

Underground and Over the Sea: More Community Prophylactics in Europe, 1100-1600

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ABSTRACT

Public health historians have repeatedly shown that the theory, policy, and practice of group prophylactics far predate their alleged birth in industrial modernity, and regularly draw on Galenic principles. While the revision overall has been successful, its main focus on European cities entails a major risk, since city dwellers were a minority even in Europe's most urbanised regions. At the same time, cities continue to be perceived and presented as typically European, which stymies transregional and comparative studies based at least in part on non- or extra-urban groups. Thus, any plan to both offer an accurate picture of public health's deeper past and fundamentally challenge a narrative of civilizational progress wedded to Euro-American modernity ("stagism") would benefit from looking beyond cities and their unique health challenges. The present article begins to do so by focusing on two ubiquitous groups, often operating outside cities and facing specific risks: miners and shipmates. Evidence for these communities' preventative interventions and the extent to which they drew on humoral theory is rich yet uneven for Europe between the thirteenth and sixteenth centuries. Methodological questions raised by this unevenness can be addressed by connecting different scales of evidence, as this article demonstrates. Furthermore, neither mining nor maritime trade was typically European, thus building a broader base for transregional studies and comparisons.

KEYWORDS: Galenism; humoral theory; mines; ships; preindustrial Europe; public health

The theory, policy, and practice of community prophylactics stretch deeper in time, and farther in space, than scholars of European health history have tended to recognize. Studies on England and Wales, Italy, Iberia, the Low Countries, Scandinavia and Germany between the thirteenth and sixteenth centuries, to name a few examples, have roundly rejected a common claim that the rise of the public health movement was

essentially a response to the Industrial Revolution in the later eighteenth century.¹ These works, based on abundant and diverse evidence, appeared over the last two decades, building in turn on previous medical-historical and urban-archaeological scholarship,² with first signs finally emerging of their collective impact.³ One risk that this revision runs, however, is allowing its main objects of study, that is urban communities, to be seen as the exclusive domains of preventative health interventions. Even within Europe's most urbanized areas, such as the southern Low Countries and central-northern Italy, town- and city dwellers rarely amounted to more than 30 per cent of regional populations, and the continent as a whole is estimated to have been around 80-90% rural. Despite poorer and certainly less accessible evidence for extra-urban communities' preventative programs, looking outside the city walls merits greater attention, correcting en route a common sedentary bias in the social history of health.

Furthermore, although the present article limits itself to Europe, it does so in a conscious effort to broaden the comparative and transregional basis.⁴ If health historians are to fundamentally challenge a common "stagist" narrative of civilizational progress still beholden to European urban culture,⁵ they would benefit from extending their scope of subjects in this field by examining communities that also moved in and out of cities, and which accordingly did not develop preventative programs uniquely in response to, or in anticipation of, typically urban risks. Armies are perhaps a surprising case in point. These large groups practiced preventative health and often lived, trained, fought and died outside cities, although they could certainly find themselves besieged in or assaulting a city. Operating regularly under conditions of scarcity, with limited access to food, water and shelter, armies were constantly on the move, usually in a rural

- 1 Carole Rawcliffe, *Urban Bodies: Communal Health in Late Medieval English Towns and Cities* (Woodbridge: Boydell Press, 2013); G. Geltner, *Roads to Health: Infrastructure and Urban Wellbeing in Later Medieval Italy* (Philadelphia: University of Pennsylvania Press, 2019); Janna Coomans, *Community, Urban Health and the Environment in the Late Medieval Low Countries* (Cambridge: Cambridge University Press, 2021); Dolly Jørgensen, "Cooperative Sanitation: Managing Streets and Gutters in Late Medieval England and Scandinavia," *Technology and Culture* 49 (2008): 547-567; Isla Fay, *Health and the City: Disease, Environment and Government in Norwich, 1200-1575* (Woodbridge: Boydell & Brewer, 2015); Leona J. Skelton, *Sanitation in Urban Britain, 1560-1700* (London: Routledge, 2015); Abigail Agresta, "From Purification to Protection: Plague Responses in Late Medieval Valencia," *Speculum* 95 (2020): 371-395; Kirsty Wilson Bower, *Plague and Public Health in Early Modern Seville* (Rochester, NY: University of Rochester Press, 2013); Annemarie Kinzelbach, "Infection, Contagion, and Public Health in Late Medieval and Early Modern German Imperial Towns," *Journal of the History of Medicine and Allied Sciences* 61 (2006): 369-389; Carole Rawcliffe and Claire Weeda, ed., *Policing the Urban Environment in Premodern Europe* (Amsterdam: Amsterdam University Press, 2019).
- 2 Janna Coomans and G. Geltner, ed., "Bibliography of Premodern Public Health." Online publication: <https://hcommons.org/groups/premodern-public-health/documents/>.
- 3 Tom Crook, *Governing Systems: Modernity and the Making of Public Health in England, 1830-1910* (Berkeley: University of California Press, 2016), 12-14; Richard Rodger, "Urban Public Health: A Historical Perspective," in *Urban Health*, ed. Sandro Galea, Catherine K. Ettman, and David Vlahov (Oxford: Oxford University Press, 2019), 169-178 at 169.
- 4 Catherine Holmes and Naomi Standen, "Introduction: Towards a Global Middle Ages," *Past & Present* 238 (2018): 1-44; G. Geltner and Janna Coomans, "Public Health Beyond the Simplex of the Pre: A Multiscalar Methodology," [forthcoming].
- 5 Dipesh Chakrabarty, *Provincializing Europe: Postcolonial Thought and Historical Difference* (Princeton: Princeton University Press, 2009), 4-10.

setting.⁶ And it is there, on the march and in the camp, that most soldiers prior to the twentieth century also perished. Against this backdrop, it is small wonder that soldiers put their minds and bodies to work on preempting some of their deadliest foes. They developed strategies for staying healthy as mobile groups through carefully managing resources, appropriate diets and rest, and tarried in what were, at least to their minds, salubrious places, and not merely defensible ones.⁷

But how did other, perhaps smaller and sometimes ad hoc communities seek to fight disease and promote health beyond an urban context? And to what extent did their efforts draw on environmental-medical thinking or Galenism, a major (if hardly exclusive) influence in urban and military settings? Statistically speaking, the most important group for exploring such questions are rural agriculturalists, comprising as they did the vast majority of Europe's inhabitants even well after the Industrial Revolution. Unfortunately, most of the pertinent records for doing so remain buried or else did not survive. Yet reconstructing extra-urban realities is possible by focusing on two ubiquitous groups facing unique clusters of health risks, some of which stemmed directly from these communities' different and changing environments: the mostly sedentary miners and the often-itinerant shipmates. Historical and archaeological evidence for these societies is rich but uneven across Europe, both geographically and chronologically. Yet neither mining nor maritime trade and transportation was limited to one continent, allowing in due time for transregional studies and comparisons, an endeavor that will also help weaken claims of European (and urban) exceptionalism when it comes to preventative healthcare at the group level. To do so, the first section will briefly situate the communities to be explored within the reigning medical paradigm of the era (and indeed until the eighteenth century), namely Galenism or humoral theory. The next sections will then survey evidence for prophylactic policy and practice among miners and shipmates, respectively, reconstruct the real and perceived dangers against which they sought to defend themselves, and the extent to which their efforts drew on Galenic principles. The conclusion will briefly combine the insights from the two case studies and link them as thematic and methodological bridgeheads to other communities of prophylactic practice in the deeper past. The analysis utilizes different types of records and methodologies, illustrating the productiveness of working across a variety of scales when it comes to the history of public health.

6 On armies' expertise in sustainably exploiting rural resources see Sander Govaerts, *Armies and Ecosystems in Premodern Europe's Meuse Region* (Amsterdam: ARC Humanities Press, 2021). On how villagers, being reduced to an element in the landscape, bore the brunt of such expertise, see Jason Moralee, "It's in the Water: Byzantine Borderlands and the Village War," *Humanities* 7 (2018): 86: <https://doi.org/10.3390/h7030086>.

7 G. Geltner, "In the Camp and on the March: Military Manuals as Sources for Studying Premodern Public Health," *Medical History* 63 (2019): 44-60; Joanna Philips, "Who Cared? Locating Caregivers in Chronicles of the Twelfth- and Thirteenth-Century Crusades," *Social History of Medicine* (2019): <https://doi.org/10.1093/shm/hkz100>.

GALENISM, THE ENVIRONMENT, AND COMMUNITY PROPHYLACTICS

Hippocratic scholars theorized circa 400 BCE that the environment—the climate, winds, precipitation, and terrain—affected the physiology of mortal beings, producing people made up of varying physical builds and mental dispositions. Galen of Pergamon, authoritatively expanding the knowledge of medicine and anatomy in the second century CE, created a framework of six factors external to the human body (the so-called non-naturals), whose management had a crucial effect upon personal well-being.⁸ Firstly, health was to a substantial extent determined by diet, the fuel upon which the effectiveness of every physical and mental process depended. Physicians considered the quality of a person's diet to be key, and advised to avoid the intake of corrupt food and drink, in particular meat and fish. In addition, the quality of the air, purgation (or evacuation), exercise, and rest, and the regulation of the passions were considered vital factors and tools for maintaining good health.⁹ Collectively, environment, matter, and emotions, along with their motility, were crucial external agents, whose workings manipulated the balance of the four bodily humours (sanguine, choleric, phlegmatic, and melancholic, made up of the four elements, air, water, earth, and fire, and the qualities, hot, cold, moist, and dry). To attain a level of dynamic balance, human beings were advised to constantly administer to the proportions of elements and qualities of heat, cold, moisture, and dryness within their bodies.¹⁰ A strong imbalance caused sickness and even death.

