

Introduction

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Since the earliest of times, diseases have shaped the course of human history. Diseases and, in particular, epidemics have affected humans economically, politically and culturally.¹ Some diseases have even been credited or blamed for causing the success and failure of societies. The fall of the Roman Empire, for instance, has been attributed to a pandemic of bubonic plague.² Others argue that malaria was to blame.³ The most obvious effects of disease, indeed, have been demographic: they have caused misery and death and have led to declining or stagnant population numbers.

The collection of four articles in this issue focuses on the burden of disease in the Low Countries. Each article deals with a different disease that was typical for a specific era: medieval plague, early modern smallpox, late nineteenth-century tuberculosis and twentieth-century cancer in the form of mesothelioma. The articles stem from a workshop held at Maastricht University as part of what has become an annual WOG event since 2008, the Day of Historical Demography.⁴ The Ninth Day of Histor-

1 For an introduction to the history of epidemics and their effects on history: A. Crosby, *Ecological imperialism: The biological expansion of Europe, 900-1900* (Cambridge 2009); J. Diamond, *Guns, germs, and steel: The fates of human societies* (New York 1997); M. Harrison, *Disease and the modern world: 1500 to the present day* (Cambridge 2004); J.N. Hays, *The burden of disease: Epidemics and human response in Western history* (New Brunswick 2009); W. McNeill, *Plagues and peoples* (New York 1998).

2 M. McCormick, 'Tracking mass death during the fall of Rome's empire (I)', *Journal of Roman Archeology* 28 (2015) 325-357 and 'Tracking mass death during the fall of Rome's empire (II): A first inventory of mass graves', *Journal of Roman Archeology* 29 (2016) 1008-1046.

3 D. Soren, 'Can archaeologists excavate evidence of malaria?', *World Archaeology* 35 (2003) 193-209.

4 The WOG Historical Demography is a scientific research network (Wetenschappelijke Onderzoeks Gemeenschap) coordinated by Koen Matthijs (KU Leuven) and funded by the Research Foundation Flanders. It aims to stimulate exchange among scholars at various stages in their careers and with different backgrounds interested in historical demography. For a detailed overview of the partners involved and the activities of the WOG Historical Demography, see <http://www.historicaldemography.be> (last accessed 15 October 2017).

ical Demography, which took place in December 2016, was devoted to the study of diseases, causes of death and the epidemiological transition.

In the introduction to this special issue we first discuss the main sources and indicators used to examine the burden of disease in the past. Next, we introduce the theory of the epidemiological transition and provide a brief overview of the literature for the Low Countries. Finally, we present the four key diseases in this issue and the new insights their analyses bring.

Sources for the history of disease

The term ‘disease’ refers to any condition that impairs the normal functioning of the body, rather than referring to the absence of health. The World Health Organization (WHO) defines health in a broad sense as ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’.⁵ The definition has been subject to debate, particularly due to the use of the word ‘complete’ as it not only concerns physical health but also mental health. However, the main criticism is that the definition lacks operational value.

Indeed, disease is not only a biological phenomenon but also a social construction. Consequently, researchers have to search for evidence of both. A condition may be considered a disease in some cultures, but not in others. Changing medical knowledge can result in different treatment and different registration of a particular disease. For instance, the new cause-of-death registration established in the Netherlands in 2013 resulted in a sharp change in the most common causes of death, particularly in dementia. Dementia, alcohol addiction and high levels of cholesterol are now much more likely to be causes of death, whereas the number of lung infection deaths has declined. Because infections are much more serious for people with dementia, the reasoning is that, without the dementia, the lung infection would not have been fatal; therefore, dementia is the main cause.⁶

5 Preamble to the Constitution of WHO as adopted by the International Health Conference, New York, signed on 22 July 1946 by the representatives of 61 States and entered into force on 7 April 1948. The definition has not been amended since 1948. See <http://www.who.int/about/mission/en/> (last accessed 31 October 2017).

6 P. Harteloch, *Verschuivingen in de doodsoorzakenstatistiek bij de introductie van het automatisch coderen* (The Hague 2014).

Historical sources, especially those preceding the bacteriological revolution, are often blurry in distinguishing different diseases.⁷ Until the nineteenth century, when germ theory was not yet common knowledge, the word 'plague', for instance, was used as a generic term for an epidemic or pandemic.⁸ Likewise, 'fever' was then considered descriptive of a group of diseases with similar characteristics but distinctive names: intermittent, puerperal, scarlet, typhoid and so on. Over the years, medical historians have been able to identify many of them. Besides the well-known and devastating *Yersinia pestis*, other diseases that seem to have dominated the epidemiological landscape of the Low Countries have been identified as malaria, smallpox, measles, typhus, and dysentery.

