



SAPIENZA
UNIVERSITÀ DI ROMA



© Author(s)
E-ISSN 2531-7288
ISSN 0394/9001



Public Health in Preindustrial Europe: Urban and Rural Practices

G. Geltner

Monash University - Melbourne

MEDICINA NEI SECOLI

Journal of History of Medicine
and Medical Humanities

36/1 (2024) 27-38

Received: Settembre 2023

Accepted: Novembre 2023

DOI: 10.13133/2531-7288/2895

Corresponding Author:

guy.geltner@monash.edu

ABSTRACT

Recent revisions to the medical history of western Europe between the twelfth and sixteenth century established that public health far predates Euro-American modernity and straddles the urban/rural divide and diverse occupational groups. Like numerous past societies, this civilization too monitored behaviors and manipulated environments in order to improve health outcomes by combining a culturally specific common sense with a prevalent natural-philosophical paradigm, in this case Galenism. The present review explains some of the preventative programs that urban and rural communities in Europe devised at the time, and their scientific and spiritual underpinnings. Beyond disputing these groups' longstanding reputation for hygienic apathy and ignorance, the broadened historical perspective shows that practicing public health can mean different things in different contexts.

Keywords: Public health - Europe - Periodization - Cities - Rural society - Galenism

Introduction

During the recent pandemic, large swathes of the so-called developed world witnessed the resurgence of low-tech, community-based prophylactics to the forefront of medical practice. The visible shift, from complex procedures and expensive drugs administered by trained professionals, to physical distancing, mask wearing and community support, evinced biomedicine's limitations when it comes to epidemic disease control. These changes in the perception and focus of public health interrogated an ameliorist ("newer is better") view of the field as well as its origin myth as a response to the Industrial Revolution and the culmination of advanced

science, secularism, the nation state and global capitalism¹. As such, it vindicated numerous historical, archaeological and anthropological studies concerning different regions and eras, which have long challenged the teleology underpinning much of public health history as a by-product of European modernity. In addition, it underscored the importance, in a deeply unequal world, of accepting that community health always faces huge obstacles and that it can follow different paths and mean different things to different people². Completing and solidifying this shift in both execution and perception, however, relies on adopting a culturally and spatially sensitive approach, one that rejects the accepted and often normative cesura between ‘premodern’ and ‘modern’ prophylactics, and moreover de-centers cities as the latter’s main locus. The present essay accordingly lays out some of the ways in which public health historians have begun to collapse traditional geographical, locational and environmental divides. And although it focuses on western Europe between the twelfth and sixteenth century, there is excellent work to similar effect on earlier eras and different regions as well³.

Urban prevention

For nearly a century medical historians and archaeologists have refuted deep-seated, modernist and Eurocentric views of earlier civilizations as unhygienic. By honing emic (bottom-up, culturally specific) perspectives, including through bio- and landscape archaeology, linguistics and oral history, scholars of health and hygiene in different world regions have shown that neither neglect nor ignorance characterised past societies’ approaches to their own wellbeing as groups⁴. Nor did they lack a natural philosophy to inform their efforts. Across much of Africa, Europe and Asia, for instance, tens of millions of people shared the medical paradigm of humoralism, also known as Galenism or Hippocratic medicine⁵. The system was developed in ancient Greece, Rome and the eastern Mediterranean, and spread widely by Islamic merchants, settlers and conquerors centuries before it regained prominence in western Europe. Broadly speaking, Galenism identified three major vectors of disease transmission (person-to-person, mental contagion and miasma) and consistently privileged prevention over cure at both the individual and group level. Its practitioners, from Dublin to Delhi, strove to maintain a dynamic balance between people’s humors (yellow bile, black bile, blood and phlegm) in the context of specific surroundings, activities and behaviors⁶. It was this set of principles that we can sometimes detect as underlying diverse preventative measures and applied to different circumstances. Limiting ourselves to Galenic cultures in western Europe, recent studies of diets, labor, exercise, reproduction, town planning and governance have variously identified medical principles and programs purporting to promote community health⁷. Often the natural-philosophical inspiration is implicit, although on occasion extant documents and artefacts lay bare a policy’s health-promoting intentions. In Italy, for example, city