Both Hippocratic climate theory and Galenism held entrenched ideas about the importance of circulation and flow, as stagnant water or musty air was deemed to pose a serious health hazard. Air directly affected the nervous system via its intake through the nose, mouth, and pores. Bad air (*mala aria*) was considered a severe cause of sickness, as medical theory held foul particles travelling through the air (miasma) to be the source of contagious diseases, which also spread through touching contaminated objects. Stench, produced by noxious fumes, fetid water, corrupt food, waste and faeces, bad breath, or wounds, was a sign of clear and imminent danger. Conversely, clean mountain air, water, and sweet vapours revitalised the body's system. Proximity to the

- 8 They were diet, the environment, sleep and waking, retention and evacuation (through such procedures as blood-letting and the use of laxatives), exercise and rest, and accidents of the soul (involving the reduction of levels of anxiety and other intense emotions): L.J. Rather, "The Six Things Non-Natural: A Note on the Origins and Fate of a Doctrine and a Phrase," *Clio Medica* 3 (1968): 337-347; Petro Gil Stores, "The Regimens of Health," in *Western Medical Thought from Antiquity to the Middle Ages*, ed. Mirko D. Grmek, trans. Antony Shugar (Cambridge, MA: Harvard University Press, 1998), 291-318.
- 9 Luis García-Ballester, "On the Origins of the Six Non-Natural Things in Galen," in *Galen und das hellenistische Erbe: Verhandlungen des IV. Internationalen Galen-Symposiums veranstaltet vom Institut für Geschichte der Medizin am Bereich Medizin (Charité) der Humboldt-Universität zu Berlin 18.-20. September 1989*, ed. Jutta Kollesch and Diethard Nickel (Stuttgart: Franz Steiner Verlag, 1993), 105-115; Heikki Mikkeli, *Hygiene in the Early Modern Medical Tradition* (Helsinki: Academia Scientiarum Fennica, 1999), 19-23. See also Rawcliffe, *Urban Bodies*, 49-53, and Sandra Cavallo and Tessa Storey, *Healthy Living in Late Renaissance Italy* (Oxford: Oxford University Press, 2013).
- 10 Carole Rawcliffe, "The Concept of Health in Late Medieval Society," in *Le Interazioni fra Economia e Ambiente Biologico nell' Europa Preindustriale Sec. XIII-XVIII*, ed. Simonetta Cavaciocchi (Florence: Firenze University Press, 2010), 317-334 at 318-322.

elements such as earth and water, present in minerals and metals, proclaimed to significantly affect human and animal physiology. Nonetheless, what was considered to be beneficial to health was always contextual, relativistic and subject to cultural, social, and religious constructs. The effectiveness of movement, for instance, depended on its voluntary nature – hard-labor tilling the fields was not on par with exercise in the form of leisurely walks, sports, dance, or travel as a form of therapeutics. Moreover, movement's taxonomy included unfamiliar forms of exercise through sight, sound, voice, and mind.¹¹ Nor was dirt—as matter out of place—a fixed category, in view of its constructed feature based on the rules and boundaries determining place.¹² Last but by no means least, the physiology of beings mutated to the sway of the seasons, the passage of time, and gender.

In Europe, scholars, urban magistrates, households, and workers became more attuned to Galenic and Hippocratic environmental and medical theory from the twelfth century onwards. In Arabic and Persian learning, however, Galenism was already occupying a central position in medical thought and courtly advice literature in earlier centuries. Nor was Galenic medical theory entirely absent in earlier periods in a European context, for monks in monasteries applied, copied and adapted several Galenic veins in an unbroken transmission from antiquity, as well as adapting them to religious interpretations of sin and virtue. At any rate, the accelerated translation of Greek-Arabic medical treatises and health regimens in Mediterranean Spain, Sicily, southern Italy's Salerno and Monte Cassino, and Byzantium, and soon afterwards in the new centers of learning in Paris, Bologna, Padua, Montpellier, and Oxford, meant a transformation of scale and substance. The medical compendium known as the *Articella*, a collection of treatises that included Hunayn ibn Ishaq al-Ibadi's (in Latin *Iohannitius*) *Isagoge* and Constantine the African's *Viaticum peregrinantis* – a translation of the ninth-century handbook of Ibn al-Jazzar's *Provisions for the Traveller and Nourishment for Sedentary* – allowed students to (re)familiarize themselves with the basic tenets of humoralism and climate theory.¹³ Al-Majusi's tenth-century *Kitab*, translated into Latin under the title *Liber regalis*, and partially adapted as the *Liber pantegni* by Constantine the African, al-Razi's *al-Mansuri*, and Ibn Sina's eleventh-century *Canon of Medicine* were some of the most influential texts in this field. Catering to a wider audience, ubiquitous regimens of health (*regimina sanitatis*) in Latin and vernacular languages moreover presented lay and religious households with health scripts for bodily maintenance based on the non-naturals, advising on diet, sleep, bloodletting, and exercise.¹⁴

11 Peregrine Horden, "Regimen and Travel in the Mediterranean," in *Mobility and Travel in the Mediterranean from Antiquity to the Middle Ages*, ed. Renate Schlesier and Ulrike Zellmann (Münster: Lit Verlag, 2004), 117-132 at 123.

12 Mary Douglas, *Purity and Danger: An Analysis of Concept of Pollution and Taboo* (London: Routledge, 2002).

13 Horden, "Regimen and Travel," 119; Cornelius O'Boyle, *The Art of Medicine: Medical Teaching at the University of Paris, 1215-1400* (Leiden: Brill, 1998).

14 For an overview of sources within the genre, see Marilyn Nicoud, *Les régimes de santé au moyen âge: Naissance et diffusion d'une écriture médicale (xiii^e-xv^e siècle)* (Rome: École française de Rome, 2007).

As urban historians in particular have shown, the proliferation of such learned texts, alongside their cultural adaptation for different regions within Latin Christendom, ensured Galenism had a lasting impact on preventative health programs across Europe at least until the eighteenth century. The following sections move past the city and evaluate the extent to which this medical paradigm shaped thinking and behaviour in two unique yet ubiquitous communities, mostly toiling underground and over the sea.

PREVENTION AMONG MINERS

Whether they were digging for metals or minerals, miners in Europe between the twelfth and sixteenth centuries faced regular and serious threats. Indeed, as two major scholars in the field aver, miners were entirely artificial communities working in inhospitable places created against all odds.¹⁵ An earlier historian described their lives as unhealthy, even miserable,¹⁶ echoing a rich folkloric and literary tradition,¹⁷ and at least one Jesuit's account of miners near Liège compares them unfavorably with dogs, and depicts them as constantly beset by dangers from water and fire.¹⁸ However, and as we shall see in greater detail below, Europe's geology and political geography, combined with the available techniques of extraction, offered miners distinct social, economic, and legal advantages over most other physical laborers at that time. For, if miners' lives both above and below the ground were recognized as precarious, elites' ability to attract such workers—let alone retain them—had to compensate for it somehow. Miners' expertise and scarcity accordingly meant that their health and general wellbeing mattered, not only to them, but also to their employers, who chose to preserve it actively, rather than take it for granted or rely entirely on divine protection or a high turnover of laborers. Different stakeholders thus participated in healthscaping mines, a process with some direct and some implicit ties to Galenism.¹⁹

To set the scene of a European mine and the dangers of working in it five or six hundred years ago, it would help to put aside present-day or recently decommissioned plants. The physical scale of the latter grew out of nineteenth- and twentieth-century economies and technologies of extraction, which involved substantial human labor

- 15 Marie-Christine Bailly-Maitre and Paul Benoit, "L'habitat des mineurs: Brandes-en-Oisans et Pampailly," in *Cadres de vie et manières d'habiter (xii^e-xvi^e siècle)* (Caen: Publications du CRAHM, 2006), 259-265 at 260.
- 16 Henri Rouzaud, *La mine de Rancié* (Toulouse: Édouard Privat, 1908), 109.
- 17 Paul Sébillot, *Les travaux publics et les mines dans les traditions et les superstitions de tous les pays* (Paris: n.p., 1894), 389-590; Volker Honemann, "Bergbau in der Literatur des Mittelalters und der frühen Neuzeit," in *Stadt und Bergbau*, ed. Karl Heinrich Kaufhold and Wilfried Reininghaus (Cologne: Böhlau, 2004), 239-261.
- 18 Horst Kranz, "Arbeit und Kapital im Steinkohlenbergbau des Lütticher Zisterzienserklosters Val Saint-Lambert," in *Arbeit im Mittelalter. Vorstellungen und Wirklichkeiten*, ed. Verena Postel (Berlin: Akademie Verlag, 2006), 187-202 at 199-200, citing Bartholomeus Fisen, *Sancta legia Romanae ecclesiae filia sive historiarum ecclesiae Leodiensis partes duae*, 1, 2 (Liège, 1696) [orig. pub. 1642], 272: "Miserrimum mortali-um genus sunt fossores isti, cuniculorum potius, quam hominum vitam agentes... Non rara sunt ab aquis & igne pericula."
- 19 On the concept of healthscaping and its ties to Galenic thought see G. Geltner, "Healthscaping a Medieval City: Lucca's *Curia viarum* and the Future of Public Health History," *Urban History* 40 (2013): 395-415; G. Geltner, *Roads to Health*, Introduction.

alongside gargantuan drilling, hauling and sifting equipment, usually powered by internal combustion engines running on fossil fuels. Mines' size and location today continue the ancient symbiosis between mining and metallurgical industries, but their attendant infrastructure of transportation, mostly by rail and water, is far larger and more complex than in preindustrial times. Nonetheless, by one estimate, there may have been upwards of 100,000 miners across Europe in the early sixteenth century,²⁰ although they would have been spread quite thinly from Durham to Tuscany and from the French Alps to Kutná Hora.²¹ With little or no mechanization, sites and communities' size were modest and their layout tight. Indeed, a main characteristic of mining works in this period was their relatively shallow penetration beneath the earth's surface, that is when they were not alluvial or open-pit. Given the available tools, energy regimes, and hauling and drainage possibilities, vertical ventilation shafts were short, which in turn limited the horizontal advance of galleries along deposit seams, a limitation, to be sure, imposed also by considerations of health and safety.²²

Miners, like soldiers and mariners at the time, were overwhelmingly male groups who were highly exposed to professional dangers. Yet they successfully managed risks that stemmed directly from their work environment perhaps to an even greater extent than did armies, who prior to the twentieth century perished in much larger numbers off the battle field than in combat.²³ In alluvial and open-pit mining some hazards may have been avoided, but underground and mountainside works carried major risks, especially poor ventilation, flooding, and collapse, alongside injuries resulting from polluted air, extended crouching, carrying heavy weights, and toiling for long hours with sharp tools in a humid, dark, and fragile tunnel. Furthermore, outside the workplace miners had to contend with a similar array of challenges facing many of their contemporaries, from inclement weather, to food and water scarcity, to violence and ill health, including pulmonary diseases resulting from inhaling sulfur and other noxious gases released during metallurgical processes both in and especially near the mine. Finally, European miners pursued their trade mostly in rural settings, often on or indeed under forested hills and mountains.²⁴ Their arrival did not necessarily herald the foundation of a town

20 John Nef, *The Conquest of the Material World* (Chicago: University of Chicago Press, 1964), 43.

21 By comparison, even in its full decline in the 1970s the coal mining industry in the UK alone employed around 300,000 people: <https://www.statista.com/statistics/371069/employment-in-coal-mining-industry-in-the-united-kingdom-uk/>. There are currently around 100,000 miners and direct support staff in Canada: <https://www.nrcan.gc.ca/mining-materials/publications/16739>.