Diseases and epidemics were ubiquitous in the past. Primary source materials that contain evidence of disease are not hard to find. For medieval and early modern times, for instance, we can rely on chronicles, correspondence and medical treatises. Still, the subjectivity of individual descriptions of disease, which is common in these source types, undermines any possible quantitative analysis. Likewise, records of friendly societies, sickness funds and hospitals, which served the sick, the infirm and the poor, make it difficult to distinguish among their populations.⁹ Hardly any standardized demographic sources are available until the early sixteenth century when parish priests in the Low Countries systematically started registering burials.¹⁰ Moreover, parish registers do not mention the cause of death. In other words, although there is ample evidence of disease in the pre-industrial world, most sources do not make it possible to quantify their impact. Therefore, in this special issue, Joris Roosen makes very clever use of a fiscal source, namely an annual series of so-called *mortmains* accounts covering over a century and more than 25,000 individuals, to analyse the severity of the Black Death and recurring plague outbreaks in the Southern Netherlands from 1349 to 1450.

By the early nineteenth century, when medical topographies became increasingly popular, the vague and unclear disease descriptions in the medical treatises were gradually replaced by mortality figures and

7 G. Alfani and T. Murphy, 'Plague and lethal epidemics in the pre-industrial world', *Journal of Economic History* 77 (2017) 315.

8 L. Noordegraaf and G. Valk, *De gave Gods. De pest in Holland vanaf de late middeleeuwen* (Amsterdam 1996) 19-21.

9 J. Riley, 'Disease without death: new sources for a history of sickness', *Journal of Interdisciplinary History* 3 (1987) 538.

10 I. Devos and C. Vandenbroeke, 'Historische demografie', in: M. Boone and J. Art (eds.), *Inleiding tot de lokale geschiedenis van de 12de tot de 18de eeuw* (Ghent 2004) 195-196; A. Schuurman, *Historische demografie: Bevolkings- en gezinshistorie* (Zutphen 1991).

detailed cause-of-death statistics. The quantitative approach allowed study of the typical course of disease outbreaks and insight into the determinants and circumstances of particular diseases.¹¹ Especially the statisticians – with the Belgian Adolphe Quetelet in the lead – gave medical research a more scientific character.¹² Together with medical professionals, they urged the governments in the Low Countries to introduce cause-of-death registration. In Belgium from 1851 onwards and in the Netherlands from 1865 onwards, municipal authorities were obliged to keep a cause-of-death register. Still, the cause-of-death data must be handled with great care. In Belgium, it was common practice for civil servants to fill out the certificates. They usually relied on family members or neighbours to provide the cause of death, possibly leading to wrongful registrations, particularly in socially loaded cases.¹³ In large cities, a doctor was appointed for the task. In the Netherlands, the cause of death had to be certified by a medical practitioner; however, from the high number of ‘unknown’ causes of death in the first years after 1865, it is clear that doctors sometimes did little to determine the exact cause of death. The great diversity in causes of death also brought about many administrative problems. In Belgium, the first cause-of-death nomenclature was drawn up in 1867 – a year after the Netherlands did so – and it contained 166 diseases.¹⁴ In the Netherlands, a national classification system was established in 1875 that consisted of 34 different categories of disease. This classification system remained in existence until 1899 when the first International Classification of Diseases (ICD) was adopted. Later the list was regularly adapted.¹⁵ Nevertheless, in the early twentieth century, still more than 20 per cent of all causes of death in Belgium were recorded as undefined as a result of

11 K. Velle, ‘Medisch-geografisch en epidemiologisch onderzoek in België sinds het laatste kwart van de 18de eeuw tot ca. 1850. Een bijdrage tot de sociale geschiedenis’, *Handelingen van de Koninklijke Zuid-Nederlandse Maatschappij voor Taal- en Letterkunde en Geschiedenis* 38 (1984) 209-228.

12 P. Klep and B. Kruithof, ‘The rise of quantification and statistics in Dutch medical research (1850-1940)’, in: I. Stamhuis, P. Klep and J. van Maarseveen (eds.), *The statistical mind in modern society, the Netherlands 1850-1940* (Amsterdam 2008) 335-356.

13 L. Nys, ‘De ruiters van de Apocalyps: alcoholisme, tuberculose, syfilis en degeneratie in medisch België, 1870-1940’, *Tijdschrift voor Geschiedenis* 115:1 (2002) 26-46.

14 K. Velle, ‘Statistiek en sociale politiek: de medische statistiek en het gezondheidsbeleid in België in de 19de eeuw’, *Belgisch Tijdschrift voor Nieuwste Geschiedenis* 16 (1985) 213-242.