councils and rulers promulgated by-laws *pro maiori sanitate hominum* and developed offices to enforce them within the city walls and in outlying areas⁸. Significantly, such efforts rarely distinguished between mental and physical health or indeed between the latter and communities' morality and piety. The fusion between moral and physical health reflects how in much of Christian Europe (and among Jews and throughout the Islamic world) medical practitioners and religious scholars regularly overlapped. Moreover, such experts had major inputs into government policies with regards to food provision and storage, war and diplomacy, and in preparation for or response to environmental disasters. They often sought, not only to address, but also to predict the latter by observing stellar conjunctions and other natural indicators which were integral to the study of medicine at the time⁹. In sum, the pursuit of health was both culturally authoritative and embedded in numerous power structures.

Most research on early community prophylactics has focused so far on preindustrial urban Europe. From Scandinavia to Iberia, and from the British Isles to the Adriatic coast, students of urban culture and government have unearthed a rich array of preventative policies as well as evidence for their enforcement, be it during crises such as wars, floods, famines and the Black Death (1346-1353), or in quieter periods. Sometimes building on Greek and Roman practices, interventions included the maintenance of hygienic infrastructures such as roads, bridges, wells, fountains, drains and canals, which were crucial nodes in supplying food and water as well as fighting fire and removing waste. As such, they were also strategic sites for promoting urban rulers' biopolitical agendas. In addition, municipalities were eager to attract, certify and monitor medical practitioners, from midwives, barber-surgeons and herbalists, to apothecaries and physicians, although the latter by no means exhaust the list of medical authorities people turned to. Arguably the best documented (but often overlooked) biopolitical intervention in cities concerned assuring quality of produce brought to markets, including medicinal herbs and compounds, through the strict regulation of markets and industries.

As an expressly "public" endeavor, the prerogative of promoting community health fell to different jurisdictions and organs. For instance, both city governments and craft guilds promulgated and implemented labor safety regulations to protect workers at all levels. In conjunction with ecclesiastical institutions, cities routinely modified burial practices to reduce fear and contagion, often citing Galenic principles. And both urban and ecclesiastical authorities founded leprosaria, hospitals and almshouses to protect vulnerable populations and the population at large, and curbed the bearing of arms, alcohol consumption, gambling and other morally unhygienic activities. Public health, but also public *authority*, was seen to benefit from periodically ridding cities of "unwanted" groups, such as religious minorities, the able-bodied poor, heretics and prostitutes, all of whom were easy to construe as polluting cities and disturbing communities' moral and physical balance. Most famously, perhaps, in times of crisis

urban leaders established quarantine facilities, sanitary corridors and dedicated information networks, and installed health boards to advise and monitor population health. In times of peace, in addition to regulating food supply and waste disposal, as mentioned, they also upheld building and planning norms to reduce the risks of collapse, flood, fire and pollution from industrial activities.

Cities certainly differed in terms of resources and their mobilization, and the latter's impact could be limited even with the best of intentions. Nor was the application of such programs even or their development linear. Yet evidence for the holistic and deliberate integration of preventative theory, policy and practice, often rooted in Galenic medicine, is by now too overwhelming to ignore as an exception¹⁰. However, the wealth and consistency of evidence for urban Europe in this period runs the risk of positioning the region as exceptional, a precocious forerunner to the hygienic triumph of later centuries. That is decidedly not the case, although retracing group prophylactics in other regions often requires more tools than archival methods due to the disappearance, destruction or non-existence of relevant documents. Linguistics, religious studies, anthropology, ethno-architecture, literature as well as the variety of (bio)archaeological approaches are in this sense instrumental for achieving a detailed and comprehensive view of these communities' hygienic pasts¹¹. Moreover, developments in archaeological, art and architectural studies have shed much new light on the scale and achievement of providing for large populations in the Americas¹², and how numerous Asian and African cities likewise developed their own preventative programs, in response to different and changing threats, and based on a variety of medical, religious and natural-philosophical insights. These traditions live on, despite the globalization of biomedicine¹³.