22 Foundational texts on preindustrial-era mines across Europe include Henri de Formevill, *Les barons fossiers et les férons de Normandie* (Caen: n.p., 1852); Johann Adolf Tomaschek, *Das alte Bergrecht von Iglau* (Innsbruck: Wagner, 1897); Peter Hitzinger, *Das Quecksilber-Bergwerk Idria* (Ljubliana: Laibach, 1860); Konrad Häbler, *Die Geschichte der Fugger'schen Handlung in Spanien* (Weimar: E. Felber, 1897); Max Reichstritter von Wolfstrigl-Wolfskron, *Die Tiroler Erzbergbaue, 1301-1665* (Innsbruck: Wagnersche Universitäts-Buchhandlung, 1903); and Oswald Hoppe, *Der Silberbergbau zu Schneeberg bis zum Jahre 1500* (Freiberg: Gerlachsche Buchdruckerei, 1908).

23 Richard A. Gabriel and Karen S. Metz, *A History of Military Medicine*, 2 vols. (New York: Greenwood Press, 1992), 1:2.

24 Patrice Beck, Philippe Braunstein, and Michel Philippe, with Alain Ploquin, "Minières et ferries du Moyen Âge en Forêt d'Othe (Aube, Yonne): approches historiques et archéologiques," *Revue archéologique de l'Est* 57 (2008): 333-365; Heiko Steuer, "Settlements in the Southern Black Forest: Castles

or city, although in some areas it certainly could do so over time,²⁵ while on more rare occasions it was precisely cities, especially ones situated on major thoroughfares, that supported the development of local mining industries.²⁶

The economic and political benefits of mining to elites clearly outweighed its risks to workers, but in the absence of slave or forced labor, it was perhaps even more urgent that these risks be mitigated. Diverse stakeholders in preserving miners' wellbeing accordingly developed physical and other preventative health measures that incentivized laborers' interest to sign up and convinced them to remain on site. These emerge from diverse archaeological, financial, literary and pictorial sources, but perhaps most clearly from legislation on miners' duties and privileges from the late twelfth century onwards, a phenomenon long remarked upon by legal scholars and historians of labor and technology.²⁷ As compared with other manual laborers (such as peasants), on the one hand, and mobile communities at risk (such as armies), on the other, miners enjoyed a unique range of long-term benefits. They could regularly own their plots and alienate them, had penal jurisdiction over their internal affairs, received tariff waivers on certain imports and exports, and exercised broad autonomy over managing the lands surrounding their pits, including hunting, access to water, felling trees, and raising cattle. In legal terms, miners' common status as directly beholden to the local forest or mountain owner, often a king, a bishop, or a major landlord such as a monastery, was comparatively high.

Magnates combined the enhancement of mines' pull factors with measures directly addressing health risks both above and below ground. And it is here, with limiting push factors, that we may begin to detect the presence of Galenic ideas on dynamic balance,

- and Mining (Dominance through Commerce)," in *Hierarchies in Rural Settlements*, ed. Jan Klápště (Turnholt: Brepols, 2013), 123-137; Filip Kasl, "Small Feudal Settlements and Their Relation to Mining of Mineral Resources in the West of Bohemia," in *Adel, Burg und Herrschaft an der "Grenze": Österreich und Böhme*, ed. Klaus Birngruber and Christina Schmid, Studien zur Kulturgeschichte von Oberösterreich 34 (Linz: Oberösterreichisches Landesmuseum, 2012), 221-224; M. Romero Tallafigo, "Ordenanzas para la explotación de la plata en el Condado de Prades y Baranía de Entenza (Años 1343-1352)," *Historia. Instituciones. Documentos* 6 (1979): 325-340; Albert Martínez Elcacho, "Las ordenanzas promulgadas en 1352 para explotar la plata en el condado las montañas de Prades y Baranía de Entenza," *Historia. Instituciones. Documentos* 33 (2006): 423-433; Roberto Farinelli, *Le miniere di Rocca San Silvestro nella prima età moderna: Organizzazione produttiva, cultura materiale, tecniche estrattive e metallurgiche nell'impresa di Cosimo I* (Siena: Nuova Immagine Editrice, 2017).
- 25 Marie-Christine Bailly-Maitre, "Les agglomerations minières au moyen âge en Europe occidentale," in *Naissance et développement des villes minières en Europe*, ed. Jean-Pierre Poussou and Alain Lottin (Arras: Artois Presses Université, 2004), 215-226; Boglárka Weisz, "Mining Town Privileges in Angevin Hungary," *Hungarian Historical Review* 2 (2013): 288-312.
- 26 *Stad und Bergbau*, ed. Kaufhold and Reininghaus; Horst Kranz, *Lüttischer Steinkohlenbergbau im Mittelalter* (Herzogenrath: Shaker Verlag, 2000); *Codex Wangianus: I cartulari della Chiesa trentina (secoli XIII-XIV)*, ed. Emanuele Curzel and Gian Maria Varanini, with Donatella Frioli, 2 vols. (Bologna: Il Mulino, 2007), no. 135 (2: 815); Bettina Anzinger, "Die Rechnungsbücher der Bergrichter zu Klausen 1492-1527," *Tiroler Heimat, Jahrbuch für Geschichte und Volkskunde Nord-, Ost- und Südtirols* 77 (2013): 51-72.
- 27 Paul Benoit, *La mine de Pampailly, XVe-XVIIIe siècles: Brussieu, Rhône* (Lyon: D.A.R.A., 1997); Roberto Farinelli and Giovanna Santinucci, ed., *I codici minerari nell'Europa preindustriale: archaeologia e storia* (Florence: All'Insegna del Giglio, 2014); Nicolas Minvielle Larousse, Marie-Christine Bailly-Maitre, and Giovanna Bianchi, ed., *Les métaux précieux en Méditerranée médiévale. Exploitation, transformations, circulations* (Aix: Presses Universitaires de Provence, 2019).

peace, and order that take environments' and communities' specificity into account.²⁸ For instance, a royal ordinance concerning three silver and copper mines near Lyons drafted in the mid-fifteenth century pays special attention to the miners' wellbeing, including their sleeping arrangements and nourishment, and imposes strict bans on blasphemy, theft, bearing arms, and violence, for which workers would be liable to fines, incarceration, and even permanent banishment. Notably, the code reserves a separate rubric for prohibiting the generation of filth (*ordure*) under pain of losing a week's salary or an even more rigorous punishment, justified by the unequivocally Galenic explanation that "the stench and infection (*puantise et infeccion*) caused by such filth create numerous inconveniences to the laborers, operators and other people reliant on these mines."²⁹ Like coeval urban governments and army leaders, governors of mines, too, sought to create disciplined hygienic subjects by defining when matter was out of place.

The quest for order among miners as a guarantor of health and safety was ubiquitous in the period's legislation. In one of the earliest surviving texts on the topic, Frederick, Bishop of Trent, decreed on 19 June 1208 that tunnel openings on the nearby Mount Calisio must be at least ten paces apart, and that miners encountering gas or "wind" (*ventum*) issuing forth from the rock while digging for silver may neither conceal it nor hasten its release, but rather must allow it to escape slowly (*quiete et pacifice illud apertum dimittant*). He also encouraged workers to avoid breaking down overly hard rock or operating near abundant water sources, and forbade them to kindle fire in a mine under pain of 50 lire. Acknowledging the health risks attendant on intra-human tensions, Frederick also prohibited miners from carrying weapons to work under pain of 10 lire and diverting water towards another tunnel under pain of 50 lire.³⁰ In Massa Marittima, a major mining center in Tuscany, ordinances dating to the later thirteenth century elaborated many of the aforementioned measures, specifying among others that each tunnel entrance was to be equipped with a buckled strap, which laborers would use to attach themselves to a rope running along the tunnel walls, enabling them to enter and exit the mine more safely and move safely when darkness suddenly struck.³¹

Mines' materiality thus defined miners' status, health, and safety in diverse ways. In the Forest of Dean, a mining and smelting site in western Gloucestershire, laborers' easy access to local timber appeared in royal statutes attributed to Edward III (1327-1377). While wood was essential for various parts of the mining process, the text explicitly treats its preventative role on a few occasions. For example, it instructs the local constable to supply the community with timber "sufficient to make a Lodge upon their

28 Joel Kaye, *A History of Balance, 1250-1375: The Emergence of a New Model of Equilibrium and Its Impact on Thought* (Cambridge: Cambridge University Press, 2014), 128-240.

29 Siméon Luce, "De l'exploitation des mines et de la condition des ouvriers mineurs en France au XVe siècle," *Revue des questions historiques* 21 (1877): 189-203 at 201 (no. 36).

30 *Codex Wangianus*, ed. Curzel and Varanini, no. 137 (2: 821-825).