15 F. van Poppel and J.P. van Dijk, ‘The development of cause-of-death registration in the Netherlands, 1865-1955’, *Continuity and Change* 12 (1997) 265-287; J. Wolleswinkel-van Den Bosch, F. van Poppel, and J. Mackenbach, ‘Reclassifying causes of death to study the epidemiological transition in the Netherlands, 1875-1992’, *European Journal of Population* 12 (1996) 327-361.

the limited diagnostic techniques and the poor descriptions of symptoms.¹⁶ Among medical historians and historical demographers, there is much discussion regarding the quality and usability of the historical cause-of-death data and classifications.¹⁷ Still, contemporary medical knowledge and registration practices can be clarified when compared with reports from local, provincial and national health committees and medical associations. Such contemporary writings give insight into the awareness and understanding of the causes of death, the determinants considered important and the hygienic and sanitary actions implemented.

Some of these nineteenth- and twentieth-century source trends are clearly reflected in three contributions in this issue. Ans Vervaeke and Isabelle Devos, for instance, make use of a patient list drawn up during the 1839 smallpox outbreak in the Belgian town of Thielt. Angélique Janssens and Elien van Dongen employ aggregate municipal cause-of-death registers to analyse tuberculosis and other nutrition-related causes of death in the nineteenth-century Netherlands. Laura Van den Borre and Patrick Deboosere, on the other hand, exploit aggregated national cause-of-death statistics to investigate the development of mesothelioma in Belgium since the 1950s.

Measuring the impact of disease in the past

Considering these issues of source availability, selectivity and comparability, measuring the impact of disease in the past is extremely challenging. Besides physical and psychological consequences, disease can take a social, economic and demographic toll. Not surprisingly, considering the nature of the 2016 workshop, the articles in this issue look mainly at the demographic impact and, in particular, mortality. The sheer magnitude and mortality of disease in the past is difficult to measure. An epidemic is a fast-growing outbreak of a disease that affects many people. In general, the term 'epidemic' is used because it conveys notions of severity, temporality and emergency. However, its definition contains no quantitative component. An epidemic is a temporary phenomenon resulting in excess mortality, morbidity or both. Yet, there is

16 I. Devos, *Allemaal beestjes. Mortaliteit en morbiditeit in Vlaanderen, 18de-20ste eeuw* (Ghent 2006) 50.

17 G. Alter and A. Carmichael, 'Reflections on the classification of causes of death', *Continuity and Change* 12 (1997) 169-173; G. Alter and A. Carmichael, 'Studying causes of death in the past: Problems and models', *Historical Methods* 29 (1996) 44-48.

no consensus on what constitutes a significant excess or how long an epidemic 'should' last.¹⁸

Several measures are used to quantify the demographic burden imposed by disease on people. Three contributions here use standard mortality indicators to assess the impact of disease, albeit at a different level. Van den Borre and Deboosere, along with Janssens and Van Dongen use respectively country-level and municipal-level cause-of-death registration to calculate cause-specific mortality rates for nineteenth-century Netherlands and twentieth-century Belgium. Roosen, on the other hand, uses individual accounts to calculate mortality estimates per locality in medieval Hainaut.

In recent decades, however, a number of alternative measures have been developed to capture a more complete estimate of health than 'traditional' mortality indicators. For instance, morbidity (the prevalence of disease in a population) is a more sensitive indicator of quality of life and generally considered a more complete reflection of the effects of dearth, war and epidemics. Morbidity in the past is not well documented, however. Besides mortality and morbidity, disease-free and anthropometric indicators are also being considered. We can refer to health-adjusted life expectancy (HALE) by the WHO and Healthy Life Years (HLY) by Eurostat, which measure not just the incidence of epidemics and how long people lived but also the quality of health through their lives. For instance, in 2015, HALE at birth in Europe was estimated at 65.6 years for women and 70.5 years for men. In the Netherlands, HALE was 71.2 years for men and 73.2 years for women. The corresponding range for Belgium was 69.4 and 72.8 years.¹⁹ These numbers represent approximately 88 per cent of total life expectancy for women and men in the Low Countries.

Historical research is far from containing such disability- and disease-free health indicators. Still, in recent years, the discipline of historical anthropometry has made significant progress in this matter by using height.²⁰ In fact, the WHO describes average height as one of the best measures of overall health conditions within a society. Average height is

18 Hays, *The burden of disease*, 5.

19 Data from Global Health Observatory Repository: <http://apps.who.int/gho/data/view.main.HALEX> (last accessed 28 October 2017).

20 J. Komlos and J. Baten, 'Looking backward and looking forward: Anthropometric research and the development of social science history', *Social Science History* 28 (2004) 191-210; R. Steckel, 'Heights and human welfare: Recent developments and new directions', *Explorations in Economic History* 46 (2009) 1-23.

a net measure; i.e. it incorporates not only the supply of inputs, such as childhood nutrition, but also the demands on those inputs, such as disease and physical exertion.²¹ Moreover, heights – at least for men – are easily available in historical sources such as military records and prison registers. Nonetheless, when analysing attained height, it is difficult to assess the role of the different determinants (nutrition, disease, genetics, et cetera). In their contribution to this issue, Vervaeke and Devos examine more than 400 military individuals using height to measure the impact of one particular disease, namely smallpox.