Rural prevention

City dwellers were a minority in many pre-industrial societies, and a focus on their group prophylactics can therefore be misleading or easy to dismiss as untypical. However, a similar methodological openness used to trace preventative programs in non-European cities provides insights into rural practices, too. Preindustrial miners and armies are a case in point, as they tended to be based in the countryside. Typically, these communities faced, in addition to their hard labor, food scarcity and exposure to the natural elements, several risks stemming from their (underground) work environments. For miners, these could include collapsing rock, flooding, dampness, darkness, fire, poor ventilation and poisoning¹⁴. Hundreds if not thousands of "underground cathedrals," as well as dwellings, art and documents miners left behind, allow us to assess miners' awareness and readiness to fight such hazards. Collectively these sources paint a rich picture of deliberate interventions in space, social organization and behavior designed to promote health and fight injury and disease at the community level. Some of these were unique to extractive activities in specific topographies, geologies and climates, while others reflect stresses common to rural life.

Miners' preventative programs were not necessarily and fully successful, but they certainly demonstrate that, as in cities, so in the countryside, people were proactive about preserving their health. Preventative interventions included, underground, the wearing of protective gear, including boots, legging, gloves, leather aprons and hats as well as face masks meant to save them from miasmatic vapors that Galenic physicians thought issued forth from exposed seams. Miners also designed guidance systems from ropes and leather straps to return them to safety or aid their rescue if they lost their way or consciousness. Tunnel supports, lamps, drains and ventilation shafts, moreover, were commonly used to increase safety at work, as did an organization into shifts of 6-8 hours, spread reasonably throughout the work week. Finally, the fostering of certain pious behaviors, including the use of crosses, prayers, charms and votives was meant to curry favor with god, relevant patrons such as Saint Barbara, as well as demons, which many miners believed occupied underground tunnels.

Above the ground miners strove to promote their health and fight disease in additional ways. In particular, other than encouraging the aforementioned pious behaviors, they built and decorated chapels, invited priests and followed the annual cycle of feasts. Mining communities also had access to relatively abundant diets thought by medical authorities specifically to counter the impact on their humoral balance by harmful vapors and working in cold, damp places. Nutritious diets were also achieved, given miners' commonly remote location, by adapting their environments for pasture, foraging and cultivation of grains, fruits and vegetables. A final and major example of preventative measures was zoning. The layout of mining villages was common and reflects an awareness (Galenic, not biomedical) to the importance of reducing the risk of breathing, drinking or consuming matter exposed to pollutants coming out of shafts or produced by metalworks or other industrial processes¹⁵. If zoning was a regular prophylactic technique in the era's towns and cities, it benefited rural miners as well. Community prophylactics' impact can also be recovered, albeit more sporadically, through archaeological and paleo-scientific studies¹⁶. For instance, the near absence of cranial trauma and low rates of major fractures in arms and legs suggest that miners actually used and benefitted from protective gear. Proximate data for nutrition, demographics, height and life expectancy at birth matches those of regional urban *comparanda*, showing how miners compensated for their harsh conditions effectively. However, skeletal remains also exhibit stress markers in ligaments and bones associated with squatting, heavy lifting and strenuous physical activity, and soil deposits capture rather high concentrations of lead particles and other toxins, suggesting the limits of spatial interventions such as zoning. At any rate, collectively the evidence underscores how rural dwellers such as miners strove to maintain their health, and in doing so drew on a combination of common sense and the era's medical principles, as presumably did other extra-urban communities across the preindustrial world.

If miners tended to be sedentary communities, preindustrial society also included many groups that moved routinely between landscapes, seasons, settlements and cultural contexts, and thus faced changing health hazards. Merchants, pilgrims, armies and princely courts were among such groups, which could intersect, and are relatively well documented as compared with peasants. Among these the most numerous, socio-economically diverse and physically mobile groups were armies¹⁷. Before World War II, armies were demographic black holes, in that most soldiers died as a result of hunger and disease, not in combat or even from battle-inflicted wounds. Yet the political elites who led them hardly accepted this as a matter of course. Indeed, they developed a heightened awareness, if not a modern, biomedical understanding, of the threats soldiers faced, in the camp and on the march. The tactical guides they composed and consulted accordingly paid regular attention to the changing environmental circumstances an army had to contend with, and advised generals on the situation and organization of camps, length of exercises and marches, appropriate diets and rest¹⁸. For instance, the most influential military manual for all of Latin Europe, Vegetius' *De re militari* (late fourth or fifth century), stressed concerning a military camp that its "situation should be strong by nature" and that "[i]f the army is to continue in it any considerable time, attention must be had to the salubriousness of the place"¹⁹. Establishing the what a healthy place is relied in turn on Galenic medical principles; namely it:

[D]epends on the choice of situation and water; on the season of the year, medicine and exercise. As to the situation, the army should never continue in the neighborhood of unwholesome marshes any length of time, or on dry plains or eminences without some sort of shade or shelter. In the summer, the troops should never encamp without tents. And their marches, in that season of the year when the heat is excessive, should begin by break of day so that they may arrive at the place of destination in good time. Otherwise they will contract diseases from the heat of the weather and the fatigue of the march. In severe winter they should never march in the night in frost and snow, or be exposed to want of wood or clothes. A soldier, starved with cold, can neither be healthy nor fit for service. The water must be wholesome and not marshy. Bad water is a kind of poison and the cause of epidemic distempers²⁰.

Archaeological and other sources suggest that armies applied and modified such advice in specific contexts to benefit and promote their wellbeing²¹. Armies, like miners and other non-urban groups, thus hardly had to wait for modern science and technology in order to develop preventative practices. In doing so, they routinely took their rural and ambient environments into careful consideration and sought to apply Galenic principles to reduce their harm.

Conclusion

All past societies, be they rural or urban, mobile or sedentary, were sensitive to how people and their changing environments mingled, with diverse impacts on their health. The measures they developed far predate environmentalism, biomedicine and the sup-

posed birth of the public health movement in Euro-American modernity, and they drew on culturally specific medical, religious and natural-philosophical principles. Moreover, as we have recently experienced, some of these allegedly low-tech measures remain relevant and are practiced today, and even if their efficacy is differently explained, communities around the globe relate positively to them. Medical history (and the history of science more broadly) showcases the wealth, diversity and contingency of cultural production across space and time, and not merely the “success” or “superiority” of certain measures, ideas or procedures. From this angle, public health in and beyond preindustrial Europe offers an exciting prism through which to view the human past. And it may also offer some inspiration on how to imagine our future.

Acknowledgements:

Funding was provided by the Australian Research Council, grant number DP220102914. I am grateful to Sarah May for their help in formatting this contribution.

Bibliography and notes

Non-ISO4 abbreviations

AHAMed = Acta historica et archaeologica mediaevalia (Barcelona)

Printed primary sources & Studies

- Agresta A, *The Keys to Bread and Wine: Faith, Nature and Infrastructure in Late Medieval Valencia*. Ithaca: Cornell University Press; 2022.
- Bäckström Y, Price TD, *Social Identity and Mobility at a Pre-Industrial Mining Complex, Sweden*. *J Archaeol Sci* 2016;66:154-68.
- Bailly-Maître M-C, Benoit P, *L’habitat des mineurs: Brandes-en-Oisans et Pampailly*. In: Alexandre-Bidon D, Piponnier F, Poisson J-M (eds), *Cadre de vie et manières d’habiter (XII^e-XVI^e siècle)*. Caen: Publications du CRAHM; 2006. pp. 259-65.
- Berridge V, Gorsky M, Mold A, *Public Health in History*. Maidenhead, UK: Open University Press; 2011.
- Blažina V, Tomić XB, *Expelling the Plague: The Health Office and the Implementation of Quarantine in Dubrovnik, 1377-1533*. Montreal and Kingston: McGill-Queen’s University Press; 2015.
- Bocchi F, *Regulation of the Urban Environment by the Italian Communes from the Twelfth to the Fourteenth Century*. *Bull John Rylands Libr* 1990;72:63-78.
- Brenner E, *Leprosy and Public Health in Late Medieval Rouen*. In: Clark L, Rawcliffe C (eds), *The Fifteenth Century XII: Society in an Age of Plague*. London: Boydell & Brewer; 2013. pp. 123-38.
- Carmichael AG, *Plague and the Poor in Renaissance Florence*. Cambridge: Cambridge University Press; 2014.
- Chakrabarty D, *Community, State and the Body: Epidemics and Popular Culture in Colonial India*. In: Hardiman D, Bihari Mukharji P (eds), *Medical Marginality in South Asia: Situating Subaltern Therapeutics*. London: Routledge; 2012. pp. 36-58.