31 *Ordinamenta super arte fossarum rameriae et argeneriae civitatis Massae*, ed. Antonio Panella (Florence: Felice Le Monnier, 1938), no. 38 (80): "comunitas fovee habeat et habere debeat ad canape unam corrigiam sive cinghiam amplam et cum fibbia, cum qua quilibet ingrediens cum canape ipsam possit ea cingere, ut securius ingredi valeat foveam et exire." And see *ibid.*, nos. 5, 7, 35, 50-53 (67-68, 68-69, 79-80, 86-87, respectively).

Pitt to keep and to save the Pits and the Mine of the Kings and Miners.” The space, moreover, is to be large enough “that the Miner may stand and cast so far from him Redding and Stones with a Bale, as the manner is,” likely as a way to defend himself from injury and perhaps in recognition of harmful odors and fire hazards (see also below). Health and safety were similarly present concerns in a rubric ordering that each miner “shall have a bold [i.e., safe, strong] place in the which the Miner make and perform the Timber to build the said Pit,” and in a subsequent instruction that “the Pit shall have a Wyneway [wind way, i.e. a surrounding path?] so far from him as is aforesaid pertaining to the said Pit.”³² Mines’ directionality, place and space were thus also shaped by ideas on how to make them more salubrious environments.

Such precautions were widely perceived as pertinent and wise. As another mining code, attributed to Edward IV (1461-1470) and concerning the Forest of Mendipp in Somerset, states, “if any man by means of Misfortune take his death, as by falling of the Earth upon him, by drawing of stifeling, or otherwise, as in time past many have been, the Workmen of the same Occupation are bound to fetch him out of the Earth, and to bring him to Christian Burial at their own costs and charges, although he be forty Fathome under the Earth, as heretofore hath been done, and the Coroner or any officer at large shall not have to do with him in any respect.”³³ It was patent that being buried alive or suffocating underground were professional risks that miners faced. Yet, both behaviorally and materially, legislators tried to prevent such tragic events from becoming full blown crises by building a community around them. A Dutch text from the fifteenth century echoed the approach in stating that deaths underground would be treated by default as accidents unless there was evidence of foul play.³⁴

While such accidents occasionally featured in laws, chronicles, and administrative sources, it is unclear how common they actually were. Nor, as the texts above imply, is their physical evidence likely ever to emerge.³⁵ Yet some paleo-pathological studies of cemeteries directly associated with mining sites help assess communities’ general health. A case in point is the mining village of Rocca San Silvestro in Tuscany, mainly active between the twelfth and fourteenth centuries. The settlement regularly comprised about fifty households and left behind nearly one thousand burial units, only

32 *The Laws and Customs of the Miners in the Forrest of Dean, in the County of Gloucester*, ed. Thomas Houghton (London, 1687), nos. 34, 35 and 38 (pp. 18-19). In the mid-fourteenth century a law concerning the mining region of Jihlava (Iglau) stated that local lords must supply miners with all the wood necessary for their craft, whether it grows locally or not. See Tomaschek, *Das alte Bergrecht von Iglau*, VI, no. 83 (p. 86).

33 *Ancient Laws, Customs and Orders of the Miners in the King's Forrest of Mendipp in the County of Somerset* (London, 1687), no. 10 (pp. 6-7).

34 B.H.D. Hermesdorf, “Opmerkelijke regelingen uit een 15de eeuwse mijnbouw-instructie,” *De maasgouw* 89 (1970): 89-98 at 95.

35 A 1228 text from Languedoc likewise deals with the eventuality of a miner “struck by a sudden death.” See the appendix to Marie-Christine Bailly-Maitre, “Pour une histoire des mines au Moyen Âge: l'exemple des mines de la terre d'Hierle (Gard),” *Archéologie du Midi médiéval* 7 (1989): 61-71 at 70, Part 2, article 2. And see Philippe-Jean Hesse, “Accidents du travail et maladies professionnelles dans les mines (1300-1550),” *Histoire des accidents du travail* 2 (1976): 4-17; Irina Metzler, *A Social History of Disability in the Middle Ages: Cultural Considerations of Physical Impairment* (London: Routledge, 2013), 57-60.

350 of which have been examined to date, and unaided by the most recent analytical techniques. Osteoarchaeological research alongside faunal and botanical surveys, however, suggest that the inhabitants' diet was varied and substantial in contemporaneous terms.³⁶ More detailed information on miners' health emerges from a study of some 170 skeletons from the southeastern French mining town of Brandes-en-Oisans, near present-day Alpe d'Huez in Isère. Local remains, mostly carbon-dated to between the early thirteenth and early fifteenth centuries, yielded a life expectancy at birth of around 30 years, which was typical for the period, and an average height among men of 1.63 meters and 1.50 meters among women, somewhat below coeval averages. Bone measurements alongside other characteristics indicate reasonable nutrition for that period, while evidence of strong muscular and clavicular attachments record a physically demanding life for both men and women. The preponderance of buried fetuses likewise means that birthing mothers' death may have been common occurrence. On the other hand, none of the skeletons contain traces of deformities that can be directly associated with hard labor.³⁷

Instead, it seems that environmental risks above the ground at Brandes were more significant than directly mining-related ones: dangerously high concentrations of lead (up to 5221ppm) and copper (250ppm) in the skeletons and significant traces of lead, zinc, copper, nickel, and silver in the surrounding earth raise the strong possibility of a site made toxic due to processing metals, although the ground's impregnation by these materials over time probably resulted in skeletons becoming further contaminated after their inhumation. At any rate, all residents, including women and children, would have inhaled the fumes of various metallurgical processes, and exposed themselves to additional toxins by consuming animals raised locally, as confirmed by an analysis of coeval goat skeletons from the site.³⁸ That is not to argue that residents were oblivious or apathetic to their plight, even if they understood it in miasmatic rather than biochemical terms.³⁹ The location of two industrial quarters away from the main habitation area suggests that the community sought to reduce pollution by detaching miasma-inducing activities, a form of preventative micro-zoning familiar from numerous urban sites and military manuals from that period.

Skeletal evidence for miners' balanced nutrition in one site receives confirmation from fiscal accounts elsewhere in France. For three years in the mid-fifteenth century, the owner of three mines near Lyons recorded the purchase of ample wheat and rye flour for making high-quality bread, and the consumption of 6,000-8,000 cups (*bichets*) of white and red wine (the equivalent of 1.2-1.6 tons), 46 oxen, 21 cows, 204 sheep, 26

36 Riccardo Francovich and Kathy Gruspier, "Relating Cemetery Studies to Regional Survey Rocca San Silvestro: A Case Study," in *Reconstructing Past Population Trends in Mediterranean Europe (3000 BC - AD 1800)*, ed. John Bintliff and Kostas Sbonias (Oxford: Oxbow, 1999), 249-257. See also Riccardo Francovich and Roberto Parenti, ed., *Rocca San Silvestro e Campiglia. Prime indagini archaologiche* (Florence: All'Insegna del Giglio, 1987).

37 Marie-Christine Bailly-Maitre and Joëlle Bruno-Dupraz, *Brandes-en-Oisans. La mine d'argent des Dauphins (XIIe-XIVe siècles)*, Isère (Lyons: Alpara, 1994), 105-152.

38 Ibid.

39 Georgius Agricola, *De re metallica*, Book VI, trans. Herbert Clark Hoover and Lou Henry Hoover (New York: Dover, 1950), 214-218.

pigs, and 16 salted pigs. He furthermore paid for 155 pounds of eggs and cheese, 120 pounds of fresh and salted fish, 22 pounds of garlic, onions, and horseradish, and 9 pounds of spices, figs, nuts, raisins, verjuice, and vinegar.⁴⁰ These fed (and thus medicated) groups never comprised more than a few dozen men, who also enjoyed material benefits such as fairly comfortable beds and bedding. They earned handsome salaries and had access to fresh produce from cultivated fields and vineyards and fresh river water. Lastly, they were attended to by physicians and priests regularly and at the owner's expense.⁴¹ Notably, when the mines were confiscated from their original owner by the French king in 1455, the royal executor stressed that the new overseer must reduce the impact of drought or famine, by accumulating sufficient supplies well in advance and storing them in a safe place.⁴² He also had to employ diligent and loyal bakers, cooks, and suppliers for the miners' hostel and ensure that the men be provided with bread, wine, meat, fish, and other necessities seasonally (*par saison*).⁴³ The latter comment, in combination with the same text's concern for the effects of filth on health, suggests a modicum of awareness to Galenic theory or at the very least its indirect influence.

Archaeological remains confirm miners' investment in preventative health and safety measures below the ground as well, including water drainage systems, regular ventilation shafts, nooks for lamps at regular intervals, and—as the legal sources above attest—ample timber support along the galleries.⁴⁴ Abandoned shafts as well as new entrances were another source of danger that miners sought to fight, adopting a policy of clear communications. A code from early thirteenth-century Languedoc, probably based on a still earlier text, stresses the importance of declaring the beginning or ending of works on a gallery or shaft by publicizing the fact in the local church.⁴⁵ Textual as well as pictorial evidence, including depictions of miners' patron saints (see below), manuscript illuminations associated with the central Bohemian mines of Kutná Hora, illustrated copies of physician and mining expert Georg Agricola's *De re metallica* (1556), and the *Schwazer Bergbuch* (1561), establish the expectation that miners wore protective gear: tall boots or leggings, canvas pants, leather aprons to protect their chests and backs, wide-rimmed hats, and hard leather gloves. Individual cushions and padding attached to laborers' pants provided some relief to their knees and behinds.⁴⁶

40 Luce, "De l'exploitation des mines," 193.

41 *Ibid.*, 193-194.

42 *Ibid.*, appendix, no. 13, 198.

43 *Ibid.*, appendix, nos. 10-11, 197.

44 Marie-Christine Bailly-Maitre, "L'eau et les mines au Moyen Âge: enemies et alliées," in *Water Management in Medieval Rural Economy*, ed. Jan Klápště (Prague: Institute of Archaeology, Academy of Sciences of the Czech Republic, 2005), 24-33; Bailly-Maitre, "Pour une histoire des mines au Moyen Âge."

