit cum febris continuis cum maxima anxietate anelitus. Iudicio Magistri Antonii de Cuxano' (ASMi, *Pop., p.a., c.* XX, 1 May 1475).⁴⁶ I further offer just a few examples of non-plague causes of death reported during years when plague had been identified in Milan.

- 'Johannes Maria Bellabucca annorum 22, 3 ebdomodis tussi et febre duplici demum pleuresi. Iudicio Magistri Benedicti Bellabuce' (ASMi, *Pop., p.a., c.* 83, 4 January 1513).⁴⁷
- 'Magister Johannes Petrus de Cermignagha annorum 48 ex consumpta medicina effrenitante a seipso et flusu succedente sine suspectis. Iudicio Magistri Yeronimi Serazoni' (ASMi, *Pop., p.a., c.* 82, 21 November 1512).⁴⁸
- 'Simona de Reynis annorum Lx ex morbo galico tandem febre cum asmate non suspectis. Iudicio Magistri Baldesaris Coyri' (ASMi, *Pop., p.a., c.* 82, 2 October 1511).⁴⁹
- 'Caterina filia Jo Jacobi de Sonia annorum iiii^o ex febre continua cum opilatione epatis et principio Idropsis egritudine non suspectis. Iudicio Magistri yeronimi arluni' (ASMi, *Pop., p.a., c.* 80, 31 August 1505).⁵⁰
- 'Antonius de Zello annorum 11 ex Idropesi et fistulis duabus in coxis non suspectis. Iudicio Magistri raynaldi busti' (ASMi, *Pop., p.a., c.* 80, 10 May 1504).⁵¹
- 'Mafiola de Brioscho annorum Lxx ex asmate catarrali et febre quotidiana sine aliqua suspicione. Iudicio Magistri nicolay antiquarij' (ASMi, *Pop., p.a., c.* 86, 20 December 1520).⁵²

Diagnostic detail occurs in the Sforza-era records because participating physicians and surgeons embraced the task of reporting causes of death among their own patients. Giovanni Catelano was himself a member of the College of Medicine, and he quite rarely offered a simple 'not suspicious' as a diagnostic report. Identifying the cause mattered. On 14 February 1485, plague had been significant in Milan for almost two years, when Giovanni Catelano reported the death of a 47-year-old man named Raynaldo of Bergamo. 'in domo suspecte. Reynaldus de Pergamo, annorum xlvii, porta Ticinese Sancti Eufemia, infirmatur a die veneris citra pleuresi vera lateris sinistri satis

⁴⁵ On the record source, see Biganzoli *et al.*, 2021.

⁴⁶ (Magdalena, the 32-year-old wife of Andrea Pirovano, died with maximum difficulty giving birth to a dead fetus, and found with continuous fever and maximum anxiety in breathing. In the judgment of Master Antonio Cusano). Master [Gian]Antonio Cusano was a long-serving member of the College of Medicine; I find it noteworthy that the death described here did not occur among the Milanese aristocracy.

⁴⁷ (Giovanni Maria Bellabucca, 22 years old, died, [ill] three weeks with coughing and double [tertian] fever, finally pleurisy. In the judgment of Master Benedetto Bellabucca [a College Physician]).

⁴⁸ (Magister Giovanni Pietro de Cermignaga, 48 years old, died from uncontrolled consumption of medicine at his own hand, and subsequent flux; without suspicion. In the judgment of Master Hieronymo Serazoni [or Seragoni]).

⁴⁹ (Simona Reynis, age 60, died of *morbo galico* mostly, and fever with asthma, not suspect. In the judgment of Master Baldesar Corio [a College physician]).

⁵⁰ (Caterina daughter of Bartolomeo, 11 years old, died from a continuous fever with malignant worms and a chronic ventral swelling, not suspect. In the judgment of Master Antonio [Antonio di Arona, *catelano*]).

⁵¹ (in the hospital of Sant' Ambrogio, Antonio Zello, age 11, died from dropsy and two fistulas in his buttocks, not suspect. In the judgment of Master Raynaldo Busti).