- Ciecieszki NJ, *The Stench of Disease: Public Health and the Environment in Late-Medieval English Towns and Cities*. *Health soc cult* 2013;4:92-104.
- Coomans J, *Community, Urban Health and Environment in The Late Medieval Low Countries*. Cambridge: Cambridge University Press; 2021.
- de Lépinau A, Castex D, Brzobohatá H, Frolík J, Velínský F, Brůžek J, Velemínský P, Kacki S, *Entre peste et famine: caractérisation d'une crise de mortalité par l'étude de trois sépultures multiples du site de Kutná Hora – Sedlec (République tchèque, XIV^e siècle)*. *BMSAP* 2021;33(2).
- Falcón I, *Aprovisionamiento y sanidad en Zaragoza en el siglo XV*. *AHAMed* 1998;19:127-44.
- Fay I, *Health and The City: Disease, Environment and Government in Norwich, 1200-1575*. Woodbridge, UK: York Medieval Press; 2015.
- Flavius Vegetius R, *De re militari*, Reeve MD (ed.), Oxford: Oxford University Press; 2004.
- Flavius Vegetius R, *Epitome of Military Science*, 2nd ed, Milner NP (trans.). Liverpool: Liverpool University Press; 1996.
- Gabriel RA, Metz KS, *A History of Military Medicine*, 2 vols. New York: Greenwood Press; 1992.
- Geltner G, Coomans J, *The Healthscaping Approach: Towards a Global History of Early Public Health*. *Hist Methods* 2023;56:18-33.
- Geltner G, Coomans J, Yoeli-Tlalim R (eds), *Dynamic Balances: Public Health in the Premodern World*. Oxford: Oxford University Press; forthcoming.
- Geltner G, *Healthscaping a Medieval City: Lucca's Curia Viarum and the Future of Public Health History*. *Urban Hist* 2013;40:395-415.
- Geltner G, *In the Camp and on the March: Military Manuals as Sources for Studying Premodern Public Health*. *Med Hist* 2019;63:44-60.
- Geltner G, *Kinetic Health: Ecologies and Mobilities of Prevention in Europe, c. 1100-1600*. *Mobilities* 2021;16:553-68.
- Geltner G, *Preventative Health Among Miners in Europe, 1200-1550*. In: Geltner G, Coomans J, Yoeli-Tlalim R (eds), *Dynamic Balances: Public Health in the Premodern World*. Oxford: Oxford University Press; forthcoming.
- Geltner G, *Roads to Health: Infrastructure and Urban Wellbeing in Later Medieval Italy*. Philadelphia: University of Pennsylvania Press; 2019.
- Geltner G, *The Path to Pistoia: Urban Hygiene Before the Black Death*. *Past Present* 2020;246:3-33.
- Geltner G, Weeda C, *Underground and Over the Sea: More Community Prophylactics in Europe, 100-1600*. *J Hist Med Allied Sci*. 2021;76:123-46.
- Govaerts S, *Armies and Ecosystems in Premodern Europe: The Meuse Region, 1250-1850*. Amsterdam: Amsterdam University Press; 2021.
- Harvey HR, *Public Health in Aztec Society*. *Bull N Y Acad Med* 1982;57:157-65.
- Henderson J, *The Renaissance Hospital: Healing the Body and Healing the Soul*. New Haven: Yale University Press; 2006.
- Hsu E, Horden P (eds), *The Body in Balance: Humoral Medicines in Practice*. New York: Berghahn Books; 2015.
- Huisman F, Tomes N, *A World South-Side Up? Global Health and the Provincializing of Europe*. *Eur J Hist Med Health* 2021;78:195-212.
- Jackson M (ed.), *A Global History of Medicine*. Oxford: Oxford University Press; 2018.
- Jørgensen D, *Cooperative Sanitation: Managing Streets and Gutters in Late Medieval England and Scandinavia*. *Technol Cult* 2008;49:547-67.

