ASTROLOGY, PLAGUE, AND PROGNOSTICATION IN EARLY MODERN ENGLAND: A FORGOTTEN CHAPTER IN THE HISTORY OF PUBLIC HEALTH*

The otherwise unremarkable London astrologer Richard Edlyn (1631–77) became a household name amongst prognosticators when he correctly predicted the Great Plague of 1665 on account of astronomical phenomena.[1] Edlyn had been studying the new *Astronomia Carolina* tables in his study on Bishopsgate Street when he became deeply troubled by an upcoming astronomical event of some significance. The event in question was a great conjunction of two superior planets, Saturn and Jupiter, set to take place in the morning of 10 October 1663. Knowing from his training that planetary conjunctions heralded momentous events on earth, Edlyn set out to discover the consequences of this particular episode. His first step was to use his astronomical tables to draw up a horoscope (see Plate 1). His next step

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[1] Richard Edlyn, *Prae-Nuncius Sydereus: An Astrological Treatise* (London, 1664). Cf. Marjorie Nicolson, who claimed no astrologers at the time were able to predict the Great Plague: 'English Almanacs and the "New Astronomy"', *Annals of Science*, iv (1939), 7. For Edlyn's reputation into the eighteenth century, see, for example, Tycho Wing, *Olympia domata* (London, 1744), sig. c4^{v}. For the 1665 plague, see Paul Slack, *The Impact of Plague in Tudor and Stuart England* (Oxford, 1985); A. Lloyd Moote and Dorothy C. Moote, *The Great Plague: The Story of London's Most Deadly Year* (Baltimore, 2004).

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was to interpret it. Edlyn first noted that Saturn (♄) and Jupiter (♃) were to meet in Sagittarius, a sign of the Fiery Triplicity, the most significant of the four groups of Zodiac signs. He recalled, moreover, that Saturn was responsible for various medical calamities, afflicting bodies with fevers and fostering disease-producing conditions such as 'unwholsom Airs' and 'long and tedious Frosts'.[2] Benign Jupiter generally stimulated more positive effects, but Edlyn concluded that in this particular conjunction Saturn possessed more power and thus would exert more influence. The astrologer also noticed that Mercury (☿) was unfortunately in the treacherous sign Scorpio and, more troublingly still, the third superior planet, Mars (♂), was in the rising sign, Leo — yet another fiery sign.[3]

These were worrying findings. Taking into consideration the influence of other cooperating causes, including an imminent conjunction of Saturn and Mars in 1664, Edlyn concluded that something terrible was afoot. Because the astronomical tables he relied on were calculated for the meridian of London, Edlyn knew it was London that was under threat and Londoners who needed forewarning. Anticipating how useful his foresight would be to his local community, who might be able to take action to mitigate the impending threat, Edlyn set to work on a prognostication, which he entitled *Prae-Nuncius Sydereus* (1664), a play on Galileo's celebrated *Sidereus Nuncius* (1610). As he carefully explained therein, the Saturn–Jupiter conjunction meant that Londoners, regrettably, had 'great cause to fear an approaching Plague, and that a very great one, ere the year 1665 be expired'.[4]

Soon after Edlyn published this unsettling forecast, the appearance of two comets over London in December 1664 came to be seen as further indication of impending pestilence, leading

[2] Edlyn, *Prae-Nuncius Sydereus*, 60–1.

[3] *Ibid.*, 21. The date and time listed in Edlyn's horoscope represent not the beginning of the conjunction, which Edlyn thought was impossible to obtain exactly, but the new moon that followed it. He explained this unusual procedure in *Observationes Astrologiae* (London, 1658).

[4] Edlyn, *Prae-Nuncius Sydereus*, 42. Remarkably, Edlyn's analysis also led him to predict that in London 'great Destruction by Fire … will continue till the latter end of the year 1666'. *Ibid.*, 72.

1. Edlyn's horoscope (see n. 3 above). The conjunction of Saturn and Jupiter is represented in the fifth house of the horoscope in the bottom right corner. The planets meet in Sagittarius ♐. To the left of this is the fourth house, in which Mercury can be seen in Scorpio ♏, Mars in Leo ♌ is at the cusp of the first house, centre left on the horoscope. Source: The Bodleian Libraries, University of Oxford, Bodl. Ashm. 543: Richard Edlyn, *Prae-Nuncius Sydereus: An Astrological Treatise* (London, 1644), 21.

other astrologers to endorse his dire prediction.[5] The significance of these astral events was the subject of much discussion in London.[6] Newspapers offered updates about the phenomena and astrologers received letters from interested citizens outlining what they had witnessed and requesting comment.[7] If we are

[5] *The Prophecies, and Predictions, for London's Deliverance* (London, 1665). See also the endorsements from John Booker, George Wharton and William Lilly in Edlyn, *Prae-Nuncius Sydereus*, sig. A4v.

[6] J. B., *The Blazing Star, or, A Discourse of Comets, Their Natures and Effects* (London, 1665), 2.

[7] See, for example, John Gadbury, *De Cometis* (London, 1665), 31–6; *The Newes, Published for Satisfaction and Information of the People* (29 Dec. 1664), Issue 102; *The Intelligencer, Published for the Satisfaction and Information of the People* (16 Jan. 1665), Issue 5.

to believe Daniel Defoe's fictional account of the 1665 plague, these astrological forecasts served only to frighten the people, generating 'universal melancholy'. The people were 'addicted to … Astrological Conjurations', and prognosticators shrewdly exploited the naivety of the masses by printing frightening plague predictions in their copious almanacs.[8] Astrologers, in other words, were not only quacks — they were also unwelcome doomsayers. Yet astrologers like Edlyn claimed that the principal aim of their plague predictions was simple and authentic: to give the city 'an Alarm to prepare for it, expect it, and provide against it'.[9] Indeed, astrologers affixed to their prognostications tools for warding off disease, from prayers and at-home remedies to referrals to specialist doctors. After all, as historians have extensively demonstrated, medicine and astrology were intimately linked in early modern Europe.[10] The clients who poured into astrologers' consulting rooms sought advice on relationships, travel, business, and, extensively, their health. For the purposes of this article, however, what is significant about predictions like Edlyn's is the fact that they were not predicting the fortunes of individual clients so much as they were forecasting the health of the people of London as a body.

We now know a great deal about astrology's role in the diagnosis, prognosis and treatment of early modern patients. However, little attention has been paid to the attempts of astrologers to forecast the health of large groups of people — cities, regions and even nations. In fact, it is commonly assumed that pre-modern

[8] Daniel Defoe, *A Journal of the Plague Year* (London, 1722), 25–6.

[9] *The Prophecie of One of his Maiesties Chaplains, Concerning the Plague* (London, 1665), 1.

[10] There is now a large literature on medical astrology in medieval and early modern Europe. For England, see especially H. G. Dick, 'Students of Physick and Astrology: A Survey of Astrological Medicine in the Age of Science', *Journal of the History of Medicine and Allied Sciences*, i, nos. 2 and 3 (1946); Roger French, 'Foretelling the Future: Arabic Astrology and English Medicine in the Late Twelfth Century', *Isis*, lxxxvii (1996); Michael MacDonald, 'The Career of Astrological Medicine in England', in Ole Peter Grell and Andrew Cunningham (eds.), *Religio Medici: Medicine and Religion in Seventeenth-Century England* (London, 1996); Lauren Kassell, *Medicine and Magic in Elizabethan London: Simon Forman: Astrologer, Alchemist, and Physician* (Oxford, 2005). A digitized corpus of early modern astrological case records, edited by Kassell, is provided by *The Casebooks Project* at <https://casebooks.lib.cam.ac.uk/>.

medicine was interested above all in the health of the individual and rarely, if ever, looked beyond solitary case studies to consider the broader health of groups. Yet astrologers routinely made health predictions at the population level. The disease forecasts of Edlyn and his colleagues about the year 1665 were, as this article will show, neither new nor unique. Astrology, embedded as it was in late medieval and early modern universities and courts, was a vibrant aspect of European cultural and intellectual life until the eighteenth century.[11] Following the directives laid out in authoritative Greek and Arabic manuals, European astrologers had since the twelfth century used the tools of their trade to predict the illnesses that were likely to impact the health of particular regions. From the fifteenth century onwards, these predictions were made available in popular printed almanacs across Europe. Astrological approaches to health at the population level had a history as old as astrology itself, but they reached a high point in the early modern period, when the vernacularization of astrology's techniques enabled more people — including those who did not attend university — to acquire the requisite skills to practice the art, and the huge growth of cheap print greatly amplified the dissemination of such prognostications throughout all levels of society.

Before the epidemiologist there was the astrologer, who looked to the stars to find patterns between celestial configurations and major health events on earth, and used their findings to forecast the rise and fall of epidemics. This article showcases early modern astrologers at work on health and disease at the population level. An initial case study of a far broader, yet unstudied phenomenon, the article focuses predominantly on seventeenth-century England, a context for which we have a preponderance of surviving evidence, but also one that witnessed significant innovations in political arithmetic and population health more broadly. Astrologers engaged in two key activities related to health at the population level. First, astrologers used astronomical data and

[11] For England, see Keith Thomas, *Religion and the Decline of Magic* (New York, 1971), chs. 10–12; Hilary M. Carey, *Courting Disaster: Astrology at the English Court and University in the Later Middle Ages* (London, 1992); Ann Geneva, *Astrology and the Seventeenth Century Mind: William Lilly and the Language of the Stars* (Manchester, 1995).

astrological theories to make predictions about the diseases that would predominate in a particular city in a particular year, disseminating their forecasts widely alongside advice concerning what should be done in response. While historians have studied the general medical advice provided in almanacs, folding it into a broader story about the vernacularization of medicine in the period, the disease forecasts included in almanacs have been largely overlooked.[12] Pestilence was of course far from the only illness to plague early modern society, and astrologers' yearly forecasts accordingly ranged well beyond epidemics to consider the relative risk of endemic disease. Implicit in these predictive activities, I suggest, was a notion of 'population', one that had much in common with medieval and Renaissance approaches to the collective body of a city, but also foreshadowed important later developments in population thinking. Astrologers' disease forecasts predicted different health outcomes for different estates or subgroups in society, but they could also flatten social hierarchies and establish equivalences between residents of a city, effectively standardizing a large group of people.

Astrology was located at the intersection of medicine and mathematics, and this alongside astrologers' tendency to think in terms of populations made it a fruitful tool for the large-scale investigation of disease. Thus the second key activity of astrologers related to population-level health was their efforts to conduct empirical analyses of the patterns of epidemics, using historical and astronomical evidence in an attempt to identify determinants of disease at the group level. By comparing the timing and severity of plague outbreaks with the stars, astrologers sought to detect patterns that would shed light on the precise causes of plague and ultimately make for more evidence-based disease forecasts. Astrologers' interests in health

[12] For astrology and vernacular medicine in England, see Louise Hill Curth, *English Almanacs, Astrology and Popular Medicine, 1550–1700* (Manchester, 2018); Bernard Capp, *Astrology and the Popular Press: English Almanacs, 1500–1800* (Ithaca, 1979), 204–14. Similar studies on other European contexts include: Kelly M. Smith, 'The Science of Astrology: *Schreibkalender*, Natural Philosophy, and Everyday Life in the Seventeenth-Century German Lands' (Univ. of Cincinnati Ph.D. thesis, 2018), ch. 4; Thomas A. Horrocks, *Popular Print and Popular Medicine: Almanacs and Health Advice in Early America* (Amherst, 2008); Jeroen Salman, *Populair drukwerk in de Gouden Eeuw: De almanak als lectuur en handelswaar* (Zutphen, 1999), esp. 105–34.

at the population level, combined with their long-standing attempts to draw lessons from the correlation of past events with astrological phenomena, made them prime candidates for developing novel approaches to epidemics — even if the same techniques could ultimately help to undermine many of the astrological theories that first motivated them.