⁵² (Maffiola Briosco, age 70, from asthmatic catarrh and daily fever, without any suspicion. In the judgement of Master Nicolò Antiquario [a College physician]).

difficilis et periculosa de contagii et morte decesserunt [sic] hac causa et uxor et quedam sua filia sunt enim ut predie dixi huius pleureses altera epidimia atque pestilencia considerabitur. Chate-lani. Decessit hodie xv presentis uts [ut scriptis]' (ASMi, *Sforzesca, Miscellanea storica* 4, n. 739).⁵³

4. Conclusion

As part of a governing strategy, the Italian civic mortality registers established and maintained by the fifteenth-century Sforza dynasty were inclusive, recording by name, age, and parish every person who died in the city and its suburbs. State systems of registration, ubiquitous today, have been established in international law as a human's right to a unique identity (Szreter and Breckenridge 2012). Even those with a fleeting existence, a breath or two and then gone, appear in Milan's death registers. For example, 'Giovanni, son of Ambrogio de Capitaneis, *hora nulla*' [zero hours old at death] died in a time of plague, although not during the horrific turn the epidemic would take by spring, 1524.⁵⁴ Naming the dead can be thought of in similar terms, as a human right. What became habitual bureaucratic practice in Milan a half millennium ago conforms to the United Nations' 1976 covenant: 'Every child shall be registered immediately after birth and shall have a name' (Szreter 2007, 68). Registration of the living entitles the individuals to a place within the larger community or state and its collective resources. Through official registration of unique persons, states accept obligations to protect and defend their lives. Italian civic death registration could have served to increase the power of urban authorities, to foster the general Foucauldian process of 'knowability' leading to 'governability'.

The context of mutual and corresponding rights and responsibilities through state identity registration helps us to re-see differences between numbering and naming in premodern death registration. From the beginning of the ongoing SARS-CoV-2 pandemic, an international social media response to discrete personal losses opened a way for persons in internet-privileged localities to 'register' the passing of close friends and family members, persons whose lives within the global public sphere were mostly obscure. At the same time, scientists and politicians displayed enormous trust in 'big data' and mathematical modeling, often unwarranted because testing was restricted to persons who felt ill and mortality reflected deaths not due solely to coronavirus infection.

Works Cited

Archival Sources

Archivio di Stato, Milano (ASMi), Atti di Governo, Fondo popolazione, parte antica. Cited by *cartella* number, year of register within that *cartella*, and date of death report.
Archivio di Stato, Milano (ASMi), Sforzesca, Miscellanea storica.

Printed and Online Sources

Adam David (2022), 'The Effort to Count the Pandemic's Global Death Toll', *Nature* 601, 312-315.
Albini Giuliana (1982), *Guerra, fame, peste: crisi di mortalità e sistema sanitario nella Lombardia tardo-medioevale*, Bologna, Cappelli.

⁵³ (He had been ill nearly a week with pleurisy on the left side of his chest, which Catelano judged 'sufficiently difficult and with a [clear] danger of contagion'. Raynaldo's wife and one of his daughters also died of pleurisy, 'which should be considered another epidemic pestilence').

⁵⁴ ASMi, *Pop., p.a.*, c. 87, 27 July 1523.