- Kinzelbach A, Infection, Contagion, and Public Health in Late Medieval and Early Modern German Imperial Towns. *J Hist Med Allied Sci* 2006;3:369-89.
- McVaugh MR, Arnald of Villanova's *Regimen Almarie (Regimen Castra Sequentium)* and Medieval Military Medicine. *Viator* 1992;23:201-14.
- Mundy BE, *The Death of Aztec Tenochtitlan, The Life of Mexico City*. Austin, TX: The University of Texas Press; 2015.
- Nutton V, Continuity or Rediscovery? The City Physician in Classical Antiquity and Medieval Italy. In: Russell AW (ed.), *The Town and State Physician in Europe*. Wolfenbüttel: Herzog August Bibliothek; 1981. pp. 9-46.
- Nutton V, The Seeds of Disease: An Explanation of Contagion and Infection from the Greeks to the Renaissance. *Med Hist* 1982;27:1-34.
- Park K, *Doctors and Medicine in Early Renaissance Florence*. Princeton: Princeton University Press; 1985.
- Porter D, *Health, Civilization and the State: A History of Public Health from Ancient to Modern Times*. London: Routledge; 2001.
- Rawcliffe C, *Urban Bodies: Communal Health in Late Medieval English Towns and Cities*. Woodbridge, UK: Boydell Press; 2013.
- Rawcliffe C, Weeda C (eds), *Policing the Urban Environment in Premodern Europe*. Amsterdam: Amsterdam University Press; 2019.
- Rosen G, *A History of Public Health*. Baltimore: The Johns Hopkins University Press; rev. ed. 1993 [1953].
- Sabbionesi L, *Pro maiore sanitate hominum civitatis...et borgorum: lo smaltimento dei rifiuti nelle città medievali dell'Emilia Romagna*. Sesto Fiorentino (FI): All'Insegna del Giglio; 2019.
- Shepard RJ, *An Illustrated History of Health and Fitness, from Pre-History to our Post-Modern World*. New York: Springer; 2015.
- Skelton LJ, *Sanitation in Urban Britain, 1560–1700*. London: Routledge; 2015.
- Stearns J, *Infectious Ideas: Contagion in Premodern Islamic and Christian Thought in the Western Mediterranean*. Baltimore: The Johns Hopkins University Press; 2011.
- Stevens Crawshaw JL, *Cleaning Up Renaissance Italy: Environmental Ideals and Urban Practice in Genoa and Venice*. Oxford: Oxford University Press; 2023.
- van Oosten R, *De stad, het vuil en de beerput: de opkomst, verbreiding en neergang van de beerput in stedelijke context*. Leiden: Sidestone Press; 2015.
- Vaughan M, *Curing their Ills: Colonial Power and African Illness*. Stanford: Stanford University Press; 1991.
- Weeda C, *Ethnicity in Medieval Europe, 950-1250: Medicine, Power and Religion*. Woodbridge, Suffolk: Boydell Press; 2021.
- Wilson Bower K, *Plague and Public Health in Early Modern Seville*. Rochester, NY: University of Rochester Press; 2013.
- Yoeli-Tlalim R, Tibetan 'Wind' and 'Wind' Illnesses: Towards a Multicultural Approach to Health and Illness. *Stud Hist Philos Biol Biomed Sci* 2010;41:318-24.
- Zaneri T, Geltner G, *The Dynamics of Healthscaping: Mapping Communal Healthcare in Bologna, 1287-1383*. *Urban Hist* 202;49:1-26.
- Zipser B, Bouras-Vallianatos P (eds), *A Companion to The Reception of Galen*. Leiden: Brill; 2019.