Diseases, causes of death and the epidemiological transition

Mortality and morbidity have been changing all over the world, yet with variations in time and pace. Over the past three centuries, the patterns of mortality and disease have transformed from one of epidemics and high mortality from infectious disease among infants and children to one of non-communicable, chronic and degenerative diseases affecting principally the elderly. These changes have been referred to as ‘the epidemiological transition’. The theory was originally posited in 1971 by Abdel-Rahim Omran, professor of epidemiology at the University of North Carolina in Chapel Hill, in an attempt to account for the extraordinary health advances made in the industrialized countries since the eighteenth century.²² It grew out of the demographic transition theory and incorporated a detailed consideration of particular diseases as causes of death. Although Omran based his analysis primarily on mortality changes in England, Wales, Japan and Sweden, he differentiated three different models: classical or Western model, accelerated model and delayed model.

According to Omran, every society experiences three stages in the modernization process:

- (1) The first stage, *the age of pestilence and famine*, is dominated by mortality crises due to food shortages, war and epidemics caused by infectious and parasitic diseases, especially among children. Major killers are plague, typhus, smallpox and malaria. As a re-

²¹ B. Bogin, *Patterns of human growth* (Cambridge 1999).

²² A.R. Omran, ‘The epidemiologic transition: A theory of the epidemiology of population change’, *Millbank Memorial Fund Quarterly* 49 (1971) 509-538; A.R. Omran, ‘The epidemiologic transition theory: A preliminary update’, *Journal of Tropical Pediatrics* 29 (1983) 305-316.

- sult, life expectancy at birth oscillates between 20 and 40 years.
- (2) The mortality peaks gradually decrease during the next stage, *the age of receding pandemics*. Life expectancy starts to rise as a consequence from about 30 to 50 years. Improved sanitation, nutrition and medicine reduce the spread of infectious diseases. Nonetheless, infectious diseases such as tuberculosis remain as major causes of death, but non-communicable diseases start to increase steadily.
- (3) During the final stage, *the age of degenerative and man-made diseases*, mortality eventually stabilizes at a relatively low level, life expectancy at birth increases to more than 70 years and cardiac and cerebrovascular diseases, cancers, chronic lung diseases and stress-related disorders become the most important causes of death.

Since the 1970s, the universality of Omran's theory has been heavily debated. As a result, many authors have offered a more nuanced picture of the epidemiological transition, taking into account contextual differences.²³ Moreover, a fourth stage, the *age of declining cerebrovascular mortality*, has been introduced as life expectancy continues to increase upwards of 80-85 years thanks to the improved medical care of cardiovascular diseases (bypass surgery) and lifestyle changes.²⁴ Despite the various criticisms, the original theory continues to provide a useful framework.

The history of disease and the epidemiological transition in the Low Countries

The historiography for the Low Countries on these topics is important, yet not well-developed. In the second half of the twentieth century, 'crisis mortality' was a heavily emphasized subject.²⁵ Most research con-

23 See for instance: A. Reid et al., 'A confession of ignorance': Deaths from old age and deciphering cause of death statistics in Scotland, 1855-1949', *The History of the Family* 20 (2015) 309-319.

24 A.R. Omran, 'The epidemiologic transition theory revisited thirty years later', *World Health Statistics Quarterly* 51 (1998) 99-119; S. Olshansky and A. Ault, 'The fourth stage of the epidemiologic transition: The age of delayed degenerative diseases', *Milbank Memorial Fund Quarterly* 64 (1986) 355-391; R. Rogers, R. Hackenberg, 'Extending epidemiologic transition theory: A new stage', *Social Biology* 34 (1987) 234-243.

25 For a historiography of mortality and morbidity in Belgium and the Netherlands: I. Devos and C. Mathys, 'A history of historical demography in Belgium', in: A. Fauve-Chamoux, S. Sogner and I. Bolovan (eds.), *A global history of historical demography. Half a century of interdisciplinarity* (Bern 2006) 157-180; T. Engelen and A. van der Woude, 'Historical demography in the Netherlands', in: *Ibid.*, 467-498.