Before diving into the world of early modern astrology, it is salutary to remind ourselves that while astrology is today often associated with magic, for much of its history it was more closely tied to mathematics and medicine. Into the seventeenth century, astrology — which sat alongside astronomy as the practical part of the 'science of the stars' — was taught in mathematics, medicine, and natural philosophy courses at universities throughout Europe.[13] Throughout the early modern period certain types of astrology were increasingly viewed as suspect by theologians and natural philosophers, but the use of astrology for medicine, agriculture and navigation was treated differently by churches and universities.[14] Astrological approaches to medicine remained widespread in Europe even into the eighteenth century, especially amongst the broader public.[15] Thus, not only were astrologers deeply interested in making predictions and recommendations about health and disease at the population level; they were also widely regarded as key experts in this aspect of health care. In an era before mathematical probability and

[13] See now H. Darrel Rutkin, *Sapientia Astrologica: Astrology, Magic and Natural Knowledge, c.1250–1800. I. Medieval Structures, 1250–1500: Conceptual, Institutional, Socio-Political, Theologico-Religious and Cultural* (Cham, 2019).

[14] See, for example, H. Darrel Rutkin, 'Is Astrology a Type of Divination? Thomas Aquinas, the Index of Prohibited Books, and the Construction of a Legitimate Astrology in the Middle Ages and the Renaissance', *International Journal of Divination and Prognostication*, i (2019); Luís Campos Ribeiro, 'The Bounded Heavens: Defining the Limits of Astrological Practice in the Iberian Indices', *Annals of Science*, lxxvii (2020); Neil Tarrant, 'Reconstructing Thomist Astrology: Robert Bellarmine and the Papal Bull *Coeli et terrae*', *Annals of Science*, lxxvii (2020); Hannah Marcus, *Forbidden Knowledge: Medicine, Science, and Censorship in Early Modern Italy* (Chicago, 2020), esp. 57–8. Note that the distinction between natural and judicial astrology common in much of the historiography is of limited use when talking of the period before the eighteenth century; although a distinction certainly existed, the above studies show it was always unclear how to define it.

[15] The declining reputation of astrology in early modern Europe remains an area of active research. We know especially little about how and why astrology was gradually removed from the medical curricula of universities.

statistical analysis, astrologers used the best quantitative tools then available to predict and monitor the incidence of disease at the population level.

I

As the Roman astrologer Claudius Ptolemy explained in his textbook *Tetrabiblos*, which was composed in the mid second century CE but remained authoritative into the early modern period, the movements of the heavenly bodies, in relation to each other and to the signs of the Zodiac, exert powerful influences on the terrestrial sphere. Planets incite injury and disease in bodies, and by cultivating accurate knowledge of planetary configurations, one could unite astrology and medicine to provide diagnoses, prognoses and appropriate treatments.[16] Bolstered by the work of Arabic astrologers, these basic tenets, combined with the principles of Galenic medicine, remained a central facet of mainstream medical theory and practice in Europe from the late medieval period into the eighteenth century. Health was determined by the balance of the four humours, the constant permutations of which were guided by the movement of the planets, which imparted varying quantities of heat, cold, dryness and moisture. An individual's predisposition to certain diseases was partly a product of the configuration of the heavens at their birth and could be analysed on a nativity chart. The heavens also defined propitious and inauspicious times to perform therapeutic procedures such as purges, fasting and bleeding, as well as the collection, compounding and administration of drugs.[17] Astrology was considered so indispensable to the practice of medicine that in the fifteenth century some

[16] Ptolemy, *Tetrabiblos*, I, 2, I, 3, III, 12.

[17] For examples of these theories in action, see Anthony Grafton and Nancy Siraisi, 'Between the Election and My Hopes: Girolamo Cardano and Medical Astrology', in William Newman and Anthony Grafton (eds.), *Secrets of Nature: Astrology and Alchemy in Early Modern Europe* (Cambridge, MA, 2001); Hilary M. Carey, 'Astrological Medicine and the Medieval English Folded Almanac', *Social History of Medicine*, xvii (2004); Monica Azzolini, *The Duke and the Stars: Astrology and Politics in Renaissance Milan* (Cambridge, MA, 2013), ch. 4; E. W. Talbert, 'The Notebook of a Fifteenth-Century Practicing Physician', *Studies in English*, xxii (1942).

European universities decreed that physicians must always have on hand a copy of the current almanac to guide their practice.[18]

Yet astrologers were specialists not only in the health of individuals, but also the health of large groups. Ptolemy's *Tetrabiblos* described two main types of prognostication: one relating to particular persons, and the other to whole races, cities or countries.[19] The latter more 'general' inquiry, which facilitated predictions about population-level events, was generally considered less controversial than the former, which was often seen as overly deterministic and in contradiction to the principle of free will.[20] General astrology was concerned with large-scale phenomena, wars as well as famine, drought, weather events, natural disasters and epidemics. In a society where the assumptions underlying general astrology were largely taken for granted, the value of such predictions was obvious, and it is no surprise that astrologers had long been crucial advisors in royal and princely courts, in the Ottoman Empire as well as throughout Europe.[21] From the late fifteenth century it was a requirement for professors of Astronomy

[18] Ian Maclean, *Logic, Signs and Nature in the Renaissance: The Case of Learned Medicine* (Cambridge, 2002), 91. Similar instructions existed for surgical guilds; see Salman, *Populair drukwerk in de Gouden Eeuw*, 109, 115–16, 122.

[19] Ptolemy, *Tetrabiblos*, III, 1.

[20] For instance, Francis Bacon's reformed astrology affirmed that general astrology was sounder than other astrological techniques and that practitioners could legitimately make predictions about droughts, famines, frosts, rains, wars and epidemics. See *De augmentis scientiarum* (London, 1623, STC 1108), iii, 4. Note, however, that after Giovanni Pico della Mirandola's famous critiques, conjunctionist astrology was often attacked as unreliable pagan accretion. See Dag Nikolaus Hasse, *Success and Suppression: Arabic Sciences and Philosophy in the Renaissance* (Cambridge, MA, 2016), 276–89.

[21] Azzolini, *Duke and the Stars*; Darin Hayton, *The Crown and the Cosmos: Astrology and the Politics of Maximilian I* (Pittsburgh, 2015); Michael A. Ryan, *A Kingdom of Stargazers: Astrology and Authority in the Late Medieval Crown of Aragon* (Ithaca, 2012); Michael H. Shank, 'Academic Consulting in Fifteenth-Century Vienna: The Case of Astrology', in John Murdoch, Edith Sylla and Michael McVaugh (eds.), *Texts and Contexts in Ancient and Medieval Science* (Leiden, 1997); Steven Vanden Broecke, *The Limits of Influence: Pico, Louvain, and the Crisis of Renaissance Astrology* (Leiden, 2003), ch. 2; Ahmet Tunç Şen, 'Astrology in the Service of the Empire: Knowledge, Prognostication, and Politics at the Ottoman Court, 1450s–1550s' (Univ. of Chicago Ph.D. thesis, 2016); Jean-Patrice Boudet, 'Les Astrologues européens et la genèse de l'État moderne (XII^{e}–XVII^{e} s.): une première approche', in *L'Etat moderne et les élites, XIII^{e}–XVIII^{e} siècles* (Paris, 1996). For England, see Carey, *Courting Disaster*; Thomas, *Religion and the Decline of Magic*, 342–5, 371.

and Mathematics in many European universities to provide yearly predictions, based on general astrology, for the local area.[22]

The key interpretive technique here was the horoscope for the revolution of the year, which mapped the heavens at the sun's annual entrance into the first degree of Aries in March (at the spring equinox).[23] The astrologer analysed the horoscope, taking into consideration the particular influence of the planet designated 'lord' of the year. As Edlyn's case suggests, planetary conjunctions that were present in the revolution horoscope or set to take place at any point throughout the year were also vital to consider, as well as eclipses and comets.[24] Each of the planets and luminaries (then known), twelve signs, and twelve houses of the horoscope were coupled with particular diseases, and astrologers drew on these associations when prognosticating. Richard Trewythian's prognostication for London in 1452, for example, took Saturn's location in the sixth house — the house of health — to mean that the year would witness diseases of a cold and dry nature, such as madness, epilepsy and leprosy.[25] Rooted in this approach was a concern with the connection between location and health; the casting of a horoscope, effectively a map of the sky as seen from the perspective of a particular time and place on earth, relied on the data collated in astronomical tables like those used by Edlyn, which were calculated for a discrete geographical location.[26]

[22] Rutkin, *Sapientia Astrologica*, 391–3; Vanden Broecke, *Limits of Influence*, 32; Alexandre Tur, 'Hora introitus solis in Arietem: les prédictions astrologiques annuelles latines dans l'Europe du XV^{e} siècle, 1405–1484' (Université d'Orléans Ph.D. thesis, 2018), 282–5.

[23] The revolution horoscope marked the beginning of spring, and astrologers could cast similar figures for summer, autumn and winter, based on the sun's entrance into Cancer, Libra, and Capricorn, respectively. It was considered best practice under certain astronomical conditions to make yearly predictions based on all four seasonal charts.

[24] Astronomically, Saturn and Jupiter conjunct roughly every twenty years, meeting in the same Zodiac triplicity for twelve or thirteen conjunctions (about 240 years) before moving to the next. Conjunctions of the superior planets signified transformations in society, the most momentous changes coming with Greater Conjunctions (the first conjunction of Saturn and Jupiter in a new triplicity) and Greatest Conjunctions (when, after moving through all the triplicities, Saturn and Jupiter meet again in Aries).

[25] Sophie Page, 'Richard Trewythian and the Uses of Astrology in Late Medieval England', *Journal of the Warburg and Courtauld Institutes*, lxiv (2001), 203.

[26] Most English almanacs were calculated for London, though regional titles increasingly flourished.

With the growth of print, annual prognostications spread more extensively than ever before. Although prognostications were often printed as standalone texts, the principal medium that enabled the spread of disease forecasts was the annual almanac.[27] Reminiscent of the modern pocket diary, almanacs contained an astronomical calendar alongside reference materials such as dates of local fairs and tables of weights and measures. Almanacs are frequently associated with the religious and political movements to which they often contributed.[28] Yet at their core almanacs were reference texts consulted for practical advice on almost every aspect of life — especially health. Almanacs contained large amounts of general medico-astrological guidance. This included folk remedies and, occasionally, Paracelsian ideas, but Louise Curth has shown that English almanacs were for the most part Galenic, providing extensive guidance on balancing the humours through the regulation of the six non-naturals (food and drink; rest and exercise; sleep and waking; excretions and retentions; ambient air; and the passions).[29] Almanacs' use of images and recognizable symbols also made them accessible to those with less literacy. The most common image was the Zodiac Man, a depiction of a (usually) male body illustrating the signs governing each body part. As the example in Plate 2 indicates, this standardized figure gave life to the theory that it was dangerous to perform surgery on a specific organ when the moon was in the sign ruling that part. Written in English rather than Latin from the mid fifteenth century onwards, almanacs were an effective means of popularizing medical knowledge.[30] In his first almanac, printed for 1684,

[27] The best introduction remains Capp, *Astrology and the Popular Press*.

[28] For England, see William E. Burns, 'Astrology and Politics in Seventeenth-Century England: King James II and the Almanac Men', *Seventeenth Century*, xx (2005); Patrick Curry, *Prophecy and Power: Astrology in Early Modern England* (Princeton, 1989).

[29] Curth, *English Almanacs, Astrology and Popular Medicine*, esp. chs. 6–8.