45 Appendix to Bailly-Maitre, "Pour une histoire des mines au Moyen Âge," 71, Part 3, article 4.

46 Hesse, "Accidents du travail et maladies professionnelles"; Jean-Pierre Leguay, "Accidents du travail et maladies professionnelles au moyen age," *L'information historique* 43 (1981): 223-233 at 229-230; Bailly-Maitre, *L'argent*, 169. See also the richly illustrated collection by Farinelli and Santinucci, *I codici minerari nell'Europa preindustriale*; and Milada Studničková, et al., *Kutnohorská iluminace* (Kutná Hora: GASK, 2010).

It should come as little surprise that the same southern French text names the local church as a center of communications among miners, including for the promotion of work safety. The Christian piety of European miners and their families was a quintessential form of preindustrial prophylactics, a sort of preventative spiritual diet shared by tens of millions of Christians across Europe.⁴⁷ A tale from Cantal, in the French Massif Central, recounts how three miners, described as good Christians, used to start their workdays with prayers, until one day, they neglected the practice and were buried alive in an avalanche. They immediately resumed their prayers, however, and were soon visited by a spirit which, by touching their lamp and morsel of bread, provided them with oil and food for seven years, until their miraculous release.⁴⁸ The Catholic church itself was never far from rural miners. Priests appeared regularly on the fifteenth-century Lyons payroll discussed above alongside physicians. Crosses were common markers of tunnel entrances and appeared as such in the *Schwazer Bergbuch*.⁴⁹ The Brandes cemetery bears witness to that community's conformity to simple but decidedly Christian last rites, with cadavers placed in a west-east orientation, crossed arms, and a chapel dedicated to St. Nicholas, a protector of mining communities in France and Germany.⁵⁰ Elsewhere miners sought to defend themselves by cultivating unique relationships with other patron saints associated with their profession, including St. Anne, whose womb was "mined" for the silver of Mary and the gold of Christ; St. Barbara, patron saint of explosives and all forms of sudden death; St. Kinga (Cunegond), renowned in Poland for her defense of salt miners; and St. Piran of Cornwall, whose particular affection for tin miners was surmised when tin smelted from his hearthstone to form a cross.⁵¹

As they emerge from diverse written and material sources, then, miners' experiences and environments were shaped by the specific risks they faced as a community, including the precautions designed to mitigate them above and below the ground. Assessing the latter's success, as measured in terms of attraction, retention, productivity, and health of miners, certainly requires further investigation. Yet the attention given to preventative health measures in European mines seems to have been regular and substantial, and relied at least in part on Galenic or humoral principles.

- 47 Rawcliffe, *Urban Bodies*; Peregrine Horden, "Ritual and Public Health in the Early Medieval City," in *Body and City: Histories of Urban Public Health*, ed. Sally Sheard and Helen Power (New York: Routledge, 2000), 17-40.
- 48 Sébillot, *Les travaux publics et les mines*, 558-559.
- 49 Roberto Farinelli, "Dall'Erzgebirge alla Toscana di Cosimo di Medici: il lavoro minerario e metallurgico secondo 'Le ordine et statuti [. . .] sopra le cave et meneri' del 1548," in *I codici minerari nell'Europa preindustriale*, ed. Farinelli and Santinucci, 83-112 at 95, 98 and 102 (figs. 16, 17, 19 and 20). And see *Ordinamenta super arte fossarum*, no. 1 (65).
- 50 Bailly-Maitre, *L'argent*, 160-165.
- 51 Jean-Paul Drolet, *Sancta Barbara, Patron Saint of Miners: An Account Drawn from Popular Traditions* (Québec: J.-P. Drolet, 1990); Gordan Bedeković, "The Legend of Saint Kinga—Patroness of Krakow Miners," *Rudarsko-geološko-naftni zbornik* 30 (2015): 133-134; Eileen Carter, *In the Shadow of Saint Piran, AD 500-2000: The History of the Saint and his Foundations at Perranzabuloe* (Wadebridge: Lodenek, 2001), 2-3, 11. In 2010, the rescue mission of the miners trapped in Copiapó, Chile, was formally named *Operación San Lorenzo* in honor of yet another patron saint of the profession: <https://www.anepe.cl/recordando-la-operacion-san-lorenzo-un-rescate-a-la-chilena/>.

SHIPS AND SHIPMATES

Being both a highway and a trove of nutriment, the sea in preindustrial times was a site of fear, marvel, and bounty.⁵² The risks upon the water were certainly manifold. Fishermen knew all too well that over the calm of sea hung the threat of storm winds and death by drowning. Merchants and privateers peered at the horizon scanning for predatory pirates. Mariners on larger galleys plying long-distance routes dealt with the dangers of malnutrition and scarcity of fresh drinking water, poor sanitation and cramped living spaces, rats, lice, fleas, and cockroaches. On board, outbreaks of dysentery, typhoid, and plague were a serious concern.⁵³ Port towns might equally be shunned for fear of contracting disease there.⁵⁴ Travel also meant passing by sites considered to be hazardous because of climatic conditions. For instance, shipmates approaching Gascon and Iberian ports risked contracting a disease now identified as malaria, transmitted by *Anopheles* mosquitoes.⁵⁵

Responses to the perils and benefits of maritime travel generated an array of preventative programmes, regulations, and technologies to manage health and safety risks and to facilitate cooperation in moments of crisis such as perilous storms, attacks, or even shipwreck. From antiquity, navigating the risks that came with farming and traversing the waters—marine and river networks were of huge significance to the food industry, trade, services, and the military—led to the production of health regimens, in Greek, Arabic, Hebrew, Latin, and later the vernacular languages, for merchants, well-to-do travellers, and naval fleets.⁵⁶ Marine communities from early on invested in the presence of medical practitioners, aided by assistants, who formed part of the standard crew onboard ships in Rome, Byzantium, and later for European admiralty and merchants.⁵⁷ The challenges of travel by water inspired technologies such as the filtration of salt water using sand, the disinfection of contaminated water by adding vinegar or wine, the treatment of seasickness by drinking salt water, and the construction of suspended lavatories for the more efficient disposal of faeces. In that sense, the ship's space regularly served as a catalyst and testing ground for preventative health programs, and

52 Jean Delumeau, *La peur* (Paris: Desclée De Brouwer, 1979), 21-42.

53 Plague, for instance, broke out on the vessel carrying Jacques le Saige back to Europe from Palestine in 1518: *Voyage de Jacques Le Saige, de Douai à Rome, Notre-Dame-de-Lorette, Venise, Jérusalem et autres saints lieux*, ed. H.-R. Duthilloeuil (Douai, 1851), 145-147.

54 As did the ship carrying Louis de Rochechoart, skipping the ports in Corfu and Modon. See Benjamin Arbel, "Daily Life on Board Venetian Ships: The Evidence of Renaissance Travelogues and Diaries," in *Rapporti mediterranei pratiche documentarie, presenze Veneziane: Le reti economiche e culturali (XIV-XVI secolo)*, ed. Gherardo Ortalli and Alessio Sopraca (Venice: Istituto Veneto di Scienze, 2017), 183-220 at 206-207.

55 Robin Ward, *The World of the Medieval Shipmaster: Law, Business and the Sea, c. 1350-c. 1450* (Woodbridge: Boydell & Brewer, 2009), 116.

56 Michel Mollat, *La vie quotidienne des gens de mer en Atlantique IXe-XVIIe siècle* (Paris: Hachette, 1983), 91; Lluís Cifuentes, "La medicina medieval i els viatges per mar," *Mot, So, Razo* 3 (2004): 35-44.

57 G.-M. Fleischer, "Seereise mit Uringlas und Speikübel – Reiseumstände und Medizinisches von Kreuzzug und Pilgerfahrt ins Heilige Land," *Zentralblatt für Chirurgie* 137 (2012): 587-591 at 590; Jacob Seide, "Doctors and Naturalists as Pilgrims and Travellers to the Holy Land," *Janus. Revue internationale de l'histoire des sciences, de la médecine, de la pharmacie et de la technique* 48 (1959): 53-61.

knowledge of best practices was avidly consumed, passed on and adapted through texts and oral transmission.

Marine health interventions catered to huge cohorts of the work force, who could at times congregate in sizable groups with attendant health risks. Whereas the standard fourteenth-century 100-ton vessel was handled by a crew of about thirty men, a three-deck ship could house over a thousand workers. Particularly the galleys used as trading vessels and the preferred warship in naval warfare well into the sixteenth century, propelled by rowers of professional oarsmen and later slaves and convicts, relied on large crews. Fleet sizes, too, could be formidable. In 1343, the Crown of Aragon maintained 32 galleys at sea. At the largest naval battle of the era, that of Lepanto in 1571, the Holy League and the Ottoman Empire each mobilized over 200 galley ships.⁵⁸ On aggregate, on large naval and merchant ships the expansion of tonnage, ship size, crew members, and fleet numbers meant that life on board became more crowded for more seafarers in the fifteenth and sixteenth centuries. Nonetheless, sailing ships such as cogs, *naus* or *nefs*, which relied on smaller work forces, slowly began to replace oar-powered galleys in the fifteenth century.

The surgeons and ship masters on board would have focused almost exclusively on maintaining the bodily health of men. Indeed, to an even greater extent than the community of miners, marine and merchant seafaring was a man's world.⁵⁹ An exception were the female pilgrims and crusaders travelling from Venice or Genoa to Palestine, but these were a minority in numbers and social status.⁶⁰ Financial accounts from the late fourteenth century show the average age of the eighty crew members on the Dartmouth ships to be thirty; they were of average height, and mostly originating from the local countryside.⁶¹ Within the seafarer's community, however, socio-economic diversity was significant. Fishermen were often seasonal workers organized in family enterprises. Privateering and naval fleets in wartime attracted experienced crew of merchant vessels or fishermen, as well as local artisans seeking temporary employment. In the course of the sixteenth century, professional oarsmen were increasingly replaced by forced labourers, convicts, and slaves.⁶²

58 Susan Rose, "Islam Versus Christendom: The Naval Dimension, 1000-1600," *Journal of Military History* 63 (1999): 561-578 at 566. The Catalan naval ordinances issued in 1354 stipulate that the crew of a galley numbered a more moderate 223 men. John A. Robson, "The Catalan Fleet and Moorish Sea-power (1337-1344)," *English Historical Review* 74 (1959): 386-408 at 392; Maryanne Kowaleski, "Working at Sea: Maritime Recruitment and Renumeration in Medieval England," in *Ricchezza del mare. Ricchezza dal mare secc. XIII-XVIII: atti della "Trentasettesima Settimana di Studi" 11-15 aprile 2015*, ed. Simonetta Cavaciocchi (Florence: Le Monnier, 2006), 907-936 at 908-909.