- Alfieri Chiara, Alice Desclaux, Kelley Sams, and Marc Egrot (2020), 'Mourning while Fighting for Justice: The First Months of the NOI DENUNCEREMO association, Bergamo, Italy', *Somatosphere*, <<http://somatosphere.net/2020/mourning-while-fighting-for-justice.html>>, accessed 4 May 2022.
- Azzolini Monica (2013), *The Duke and the Stars: Astrology and Politics in Renaissance Milan*, Cambridge, Harvard University Press.
- Bertoglio Tommaso (2021), 'Indagini mediche e medici cittadini nella Milano tardomedievale: uno studio dei *Libri Mortuorum* del 1478', *Studi di Storia Medioevale e di Diplomatica* n.s. 5, 189-211.
- Biganzoli Elia, Ester Luconi, Folco Vaglianti, Patrizia Boracchi *et al.* (2021), 'The Milano Sforza Registers of the Dead: Health Policies in Italian Renaissance', *medRxiv the preprint server for health sciences*, doi: 10.1101/2021.02.10.20249093.
- Butler S.M. (2015), *Forensic Medicine and Death Investigation in Medieval England*, New York-London, Routledge.
- Caduff Carlo (2020), 'What Went Wrong: Corona and the World after the Full Stop', *Medical Anthropology Quarterly* 34, 4, 467-487, doi: 10.1111/maq.12599.
- Carmichael A.G. (1991), 'Contagion Theory and Contagion Practice in Fifteenth-Century Milan', *Renaissance Quarterly* 44, 2, 213-256, doi: 10.2307/2862709.
- Carmichael A.G. (1998), 'Epidemics and State Medicine in Fifteenth-Century Milan', in R. French, J. Arrizabalaga, A. Cunningham, L. García-Ballester, eds, *Medicine from the Black Death to the French Disease*, Aldershot-Brookfield, Ashgate, 221-247.
- Carmichael A.G. (2017), 'Registering Deaths and Causes of Death in Late Medieval Milan', in J. Rollo-Koster, ed., *Death in Medieval Europe: Death Scripted and Death Choreographed*, London-New York, Routledge, 209-236.
- Carmichael A.G. (2022 forthcoming), 'The Legal Foundations of Post-mortem Diagnosis in Later Medieval Milan', in L. Jones and N. Varlik, eds, *Death and Disease in the Medieval and Early Modern World: Perspectives from Across the Mediterranean and Beyond*, York, York Medieval Press, 67-98.
- Cipolla C.M. (1978), 'The "Bills of Mortality" of Florence', *Population Studies* 32, 543-548.
- Cohn S.K. Jr. and Guido Alfani (2007), 'Households and Plague in Early Modern Italy', *Journal of Interdisciplinary History* 38, 2, 177-205.
- Cole S.A. (2013), 'Forensic Culture as Epistemic Culture: The Sociology of Forensic Science', *Studies in the History and Philosophy of Biological and Biomedical Sciences* 44, 36-46.
- Crawford Catherine (1994), 'Legalizing Medicine: Early Modern Legal Systems and the Growth of Medico-Legal Knowledge', in M. Clark and C. Crawford, eds, *Legal Medicine in History*, New York, Cambridge University Press, 89-116.
- De Ceglia F.P. (2020), 'Introduction: Corpses, Evidence and Medical Knowledge in the Late Middle Ages and the Early Modern Age', in F.P. de Ceglia, ed., *The Body of Evidence: Corpses and Proofs in Early Modern European Medicine*, Leiden-Boston, Brill, 1-20.
- Demaitre L.E. (2013), *Medieval Medicine: The Art of Healing from Head to Toe*, Santa Barbara-Denver-Oxford, Praeger.
- De Renzi Silvia (2002), 'Witnesses of the Body: Medico-legal Cases in Seventeenth-century Rome', *Studies in the History and Philosophy of Science Part A* 33, 2, 219-242, doi: 10.1016/S0039-3681(02)00005-5.
- De Renzi Silvia (2018), 'Seats and Series: Dissecting Diseases in the Seventeenth Century', in De Renzi *et al.*, 96-115.
- De Renzi Silvia, Marco Bresadola and Maria Conforti, eds (2018), *Pathology in Practice: Diseases and Dissections in Early Modern Europe*, London-New York, Routledge.
- De Renzi Silvia, Marco Bresadola and Maria Conforti (2018), 'Pathological Dissections in Early Modern Europe: Practice and Knowledge', in De Renzi *et al.*, 3-19.
- Di Giammatteo Laura and J.A. Mendelsohn (2020), 'Reporting for Action: Forms of Writing Between Medicine and Polity in Milan, 1580-1650', in J.A. Mendelsohn, A. Kinzelbach and R. Schilling, eds, *Civic Medicine: Physician, Polity and Pen in Early Modern Europe*, London-New York, Routledge, 135-160.