[30] See n. 12 above. It is notable, however, that many classic studies of popular English medicine explicitly exclude almanacs. See Mary E. Fissell, 'The Marketplace of Print', in Mark S. R. Jenner and Patrick Wallis (eds.), *Medicine and the Market in England and its Colonies, c. 1450–c. 1850* (Basingstoke, 2007), 111; Mary E. Fissell, 'Popular Medical Writing', in Joad Raymond (ed.), *The Oxford History of Popular Print Culture*, 6 vols. (Oxford, 2011), i, 418; Paul Slack, 'Mirrors of Health and Treasures of Poor Men: The Uses of the Vernacular Medical Literature of Tudor England', in Charles Webster (ed.), *Health, Medicine and Mortality in the Sixteenth Century* (Cambridge, 1979), 283.

the astrologer–physician William Salmon announced that he had 'laboured to make it serviceable to the Common people, in such things as may contribute to their Healths'; he endeavoured to 'accommodate' the complexities of medical astrology 'with many plain Directions fit for the capacity of the vulgar', including 'Medicaments … [they] may make themselves'.[31]

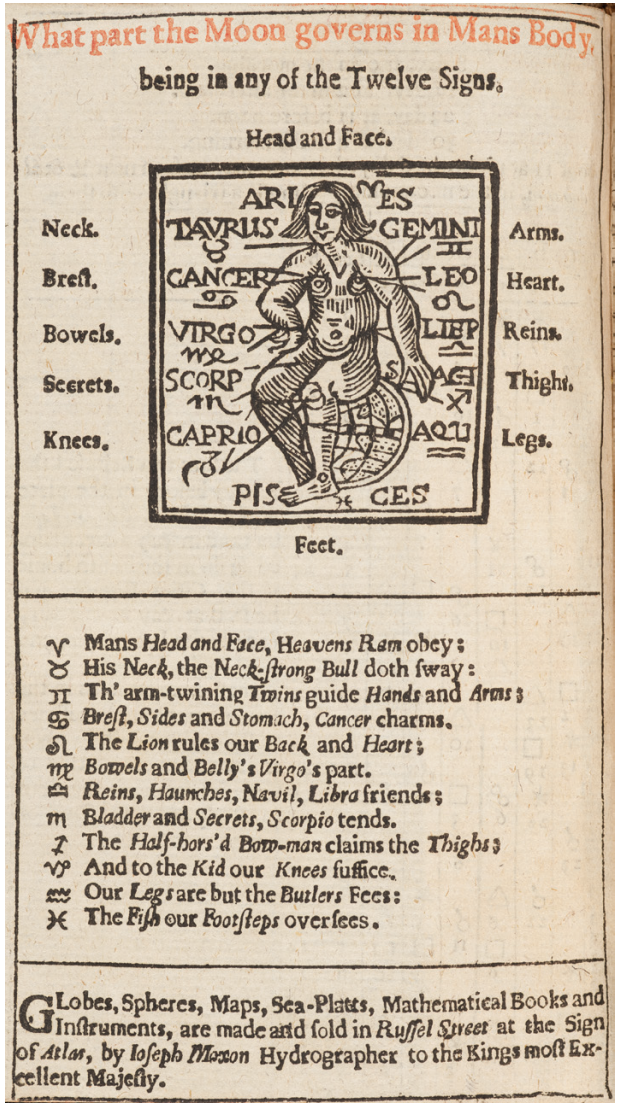
Beyond this general advice, almanacs included a prognostication that provided a report on the state of the local community's health for the coming year and the risk of major epidemics. Some of this advice was based on standard weather patterns. Thomas Balles's 1631 almanac warned that the diseases associated with winter included melancholy. To avoid this particular ailment, one should be careful not to eat 'over-moyste' food.[32] Others based their health predictions on the sun's monthly position. In his almanac for 1606, Henry Alleyn explained to the people in the town of Petworth in Sussex that in January, the sun would enter Aquarius, a masculine, airy and sanguine sign governing the legs. One should therefore be wary of swollen legs. In February, meanwhile, the sun would enter Pisces, a feminine, watery and phlegmatic sign ruling the feet, and thus readers should anticipate gout, leprosy and palsy.[33] Most predictions were based on insights drawn from the revolution horoscope, however. A forecast offered to English readers by Mathias Brothyel for the year 1545 predicted that, concerning 'the infyrmyties, diseases & plages … that shal reygne this yere', there would be 'sondrye kyndes'. In particular, the positions of Mars and Saturn meant one should expect 'burnynge diseases' such as 'feuers or agues, many aches in the head, necke, and in the eyes, and also impostumes, pluryses or stitches'.[34] Over a century later, William Andrews' almanac for 1655 noted that Mars's position in Capricorn at the cusp of the sixth house of the horoscope meant 'we must undoubtedly expect violent pestilential diseases', including 'the Plague, small Pox, burning

[31] William Salmon, *Salmon's Almanack* (London, 1684), sig. a2^{r}.

[32] Thomas Balles, *A New Almanacke and Prognostication* (London, 1631, STC 411), sig. b3^{r}.

[33] Henry Alleyn, *An Almanack and Prognostication* (London, 1606, STC 408), sigs. b5^{v}–b6^{r}.

[34] Mathias Brothyel, *A Pronostycacyon* (London, 1545, STC 420.15), sigs. c1^{r}–c2^{r}.



2. A Zodiac Man, with accompanying textual details, in a seventeenth-century almanac. Source: The Bodleian Libraries, University of Oxford, Bodl. Ashm. 597(2): John Gadbury, *Ephemeris* (London, 1655), sig. c8^{v}.

Fevers, and many other infectious diseases' that would kill thousands.[35] Yet far from being mere doomsayers, astrologers would often predict no epidemic in a given year. As Lilly claimed in his almanac for 1647, that year would thankfully see no 'Plague or generall Pestilence'.[36]

Almanacs also forecast the relative prevalence of endemic disease. The astrologer Thomas Langley used seasonal horoscopes to claim that the spring of 1635 would bring fevers, ring worm, corrupt blood and measles, and that premature births and weakened infants were also probable.[37] Mental as well as physical ailments were included in these predictions. Being a cold and dry disease, melancholy was generally associated with winter, but it was also linked with Saturn and the signs Taurus, Virgo and Capricorn. Hence Gadbury predicted melancholy to rage in 1657 because the moon was in Taurus in the sixth house, and again in 1684 because of the position of Saturn.[38] The nature of each planet and sign was crucial to these predictions. In his discussion of the revolution horoscope for 1675, Gadbury explained that the relative positions of Jupiter and Mars, the first of which governed the lungs and liver, the second of which governed the gall, meant that one should expect diseases in those body parts. Mars being hot and dry meant a particular ailment to watch out for was obstructed and dried-up lungs.[39] The heavens could also encourage behaviours that would lead to the spread of disease. Nicholas Culpeper's almanac for 1653 claimed that Venus's position as lady of the year in the revolution horoscope meant 'women will be much given to lie backward', leading ultimately to a rise in sexually transmitted disease.[40]

Alongside their predictions, astrologers offered practical tips to mitigate the severity of the outbreaks they forecast. Sometimes, especially in the case of epidemics, astrologers encouraged readers simply to pray for God's mercy or, following *Jeremiah* 10:2, to trust God rather than fear 'the signs of heaven'. Part

[35] William Andrews, *The Coelestial Observator* (London, 1655), sigs. b4^{r-v}.

[36] William Lilly, *Merlini Anglici Ephemeris* (London, 1647), sig. f8^{r}.

[37] Thomas Langley, *A New Almanacke and Prognostication* (London, 1635, STC 479), sig. b3^{r}.

[38] John Gadbury, *Speculum Astrologicum* (London, 1657), sig. c5^{v}; John Gadbury, *Ephemeris* (London, 1684), sig. a7^{r}.

[39] John Gadbury, *Ephemeris* (London, 1675), sigs. d1^{v}–d2^{r}.

[40] Nicholas Culpeper, *An Ephemeris* (London, 1653), 13.

of the aim of prognostications was in this sense pastoral and natural theological; by revealing how God used the heavens as his instruments, astrologers hoped to cultivate appreciation of divine governance of the world.[41] Yet for the most part astrologers stressed that the stars incline, but they do not compel (*astra inclinant, sed non obligant*), and thus prognostications were usually not intended as fatalistic but instead as accounts of future trends that could be assuaged with proper conduct. Culpeper reminded his readers in 1653 that although 'fatality rules fools, wise men rule the Stars, while they govern themselves by sound counsel'. Thus, when Culpeper alerted his readers of 'a mortal Summer' that year, 'very destructive to the Commonalities lives', he encouraged the reader not to 'keep his brain in his books', but instead to seek out remedies 'in time'. He also predicted the arrival of 'a new and unheard of Disease' in the winter of the same year, advising readers that *Amara dulcis* would be 'an excellent Herb at this time', one that should be procured 'before-hand' in case 'when it is needful it is not to be had'.[42]

The aim was to equip laypeople with the health literacy they needed to respond effectively to the forecast. For this, readers could also draw on the general medical advice that appeared throughout their almanac. Within Galenic medicine, a certain amount of personal responsibility for one's health was assumed. Although there were aspects of one's humoural make-up that could not be altered, individuals could nevertheless work to bring their humours into balance by regulating the six non-naturals. For instance, one could work to counteract the predicted risk of a hot and dry disease such as a fever by taking cold baths. Part of this also involved the aid of medical practitioners, and astrologers often encouraged readers to visit experts — including, at times, themselves — who specialized in the forecast diseases or sold proprietary drugs. When Culpeper predicted much 'suppression of Menses' (pregnancy) in the year 1654, he gave advice on abortifacients and offered women '[his] house, where

[41] In the middle decades of the seventeenth century, a group of English astrologers sponsored a series of sermons that addressed this topic. See Michelle Pfeffer, 'The Society of Astrologers, *c.*1647–1684: Sermons, Feasts and the Resuscitation of Astrology in Seventeenth-Century London', *British Journal for the History of Science*, liv (2021).

[42] Culpeper, *Ephemeris* (1653), 6, 19, 23.

you shall have them prepared and administered by my friend Dr Harrington'.[43] Gadbury predicted consumption, dropsy, gonorrhoea, 'stranguary', and corruptions of the liver and pancreas in 1680, but, luckily for his readers, advertised a 'Universal Pill' claiming to cure many of these ailments.[44] In 1673, he predicted 'raging distempers' in the body 'too hard and knotty even for many learned Physicians, unacquainted with Astrology, to understand'. The solution? Visit Gadbury at his rooms in Brick Court, Westminster.[45]

Although we know what astrologers advised their readers to do, little evidence is available to shed light on how readers actually responded. We know that extraordinary astrological predictions often caused a significant public response in early modern Europe.[46] After dire predictions about Black Monday, the solar eclipse of March 1652 — which was predicted to bring treachery, disputes, invasion, earthquakes and pestilence — many in London stopped turning up to work and the rich left for the countryside.[47] It is possible that annual disease predictions encouraged some to leave the city early in search of safe refuge in the country, as was common practice in times of plague, even though, as below, not every astrologer thought this was a good idea.[48] Presumably some readers followed astrologers' advice to alleviate incoming disease through regimen, appropriate cures and the attention of expert practitioners. After all, the recognizable trope of the almanac reader, who based their

[43] Nicholas Culpeper, *An Ephemeris* (London, 1654), 9–11.

[44] John Gadbury, *Ephemeris* (London, 1680), sigs. b3^{r}, c8^{v}.

[45] John Gadbury, *Ephemeris* (London, 1673), sigs. b5$^{r–v}$.

[46] The most famous early modern example is the predicted 'flood' of 1524, based on a conjunction in the watery sign Pisces. On astrology and early modern approaches to 'disasters', see Louis Gerdelan, 'Calamitous Knowledge: Disaster Research in the British, French and Spanish Atlantic Worlds, *c.*1605–1755' (Harvard Univ. Ph.D. thesis, 2021), ch. 3. I am grateful to Louis Gerdelan for sharing his dissertation with me.

[47] William E. Burns, ' "The Terriblest Eclipse that Hath Been Seen in Our Days": Black Monday and the Debate on Astrology during the Interregnum', in Margaret J. Osler (ed.), *Rethinking the Scientific Revolution* (Cambridge, 2000).

[48] The popular fifteenth-century Latin translation and abridgement of Abû Ma'shar's *Introduction to Astronomy* explained that foreknowledge gave one time to flee or to prepare the body. See Steven Vanden Broecke, 'Self-Governance and the Body Politic in Renaissance Annual Prognostications', in Charles Burnett and Dorian Gieseler Greenbaum (eds.), *From Māshāʾallāh to Kepler: Theory and Practice in Medieval and Renaissance Astrology* (Ceredigion, 2015), 498.

everyday decisions on their almanac, was ubiquitous in English plays, poems and parodies.[49] Guidebooks likewise pointed to the apparently common practice of 'Poore Countreymen', who habitually followed 'the direct rules of [their] Almanack, eyther for Phlebotomie, or other directions for the health of the body'.[50] Given the habitual, quotidian nature of these activities, however, little evidence has survived. As Curth has suggested in regard to the general medical guidance of almanacs, most readers probably did not follow astrologers' advice slavishly but, as with other genres of regimen, would pick and choose elements that seemed beneficial or achievable.[51]

Although there are considerable evidentiary difficulties in tracing the use of almanacs' disease predictions, the ubiquity of this content throughout the entire early modern period is indicative of its perceived value in the eyes of almanac-makers and their publishers and consequently their purchasers. After all, the standardized format of almanacs meant that astrologers were perpetually short on space and routinely complained that they had run out of room to deliver their prognostications in more detail. Moreover, other evidence points to extensive reader engagement: extant annotated almanacs show that many used them as a diary, composing life records in dialogue with the astrological content, noting the weather, births and deaths in the family, and, importantly, health and sickness.[52] The clergyman Matthew Page, for instance, used his almanac for 1612 to record the ill health of his infant son, his wife's painful breasts, and his own loss of a tooth.[53] Astrologers also received vast

[49] See, for example, Thomas Shadwell, *A True Widow: A Comedy, Acted by the Duke's Servants* (London, 1679), sig. a4^{r}; Thomas Middleton, *The Counterfeit Bridegroom, or, The Defeated Widow. A Comedy* (London, 1677), 5–6. I am grateful to Paige Donaghy for the second reference.