59 As skeletal analysis of the sixteenth-century naval shipwreck the *Mary Rose* confirms. Ann Stirland, "The Men of the *Mary Rose*," in *The Social History of English Seamen, 1485-1649*, ed. Cheryl A. Fury (Woodbridge: Boydell & Brewer, 2012), 47-74 at 54.

60 Fleischer, "Seereise mit Uringlas," 587.

61 Ward, *World of the Medieval Shipmaster*, 101.

62 Louis Sicking, "Naval Warfare in Europe, c. 1330-c. 1680," in *European Warfare, 1350-1750*, ed. Frank Tallett and D.J.B. Trim (Cambridge: Cambridge University Press, 2010), 236-263 at 242; Loades, "The English Maritime Community," 9-10; Louis Sicking, *Neptune and the Netherlands: State, Economy, and War at Sea in the Renaissance* (Leiden: Brill, 2004), 395; Kowaleski, "Working at Sea," 916-917; Mollat, *La vie quotidienne*, 82, 91.

What kind of medical knowledge applied to seafarers on the water, and to what extent was it prophylactic? First and foremost, on larger vessels, life on board was overseen by the shipmaster, assisted by a small army of professionals including surgeons and barbers who tended to wounds contracted as a result of accidents, saltwater rash, and fungal or other infections.⁶³ Indirectly these curative efforts might easily slip into the preventative, certainly when attention shifted to the risk of infectious disease transmission and the wish to reduce vulnerability to ill-health connected to maritime travel. Indeed, securing fresh water and food supplies for the entire crew of larger vessels was of paramount concern to ship masters, as the maintenance of crew members' health was a prerequisite for sustaining a ship's speed, and outbreaks of infectious disease within the confined space of the ship was a disaster to be avoided. Ship masters, who were literate, might thereby consult or absorb in the context of their guild training, the advice given in regimens for seafarers and armies, as wealthy travellers by sea certainly did. The prophylactic programs in the regimens and the frequently reissued ordinances used in practice relied heavily on medical insights drawn from Galenic texts and the application of the non-naturals, focusing mostly on diet, sanitation, and noxious fumes; the availability of protective clothing for seafarers that kept out the cold or heat; the regulation of the passions; and exercise, music and dance to raise the spirits and keep up levels of fitness of the travellers (and later of the enslaved).⁶⁴ Galenic medicine was in this context considered pertinent because of the proximity of seafarers to water—one of the four elements—and the mobility of travellers, although in post-Roman and Hellenistic medicine travel as a form of therapeutics was not commonly practiced.⁶⁵

To manage the health risks attendant on seafarers, certainly the more privileged naval, merchant, and pilgrim travellers could consult vernacular travel advice literature that became available from the thirteenth century, going back to the Hippocratic school and set in a long tradition of medicine harking back to the Greek physician Oribasius's fourth-century regimen for seafarers, Arabic, and Latin manuals.⁶⁶ Some of these regimens were dedicated to an elite audience; all of them were compiled for men. Although past scholarship has debated whether these texts were armchair manuals for travellers of the imagination, in fact they probably informed and reflected social practice as well. One report attests that travel guides were sold at the Franciscan monastery of San Francesco della Vigna in Venice to affluent pilgrims, diplomats, magistrates, and

63 Ward, *World of the Medieval Shipmaster*, 116; Sicking, *Neptune and the Netherlands*, 400-402. Treatment was often continued on land, as the financial accounts of the admiralty in Veere in Zeeland detail. Zeeuws Archief, GIDS101 Admiraliteit in Zeeland 2. (Tresorier-) Ontvanger-Generaal van Zeeland, administratie 'te water', 1586-1609, 2.3; Jacob Valcke, 1591-1603, 6150-6152 2e rekening met acquitten over 1591 juli 1-1591.

64 Arbel, "Daily Life on Board Venetian Ships," 212; Fury, "Health and Health Care at Sea," 212-213.

65 Horden, "Regimen and Travel in the Mediterranean," 122.

66 The seminal study on travel regimens and health is Karl Sudhoff's "Ärztliche Regimina für Land- und Seereisen aus dem 15. Jahrhundert," *Archiv für Geschichte der Medizin* 4 (1910): 263-281. See also Laura Esposito, "Il 'De regimine et via itineris et fine peregrinantium' di Adamo da Cremona e la pratica della flebotomia," in *Studi in onore di Guglielmo de' Giovanni-Centelles*, ed. Errico Cuozzo (Salerno: SISAUS, 2010), 125-165.

merchants embarking on ships to Palestine, a journey that took between four to eight weeks.⁶⁷ In addition, mobile “self-helpers,” as Peregrine Horden put it, would have applied some of the knowledge picked up along the way by word of mouth.⁶⁸ That the advice in manuals was acted upon is revealed in the plethora of travel diaries produced from the fifteenth century onward. One example is the medical advice accompanying Rumold De Doppere’s adaptation made in 1491 in Bruges of Anselme’s and Jan Adornes’s account of their journey to Palestine in 1471-1472. Besides suggestions about the victuals and accoutrements to be taken on board the preferably sturdy ship (good wine, eggs, chicken, sweets and biscuits, sugar and spices, matrasses, beds, sheets, pillows, covers, and good woollen clothes to protect against the cold of night, chilled feet, head, and breast; wax candles, and a skilled interpreter), the text focuses mostly on digestion. Travellers should restrict the time spent on board, as long stretches resulted in a hardened and distemperate stomach. Rhubarb and laxative pills of *alfangien* (that were available at the local apothecary), as well as cositive medicine to battle loose bowels in the heat, were ordered to avoid risking one’s life. Wine purchased *en route* should be drunk with caution, the manual avers, and mixed with water, because it was likely to be much stronger than in Flanders.⁶⁹ In these manuals, it is again difficult to separate the prophylactic from the curative, especially where diet is concerned. The intake of food was considered to help sustain energy levels, but was also grounded in the field of pharmacology, stretching to drinking wine and cider and consuming arrowroot, sugar, oil, nuts, raisins, and preserves.⁷⁰ Almonds, according to the prophylactic advice attached to De Doppere’s travel account, would help alleviate dysentery, but eating too many grapes heightened its risk.⁷¹ A lack of clothing could also cause sickness, wet and thin clothes upsetting the humours. A typical maritime condition—seasickness—could be mitigated by avoiding overeating, especially on the first day of travel.

For those well-to-do travellers not nauseated by the ship’s sway, there was the daily nourishment of soup, beer and biscuits, butter and cheese, salt, and fresh meat and fish (salmon, eel, cod, and herring).⁷² Beans, barley, peas, mustard, vinegar, onions, garlic,

67 A. Bernecker, *In Gottes Namen fahren wir: Die Pilgerfahrten des Landgrafen Wilhelm des Älteren von Hessen in das heilige Land* (Melsungen: Heimatschollen-Verlag, 1925); Fleischer, “Seereise mit Uringlas,” 589.

68 Horden, “Regimen and Travel,” 119, 121, 126.

69 “Dit es tregement van hu zelve ende van wat dat ghij zult doen als ghij zult commen te Venegen om te vaerne te Jherusalem upde galeyen vanden pelgrims,” Brugge, OCMW Archief, Reg. 1, “Handschrift De Doppere,” 54r-56v.

70 Fury, “Health and Health Care at Sea,” 223.

71 “Item wacht hu van te vele druven thetene, want ghij zouter lichtelike of ghecrighen den zochten lichame, twelke zeere zoorghelic es. Want als ghij der den zochten lichame ghecricht, het bediet rechte voort troode menezoen; ende daer omme doet men hu nemen houde amandelen, want tes de medecine daer tjeghens. Want wilt ghij druven heten, cnutse met broodt, alzo ne zullen zij hu niet deeren noch quaet doen.” From “Dit es tregement van hu zelve ende van wat dat ghij zult doen als ghij zult commen te Venegen om te vaerne te Jherusalem upde galeyen vanden pelgrims,” Brugge, OCMW Archief, Reg. 1, “Handschrift De Doppere,” 56r-57v.

72 Mollat, *La vie quotidienne*, 145-146; Arbel, “Daily Life on Board Venetian Ships,” 198.

and rye bread also featured in financial accounts recording ships' provisions.⁷³ To an extent, the crew members' diet would have depended on social distinction, with shipmasters and officers more likely to consume wine. The late twelfth-century codification of maritime customs known as the Rolls of Oléron, from which southern French, Flemish, German, Castilian, and Anglo-Norman maritime laws later emerged, stipulated that crew members must have a drink of wine or beer and one hot meal a day at 10 a.m. in places where grapes grow, and two hot meals a day in places where only water was available, presumably to supplement energy levels. An extra meal, consumed between 4 and 6 p.m., consisted of bread, salt or smoked fish, or salt-cured beef.⁷⁴ Wealthier passengers and pilgrims would have brought their own supplies. Conrad Grünenberg from Constance, for instance, in the fifteenth century packed bread, biscuits, lard, cheese, eggs, ham, dried pike, smoked tongue, wine, salt, chicken, flour and barley, spices, sugar, green ginger, theriac, vinegar, and fragrances for medicinal purposes.⁷⁵ Jewish travellers might secure their own victuals in accordance with dietary restrictions, as did the anonymous seafarer who in Corfu purchased extra cheese, grapes, and apricots.⁷⁶

The diet of galley oarsmen and crew workers dwelling mostly below deck would have been far more basic, consisting of a staple diet of biscuit, water, and beer, and perhaps some meat consumed three times a week and supplemented with fish.⁷⁷ Nonetheless, the seafarer's diet was usually richer than on land, where workmen were more likely to suffer from malnutrition.⁷⁸ This is corroborated by skeletal analysis of the sixteenth-century carrack (sailing) war ship *Mary Rose*, revealing some evidence of a lack of vitamin D, but mainly traces of malnutrition probably experienced in youth.⁷⁹

The bias of the sources makes it difficult to gauge the extent to which the ordinary crew members had any direct knowledge of the medical theories underlying health practices on board. However, if not theoretically framed, practical knowledge of the significance of diet and physical condition that dovetailed with Galenic theory seems likely. A main challenge for all men travelling on board was avoiding corrupt food and securing access to clean, fresh drinking water, which on larger vessels was the responsibility of the ship master. Bilge water was to be bypassed at all costs. The scarcity of water led to the development of technologies for water management, including the

73 See also J. van Beylen, *Schepen van de Nederlanden Van de late middeleeuwen tot het einde van de 17e eeuw* (Amsterdam: Van Kempen, 1970).