- Donato M.P. (2016 [2014]), *Sudden Death: Medicine and Religion in Eighteenth-Century Rome*, trans. by Valentina Mazzei, London-New York, Routledge (original edition, *Morti improvvisate: Medicina e religione nel Settecento*, Roma, Carocci, 2010).
- Gamberini Andrea (2018), *The Clash of Legitimacies: The State-Building Process in Late Medieval Lombardy*, Oxford-New York, Oxford University Press.
- Geltner Guy (2019), *Roads to Health: Infrastructure and Urban Wellbeing in Later Medieval Italy*, Philadelphia, University of Pennsylvania Press.
- Hamlin Christopher (2013), 'Forensic Cultures in Historical Perspective: Technologies of Witness, Testimony, Judgment (and Justice?)', *Studies in the History and Philosophy of Biological and Biomedical Sciences* 44, 4-15.
- Hamlin Christopher (2019), 'Forensic Facts, the Guts of Rights', in I. Burney and C. Hamlin, eds, 1-33.
- Hamlin Christopher and Ian Burney, eds (2019), *Global Forensic Cultures: Making Fact and Justice in the Modern Era*, Baltimore, Johns Hopkins University Press.
- Hanzlick Randy (2007 [2006]), *Death Investigation: Systems and Procedures*, Boca Raton, CRC Press.
- Henry W.S. (2016), 'Women Searchers of the Dead in Eighteenth- and Nineteenth-century London' *Social History of Medicine* 29, 3, 445-466, doi: 10.1093/shm/hkv133.
- Herlihy David and Christiane Klapisch-Zuber (1985 [1978]), *Tuscans and their Families: A Study of the Florentine Catasto of 1427*, New Haven, Yale University Press.
- Horrox Rosemary, ed. (1994), *The Black Death*, Manchester-New York, Manchester University Press.
- Jones Lori (2021), '“Apostumes, Carbuncles, and Botches”: Visualizing the Plague in Late Medieval and Early Modern Medical Treatises', in R.F. Canalis and M. Ciavolella, eds, *Disease and Disability in Medieval and Early Modern Art and Literature*, Turnhout, Brepols, 173-200.
- Karlinsky Ariel and Dmitry Kobak (2021), 'Tracking Excess Mortality across Countries during the COVID-19 Pandemic with the World Mortality Dataset', *eLife* 10, e69336, doi: 10.7554/eLife.69336.
- Keller R.C. (2022), 'Memorializing Death in an Age of Mass Mortality: Keywords of Covid-19', *Somatosphere*, <<http://somatosphere.net/2022/memorializing-death-mass-mortality-covid-keller.html/>>, accessed 4 May 2022.
- Naso Irma (1990), 'L'assistenza sanitaria negli ultimi secoli del Medioevo. I *medici condotti* delle comunità piemontesi', in *Città e Servizi sociali nell'Italia dei Secoli XII-XV*, Atti del XII Convegno Internazionale di Studi, Pistoia, 9-12 ottobre 1987, Pistoia, Centro Italiano di Studi di Storia e d'Arte, 277-296.
- Nicoud Marilyn (2011), 'Formes et enjeux d'une médicalisation médiévale: réflexions sur les cités italiennes (xiiiè-xvè siècles)', *Genèses* 82, 7-30.
- Nicoud Marilyn (2014), *Le Prince et les médecins. Pensée et pratiques médicales à Milan (1402-1476)*, Rome, École Française de Rome.
- Park Katherine (1994), 'The Criminal and Sainly Body: Autopsy and Dissection in Renaissance Italy', *Renaissance Quarterly* 47, 1, 1-33.
- Park Katherine (2010 [2006]), *Secrets of Women: Gender, Generation, and the Origins of Human Dissection*, New York, Zone Books.
- Pasi Testa Antonia (1976), 'Alle origine dell'Ufficio di Sanità nel Ducato di Milano e Principato di Pavia', *Archivio storico lombardo*, 10, 102, 376-386.
- Pomata Gianna (1998), *Contracting a Cure: Patients, Healers and the Law in Early Modern Bologna*, Baltimore, Johns Hopkins University Press.
- Pomata Gianna (2005), 'Praxis Historialis: The Uses of *Historia* in Early Modern Medicine', in G. Pomata and N.G. Siraisi, eds, *Historia: Empiricism and Erudition in Early Modern Europe*, Cambridge, MIT Press, 105-146, doi: 10.7551/mitpress/3521.003.0005.
- Prior Lindsay and Mick Bloor (1993), 'Why People Die: Social Representations of Death and its Causes', *Science as Culture* 3, 346-374, doi: 10.1080/09505439309526355.
- Reverby S.M. (2021), 'The Mask of Unequal Health and Excess Death: A Reality', *American Journal of Public Health* 111, S2, S89-S90, doi: 10.2105/AJPH.2021.306388.
- Robertson J.C. (1996), 'Reckoning with London: Interpreting the *Bills of Mortality* before John Graunt', *Urban History* 23, 3, 325-350, doi: 10.1017/S0963926800016898.