[50] *A Helpe to Discourse* (London, 1619, STC 1547), 270–2.

[51] Curth, *English Almanacs, Astrology and Popular Medicine*, 137–8.

[52] Adam Smyth, *Autobiography in Early Modern England* (Cambridge, 2010), ch. 1; Jason Scott-Warren, 'Early Modern Bookkeeping and Life-Writing Revisited: Accounting for Richard Stonley', in Liesbeth Corens, Kate Peters and Alexandra Walsham (eds.), *The Social History of the Archive: Record-Keeping in Early Modern Europe* (Past and Present Supplement no. 11, Oxford, 2016), 157–9.

[53] Lauren Kassell, 'Almanacs and Prognostications', in Raymond (ed.), *Oxford History of Popular Print Culture*, i, 436.

numbers of letters from readers asking questions about their predictions and requesting further guidance.[54] Indeed, it must be stressed that these forecasts were not the ramblings of eccentric outsiders, marginalized voices ignored by the majority. On the contrary, almanacs were one of the most successful genres of the period. At their highest point in the 1660s, sales averaged between 350,000 and 400,000 annually in England, outselling all other types of books.[55] The fact that astrologers often made predictions that did not come to pass did not significantly impact almanac sales. As an art dealing with complex and variable materials, astrology had long been conceived as a form of educated guesswork.[56] It was common to blame an 'artist' rather than the art itself. Moreover, errors could buttress the system, as the reaction to an incorrect prediction was often to turn to another almanac for better advice.[57] One of the first forms of mass media, almanacs were arguably the most accessible conduit for information about population-level health in the early modern period.

II

Given the strong ties between astrology and pre-modern politics, it is striking to modern eyes that, as the above examples suggest, the instructions astrologers offered in their almanacs to allay population-level health threats were centred on individual, rather than state or community, action. We are accustomed to associating interest in population-level health — and in 'population' and 'populations' more generally — with the modern

[54] A substantial tranche of such letters for the mid seventeenth century is preserved in the Ashmole papers in the Bodleian Library. Many letters were also printed in almanacs themselves. Gadbury received so many that he warned his correspondents he would only respond to those who pre-paid postage: *Ephemeris* (London, 1665), sig. a1^{v}. William Salmon claimed to receive 1,500 to 1,600 yearly: *London Almanac* (London, 1704), sig. c8^{v}.

[55] Cyprian Blagden, *The Stationers' Company: A History, 1403–1959* (London, 1960), 188.

[56] See, for example, James Allen, 'Failure and Expertise in the Ancient Conception of an Art', in Tamara Horowitz and Allen I. Janis (eds.), *Scientific Failure* (Lanham, MD, 1994). It was also common to buy multiple almanacs and compare them. See Thomas, *Religion and the Decline of Magic*, 353.

[57] *Ibid.*, 397–402.

activity of governments and state actors.[58] It is clear from the above that the close interaction between the state and population statistics that we see from the eighteenth century onwards was not in play in early modern astrological practice.[59] The suggestions astrologers offered in their printed almanacs for dealing with impending health threats were not ultimately directed at government authorities. To take a modern analogy, almanac prognostications functioned more like WHO press releases containing guidance for the public than reports with advice for state administrators. There are two main reasons for this. First, many early modern astrologers argued that there was little that governments could or should do about epidemic disease. Simon Forman maintained that quarantine only caused fear amongst those shut up in their homes, leading to disordered humours and thus increased susceptibility to infection. As was commonplace, he argued that the solution to plague was moral: penitence, rather than confinement or flight from the city, was the best response.[60] Gadbury similarly saw quarantine and escape from the city as misguided attempts to evade God's wrath and 'baffle Celestial destiny'.[61] Second, the change in audience that came with the popularization of general astrology in cheap print demanded a change in the type of guidance that was offered. In earlier prognosticatory culture, predictions based on general astrology were primarily directed to members of courts and universities and were heard by few beyond these elite circles.[62] It

[58] Following Foucault in particular, there has been a tendency to assume a constitutive relationship between the state and its statistics, and to link population-level health with 'governmentality' and 'biopower', by which Foucault meant the efforts of governments and institutions to regulate and control the biological features of populations. See, especially, Michel Foucault, *Sécurité, territoire, population: Cours au Collège de France, 1977–78* (Paris, 2004).

[59] Joanna Innes, *Inferior Politics: Social Problems and Social Policies in Eighteenth-Century Britain* (Oxford, 2009); D. V. Glass, *Numbering the People: The Eighteenth-Century Population Controversy and the Development of Census and Vital Statistics in Britain* (Farnborough, 1973).

[60] Kassell, *Medicine and Magic in Elizabethan London*, 111.

[61] John Gadbury, *London's Deliverance Predicted* (London, 1665), 29 and *passim*. He knew both also impacted trade. See *ibid*., sigs. A4^{r-v}, 19, 29–30.

[62] Despite the near ubiquity of astrologers in these elite pre-modern spaces, the extent to which astrological guidance of any kind was put to use by the state varied according to the predilections of rulers. See the various case studies of English monarchs in Carey, *Courting Disaster*.

is true that in England as elsewhere, many of the earliest almanacs were produced at the behest of the Crown or local council officials, and some city councils and regional parliaments made bulk annual purchases of almanacs.[63] But almanacs were ultimately mass-produced, public-facing documents whose primary audience was the reading public.

In the mid 1650s, one almanac compiler claimed that the many 'thanks' he had received for an earlier disease forecast meant he would not be 'sparing to deliver my Judgement … *for the publique good*, what Diseases are like to reign, and what may be applicable for them that shall be afflicted with them'.[64] As this quotation suggests, astrologers' emphasis on individual action should not detract from their concern with the well-being of their city as a whole nor their ability to think and work at the population level. In this case, individual-level guidance was issued for the sake of the collective and, indeed, for the 'population' at large — and hence 'for the publique good'. After all, the success of any programme of population health has always relied on the collaboration and complicity of individuals who take action for the benefit of the larger group. In comparison to the bespoke guidance astrologers offered in their clinics to individual patients, the guidelines in almanacs were not individuated medical advice tailored to the particular humoural or astrological characteristics of each reader. On the contrary, almanacs were directed to unindividuated 'everymen', who were the object of astrologers' guidance insofar as they were residents in the city under consideration and could therefore contribute to the health of the whole.[65] Astrologers certainly worked within classical and humanist ideals of the body politic as made up of linked and hierarchical social estates, treating their readers as members of subgroups sorted by age, confession, affluence and other categories. Yet general astrology also allowed practitioners

[63] William Parron, composer of the earliest surviving English almanacs, wrote them primarily for the use of Henry VII: Capp, *Astrology and the Popular Press*, 67. See also Vanden Broecke, *Limits of Influence*, 31; Salman, *Populair drukwerk in de Gouden Eeuw*, esp. 57.

[64] Nicholas Culpeper, *An Ephemeris* (London, 1655), 8, my emphasis. Culpeper died in January 1654 but the Stationers' Company paid another astrologer to continue to issue almanacs under his name.

[65] On ideal almanac readers as individual 'everymen', see Vanden Broecke in 'Self-Governance and the Body Politic in Renaissance Annual Prognostications', 510.

to see the inhabitants of a region, regardless of social status, as part of a relatively standardized group: a collection of mortal bodies.

Within astrological and Galenic medicine, health was a community project in which everyone contributed. The responsibility for action in response to disease forecasts thus lay with residents, who could repent and ask for God's protection as well as — especially in the face of endemic disease — monitor their bodies and behaviour. They were seen as possessing responsibility for their health; more importantly, through the management of their own bodies they contributed to the overall health of the local community. Steven Vanden Broecke has argued similarly for Renaissance prognostications more generally: the ideal reader identified themselves in relation to the social body of which they were a part, and in response to predictions organized their behaviour to ensure that good fortune would reign in their city.[66] Such forecasts were thus issued, in the words of one English astrologer, 'for the profit of the Republicke'.[67]

We can see similar assumptions at work in pre-modern attempts to maintain and manage the health of cities across Europe. The foundation of urban hospitals, leprosaria and quarantine facilities in medieval and Renaissance municipalities — as well as the implementation of strategies for managing waste and pollution and the appointment of plague commissioners and boards of health — were often state-sponsored measures for protecting and promoting residents' health.[68] Yet a considerable responsibility still lay with individual residents and visitors within a given city, who were expected to act for the benefit of the body politic. To name just a few examples, residents were variously tasked with ensuring the cleanliness of their homes and nearby streets and waterways, with disposing of their waste

[66] *Ibid.*, esp. 506–10. Similar points are made in Jeroen Salman, 'Information, éducation et distraction dans les almanachs hollandais au XVII^{e} siècle', in Hans-Jürgen Lüsebrink (ed.), *Les Lectures du peuple en Europe et dans les Amériques du XVII^{e} au XX^{e} siècle* (Brussels, 2003).

[67] *An Ephemeris for Nine Yeeres* (London, 1609, STC 22142), sig. a2^{r}.

[68] There is a growing literature on pre-modern population-level health care. For an overview, see Guy Geltner, 'Public Health and the Pre-Modern City: A Research Agenda', *History Compass*, x (2012).

properly, and with keeping animals prudently and hygienically.[69] If they failed to do so, all inhabitants were impacted. The Galenic emphasis on the six non-naturals meant that in taking action to improve the local environment (especially, of course, the air), individuals could improve health at an individual as well as a group level.[70] This approach to population-level health fitted well with reigning ideas of society as a living body, one in which authorities had a certain amount of responsibility over the group while inhabitants were expected to support their efforts. Not every part of the body politic was of equal rank, but every estate had its own part to play for the benefit of all.[71]

Early modern astrology largely operated within the same paradigm. The individuals who were expected to act in response to prognostications were themselves part of multiple, overlapping social estates that together composed the body politic. It is for this reason that when astrologers prognosticated, they often made specific predictions regarding particular estates or subgroups. Here astrologers relied on late medieval theories about planetary rulership, according to which different classes of people — men or women; young or old; rich or poor; but also lawyers, soldiers or fishermen; Protestants, Catholics or Jews — were said to be governed by different parts of the heavens.[72] Health forecasts broke down the residents of a place by age, gender, and temperament, as well as by class, occupation, and confession. For example, Culpeper predicted that certain astrological conditions in 1652 meant that 'Epidemical Disease will arise amongst the Clergy and Lawyers' in particular. Other celestial configurations meant the 'Vulgar' would likely 'hasten their ends by ill dyet'. The positions of Venus and Mars, furthermore, would see men much 'given to Lechery', resulting in the

[69] Carole Rawcliffe, *Urban Bodies: Communal Health in Late Medieval English Towns and Cities* (Woodbridge, 2013), ch. 3; Guy Geltner, *Roads to Health: Infrastructure and Urban Wellbeing in Later Medieval Italy* (Philadelphia, 2019), ch. 1 and appendix I; Janna Coomans, *Community, Urban Health and Environment in the Late Medieval Low Countries* (Cambridge, 2021), ch. 4.

[70] Coomans, *Community, Urban Health and Environment in the Late Medieval Low Countries*, ch. 1.

[71] *Ibid.*, 254–7; Rawcliffe, *Urban Bodies*, 78–89.

[72] See, for example, the rules for prognosticating different estates in Nicholas Culpeper, *An Ephemeris* (London, 1654), 27–8.

spread of the Pox.[73] As was standard, general predictions about the fate of the 'rich' (or 'princes') often differed from predictions about the 'vulgar'. Age also mattered: in his almanac for 1684, Gadbury predicted that in April the positions of Saturn and Mars meant 'many elderly Persons will dye'.[74] People who shared humoural dispositions (sanguine, cholerick, melancholic, or phlegmatic) were also more likely to fall prey to certain types of diseases, and so could be grouped together in forecasts.[75] The same went for those living in particular environments. William Andrews claimed that in 1670 the position of Saturn indicated that melancholy would afflict many people living in the countryside. Meanwhile, 'strange colds, coughs, and consumptions' were likely amongst those who lived in 'moist, Moorish & fenny places'.[76] Thus, in a given year, a resident could be liable to one disease as a man, another as a lawyer, and yet another because of his temperament. Although astrologers divided society into different estates, their reliance on 'biological' categories like age and temperament did not map neatly onto the social estates traditionally thought to make up the body politic. Instead, in grouping residents into these categories, astrologers essentially treated them as unindividuated members of subpopulations within a larger group.