cerning the pre-industrial Low Countries was concerned with outbreaks of plague and dysentery.²⁶ We can refer to studies on the presence and disappearance of plague such as Van Werveke's analysis of the Black Death in 1349-1351 and Charlier's plague in Brussels in 1667-1669.²⁷ Likewise, the dysentery epidemic of 1779/1780 which swept both countries aroused the interest of Bruneel, Mentink and Van den Eerenbeemt.²⁸ Gutmann analyzed the impact of war on population dynamics in the early modern Low Countries and concluded that this was rarely sufficient to provoke a severe demographic crisis on its own. Such conflicts only had a strong impact on the population as a whole when, for instance, they were compounded by disease.²⁹ Bruneel confirmed the complexity of mortality crises by investigating causes of death for the Duchy of Brabant's population during the early modern period. Clearly, most historical scholarship concentrated on epidemics rather than on disease.³⁰ Fortunately, since the late 1980s, we can refer to the extensive book on plague by Noordegraaf and Valk, along with that on smallpox by Rutten.³¹ In a series of smaller studies, Knottnerus and Devos examined malaria in the Low Countries.³² Still, systematic analyses of burial records and other sources examining the territorial extensiveness of dis-

26 For an overview of the literature on plague in the Low Countries, see: D. Curtis, 'Was plague an exclusively urban phenomenon? Plague mortality in the seventeenth-century Low Countries', *The Journal of Interdisciplinary History* 47:2 (2016) 141-142.

27 H. van Werveke, 'De Zwarte Dood in de Zuidelijke Nederlanden (1349-1351)', *Mededelingen van de Koninklijke Vlaamse Academie voor Wetenschappen* 12 (1950); H. van Werveke, 'Nogmaals de Zwarte Dood in de Nederlanden', *Bijdragen voor de Geschiedenis der Nederlanden* 8 (1953-1954) 251-258; H. van Werveke, 'La mortalité catastrophique en Flandre au XVII^e siècle', in: P. Harsin and E. Hélin (eds.), *Problèmes de mortalité. Actes du Colloque International de Démographie Historique, Liège, 18-20 Avril 1963* (Liège 1965) 457-464; J. Charlier, *La peste à Bruxelles de 1667 à 1669 et ses conséquences démographiques* (Brussels 1969).

28 C. Bruneel, 'L'épidémie de dysenterie de 1779 dans les Pays-Bas autrichiens', *Handelingen van de Koninklijke Commissie voor Geschiedenis* 145:3-4 (1979) 191-395; G. Mentink, 'De rode loop in Gelderland. De dysenterie-epidemie in de jaren 1778-1779 en 1782-1783', *Bijdragen en Mededelingen der Vereniging Gelre* 65 (1970) 29-39; H. van den Eerenbeemt, 'De rode dood in stad en meijerij van 's Hertogenbosch, een dysenterie-epidemie in de jaren 1779-1783', *Economisch- en Sociaal-Historisch Jaarboek* 36 (1973) 75-101.

29 M. Gutmann, *War and rural life in the Early Modern Low Countries* (Princeton 1980).

30 C. Bruneel, *La mortalité dans les campagnes: Le duché de Brabant aux XVII^e et XVIII^e siècles* (Louvain 1997).

31 Noordegraaf and Valk, *De gave Gods*; W. Rutten, *De vreselijkste aller harpijen. Pokkenepidemieën en pokkenbestrijding in Nederland in de achttiende en negentiende eeuw: Een sociaal-historische en historisch-demografische analyse* (Wageningen 1997).

32 O. Knottnerus, 'Malaria around the North Sea: A survey', in: G. Wefer et al. (eds.), *Climatic development and history of the North Atlantic realm: Hanse conference report*. (Berlin 2002) 339-353; I. Devos, 'Malaria in Vlaanderen tijdens de 18de en 19de eeuw', in: J. Parmentier and S. Spanoghe (eds.), *Orbis in Orbem. Liber Amicorum John Everaert* (Ghent 2001) 197-233.

eases before the nineteenth century remain limited. Currently, the critical works by Curtis and Roosen and the spatial analyses by Devos and Van Rossem are promising in this regard.³³

As mentioned previously, rich cause-of-death data are available from the nineteenth century onwards. As such, an encompassing overview of the epidemiological transition was presented by Devos for Belgium and by Mackenbach for the Netherlands.³⁴ They showed that in the Low Countries, non-communicable diseases replaced infectious and parasitic diseases as main causes of death during the interbellum. This shift was accompanied by a strong increase in lifespan. Life expectancy at birth increased in Belgium and the Netherlands, respectively, from 42.3 and 39.8 years in 1850, 46.5 and 48.4 years in 1900, 66.3 and 71.4 years in 1950, to 80.9 and 81.6 years in 2015.³⁵ In addition, Havelange, Velle and Houwaart contributed to these overviews by framing the history of social medicine, medicine organizations and politics in these countries.³⁶ Wolleswinkel, moreover, provided an in-depth analysis of the Dutch transition by examining possible determinants.³⁷

The historical study of spatial differences in mortality has a long tradition in the Low Countries, but the geography of the causes of death has been largely neglected.³⁸ Except for the high mortality in the coastal areas which has been the subject of a heated debate in the 1980s. Some scholars argued that endemic malaria was to blame, others referred