1. For the ongoing attraction of the latter view, see Shepard RJ, *An Illustrated History of Health and Fitness, from Pre-History to our Post-Modern World*. New York: Springer; 2015; Berridge V, Gorsky M, Mold A, *Public Health in History*. Maidenhead, UK: Open University Press; 2011.
2. Rosen G, *A History of Public Health*. Baltimore: The Johns Hopkins University Press; rev. ed. 1993 [1953]; Porter D, *Health, Civilization and the State: A History of Public Health from Ancient to Modern Times*. London: Routledge; 2001; Jackson M (ed.), *A Global History of Medicine*. Oxford: Oxford University Press; 2018.
3. Huisman F, Tomes N, *A World South-Side Up? Global Health and the Provincializing of Europe*. *Eur J Hist Med Health* 2021;78:195-212; Geltner G, Coomans J, Yoeli-Tlalim R (eds), *Dynamic Balances: Public Health in the Premodern World*. Oxford: Oxford University Press; forthcoming.
4. Harvey HR, *Public Health in Aztec Society*. *Bull NY Acad Med* 1982;57:157-65; Vaughan M, *Curing their Ills: Colonial Power and African Illness*. Stanford: Stanford University Press; 1991; Chakrabarty D, *Community, State and the Body: Epidemics and Popular Culture in Colonial India*. In: Hardiman D, Bihari Mukharji P (eds), *Medical Marginality in South Asia: Situating Subaltern Therapeutics*. London: Routledge; 2012. pp. 36-58.
5. Zipser B, Bouras-Vallianatos P (eds), *A Companion to The Reception of Galen*. Leiden: Brill; 2019.
6. Nutton V, *The Seeds of Disease: An Explanation of Contagion and Infection from the Greeks to the Renaissance*. *Med Hist* 1982;27:1-34; Stearns J, *Infectious Ideas: Contagion in Premodern Islamic and Christian Thought in the Western Mediterranean*. Baltimore: The Johns Hopkins University Press; 2011; Geltner G, *Kinetic Health: Ecologies and Mobilities of Prevention in Europe, c. 1100-1600*. *Mobilities* 2021;16:553-68.
7. Kinzelbach A, *Infection, Contagion, and Public Health in Late Medieval and Early Modern German Imperial Towns*. *J Hist Med Allied Sci* 2006;3:369-89; Rawcliffe C, *Urban Bodies: Communal Health in Late Medieval English Towns and Cities*. Woodbridge, UK: Boydell Press; 2013; Fay I, *Health and The City: Disease, Environment and Government in Norwich, 1200-1575*. Woodbridge, UK: York Medieval Press; 2015; Coomans J, *Community, Urban Health and Environment in The Late Medieval Low Countries*. Cambridge: Cambridge University Press; 2021; Agresta A, *The Keys to Bread and Wine: Faith, Nature and Infrastructure in Late Medieval Valencia*. Ithaca: Cornell University Press; 2022; Stevens Crawshaw JL, *Cleaning Up Renaissance Italy: Environmental Ideals and Urban Practice in Genoa and Venice*. Oxford: Oxford University Press; 2023.
8. Sabbionesi L, *Pro maiore sanitate hominum civitatis...et borgorum: lo smaltimento dei rifiuti nelle città medievali dell'Emilia Romagna*. Sesto Fiorentino (FI): All'Insegna del Giglio; 2019; Geltner G, *Roads to Health: Infrastructure and Urban Wellbeing in Later Medieval Italy*. Philadelphia: University of Pennsylvania Press; 2019.
9. Nutton V, *Continuity or Rediscovery? The City Physician in Classical Antiquity and Mediaeval Italy*. In: Russell AW (ed.), *The Town and State Physician in Europe*. Wolfenbüttel: Herzog August Bibliothek; 1981. pp. 9-46; Park K, *Doctors and Medicine in Early Renaissance Florence*. Princeton: Princeton University Press; 1985; Carmichael AG, *Plague and the Poor in Renaissance Florence*. Cambridge: Cambridge University Press; 2014; Henderson J, *The Renaissance Hospital: Healing the Body and Healing the Soul*. New Haven: Yale University Press; 2006; Weeda C, *Ethnicity in Medieval Europe, 950-1250: Medicine, Power and Religion*. Woodbridge, Suffolk: Boydell Press; 2021.