Almanacs thus variously privileged (or disadvantaged) different groups according to astrologically based characteristics. However, general astrology could also flatten social hierarchies and homogenize populations, prognosticating the health of entire cities or towns and making no distinction between differences of rank, gender or confession amongst residents. When the author of *The London Almanack* came to make predictions for January 1673, for example, they explained that the position of Jupiter would impact all 'the worthy Inhabitants' of London.[77] These predictive practices drew on long-held theories that were laid out in authoritative works on general astrology. The deeply

[73] Nicholas Culpeper, *An Ephemeris* (London, 1652), 23–4.

[74] John Gadbury, *Ephemeris* (London, 1684), sig. a7^{r}.

[75] See, for example, John Dade, *A New Almanacke and Prognostication* (London, 1608, STC 434.20), sig. b3^{r}.

[76] William Andrews, *Coelestes Observationes* (London, 1670), sig. c7^{v}.

[77] *The London Almanack* (London, 1673), sig. c5^{r}.

influential *Flores*, written by the ninth-century Baghdad astrologer Abû Ma'shar and read widely amongst astrologers in early modern Europe, explained that revolution horoscopes enabled specific predictions regarding the achievements, temperaments and business affairs of the rich (*dives*) as well as the vulgar (*vulgus*). Yet, large-scale, collective events — such as famine, war, pestilence, earthquakes and floods — tended to impact all persons (*homo*) resident in a city.[78] In other words, events like diseases could cut across the boundary between *dives* and *vulgus*. Hence while Saturn generally indicated things likely to happen to the rich, for Abû Ma'shar the diseases ruled by Saturn impacted bodies in general.[79] The celebrated thirteenth-century *Speculum astronomiae* similarly explained that the revolution horoscope indicated what God would produce amongst the rich men of a particular region but also, when it came to corporate events, what would happen to the whole of the common populace in that area (*super divites quorundam climatum et in universitatem vulgi eorum*).[80] In his influential *Liber astronomiae*, the Italian astrologer Guido Bonatti likewise outlined how revolution horoscopes enabled astrologers to make predictions about the state of the populace (*populus*) or, more specifically, the inhabitants (*habitator*) of a region (*regio*). Such predictions allowed one to know in advance the accidents that were going to come to the region in which one was located (*in regione in qua fueris*).[81]

These theories fed into the practice of general astrology in the early modern period. Many disease predictions were assumed to be liable to impact people simply by virtue of them being resident — or simply present for a time — in the region in question. The physical location could be more important than the social standing of any individual or subgroup not only because of the geographical assumptions implicit in astronomical tables but also because within astrology, different cities, regions and nations carried their own associations with particular parts of the heavens. As Ptolemy had explained in *Tetrabiblos*, the

[78] Albumasar, *Flores astrologiae* (Venice, *c.*1500), sigs. a2^{v}, c2^{v}–c3^{v}.

[79] *Ibid.*, sig. b4^{r}.

[80] [Anon.], 'Speculum astronomiae', in Paola Zambelli (ed.), *The* Speculum Astronomiae *and its Enigma: Astrology, Theology and Science in Albertus Magnus and His Contemporaries* (Dordrecht, 1992), 228–9.

[81] Guido Bonatti, *De astronomia tractatus X* (Basel, 1550), 489, 501.

four quarters of the earth were each governed by one of the Triplicities, which gave each region certain traits. Furthermore, nations and cities were linked with a sign (London with Gemini, for instance), and each city could have a nativity horoscope cast for the moment of its foundation. Conclusions about the consequences of an eclipse, for example, could therefore be drawn not only by considering the city for which a horoscope of the eclipse was cast, but also by paying attention to the location of the eclipse itself on the horoscope: the planets, signs and houses it interacted with, and the cities or regions associated with those celestial signifiers.[82]

These principles enabled predictions for specific regions and all the people that dwelled in them. As the famous Italian mathematician and astrologer Girolamo Cardano (1501–76) explained in a commonly cited aphorism, eclipses act on cities, provinces and kingdoms more powerfully than they do on persons of private conditions, or even on kings, because their effects are in respect to the 'multitude'.[83] Like many other English astrologers, Gadbury followed Cardano when he came to predict the likely outcomes of several eclipses set to take place in the year 1656. Noting that one of the eclipses had Saturn (in Aquarius) as its Lord, he predicted it would bring about 'strange corruptions in Mans Body; tedious cold and dry Diseases, Coughs, Consumptions, Fluxes, Rhumes, Palsies, Tremblings, Quartan Agues, Leprosie, [and] all manner of melancholy diseases, either of body or mind'. Importantly, these diseases could impact anyone and everyone in London. Reading the horoscope more closely, however, Gadbury noted the significance of the position of Saturn in relation to Virgo, and because Virgo was the ascendant of Paris, he concluded that the worst of these effects would actually take place in 'the Theatre of France'.[84] Elsewhere, when prognosticating plague, Gadbury acknowledged that the fate

[82] Ptolemy, *Tetrabiblos*, III, 2–7.

[83] *Hieronymi Cardani mediolanensis, philosophi ac medici celeberrimi, opera omnia* (Lugduni, 1663), vol. 5, 61: 'Eclipses luminarium super civitates, provincias, & regna, magis quam super privatae conditionis homines, aut etiam super reges, respiciunt enim multitudinem'.

[84] John Gadbury, *Speculum Astrologicum, or, An Astrological Glasse* (London, 1656), sigs. c8^{r-v}.

of one city could be different to that of another, and hence by changing residence one could alter their fortune.[85]

What this suggests is that in practising general astrology, astrologers were relying on a quite sophisticated if largely implicit notion of population that had a homogenous group of residents as its object. Philip Kreager has argued that pre-modern concepts of population were embedded in classical and humanist ideals of society as made up of 'diverse but linked memberships'. Here, certain subgroups, such as elite families, were superior to other groups, some of whom (for example, non-citizens or women), were excluded from the body politic.[86] Practically speaking, medieval (and, indeed, classical) approaches to cities had long had to think in terms of the multitude; Peter Biller has shown the extent to which medieval thinkers were preoccupied with questions of populousness — including the best or most efficient size of a polity and the relative ratios of its estates — which in many cases involved some levelling of the people of a city.[87] Arguably, pre-modern initiatives for the health of the people also relied on an idea of population that encompassed all of the residents of a city, regardless of their estate. Guy Geltner has noted for medieval urban health that 'any action designed to identify and resist behaviours thought to put a community at risk requires defining that community',[88] and while this was largely implicit, those who were expected to contribute to and benefit from these measures suggest the working idea of population here was residential, and included citizens and local inhabitants as well as foreigners and temporary visitors. In all this, however, there still remained 'a logic of inequality and natural hierarchy'.[89]

[85] Gadbury, *London's Deliverance*, sig. a4^{r}.

[86] Philip Kreager, 'The Emergence of Population', in Nick Hopwood, Lauren Kassell and Rebecca Fleming (eds.), *Reproduction: From Antiquity to the Present Day* (Cambridge, 2018); Philip Kreager, 'Population and the Making of the Human Sciences: A Historical Outline', in Philip Kreager *et al*. (eds.), *Population in the Human Sciences: Concepts, Models, Evidence* (Oxford, 2015); Philip Kreager, 'Population Theory — A Long View', *Population Studies*, lxix, suppl. 1 (2015).

[87] Peter Biller, *The Measure of Multitude: Population in Medieval Thought* (Oxford, 2000). See also Peter Biller, 'The Multitude in Later Medieval Thought', in Hopwood, Kassell and Fleming (eds.), *Reproduction*.

[88] Geltner, *Roads to Health*, 22.

[89] Coomans, *Community, Urban Health and Environment in the Late Medieval Low Countries*, 256.

Kreager and others have shown that this began to change in the seventeenth century with the work of John Graunt and William Petty, who relied on quantitative analysis of demographic records to measure and track populations. Mortality records had been kept in London since at least the sixteenth century and were made publicly available in the weekly Bills of Mortality, printed on a regular basis from the early seventeenth century. The Bills tabulated the information collected by 'Ancient Woemen' who were engaged by their local parish to visit the bodies of the newly deceased to determine the cause of death.[90] Many locals subscribed for personal copies of the Bills, which were at first used to trace the movement of pestilence throughout the city.[91] In 1662, however, the haberdasher John Graunt published *Natural and Political Observations … Upon the Bills of Mortality*, a ground-breaking study comprising numerical analyses of several decades of Bills, producing insightful conclusions about birth and death rates, the sex ratio, and the relative burden of infectious versus chronic disease at the population level.[92] In the closing decades of the seventeenth century, Petty, close collaborator of Graunt, also applied quantitative methods to human society, pioneering a political arithmetic that among other things analysed mortality bills, searching for patterns.[93] As Kreager has argued, all this marked the beginning of modern population thinking, which standardizes large collections of individuals and takes aggregate groups as its object. 'A population', Kreager writes, 'increasingly became any enumerated resident aggregate, regardless of how it was formed and sustained'.[94]

[90] Stephen Greenberg, 'Plague, the Printing Press, and Public Health in Seventeenth-Century London', *Huntington Library Quarterly*, lxvii, 4 (2004); Richelle Munkhoff, 'Searchers of the Dead: Authority, Marginality, and the Interpretation of Plague in England, 1574–1665', *Gender and History*, xi (1999).

[91] J. C. Robertson, 'Reckoning with London: Interpreting the Bills of Mortality before John Graunt', *Urban History*, xxiii (1996).

[92] Philip Kreager, 'Death and Method: The Rhetorical Space of Seventeenth-Century Vital Measurement', in Eileen Magnello and Anne Hardy (eds.), *The Road to Medical Statistics* (Amsterdam, 2002); Margaret Pelling, 'Far Too Many Women? John Graunt, the Sex Ratio, and the Cultural Determination of Number in Seventeenth-Century England', *Historical Journal*, lix (2016).

[93] See now Ted McCormick, *William Petty and the Ambitions of Political Arithmetic* (Oxford, 2009).

[94] Kreager, 'Population Theory', S32.

The assumptions of astrologers are of course a far cry from the efforts of modern specialists to standardize populations. But in light of Kreager's claims, it is significant that pre-modern astrologers not only regularly moved beyond the level of the individual to consider population-level health, but were also comfortable with conceiving of cities as being composed of various subpopulations as well as, ultimately, a group of residents with mortal bodies. Astrologers using general astrology had long been working with an implicit notion of the collective residential body of a city that approached more modern ideas of population. From the examples given above, it is clear that astrologers continued to see the body politic as composed of different estates or classes. Yet the disease predictions of general astrology could also assume a certain equivalence amongst individual members of the larger group. Like earthquakes, floods and other large-scale events, epidemic and endemic disease were seen to be experienced corporately and across the board. As the astrologer William Ramesey explained, 'the Grandees of the Earth, although never so great and proud, yet they must know (with us) they are but men, and such too, as are not excused from the harmonious configurations of the Celestial Planets and Heavens'.[95] In this sense, astrologers' notions of population were located midway between older notions of the social body and modern ideas of aggregate populations as they began to emerge in the later seventeenth century.

Considering astrologers' sophisticated approaches to population and to populations, it is no coincidence that early proponents of political arithmetic were themselves interested in the part that astrology could play in population-level health. In the 1640s and 1650s, many leading physicians and natural philosophers in England displayed serious astrological ambitions, seeing astrology as a fruitful tool for the study of disease at the population level. In 1648, Petty himself envisaged the founding of a college that would include an expert in astrology to 'calculate the Events of diseases'. The scholar would keep careful records of 'epidemicall diseases befalling man', comparing them with 'the Aspects of the Celestiall bodies'.[96] As a university-trained

[95] William Ramesey, *Astrologia Restaurata* (London, 1653), 219.