- Rothman K.J. (1996), 'Lessons from John Graunt,' *The Lancet* 347, 8993, 37-39, doi: 10.1016/s0140-6736(96)91562-7.
- Rusnock A.A. (2002), *Vital Accounts: Quantifying Health and Population in Eighteenth-Century England and France*, New York, Cambridge University Press.
- Russell Patrick (1791), *A Treatise of the Plague, containing an Historical Journal, and Medical Account, of the Plague, at Aleppo, in the Years 1760, 1761, and 1762 ...*, London, G.G. J. and J. Robinson.
- Sheridan M.B. (2021), 'How Two Young Math Geeks Solved the Mystery of Mexico City's Covid-19 Dead', *The Washington Post*, 3 May, <<https://www.washingtonpost.com/world/2021/05/03/mexico-coronavirus-excess-death/>>, accessed 4 May 2022.
- Siena Kevin (2011), 'Searchers of the Dead in Long Eighteenth Century London', in K. Kippen and L. Woods, eds, *Worth and Repute: Valuing Gender in Late Medieval and Early Modern Europe: Essays in Honour of Barbara Todd*, Toronto, Centre for Reformation and Renaissance Studies, 123-152.
- Siena Kevin (2020), 'Corpses, Contagion and Courage: Fear and the Inspection of Bodies in 17th-Century London', in F.P. de Ceglia, ed., *The Body of Evidence: Corpses and Proofs in Early Modern European Medicine*, Leiden-Boston, Brill, 149-174, doi: 10.1163/9789004284821_008.
- Siraisi Nancy (2001), '"Remarkable" Diseases, "Remarkable" Cures, and Personal Experiences in Renaissance Medical Texts', in Ead., ed., *Medicine and the Italian Universities*, Boston-Leiden, Brill, 226-256.
- Slack Paul (1985), *The Impact of Plague in Tudor and Stuart England*, Oxford, Oxford University Press.
- Slauter Will (2011), 'Write Up Your Dead: The Bills of Mortality and the London Plague of 1665', *Media History* 17, 1, 1-15, doi: 10.1080/13688804.2011.532371.
- Statuta & Ordinationes Dominorum Phisicorum Collegii Mediolanensis* (1517), Milan, Gotardum de Ponte, n.p.
- Stein Peter (2012 [1999]), 'Court Practice as a Source of Law', in Id., *Roman Law in European History*, Cambridge, Cambridge University Press, 92-94.
- Szreter Simon (2007), 'The Right of Registration: Development, Identity Registration, and Social Security – A Historical Perspective', *World Development* 35, 1, 67-86, doi: 10.1016/j.worlddev.2006.09.004.
- Szreter Simon and Keith Breckenridge (2012), 'Recognition and Registration: The Infrastructure of Personhood in World History', in K. Breckenridge K. and S. Szreter, eds, *Registration and Recognition: Documenting the Person in World History*, Oxford, Oxford University Press, 1-36.
- Tedeschi Carlo (1899), *Origini e vicende dei cimiteri di Milano e del servizio mortuario*, Milano, G. Agnelli.
- Vaglienti Folco (2013), '*Noluit ire ad visum*: I segreti dei *Mortuorum Libri* di Milano da Francesco Sforza a Leonardo da Vinci (1452-1485)', in F. Vaglienti and C. Cattaneo, eds, *La popolazione di Milano dal Rinascimento: fonti documentarie e fonti materiali per un nuovo umanesimo scientifico*, Milano, Edizioni Biblioteca Francescana, 25-59.
- Vaglienti Folco (2020), '*Marginalia*. Esempi di umane miserie nei Registri dei Morti di età sforzesca', *Flos studiorum. Saggi di storia e diplomatica per Giuliana Albini. Quaderni degli studi di storia Medioevale e di Diplomatica* 3, 383-400, doi: 10.17464/9788867742967_17.
- Vaglienti Francesca and Cristina Cattaneo (2010), 'A Medieval Contribution to the History of Legal Medicine: The First European Necroscopic Registry', *International Journal of Legal Medicine* 124, 6, 669-670, doi: 10.1007/s00414-009-0378-z.
- Vallerani Massimo (2012 [2005]), *Medieval Public Justice*, trans. by S.R. Blanshei, Washington, Catholic University of America Press.
- Vanzan Marchini N.E., ed. (1998 [1995]), *Le Leggi di sanità della Repubblica di Venezia*, vol. 2, Treviso-Vicenza, Canova-Neri Pozza.
- Visconti Alessandro (1911), 'Il Magistrato di Sanità nello stato di Lombardia', *Giornale della società storica lombarda* 4, 15, 30, 263-284.
- Watson K.D. (2010), *Forensic Medicine in Western Society: A History*, New York, Routledge.
- Williamson Raymond (1958), 'The Plague of Marseilles and the Experiments of Professor Anton Deidier on Its Transmission', *Medical History* 2, 4, 237-252, doi: 10.1017/s0025727300023930.
- Wernimont Jacqueline (2018), *Numbered Lives: Life and Death in Quantum Media*, Cambridge, MIT Press.
- Zanetti D.E. (1976), 'La morte a Milano nei secoli XVI-XVIII: appunti per una ricerca', *Rivista Storica Italiana* 88, 803-851.