74 David Loades, "The English Maritime Community, 1500-1650," in *Social History of English Seamen*, 5-26 at 7; Ward, *World of the Medieval Shipmaster*, 20, 118.

75 Konrad Grünenbergs *Pilgerreise ins Heilige Land 1486: Untersuchung, Edition und Kommentar*, ed. Andrea Denke (Köln, Weimar: Böhlau Verlag, 2011), 283-291; Fleischer, "Seereise mit Uringlas," 587.

76 Adolf Neubauer, ed., "Ein anonymer Reisebrief von Jahre 1495," *Jahrbuch für die Geschichte der Juden und des Judenthums* 3 (1863): 271-302 at 285.

77 Sicking, *Neptune and the Netherlands*, 403 and note 193.

78 Fury, "Health and Health Care at Sea," 195.

79 Stirland, "The Men of the *Mary Rose*," 57. There is no evidence of leprosy or syphilis. See also Simon Mays, "Human Remains in Marine Archaeology," *Environmental Archaeology* 13 (2008): 123-133.

straining of water by using sand.⁸⁰ Another solution was to mix water with garlic, onions, or vinegar.⁸¹ The fourteenth-century physician Maynus de Mayneris considered drinking sea water with wine to be acceptable.⁸² Some of these strategies were taken from ancient texts: using sea water as a purgative was advised by the ancient Greek physician Dieuches. In De Doppere's fifteenth-century travel account, the thirsty pilgrims took to adding sugar to the dirty, black, insect-infested water used for watering the camels, adhering to the medical advice in the travel regimen attached to the travel report.⁸³

To avoid corrupt foods, ship provisions preferred turnips, beets, and onions that kept for a long period of time, as did dried meat. Live animals, such as chickens, pigs, and mutton, were carried on board for fresh meat, along with cats for chasing the mice and rats, parrots, presumably for entertainment, and horses, donkeys, and mules for transport and warfare.⁸⁴ Analysis of the skeletal remains from the Aber Wrac'h fifteenth-century clinker wreck, probably coming from the kitchen area, reveals an array of rat, rabbit, bird, mutton, and goat bones.⁸⁵ Nonetheless, numerous sources complained about maggots infesting the biscuits.

Besides a lack of fresh food and water, all crew members contended with the perceived dangers of bad air, the alleged cause of dysentery and other diseases. Critically, bad air was thought not only to arise from corrupt matter, stench, and poor sanitation, but was also the product of changing climate and environment to which the mobile seafarers were readily exposed, such as the bad airs and dangerous winds of Cyprus.⁸⁶ Accordingly, travel in the confined space of the ship over a period of time meant maintaining a delicate balance between the necessity of the intake of protein and the dangers of bad air caused by the corruption of meat or fish. The traveller Conrad Grünenberg was lost for words to describe the stench, flies, worms, mice, rats, beetles, and grubs attracted by the rotten fish, meat, and flour. His grim account relates how pilgrims who contracted dysentery lay in the bilges and released their bowels into the sand.⁸⁷ In particular those dwelling on the lower decks, the oarsmen and ordinary seaman, would accordingly have been subjected to terrible stench—allegedly, galley ships could be detected from miles off!

Although fourteenth-century cargo ships often were not fitted with separate living accommodations for crew members, some form of shelter was provided, certainly on

80 Hans Schadewaldt, "Die Wasserversorgung an Bord. Eine medizinhistorische Studie," *Gesnerus: Vierteljahrsschrift für Geschichte der Medizin und der Naturwissenschaften* 20 (1963): 47-89; Fleischer, "Seereise mit Uringlas," 588.

81 Fury, "Health and Health Care at Sea," 200.

82 Horden, "Regimen and Travel," 125, 128.

83 "Voyage d'Anselme Adornes au mont Sināi ets à Jérusalem en 1470, d'après un manuscrit de Romboudt de Doppere," ed. E. Feys, *Annales de la Société d'Emulation* 41 (1891): 135-222 at 166 and 218.

84 Arbel, "Daily Life on Board Venetian Ships," 201-202.

85 Philippe Migaud, "A First Approach to Links between Animals and Life on Board Sailing Vessels (1500-1800)," *International Journal of Nautical Archaeology* 40 (2011): 283-292; Michel l'Hour and Philippe Migaud, "Reflet d'un aspect de la vie du bord: Étude préliminaire des restes osseux de l'épave de l'Aber Wrac'h (Finistère, xv^e s.)," *Anthropozoologica* 12 (1990): 3-12.

86 "Voyage," ed. Feys, 196.

87 *Konrad Grünenbergs Pilgerreise ins Heilige Land 1486*, ed. Denke, 284-285. Fleas, lice, gnats, worms, and foul vapours pestered the travellers according to Fabri, *Evagatorium* I, 138.

expeditions to the colder north. Most men, however, slept either on deck or in the hold. Self-catering merchants probably enjoyed better conditions, dwelling in a cabin and provided with water, salt, firewood, and lamps. Paying passengers and officers usually sheltered in the stern castle, below quarter deck, or in the back part of the ship. Temporary cabins for the well-to-do were equipped with utensils, pottery, linen, candles, and wax torches. Most crew members who were not subjected to forced labor would have owned a mattress, a waterproofed bed cover and a quilt, and a small box for their possessions.⁸⁸ Fishermen probably shared beds.⁸⁹ Gilbert Anglicus advised the wealthier travellers to check the bed linen before crawling under the blankets, and oils and quicksilver were recommended to combat lice. Archaeological reports from the *Mary Rose* war ship wreckage mention combs and ear-scoops.⁹⁰

Up to the fifteenth century, faeces were generally disposed using waste buckets or containers. This was an older practice; for instance, in 949, a fleet of Byzantine dromons ordered 1000 waste buckets, each serving approximately four men, the standard size of a crew sub-unit. However, while weather conditions encouraged shipbuilders from the fourteenth century to create more layers of decking, these caused new sanitary problems: there was a decrease in the flow of air, of light on lower decks, and a rise in levels of humidity, with layers of filth accumulating in the hold and bilges below. New layers of decking meant that crew members dwelled on top of one another and drainage was not always efficient. In bad weather, crew members might discharge the bladder or bowels directly in the hull, where the residue transformed into organic compost because of the humidity. The pumps working on leaking ships raised the dirt to the upper decks, where it was discharged via the scuppers.⁹¹ Eugenio Salazar in 1573 described the hull water as “unfit for tongue and palate to taste, or nostrils to smell, or even eyes to see, for it comes out bubbling like Hell and stinking like the Devil,” and compared it to rivers of turbid filth. The cavernous insides of the ship were “closed-in, dark and evil smelling,” like burial vaults or charnel houses.⁹² Significantly, vessels also caused corruption and stench on the shores and in the ports where urban communities dwelled. A ship might be rummaged on the beach, which meant scraping clean the insides, removing the ballast, spraying the insides with vinegar and replacing the stones, sand, or shingles. In the Maerlantse port in the town of Den Briel, regulations were accordingly issued in the fifteenth century not to release the ballast in the port because of the pollution it created in the city.⁹³

To extenuate these sanitary issues, new technologies were developed in the fifteenth century. External lavatories were erected by building platforms at the bow and stern, in some cases projected over gratings which also served a military purpose to drop hot

88 Ward, *World of the Medieval Shipmaster*, 113-117.

89 Mollat, *La vie quotidienne*, 147.

90 Fury, “Health and Health Care at Sea,” 214-215.

91 Joe John Simmons, “The Development of External Sanitary Facilities Aboard Ships of the Fifteenth to Nineteenth Centuries,” unpubl. master thesis (Texas A&M University, 1985), 2-12.

92 Quoted in John H. Parry, *The European Reconnaissance: Selected Documents* (London: Palgrave Macmillan, 1968), 351; Simmons, “The Development of External Sanitary Facilities,” 12-13.

93 *De middeleeuwse keuren der stad Brielle*, ed. H. de Jager (The Hague: Martinus Nijhoff, 1901), 113.

liquids through. Steeptubs (wooden barrels used for the humidification and desalinization of salted meats) might also serve the purpose. According to Joe Simmons, the men usually faced outboard while crawling into open, semi-circular sanitary boxes hung overboard on portside or starboard, with a hole beneath their feet, which perhaps offered them a small sense of privacy. Wooden garderobes, modelled upon castle architecture, were pierced on three sides to let in the light and ventilation. Again, these also served a military purpose as look-out posts.⁹⁴ However, the external lavatories possibly serviced only a fraction of the ship's crew.