[96] William Petty, *The Advice of W. P. to Mr. Samuel Hartlib* (1648), 12. For Ted McCormick, Petty's astrologer was essentially 'a proto-statistician': *William Petty and the Ambitions of Political Arithmetic*, 71.

physician, Petty would have been familiar with the basics of astrology, including medical astrology, and clearly saw astrology's potential for understanding health at the population level. In a paper presented to the Royal Society in 1674, Petty mentioned his desire to 'build a Doctrine concerning the Influence of the Stars, and other Celestial or remote Bodies upon the Globe of the Earth, and its Inhabitants'. In a manuscript dating from the 1680s, Petty suggested again that studying the heavens could help 'compute the effects of plague' in parishes.[97] While Petty's astrological interests did not make it into his most famous writings on political arithmetic, he clearly continued to probe the possibilities of astrological analysis within population-level health. By the same token, it is no surprise that in the second half of the seventeenth century astrologers themselves were interested in developments in political arithmetic, learning from its methods and making advances of their own in the study of epidemics. We will see this in action in what follows.

III

Alongside their ability to standardize large groups of people, astrologers' interests in health at the population level and their long-standing attempts to correlate earthly events with astrological phenomena made astrology an obvious foundation for the study of epidemics. Celestial causes had played a role in most accounts of plague since the first outbreaks in Europe.[98] Famously, when professors in the medical faculty at the University of Paris were asked by Phillip VI to account for the causes of the Black Death, they pointed *inter alia* to a recent conjunction of Saturn, Mars, and Jupiter.[99] The heavens were,

[97] William Petty, *The Discourse Made before the Royal Society* (London, 1674), 76; Ted McCormick, 'Governing Model Populations: Queries, Quantification, and William Petty's "Scale of Salubrity"', *History of Science*, li (2013), 189.

[98] Jon Arrizabalaga, 'Facing the Black Death: Perceptions and Reactions of University Medical Practitioners', in Luis Garcia-Ballester *et al*. (eds.), *Practical Medicine from Salerno to the Black Death* (Cambridge, 1994), 247; Samuel K. Cohn Jr, *Cultures of Plague: Medical Thinking at the End of the Renaissance* (Oxford, 2010), 77–8, 194, cf. 195–7.

[99] Anna Montgomery Campbell, *The Black Death and Men of Learning* (New York, 1931), 37, 39–40, 158.

after all, a key facet of medieval and early modern theories of causation. It must be remembered that for most astrologers, the heavens were not just prophetic signs of what was to come — they were *causes*. Leading medieval thinkers espoused what Darrel Rutkin has called an 'astrologizing Aristotelian natural philosophy', according to which God providentially governed events on earth by using the motions and virtues of the celestial bodies.[100] The heavens stimulated plague particularly through the corruption of the air, which in turn corrupted the body.[101] Indeed, the modern word 'influenza' likely derives from the idea that the stars *influenced* the body. Astrological explanations of plague, embedded as they were in the reigning miasma theory of disease, retained considerable cultural capital throughout the early modern period, enabling astrologers to build thriving businesses treating plague.[102] But as well as treating and predicting plague, astrologers also conducted analyses of epidemics that resembled the epidemiological project to identify determinants of disease at the population level.

Astrologers' disease forecasts were based on theories about the astrological origins of epidemics that were in turn supported by the comparative investigations undertaken by astrologers. As with other astrological theories, much of the empirical data used to support plague predictions was historical.[103] The central text of conjunctionist theory, Abū Ma'shar's *De magnis coniunctionibus*, which remained influential into the early modern period, included a world history linking conjunctions

[100] Rutkin, *Sapientia Astrologica*, esp. pts I and II.

[101] Dorothea Waley Singer, 'Some Plague Tractates (Fourteenth and Fifteenth Centuries)', *Journal of the Royal Society of Medicine*, ix (1916); Geoffrey de Meaux, 'The Astrological Causes of the Plague', in Rosemary Horrox (ed. and trans.), *The Black Death* (Manchester, 1994); Lynn Thorndike, *A History of Magic and Experimental Science*, 9 vols. (New York, 1934), iii, 244–5, 284–91.

[102] Kassell, *Medicine and Magic in Elizabethan London*, ch. 5. On pre-modern debates about the causes of disease, see Vivian Nutton, 'The Seeds of Disease: An Explanation of Contagion and Infection from the Greeks to the Renaissance', *Medical History*, xxvii (1983).

[103] On astrology and historical evidence, see J. D. North, 'Astrology and the Fortunes of Churches', *Centaurus*, xxiv (1980); Laura Ackerman Smoller, *History, Prophecy, and the Stars: The Christian Astrology of Pierre d'Ailly, 1350–1420* (Princeton, 1994); Germana Ernst, 'From the Watery Trigon to the Fiery Trigon: Celestial Signs, Prophecies and History', in Paola Zambelli (ed.), *'Astrologi Hallucinati': Stars and the End of the World in Luther's Time* (Berlin, 1986).

to major historical events. There was also a long-standing tradition amongst astrologers of keeping detailed weather observations and comparing them with the positions of the celestial bodies.[104] As we have seen, this correlative and historical work was done on a more minute scale by the consumers of almanacs, who in keeping a journal in their almanac highlighted significant events that seemingly aligned with astrological conditions. Believing that a full understanding of world history would sharpen predictions about the future, early modern astrologers continued to explain the past in view of celestial events, using the patterns they noticed to direct their forecasts. In a sweeping prognostication for the years 1595–1655, the German astrologer David Origanus claimed that in order to know the coming of pestilence from the stars, it was necessary to consult the evidence of history and experience (*ex historiis et experientia*). His study found that plague struck Frankfurt approximately every ten years, 'primo, Christi 1506, Saturno existente in ♌; in 1516 in ♐; in 1526 in ♈' ('first, [in the year] of Christ 1506, with Saturn appearing in Leo; in 1516 in Sagittarius; in 1526 in Aries'). As Origanus noted, these were the three signs of the Fiery Triplicity. While in some other plague years Saturn appeared in different triplicities, Origanus cited the German astronomer Caspar Peucer, who had similarly noticed that plague typically struck Wittenberg when Saturn was in Leo or Aquarius.[105]

Across the channel, astrologers and scholars with astrological interests constructed rules about the occurrence of plague based on similar historical evidence. The antiquarian William Camden (1551–1623) was often cited as having shown via the evidence of history that whenever Saturn was in Capricorn, London would be hit by plague.[106] Simon Forman similarly

[104] See most recently Sky Michael Johnston, 'Printing the Weather: Knowledge, Nature, and Popular Culture in Two Sixteenth-Century German Weather Books', *Renaissance Quarterly*, lxxiii (2020).

[105] David Origanus, *Novae motuum coelestium ephemerides Brandenburgicae* (Frankfurt an der Oder, 1609), 518.

[106] For example, John Aubrey, *Brief Lives*, ed. Richard Barber (Woodbridge, 1998), 60. Others quoted Camden as instead pointing to Saturn's passage through the Fiery Triplicity: George Wharton, *Ephemeris* (London, 1655), 15; Edlyn, *Prae-Nuncius Sydereus*, 42. Camden's published claims were not as explicit as either version. See William Camden, *Britannia* (London, 1616, STC 23044), 207–8; Thomas Hearne (ed.), *Guilielmi Camdeni Annales Regum Anglicarum et Hibernicarum Regnante Elizabetha*, 3 vols. (Oxford, 1717), iii, 666.

declared that Saturn in Cancer indicated the coming of a great London plague.[107] In one of his almanacs, George Wharton attempted to use historical evidence to show that Saturn's presence in fiery signs caused London plagues, claiming that Saturn was in Aries for the Black Death, Leo for the plague of 1593, Sagittarius for the 1603 plague, and Leo for the 1625 plague. Extrapolating from this pattern, Wharton fortuitously predicted the Great Plague of London several years before Edlyn.[108] As we have seen, Edlyn's prediction was premised on a conjunction that took place in a sign of the Fiery Triplicity. His idea that conjunctions triggered plagues was partly founded upon the patterns he discovered between historical episodes of pestilence and the heavens. Reflecting on London plagues of the preceding century, Edlyn noted that the 'most furious' of them all followed conjunctions. Edlyn's assumption was that reliable theories and thus dependable predictions could be established 'by comparing the Histories of former times' with celestial events.[109]

From the 1660s onwards, astrologers added an additional layer of numerical evidence to this project in the form of mortality figures. This was a period in which Baconian empiricism, alongside a heightened acknowledgement of the value of numbers in natural philosophy and medicine, was becoming institutionalized in the Royal Society of London. Interest in the practical application of mixed mathematics in particular reached a high point in the middle decades of the seventeenth century.[110] At the same time, astrologers across Europe were engaged in attempts to reform astrology; in England, most astrological reformers saw themselves as Baconians who followed in the footsteps of the great philosopher.[111] Bacon himself had described a programme for the reform of astrology that involved 'a collection from the faithfull reports of History' of major events including 'Pestilences' and the contemplation

[107] Bodleian Library, Oxford, MS Ashmole 384, fo. 8^{r}.

[108] Wharton, *Ephemeris*, 14–16.

[109] Edlyn, *Prae-Nuncius Sydereus*, 42, 1, 7.

[110] Jim Bennett and Rebekah Higgitt (eds.), 'London 1600–1800: Communities of Natural Knowledge and Artificial Practice', special issue of *British Journal for the History of Science*, lii (2019).

[111] See, especially, Mary Ellen Bowden, 'The Scientific Revolution in Astrology: The English Reformers, 1558–1686' (Yale Univ. Ph.D. thesis, 1974); Curry, *Prophecy and Power*.

of 'the situation of the Heavens … at those times, when such effects came to passe'. Bacon postulated that if there appeared 'a cleere, and evident consent, and concurrence of events; there a probable rule of Prediction may be inferred'.[112] As we have seen, the 1660s was also a decade that saw the development of innovative approaches to political arithmetic, and these parallel developments in mixed mathematics also proved useful to astrologers. In particular, Graunt's book on the Mortality Bills was immensely popular: it went into five editions by 1676 and was frequently plagiarized.[113] It was in the context of the sensation produced by this book — which encouraged readers to 'do more' with the information contained in the Bills — alongside growing interest in the applications of mathematics, that astrologers began to conduct innovative quantitative studies of epidemics.

Gadbury's *London's Deliverance Predicted* (1665) is a rich example of this. Written in the midst of the Great Plague, the book was a study of correlations between the configurations of the heavens and the rise and fall of plague deaths in recent epidemics.[114] After becoming interested in astrology while reading Robert Burton's *Anatomy of Melancholy* in bed, Gadbury (whose almanacs we have already met) rose to prominence in the 1650s and 1660s with his successful prognostications and numerous mathematical books.[115] Claiming that 'it is not the Predictive but Experimental part of Astrology, that is my Diana', Gadbury engaged with the burgeoning mathematical culture of London, like many of his colleagues undertaking projects aimed at reforming astrology.[116] By this point, most aspects of astrological theory had been removed from undergraduate curricula at Oxford and Cambridge, and Gadbury was acutely aware that

[112] Francis Bacon, *Of the Advancement and Proficiencie of Learning, or, The Partitions of Sciences, IX Bookes* (London, 1640), 154–5.

[113] Kreager, 'Death and Method', 15.

[114] D. R. Bellhouse briefly recognized the significance of Gadbury's contribution in 1998, but Gadbury's study is yet to receive detailed analysis. See D. R. Bellhouse, 'London Plague Statistics in 1665', *Journal of Official Statistics*, xiv (1998), 224–5.

[115] John Gadbury, *Cardines Coeli* (London, 1684), 59.

[116] John Gadbury, *Ephemeris* (London, 1679), sig. a1^{v}.

many scholars had 'but an indifferent opinion of Astrology', with many 'Damning and Reprobating it'.[117] In his study of astrology and plague, which aimed to improve astrology's perceived legitimacy as well as provide 'encouragement' to the people of London, Gadbury found value in recent advances in the analysis of mortality records.[118]

His book's central task was to determine 'the probable time … this present Pest may abate'. Extolling the ability of astrology to provide an answer to this pressing question, Gadbury asserted that physicians were unable to explain when epidemics would arrive let alone how long they would last or how many lives they would claim.[119] As many astrologers before him had asserted, because the causes of plague were to be found in the heavens, astrologers were best placed to forecast its course. Gadbury's initial supposition was a mainstay of astrological lore: pestilential diseases arise from Mars and Saturn. Mars was dry, hot and Cholerick (and therefore the source of pestilence), and Saturn was earthy, cold and dry (and therefore the author of all 'tedious and durable infirmities'). 'Co-operating Causes' included comets and eclipses. Gadbury found a 'demonstration' for these theories in history. For example, the sweating sickness epidemic of 1527 was accompanied by a comet and a conjunction in Pisces, a watery sign that accounted for the sweat. The plagues of 1593, 1603, 1625 and 1636 told similar stories.[120] Thus far Gadbury's study was unoriginal, and he cited Origanus, Peucer and others as his sources. However, Gadbury then sought to go beyond these studies by drawing on quantitative records to support and expand on his contentions.