33 D. Curtis, 'Was plague an exclusively urban phenomenon?'; D. Curtis and J. Roosen, 'The sex-selective impact of the Black Death and recurring plagues in the Southern Netherlands, 1349-1450', *American Journal of Physical Anthropology* 164:2 (2017) 246-259; J. Roosen and D. Curtis, 'The "light touch" of the Black Death in the Southern Netherlands: An urban trick?', *The Economic History Review* (forthcoming); J. Roosen and D. Curtis, 'Dangers of noncritical use of historical plague data', *Emerging Infectious Diseases* (forthcoming); I. Devos and T. Van Rossem, 'Oud, ouder, oudst. Regionale en lokale verschillen in sterfte in het graafschap Vlaanderen tijdens de zeventiende en achttiende eeuw', *Jaarboek De Zeventiende Eeuw* (2017) 39-53.

34 Devos, *Allemaal beestjes*; J.P. Mackenbach, *De veren van Icarus. Over de achtergronden van twee eeuwen epidemiologische transitie in Nederland* (Utrecht 1992).

35 Data from the Human Mortality Database, see <http://www.mortality.org/> (last accessed 20 October 2017).

36 C. Havelange, *Les figures de la guérison, XVIIIe-XIXe siècles: une histoire sociale et culturelle des professions médicales au pays de Liège* (Paris 1990); K. Velle, *De nieuwe biechtvaders. De sociale geschiedenis van de arts in België* (Leuven-Amsterdam 1991); E. Houwaart, *De hygiënisten: Artsen, staat & volksgezondheid in Nederland, 1840-1890* (Groningen 1991).

37 J. Wolleswinkel-van den Bosch, *The epidemiological transition in the Netherlands* (Rotterdam 1998).

38 The historiography of regional mortality has been covered for Belgium by Devos and Matthys, 'A history', and for the Netherlands by Engelen and Van der Woude, 'Historical demography'. For publications using the Historical Sample of the Netherlands (HSN), see: J. Kok, K. Mandemakers and H. Bras, 'Van geboortebank tot collaborator', *Tijdschrift voor Sociale en Economische Geschiedenis* 6:4 (2009) 3-36.

to differences in the quality of the drinking water or in breastfeeding practices.³⁹ For Belgium, we can refer to a small-scale study by Neven, a cause-specific mortality of infant mortality in the Belgian districts by Masuy-Stroobant, and a very recent study for adults by Van Rossem et al.⁴⁰ For the Netherlands cause-specific mortality has been investigated more extensively by Wolleswinkel, Van Poppel, Walhout and Van den Boomen, who pointed out important regional differences, also in connection with differences between Roman Catholic and Protestants.⁴¹

As opposed to the numerous demographic studies on individual variations in fertility in the past, less research has been done on individual-level mortality.⁴² Although social inequalities in death are currently high on the historical agenda, little attention is paid to the underlying medical causes of death.⁴³ This oversight is mostly related to a lack of adequate data. In recent years, however, this unique source – the individual-level cause-of-death registers (cf. supra) – has come to the surface and will permit researchers to make important contributions to our understanding of the historical roots of social inequalities in death. The registers will make it possible to study individual diseases according to age, sex, occupation and place of death and birth, as well as to examine

39 E. Hofstee, 'Geboorten, zuigelingenvoeding en zuigelingensterfte in hun regionale verscheidenheid in de 19de eeuw', *Bevolking en Gezin* (1983 supplement) 7-60; C. Vandenbroeke, F. van Poppel, A. Van der Woude, 'De zuigelingen- en kindersterfte in België en Nederland in seculair perspectief', *Tijdschrift voor Geschiedenis* (1981) 461-491; C. Vandenbroeke, F. van Poppel and A. Van der Woude, 'De borstvoedingshypothese: een nawoord', *Bevolking en Gezin* (1983 supplement) 117-118.

40 M. Neven, 'Epidemiology of town and countryside. Mortality and causes of death in East Belgium, 1850-1910', *Belgisch Tijdschrift voor Nieuwste Geschiedenis* 27:1-2 (1997) 39-82; G. Masuy-Stroobant, 'La surmortalité infantile des Flandres au cours de la deuxième moitié du XIXe siècle: Mode d'alimentation ou mode de développement?', *Annales de Démographie Historique* (1983) 231-256; T. Van Rossem, P. Deboosere, I. Devos, 'Spatial disparities at death. Age-, sex- and disease-specific mortality in the Belgian districts at the beginning of the twentieth century', *Espace Populations Sociétés* (forthcoming).