To attract recruits, naval fleets, like mine owners, needed to provide for the security and health of its crew at a group and individual level. Workers' protection for crew members not subject to forced labor was organized in case the ship foundered, in which case the costs for the journey home were reimbursed, and in general there was a commitment to pay crew members' wages regardless of the financial outcome of an expedition.⁹⁵ Remuneration of the wounded and ill was expected to be continued until a naval expedition had reached its end, and compensation offered for medical expenses, which next of kin received in the case the crew member died. Often, the wounded and sick were taken care of on land in port cities. The Rolls of Oléron instruct that the wounded and sick are to be supplied with food and light and be cared for by a ship's boy or a woman.⁹⁶ Most of the injuries sustained on board were usually caused by drunkenness and falling asleep on watch. Significantly, analysis of the skeletal remains of the *Mary Rose* war ship reveals surprisingly few fractures of the bone among crew members, although some avulsion fractures were identified, possibly caused by jumping or falling on an unstable surface.⁹⁷

Anticipating moments of crisis, prophylactic regulations were also drawn up to avoid conflict in emergencies. To this end there was a distinct hierarchy on board, which was visualized and performed through the seating arrangements at the communal dining table. The shipmaster, responsible for the hiring of crewmembers, was their judge and disciplinarian, meting out punishment in accordance with the scale of offences.⁹⁸ These might include denigration of the shipmaster or another crew member at sea; undressing on board; and sleeping ashore or leaving the ship without permission. In the case of a conflict, the shipmaster removed the *towaile*, the cloth at the mess table, from in front of the wrongdoer, thus visually marking the cutting back on rations or another form of exclusion for a set period. However, crewmembers could defend themselves against the shipmaster if the latter struck them more than once.⁹⁹ Other regulations also aimed to ensure that relations remained harmonious in moments of

94 Simmons, "The Development of External Sanitary Facilities," 15-43.

95 Ward, *World of the Medieval Shipmaster*, 107.

96 *Ibid.*, 193.

97 Stirland, "The Men of the Mary Rose," 62.

98 Sicking, *Neptune and the Netherlands*, 397; Kowaleski, "Working at Sea," 922-928.

99 Ward, *World of the Medieval Shipmaster*, 105-106. On land, the treatment of crew members taken prisoner in warfare is detailed in a sixteenth-century prison regulation from Veere. Victuals included daily bread, potage as soup for the sick, and beer. In addition, water should be provided every day to wash; and a broom to clean the cell and remove dirt via the small window. Zeeuws archief, Admiraliteit te Veere, 1460-1562, "Regelement voor de gevangenis van de admiraliteit," 246, 6.

crisis. In case of jettison, those who had sacrificed their goods to save the ship shared the value of the remaining goods according to the principle known as “general average.”¹⁰⁰ Crew portages were exempted from being thrown overboard in the Rolls of Oléron, as were, in a Letter Patent of Edward I of 1285, the crew’s own belongings, food, and cooking utensils.¹⁰¹

Ashore, formal organizations for seamen engaged in merchant shipping looked after the general welfare of their members. In Bruges, for instance, a guild ordinance dating to 1415 arranged for the care of elderly, vulnerable seafarers.¹⁰² Guilds were established in the north from the fourteenth century and corporations sprang up in the North Sea and Baltic region, as did ubiquitous fraternities everywhere. By the sixteenth century, the guilds had transformed into confederations of ship masters. In the course of the seventeenth century, *Monti de marinari et pescatori* were founded, insurance boxes to supply relief, dowries, ransom, and subsistence money for those who could not pay their debts. The Hamburg Schiffer-Gesellschaft established a hospital for seafarers, as did the guilds in Danzig and Venice.¹⁰³

Finally, prophylactic measures in the seafarer’s community tended as much to spiritual health as they did to physical wellbeing. In this, the men of sea were no different to the men working underground. Religious devotion was highly organized in confraternities dedicated to Saint Nicholas, Peter, Julian, and Catherine. In times of need, Saint Erasmus/Elmo might be a flickering light in the darkness, as for instance when he was called upon by Henry Walter, a mariner suffering from a life-threatening stomach wound who had been abandoned by his crewmates because of the stench of his wounds.¹⁰⁴ Many local saints served on the coast to protect against the dangers of sea crossings. On larger vessels, seafarers took care to ensure that religious services were continued, holding “dry mass” at daybreak in which the host was not consecrated (for fear it might be dropped or, according to the pilgrim Felix Fabri, vomited by the priest).¹⁰⁵ Services could be held up to three times a day. Ships thus not only endeavoured to secure food supplies, but also spiritual nourishment. The Black Book of the Admiralty, a compilation of admiralty law of which the earliest surviving manuscript copy dates to the mid-fifteenth century, ruled that the sacrament on board of ships was not to be touched, nor its box, under penalty of being drawn and hanged. Seamen might also bring on board images of Mary, a crucifix, or other saints, whose effigy might be painted on the stern of the ship. On Good Friday, sailors brought biscuits marked

100 Kowaleski, “Working at Sea,” 919.

101 Ward, *World of the Medieval Shipmaster*, 96-100.

102 “Ordonnantie up den onderhoudt van de verweecke scpileden,” in *Inventaire des archives de la Ville de Bruges. Première section: Inventaire des chartes. Première série: treizième au seizième siècle*, ed. L. Gilliodts-Van Severen, 9 vols. (Bruges: Gailliard, 1871-1885), 5: 74-75.

103 Karel Davids, “Seamen’s Organizations and Social Protest in Europe, c. 1300-1825,” *International Review of Social History* 39 (1994): 145-169 at 146-151.

104 Vincent V. Patarino, Jr., “The Religious Shipboard Culture of Sixteenth and Seventeenth-Century English Sailors,” in *Social History of English Seamen*, 141-192 at 166-167; Davids, “Seamen’s Organizations,” 149.

105 *The Book of the Wanderings of Felix Fabri*, trans. Aubrey Stewart, 2 vols. (London, 1896-1897), 1: 145.

with a cross.¹⁰⁶ In this regard, to manage their risks, seafarers are sometimes associated with so-called superstitions, such as the belief that sighting dolphins and porpoises indicated that a storm was brewing. The fears arising on the fickle sea, and the desire to control them through coping mechanisms, not only begot rituals and beliefs, but informed language and metaphor as well: illness was likened to a sea crossing, at the end of which beckoned the port as a safe haven. Or, on a more institutional level, the Church was compared to a boat, the pope to the pilot, and Christians to its passengers.¹⁰⁷

CONCLUSION

Mining and seafaring communities across Europe between the twelfth and sixteenth centuries left diverse and abundant evidence for their prophylactic programs. While the health hazards that each group faced combined into a unique (and dynamic) profile, it is clear, even from this brief survey, that their collective efforts to promote health and fight disease were constant and often built on the ancient and evolving medical and natural-philosophical paradigm known as Galenism, which was increasingly available to Europeans since the twelfth century. While by no means an exhaustive or an exclusive paradigm, Galenic thought informed these communities' diets, shaped the physical layout of and movement in and through the sites and vessels they occupied, and directed their attention toward particular dangers such as stagnant air and liquid, darkness and humidity, decaying matter and its odors, and changing climates and seasons. Last but not least, in its Christianized form, Galenism certainly accommodated religious norms and piety, including the cult of specific patron saints, as integral to health-preserving programs.

This conclusion dovetails with recent attempts to provide an empirical basis to the re-periodization of public health history. Rather than seeing the latter as a response to the environmental degradation of the Industrial Revolution, and enabled by key benchmarks of modernization, a growing number of scholars have now shown that prophylactic programs were not only laid out but also practiced and enforced many centuries beforehand. With few exceptions, that scholarship has focused, and understandably so, on richly documented monasteries and west-European cities, societies, and spaces whose preventative interventions immediately challenge what Kathleen Davis has aptly called "the simplex of the pre."¹⁰⁸ That solid basis in turn owes much to scholars' sensitivity to and ability to engage diverse types of sources and scales, from urban panegyrics and medical theory, to civic- and bioarcheological data mapped using Historical Geographical Information Systems (HiGIS), to art and administrative records. The foregone essay sought to implement the same methodology in order to expand the range of historical communities of prophylactic practice to groups that, while sometimes of urban origin, and whose paths certainly could intersect with urban realities,

106 Patarino, "The Religious Shipboard Culture," 150-160, 189-191.

107 Mollat, *La vie quotidienne*, 19-26, 75, 112, 118-119, 144-145.

108 Kathleen Davis, "From Periodization to the Autoimmune Secular State," *Griffith Law Review* 27 (2018): <https://doi.org/10.1080/10383441.2018.1669266>.

nonetheless had to address a unique set of health challenges, for instance underground and over the sea.

The range of prophylactic communities can be extended further: pilgrims, land convoys and (peripatetic) courts, as well as rural or extra-urban events such as periodic fairs, ceremonial gatherings, and slave and animal markets, each with their distinct and changing profile. Following these communities' preventative steps will not only enrich the medical and especially health history of Europe, but also expand the possible scope of transregional and comparative studies across the globe, among communities beholden to a Galenic paradigm, such as East Rome (Byzantium) and the Islamic world, and well beyond them, into Oceania, north and east Asia, Africa, and the Americas. The latter regions, to be sure, already have a rich and developed (public) health historiography, yet its chronology tends to critically engage with evidence postdating the encounter with Europeans, be it as missionaries, merchants, armies, or long-term settlers. Evidence of any kind prior to such encounters may be thinner on the ground from a Euro-American historiographical perspective, yet it is worthwhile tracing. And focusing on non-urban populations, which were the majority in many world regions, seems to be a fruitful path to take. For whether they were urban based or not, past communities such as miners and shipmates, armies and pilgrims, all had a vested interest in learning how to manage risk, including from one another. It is also reasonable to assume that political and economic elites pursued the protection of their material interest, including the health of non/human animals, crops, and settlements. Finally, across urban/rural, occupational, gender, culture, age, and socioeconomic divides, faith and religious practices often seamlessly combined with natural-philosophical knowledge to improve communities' wellbeing. Ignoring this scale, like any other touched upon here, impoverishes our understanding of public health history.

FUNDING

This work was supported by the European Research Council (grant no. 724114).

ACKNOWLEDGEMENTS

The authors are grateful to the Premodern Healthscaping group for their comments and ongoing intellectual companionship: Janna Coomans, Lola Digard, Léa Hermenault, and Taylor Zaneri; to Louis Sicking for his help navigating maritime history; to Justyna Wubs-Mrozewicz for her help with Polish sources; and to Markus Stauff and Judith Keilbach for their inspiration above and below the ground.