[117] Gadbury, *London's Deliverance*, sig. a2^{r}. The removal of astrology from English universities has been neglected by historians. Officially, 'all judicial astrology' was banned from the astronomy curriculum by the Oxford Savilian statutes of 1619, but this did not include medicine and natural philosophy courses. Throughout much of the seventeenth century, unofficial astrology teaching continued at Oxford and Cambridge. G. R. M. Ward (ed. and trans.), *Oxford University Statutes*, 2 vols. (London, 1845), i, 274; Phyllis Allen, 'Scientific Studies in the English Universities of the Seventeenth Century', *Journal of the History of Ideas*, x (1949), 226; Thomas, *Religion and the Decline of Magic*, 354; Capp, *Astrology and the Popular Press*, 187.

[118] Gadbury, *London's Deliverance*, sig. a4^{v}.

[119] *Ibid.*, sig. a2^{r}.

[120] *Ibid.*, 2, 4–8.

Gadbury knew that Saturn and Mars were involved in the onset of plague, and that conjunctions and other angles ('aspects') between the superior planets also played a role. But what precise celestial configurations should one search for when prognosticating the course of plague? To answer this question, Gadbury turned to mortality records. In Chapter 3 of his book, Gadbury included 'A Table shewing the Increase and Abatement of the Plague in the years 1593, 1603, 1625, 1636' (see Plate 3). It charted the number of reported plague deaths each week for these major epidemics.[121] Bringing together this set of quantitative records with another — astronomical calculations — Gadbury parsed his table, comparing the incidence of plague deaths with the respective positions of the heavens. The correlations he found most important were not comets or eclipses, but the aspects between the planets. Conjunction (0°), sextile (60°), square (90°), trine (120°), and opposition (180°) were each traditionally thought to modulate the planets' effects. Gadbury knew that, in general, opposition and square were unfortunate; sextile and trine were fortunate; and while a conjunction between two good planets boded well, a conjunction between two bad planets did not.[122] These theories underlay Gadbury's analysis. Referring his readers to the table, Gadbury noted that in 1593, plague deaths were low until June, when Saturn was in opposition with the ascendant. Deaths then worsened in July, when Mars was square with the moon, and the sun was in opposition with Mars and Jupiter, and in conjunction with Saturn. Plague grew 'less tyrannous' in September, when Venus was trine with the sun and moon. In October, November and December, plague 'vanished by degrees to almost nothing', when Venus and Jupiter's positions were more beneficial. Gadbury found similar patterns for 1603, 1625 and 1636. Gadbury's analysis boiled down to this: when two maleficent planets were in bad aspects, plague increased; when two 'friendly' planets were in favourable aspects, plague decreased. Mars tended to initiate plague;

[121] Comparison of Gadbury's data with extant mortality records suggests he cribbed his figures from an anonymous pamphlet, *The Four Great Years of the Plague* (1665).

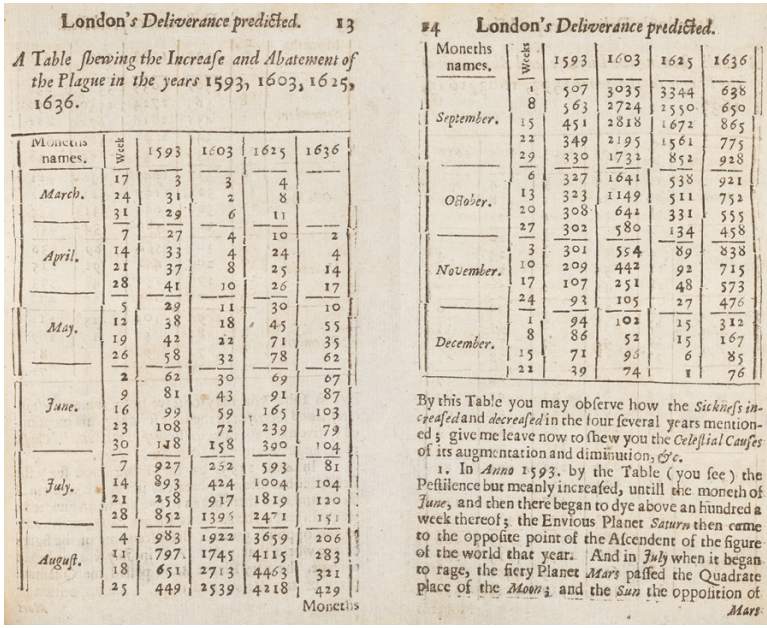
[122] John Gadbury, *Thesaurus astrologiae, or, An Astrological Treasury* (London, 1674), 158–63.

Saturn sustained it. Venus and Jupiter, meanwhile, were responsible overall for 'lessen[ing] the fury' of pestilence.[123] All of this is, of course, a confusion between correlation and causation. Yet the analysis nevertheless gave Gadbury patterns to search for in the year 1665.

Gadbury next applied his findings to the present plague. He noted that the outbreak was likely triggered by the Saturn–Jupiter conjunction identified by Edlyn alongside the 1664 comets. These circumstances meant the outbreak actually should have begun in late 1664, but the 'extreamly sharp' winter held it back, with only a few cases reported in December (including Gadbury's own infection).[124] Gadbury noted that, according to the Bills published thus far, plague deaths only increased significantly in June and July 1665. Writing in early August, Gadbury then used the revolution horoscope to predict plague's incidence for the rest of the year. In August, Saturn would be square with the sun, and this aspect would bring about much mortality, though the positions of Venus and Jupiter may 'contemper the fury of it'. September was 'likely to prove somewhat dangerous', especially in the middle of the month, as a result of the positions of Saturn and Mars. October seemed to 'promise well', except for the second and last week, which would be far worse. Finally, astrological conditions meant that November and December would 'prove very kindly'.[125] Comparing surviving Bills with Gadbury's predictions suggests that while he was correct in predicting a peak in plague deaths in September followed by a steep decrease later in the year (which, it may be noted, was a common pattern), his prediction about a decrease in August did not come to pass. The accuracy or otherwise of Gadbury's predictions aside, the difficulty that he and others faced in trying to demonstrate astrological causation experimentally lay not only in the great complexity of the movements of the heavenly bodies, but also in the fact that the same configurations of the heavens reoccur only extremely rarely.

The significance of Gadbury's study lies not only in its innovative combination of two sets of quantitative evidence, astronomical figures alongside mortality records. It also lies in his

[123] Gadbury, *London's Deliverance*, 15–17.
[124] *Ibid.*, 2.
[125] *Ibid.*, 20–1.



London's *Deliverance predicted.* 13

A Table shewing the Increase and Abatement of the Plague in the years 1593, 1603, 1625, 1636.

Moneths names.	Week	1593	1603	1625	1636
March.	17	3	3	4	
	24	31	2	8	
	31	29	6	11	
April.	7	27	4	10	2
	14	33	4	24	4
	21	37	8	25	14
	28	41	10	26	17
May.	5	29	11	30	10
	12	38	18	45	55
	19	42	22	71	35
	26	58	32	78	62
June.	2	62	30	69	67
	9	81	43	91	87
	16	99	59	165	103
	23	108	72	239	79
	30	148	158	300	104
July.	7	927	252	593	81
	14	893	424	1004	104
	21	258	917	1819	120
	28	852	1396	2471	151
August.	4	983	1922	3659	206
	11	797	1745	4115	283
	18	651	2713	4463	321
	25	449	2539	4218	429

Moneths

14 London's *Deliverance predicted.*

Moneths names.	Weeks	1593	1603	1625	1636
	1	507	3035	3344	638
September.	8	563	2724	2550	650
	15	451	2818	1672	865
	22	349	2195	1561	775
	29	330	1732	852	928
	6	327	1641	538	921
October.	13	323	1149	511	752
	20	308	642	331	555
	27	302	580	134	458
	3	301	554	89	838
November.	10	209	442	92	715
	17	107	251	48	573
	24	93	105	27	476
	1	94	102	15	312
December.	8	86	52	15	167
	15	71	96	6	85
	22	39	74	1	76

By this Table you may obſerve how the *Sickneſs increaſed* and *decreaſed* in the four ſeveral years mentioned; give me leave now to ſhew you the *Celeſtial Cauſes* of its augmentation and diminution, *&c.*

1. In *Anno* 1593. by the Table (you ſee) the Peſtilence but meanly increaſed, untill the moneth of *June*, and then there began to dye above an hundred a week thereof; the Envious Planet *Saturn* then came to the oppoſite point of the Aſcendent of the figure of the world that year. And in *July* when it began to rage, the fiery Planet *Mars* paſſed the Quadrate place of the *Moon*; and the *Sun* the oppoſition of

Mars

3. Gadbury's table. Source: The Bodleian Libraries, University of Oxford, Bod. Ashm. 311(5): John Gadbury, *London's Deliverance Predicted* (1655), 13–14.

attempt to find correlations with minute fluctuations in mortality rates, and his subsequent use of this analysis to 'model' the rise and fall of an epidemic. Located at the nexus between mathematics and medicine, astrology was initially a promising pathway for the study of epidemic disease. Earlier in the seventeenth century, Forman had devised astrological rules for predicting 'howe manie shall die of the plague in one week then in another', but this did not involve extended analysis of the Bills.[126] But twenty years after *London's Deliverance Predicted*, the astrologer John Goad also used the Bills of Mortality to study the incidence of mental as well as bodily illness.[127] After noticing that multiple individuals died from lunacy in February 1682, Goad wondered what the cause might have been, and began to

[126] Bodleian Lib., MS Ashmole 384, fo. 8[r].

[127] Goad had been thinking about the Bills in terms of the stars since at least 1679, when he wrote to Elias Ashmole to discuss the causes behind the increase in deaths by cough: Bodleian Lib., MS Ashmole 368, fo. 62[r].

investigate possible 'Co-incidences' between the figures in the Bills and the positions of the heavens. 'God hath given us leave … to consider what Second Causes he is pleased to use in the powring out of his Fury on us', he explained.[128] Goad ended up comparing suicide rates, as recorded in the Bills, with the aspects of Saturn and Jupiter.[129] He did the same thing with various epidemics — plague, but also the sweating sickness — relying on exact mortality figures whenever he had access to them.[130] When it came to the 1665 plague, Goad engaged in a similar analysis to Gadbury's. Numbers were important to consider because, as Goad explained, there are crucial differences between a plague that kills ten thousand in a year to one that kills fifty thousand or even a hundred thousand.[131]

It is worth briefly comparing these efforts with other contemporary attempts to correlate the wax and wane of plague with external factors. In the 1620s and 1630s, the Londoner John Flower offered a simple comparative analysis when he noted some parallels between the rise and fall of plague deaths and changes in the weather.[132] More sophisticated were John Locke's attempts from the mid 1660s to connect the incidence of plague with climatic data, but even this study was limited in its use of numbers and was ultimately left unfinished.[133] In a very different display of comparative analysis, John Bell of the Parish Clerks Company accounted for differences in plague mortality by drawing on the patterns he discovered in the Old Testament. Bell found that plagues initiated by the peoples' sins killed men and women, while those triggered by sinful kings killed only men. As London plagues killed everyone, they were therefore caused by sins of the people, most likely rebellion.[134] None of these studies were as extensive as Gadbury's, or even Goad's,

[128] John Goad, *Astro-Meterologica, or Aphorisms and Discourses of the Bodies Coelestial* (London, 1686), 252.

[129] *Ibid.*, 506–7.

[130] For example, *ibid.*, 252–4, 286–88, 473–89. Goad did not have access to all the Bills and lamented the periods for which he lacked 'the Weekly account'. See *ibid.*, 433.

[131] *Ibid.*, 433–4, 387.

[132] Robertson, 'Reckoning with London', 341–3.