41 J. Wolleswinkel-van den Bosch et al., 'Cause-specific mortality trends in The Netherlands, 1875-1992: A formal analysis of the epidemiologic transition', *International Journal of Epidemiology* 26:4 (1997) 772-781; F. van Poppel, 'Trends in mortality and the evolution of the cause-of-death pattern in the Netherlands, 1850-2000', in: T. Engelen, J.R. Shepherd and W. Yang (eds.), *Death at the opposite ends of the Eurasian continent* (Amsterdam 2011) 17-43; E. Walhout, 'Is breast best? Evaluating breastfeeding patterns and causes of infant death in a Dutch province in the period 1875-1900', *History of the Family* 15:1 (2010) 76-90; N. van den Boomen and P. Ekamper, 'Denied their natural nourishment: Religion, causes of death and infant mortality in the Netherlands, 1875-1899', *The History of the Family* 20:3 (2015) 391-419.

42 J. Kok, 'Historical demography. Understanding temporal change, individual variation and regional persistence', *Tijdschrift voor Sociale en Economische Geschiedenis* 11:2 (2014) 237-260.

43 T. Bengtsson and F. van Poppel, 'Socioeconomic inequalities in death from past to present: An introduction', *Explorations in Economic History* 48:3 (2011) 343-356.

in-depth health changes going back as far as the mid-nineteenth century. Unfortunately, such registers have been preserved only for a small number of cities and villages in the Low Countries. Because of medical privacy and confidentiality issues, many were destroyed. Currently, digitization processes of the registers are under way in several cities (Amsterdam and Maastricht) or being set up (Antwerp).⁴⁴ Considering the labour-intensive nature of the data input, volunteers are being deployed.⁴⁵ These registers also constitute the key source of the newly established SHiP network (Studying the history of Health in Port Cities network), which evaluates health in European port cities since the 1850s.⁴⁶ Besides social historians and historical demographers, the network brings together medical historians and historical epidemiologists, as insights from medical history are essential for our understanding of disease processes.⁴⁷ The SHiP network, as embedded in and formally recognized by the European Association for the History of Medicine, is an important step in this direction. The recent establishment of a Dutch and Belgian network for medical history is also encouraging.⁴⁸

The diseases in this special issue

The four key diseases discussed in this special issue each pertain to a specific stage in the epidemiological transition. The Black Death as the most violent epidemic of medieval times and smallpox as an early modern childhood scourge are both typical diseases for the first stage of epi-

44 A. Janssens, *The Amsterdam Health and Disease Database 1854-1940* (Radboud Group for Historical Demography); W. Rutten and A. Janssens, *The Maastricht Health Transition Database 1864-1955* (Maastricht University, Centre for the Social History of Limburg; Radboud Group for Historical Demography); The Antwerp database is currently prepared by I. Devos (Ghent University, Quetelet Center for Quantitative Historical Research).

45 For Amsterdam, see https://velehanden.nl/projecten/bekijk/details/project/picvh_run (last accessed 17 October 2017).

46 The network is directed by Angélique Janssens (Radboud Group for Historical Demography) and funded by the Netherlands Organization for Scientific Research. See <http://www.ru.nl/historicaldemography/research-projects/ship> (last accessed 16 October 2017).

47 G. Mooney, 'Historical demography and epidemiology: The meta-narrative challenge', in: M. Jackson (ed.), *The Oxford handbook of the history of medicine* (Oxford 2011) 373-392.

48 For more information: <http://www.nvmg.nl/home> and <https://belgianmedicalhistory.wordpress.com/> (last accessed 17 October 2017). For an overview of recent developments in the field of twentieth century medical history in the Low Countries, see the special issue edited by Frank Huisman, Joris Vandendriessche and Kaat Wils, 'Blurring boundaries: Towards a medical history of the twentieth century', *BMGN- Low Countries Historical Review* 132:1 (2017).

demographic transition. Whereas tuberculosis, which peaked with urbanization and industrialization, can be considered a prime example of the second phase, mesothelioma is characteristic for the third phase. Before assessing the impact of each disease in the separate articles, it is crucial to first describe their key medical features and provide a brief historical perspective for each of them.⁴⁹

Plague. Plague is an infectious disease caused by the bacterium *Yersinia pestis*, named after the Franco-Swiss bacteriologist Alexandre Yersin who discovered the *plague bacillus* in 1894. Besides septicaemic and pneumonic plague, bubonic plague is the most common form of the disease and is transmitted to humans via the bite of infected fleas. Bubonic plague infects the lymph nodes and produces black patches and ulcers that can prove lethal (hence the name Black Death). Bubonic plague brought high and dramatic mortality rates. On average, more than half of those infected died within a week after the appearance of the bubo. Historical research has identified three periods when bubonic plague ravaged the world. The first, called the Plague of Justinian, occurred during Late Antiquity, reaching Western Europe in the 540s. The second entered Europe in the 1340s, broke out at intervals and only disappeared from the continent in the 1720s. The Black Death of 1348 was certainly the most massive, killing millions of Europeans. In the Low Countries, the last plague outbreak occurred in the late 1660s. Its disappearance has been credited to public health measures (e.g. quarantine and isolation), yet those reasons have been widely criticized. The third plague pandemic began in 1855 and was considered inactive by 1959, but it was mainly confined to Eurasia and Asia. Today, plague is still relatively common in many parts of the world, but the disease can be treated with antibiotics.