10. Jørgensen D, Cooperative Sanitation: Managing Streets and Gutters in Late Medieval England and Scandinavia. *Technol Cult* 2008;49:547-67; Geltner G, Healthscaping a Medieval City: Lucca's Curia Viarum and the Future of Public Health History. *Urban Hist* 2013;40:395-415; Wilson Bower K, Plague and Public Health in Early Modern Seville. Rochester, NY: University of Rochester Press; 2013; van Oosten R, De stad, het vuil en de beerput: de opkomst, verbreiding en neergang van de beerput in stedelijke context. Leiden: Sidestone Press; 2015; Skelton LJ, Sanitation in Urban Britain, 1560–1700. London: Routledge; 2015; Rawcliffe C, Weeda C (eds), Policing the Urban Environment in Premodern Europe. Amsterdam: Amsterdam University Press; 2019; Geltner G, The Path to Pistoia: Urban Hygiene Before the Black Death. *Past Present* 2020;246:3-33; Zaneri T, Geltner G, The Dynamics of Healthscaping: Mapping Communal Healthcare in Bologna, 1287-1383. *Urban Hist* 202;49:1-26; Blažina V, Tomić XB, Expelling the Plague: The Health Office and the Implementation of Quarantine in Dubrovnik, 1377-1533. Montreal and Kingston: McGill-Queen's University Press; 2015; Bocchi F, Regulation of the Urban Environment by the Italian Communes from the Twelfth to the Fourteenth Century. *Bull John Rylands Libr* 1990;72:63-78; Brenner E, Leprosy and Public Health in Late Medieval Rouen. In: Clark L, Rawcliffe C (eds), *The Fifteenth Century XII: Society in an Age of Plague*. London: Boydell & Brewer; 2013. pp. 123-38; Ciecieszki NJ, The Stench of Disease: Public Health and the Environment in Late-Medieval English Towns and Cities. *Health soc cult* 2013;4: 92-104; Falcón I, Aproveccionamiento y sanidad en Zaragoza en el siglo XV. *AHAMed* 1998;19:127-44.
11. Geltner G, Coomans J, The Healthscaping Approach: Towards a Global History of Early Public Health. *Hist Methods* 2023;56:18-33.
12. Mundy BE, *The Death of Aztec Tenochtitlan, The Life of Mexico City*. Austin, TX: The University of Texas Press; 2015.
13. Hsu E, Horden P (eds), *The Body in Balance: Humoral Medicines in Practice*. New York: Berghahn Books; 2015; Yoeli-Tlalim R, Tibetan 'Wind' and 'Wind' Illnesses: Towards a Multicultural Approach to Health and Illness. *Stud Hist Philos Biol Biomed Sci* 2010;41:318-24.
14. Bailly-Maître M-C, Benoit P, L'habitat des mineurs: Brandes-en-Oisans et Pampailly. In: Alexandre-Bidon D, Piponnier F, Poisson J-M (eds), *Cadre de vie et manières d'habiter (XIIe-XVIe siècle)*. Caen: Publications du CRAHM; 2006. pp. 259-65; Bäckström Y, Price TD, Social Identity and Mobility at a Pre-Industrial Mining Complex, Sweden. *J Archaeol Sci* 2016;66:154-68.
15. Geltner G, Weeda C, Underground and Over the Sea: More Community Prophylactics in Europe, 100-1600. *J Hist Med Allied Sci*. 2021;76:123-46; Geltner G, Preventative Health Among Miners in Europe, 1200-1550. In: Geltner G, Coomans J, Yoeli-Tlalim R (eds), ref. 3.
16. de Lépinau A, Castex D, Brzobohatá H, Frolík J, Velimský F, Brůžek J, Velemínský P, Kacki S, Entre peste et famine: caractérisation d'une crise de mortalité par l'étude de trois sépultures multiples du site de Kutná Hora – Sedlec (République tchèque, XIVE siècle). *BMSAP* 2021;33(2).
17. Gabriel RA, Metz KS, *A History of Military Medicine*, 2 vols. New York: Greenwood Press; 1992.
18. Geltner G, In the Camp and on the March: Military Manuals as Sources for Studying Premodern Public Health. *Med Hist* 2019;63:44-60.

19. Flavius Vegetius R, *De re militari*, Reeve MD (ed.), Oxford: Oxford University Press; 2004; I, xxii (25-26). Translations here and below from Id., *Epitome of Military Science*, 2nd ed, Milner NP (trans.). Liverpool: Liverpool University Press; 1996.
20. Vegetius, *De re militari*, ref. 19, III, ii (67).
21. McVaugh MR, Arnald of Villanova's *Regimen Almarie (Regimen Castra Sequentium)* and Medieval Military Medicine. *Viator* 1992;23:201-14; Govaerts S, *Armies and Ecosystems in Premodern Europe: The Meuse Region, 1250-1850*. Amsterdam: Amsterdam University Press; 2021.

Guy Geltner Orcid identifiers: <https://orcid.org/0000-0001-7827-1298>