[133] Kenneth Dewhurst, 'A Review of John Locke's Research in Social and Preventative Medicine', *Bulletin of the History of Medicine*, xxxvi (1962).

[134] John Bell, *London's Remembrancer* (London, 1665), sigs. d2^{v}–d3^{v}.

and none, including Graunt's, produced fine-grained predictions as a result.

It has been argued that Graunt's mercantile background, which gave him experience in contemporary accounting practices and helped him to see the Bills as ripe with valuable data for studying client patterns, paved the way for his innovative *Observations*.[135] Astrologers, with their expertise in both medicine and mathematics, were similarly well placed to make novel studies of epidemics. However, written in a period in which the educated elite were increasingly dissatisfied with astrological prediction, Gadbury's *London's Deliverance* was soon forgotten. It initially received a great deal of positive press, with long portions of it reprinted in other works.[136] But the limited evidence we possess of the book's reception amongst the Royal Society suggests that Gadbury's attempts to revive astrology's reputation amongst the learned were too little too late. In a memorandum dated 26 September 1665, Henry Oldenburg directed Robert Boyle to *London's Deliverance* to see how plague 'decreased and increased again'. Oldenburg acknowledged that the volume contained 'some natural observations that make his pamphlet worth the money'. However, Gadbury's overreliance on theories of planetary aspects, which Oldenburg ridiculed as 'squinting and staring looks', weakened his forecast.[137] In other words, in Oldenburg's eyes Gadbury's dependence on disputed astrological theories undermined the value of his study.

Yet the underlying methods of Gadbury's enterprising use of mortality bills remained of interest to experimental natural philosophers. In the 1680s and 1690s, the Royal Society became interested in the work of the German Protestant minister Caspar Neumann, who embarked on a similar project to Gadbury's, except that it ended up challenging the very concept of celestial

[135] Merchants used the Bills to determine the risk of clients fleeing town. Judy L. Klein, *Statistical Visions in Time*: *A History of Time Series Analysis, 1662–1938* (Cambridge, 1997), 25–7, 46–7.

[136] *Prophecies, and Predictions*; *Prophecie of one of His Maiesties Chaplains*. Gadbury complained it was much plagiarized. See John Gadbury, *Ephemeris* (London, 1666), sig. a1^{v}. Many took aim at Gadbury's controversial claims about the best way to manage plague. See John Gadbury, *Vox solis* (London, 1667), 24–7.

[137] A. R. Hall and M. B. Hall (eds. and trans.), *The Correspondence of Henry Oldenburg*, 10 vols. (Madison, 1965), ii, 523.

influence on disease. Studying the registers of births and deaths in his local Breslau, Neumann searched for patterns, finding that the movements of the moon had no influence on mortality rates, and that other related astrological theories (for example, climacteric years) were likewise unfounded.[138] Neumann's study — which also sat at the nexus of medicine and mathematics — was much lauded by the Royal Society, and paved the way for the production of the first life tables by Edmond Halley in the early 1690s, an innovation of great moment in the history of demography, public health and life insurance.[139] The same techniques that astrologers used to finesse their prognostications could thus end up being used to contest the very possibility of astrological prediction.

Although Gadbury recognized in Graunt's cutting-edge methods a way to reinforce the foundations of astrology, the approach pioneered by Graunt soon overtook whatever potential astrologically based approaches to population health were thought to offer.[140] This is not to say, as was commonly claimed in the twentieth century, that the science of the Royal Society defeated astrology.[141] In fact, many leading members of the Royal Society remained interested in the reform of astrology; Oldenburg, for his part, collected nativity horoscopes and Boyle, despite his misgivings about astrological practice, remained fascinated by the idea of celestial influence.[142] The Royal Society rarely paid

[138] Peter Koch, 'Caspar Neumann', in C. C. Heyde *et al.* (eds.), *Statisticians of the Centuries* (New York, 2001), 30. Neumann's treatise is now lost.

[139] Hans Wiesler, 'The Investigation of Mortality', in *Annals of Life Insurance Medicine* (Berlin, 1962), i, 8–9; D. R. Bellhouse, 'A New Look at Halley's Life Table', *Journal of the Royal Statistical Society A*, clxxiv (2011), 825.

[140] On the uptake of statistics in medicine, see Andrea A. Rusnock, *Vital Accounts: Quantifying Health and Population in Eighteenth-Century England and France* (Cambridge, 2002); Eileen Magnello and Anne Hardy (eds.), *The Road to Medical Statistics* (Amsterdam, 2002); Innes, *Inferior Politics*, esp. ch. 4.

[141] Astrology's fortunes in medicine in particular have received little attention, but see George R. Keiser, 'Two Medieval Plague Treatises and their Afterlife in Early Modern England', *Journal of the History of Medicine and Allied Sciences*, lviii (2003); Mark Harrison, 'From Medical Astrology to Medical Astronomy: Sol-Lunar and Planetary Theories of Disease in British Medicine, *c.*1700–1850', *British Journal for the History of Science*, xxxiii (2000).

[142] Hall and Hall (eds. and trans.), *Correspondence of Henry Oldenburg*, ii, 281, 307–8; Curry, *Prophecy and Power*, 62–4; Robert Boyle, 'Suspicions about some Hidden Qualities of the Air', in *Tracts* (London, 1674).

official, corporate attention to astrology but as Michael Hunter has argued this was in large part because its Fellows' views were so divided on the issue of astrology's legitimacy.[143] In these circumstances, it would be more accurate to say that astrological approaches to population-level health were sidelined and marginalized or, in some cases, simply forgotten. It is possible that if Gadbury had chosen to explore the impact of a different correlate — such as the coming and going of winter — his work may have enjoyed more contemporary success, and perhaps may even have been remembered in histories of epidemiology. In this sense, as is so often the case in the history of science, the Royal Society's biases have become modern historians' biases.

IV

The ability to foresee the outbreak of epidemic disease, and to predict its course, is a highly coveted skill. Most often associated with statistical techniques such as mathematical modelling, such efforts to improve the health of communities are thought to be exclusively modern. The methods and assumptions of epidemiology, it is said, are categorically distinct from pre-modern medicine, which was concerned with individual patients rather than the impact of disease at a group level.[144] Public health more generally is typically assumed to be a modern phenomenon, linked to the rise of the centralized state and modern conceptions of 'population' and 'the public'. Sixty years ago, Fraser Brockington claimed in his classic history of public health that the centuries between antiquity and the eighteenth century were spent, 'so far as concerns public health, in the wilderness'. Although Hippocrates made innovations in regards to the environmental causes of disease, and although medieval sanitary regulations of plague, leprosy and venereal disease were strides forward, no public health of note occurred during

[143] Michael Hunter, 'The Royal Society and the Decline of Magic', *Notes and Records of the Royal Society of London*, lxv (2011), 108, 110.

[144] This has been argued forcibly by Alfredo Morabia in 'Epidemiology: An Epistemological Perspective', in Alfredo Morabia (ed.), *A History of Epidemiologic Methods and Concepts* (Basel, 2004), 5, 9–11; Alfredo Morabia, 'Epidemiology's 350th Anniversary: 1662–2012', *Epidemiology*, xxiv (2013); and his review of *Public Health: The Development of a Discipline*, in *American Journal of Epidemiology*, clxxvi (2010), 564.

'those dark centuries'.[145] A more recent volume, *Public Health: The Development of a Discipline* (2008), explores the 'classics' of public health, but offers no text or figure between Hippocrates and Graunt, an astonishing gap of over two thousand years.[146] These prominent narratives are not only teleological; they also assume that pre-modern measures to improve the health of communities are not worth the attention of the public health historian because they were apparently unregulated and ineffective (even exacerbating), or else religiously based or lacking a modern notion of 'population'.

An emerging literature is calling this view into question. By illustrating myriad efforts at population-level health care long before the nineteenth century, historians have challenged the prominent view that any talk of pre-modern public health must be an oxymoron or perilous anachronism.[147] Rather than seeking precursors to modern public health and epidemiology, this work has aimed to understand earlier population-level strategies on their own terms, and has advocated for broader definitions of public health that go beyond nineteenth-century sanitation and modern epidemiology.[148] It has been argued that this should incorporate all endeavours to protect and promote community health and welfare, religious as well as medical and demographical.[149]

Does astrology also deserve a place in these histories? As we have seen, much of astrologers' activities related to population health were not primarily intended to be politically operational, nor were almanac compilers state actors. Yet many of the activities that historians have identified as pre-modern public health

[145] C. Fraser Brockington, *A Short History of Public Health* (London, 1956), 1.

[146] Dona Schneider and David E. Lilienfeld (eds.), *Public Health: The Development of a Discipline* (New Brunswick, 2008).

[147] For programmatic statements about the direction of the subfield of pre-modern public health, see Janna Coomans, 'The King of Dirt: Public Health and Sanitation in Late Medieval Ghent', *Urban History*, xlvi (2019), esp. 83–8; Guy Geltner, 'Healthscaping a Medieval City: Lucca's *Curia viarum* and the Future of Public Health History', *Urban History*, xl (2013), esp. 396–8, 409–11.

[148] Rawcliffe, *Urban Bodies*, 5; Dorothy Porter, 'The History of Public Health: Current Themes and Approaches', *Hygiea Internationalis*, i (1999), 13.

[149] Peregrine Horden, 'Ritual and Public Health in the Early Medieval City', in Sally Sheard and Helen Power (eds.), *Body and City: Histories of Urban Public Health* (London, 2017).

were initiated and shaped by a variety of non-government actors 'from the social bottom up, as well as horizontally'; after all, hierarchies of medical authority were perpetually in flux, especially in the early modern period, and the modern public/private divide had not yet fully emerged.[150] For early modern astrologers, the collective activity of the residents of cities was in any case more effective than any top-down response. Moreover, although the envisioned outcomes of astrological prognostication were not always entirely secular — revealing God's divine 'oeconomy' of the world was often as important as preparing the city for impending diseases — neatly separating pre-modern medicine from religion is a task doomed to fail. And although Kreager maintains that 'early modern population thinking did not standardize populations, nor pretend to treat them equally', the case of astrology suggests that this assumption is in need of rethinking.[151] If public health is a field with the goal to 'promote, protect and restore the health of the population',[152] then it is the contention of the present author that astrologers and their attempts to forecast and monitor population-level health should be considered as part of the history of this arena of human activity.

The evidence presented in this article suggests that in the early modern period, astrology took on many of the needs that modern public health and epidemiology eventually came to serve, taking on many activities we associate with these disciplines today. Astrological disease forecasts advised the residents of cities and towns what ailments were likely to impact their community, and what they should do about it. In using general astrology, astrologers worked with sophisticated ideas about population. Astrology was therefore ripe for the study and attempted prediction of epidemic disease. By correlating past epidemics with astrological events, astrologers sought to isolate critical factors in the spread of disease at the population level. Gadbury's *London's Deliverance* added another layer to earlier astrological investigations by buttressing his analysis with an additional set of quantitative evidence. This article has focused on England, but early modern astrologers' interests in population-level

[150] See, especially, Geltner, *Roads to Health*, 17–27.
[151] Kreager, 'Emergence of Population', 253.
[152] This is a definition used today by the WHO.

health were by no means limited to the English context, and further research will likely reveal this to have been a pan-European phenomenon.[153] Sitting at the intersection of medicine and mathematics, astrology was once a promising methodology for monitoring and managing the health of the people, even if it was ultimately a path not taken. Yet this article is grounded in the conviction that taking past conceptions of public health seriously requires us to consider the radically unrecognizable as well as the recognizable. Our modern assumptions should not justify sweeping aside an aspect of public health that was valued in the pre-modern world.

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[153] Studies of almanacs in various European contexts, while mostly focusing on the political and religious aspects of these texts, have already provided evidence that alongside discussion of agriculture, religion and war, their compilers also included sections on population-level illness. See Justin Rivest, 'Printing and Astrology in Early Modern France: Vernacular Almanac-Prognostications, 1497–1555' (Carleton Univ. MA dissertation, 2004), 122–3; Jonathan Green, *Printing and Prophecy: Prognostication and Media Change, 1450–1550* (Ann Arbor, 2012), 114, 118, 120; Martin Kjellgren, *Taming the Prophets: Astrology, Orthodoxy and the Word of God in Early Modern Sweden* (Lund, 2011), 119; Tayra Lanuza-Navarro, 'Astrological Literature in Seventeenth-Century Spain', *Colorado Review of Hispanic Studies*, vii (2009), 121–4.