Smallpox. Smallpox was an acute infectious disease caused by the variola virus, resulting in high fever, vomiting, characteristic fluid-filled blisters, body rash and scars on the face. Smallpox infection usually ended in two possible ways: long-lasting (generally lifelong) immunity or death (nearly one in three patients). Variola infections were airborne and transmitted via close contact with infected people. In Europe, smallpox was a leading cause of death during the eighteenth century, accounting for 10-15 per cent of all deaths, mainly children. In an effort

49 The descriptions are based on K. Kiple (ed.), *The Cambridge historical dictionary of disease* (Cambridge 2003); K. Kiple (ed.), *The Cambridge world history of human disease* (Cambridge 1993); *Oxford concise medical dictionary* (Oxford 2014).

to produce immunity through a mild case of the smallpox, the English physician Edward Jenner demonstrated in the late eighteenth century the effectiveness of vaccinating people with cowpox. During the nineteenth and twentieth centuries, smallpox vaccination became a common practice for children in many countries, including the Low Countries. In some countries, it was compulsory, resulting in a real reduction in its incidence. In 1980, the WHO declared the global eradication of smallpox. To date, it is still the only human infectious disease to achieve this distinction.

Tuberculosis. Tuberculosis is an infectious disease caused by the *Mycobacterium tuberculosis*. The disease generally affects the lungs (pulmonary tuberculosis) but can also affect other organs. It is spread through the air when people who have active tuberculosis in their lungs cough, spit, speak or sneeze. The classic symptoms of active tuberculosis are a chronic cough with blood-containing sputum, fever, night sweats and weight loss. Tuberculosis has been present in humans since ancient times, but disease rates in Europe began to rise in the early 1600s to a peak level in the 1800s, causing widespread public concern. Improvements in sanitation, vaccination and other public health measures significantly reduced rates of tuberculosis by the early twentieth century, although it remained a significant threat throughout the century. Today, one-third of the world's population is thought to be infected with tuberculosis. Although the disease is curable by antibiotics, it is considered a major global health emergency by the WHO.

Mesothelioma. Mesothelioma is an aggressive type of tumour that affects the lining of the lungs, heart and sometimes the abdomen (the lining is known as the mesothelium). Caused primarily by the inhalation of asbestos fibres, the highest rates of the disease occur among people who have worked with asbestos in an industrial setting (construction, shipyards) or have lived or worked in buildings containing asbestos. The connection between asbestos and mesothelioma was first reported in the 1940s. Because the disease can take more than 40 years to develop, the legacy of asbestos use is still being felt today and rapidly increasing. Nonetheless, the disease remains rare. In Belgium and the Netherlands, mesothelioma concerns less than 0.5 per cent of all cancers. Treatments for the disease are similar to other types of cancer, i.e. surgery, chemotherapy and radiation. However, the prognosis is extremely poor with only 5 per cent of patients living longer than five years.

New insights from this special issue

Using new sources and original datasets, the authors in this special issue reconsider existing theories and provide novel insights into the impact of the diseases discussed in the preceding paragraphs. What do these articles reconsider about the burden of disease, and what main new insights can be derived from them?

In his article on the Black Death (bubonic plague) in the Southern Netherlands in the late Middle Ages, Joris Roosen takes on a major challenge by looking at one of the biggest killer diseases that has ever afflicted mankind. Plague clearly speaks to the imagination, not only of the professional historian but also of the general public. Plague appeared in human history in large cycles, of which the medieval cycle has been studied most extensively. The current thought that has resulted from these studies stipulates that the Black Death evolved from a universal killer into a much more selective and less severe disease during recurring outbreaks of plague following the Black Death. However, these 'echo epidemics' have so far not received as much attention as issues related to the initial outbreak of the Black Death, a situation which contributes to an incomplete and often incorrect understanding of the total burden of this killer disease. In his contribution, Roosen develops an important corrective on the existing image of these echo epidemics and, in so doing, also generates some important points of criticism on major studies in the field concerned.

The source material to study medieval plague is scarce, fragmentary, flawed in unknown ways or only impressionistic. In the face of these extreme source difficulties, the attempt to track recurring plague epidemics over time to estimate their impact is a daunting task. Roosen is able to do this due to a new and unique database consisting of 25,610 individuals who died between 1349 and 1450 in the County of Hainaut during several outbreaks of late medieval plague. These data are taken from an exceptional source, the *mortmains* accounts, which register a death tax levied on the removable possession of the deceased. Even with this dataset, however, the researcher still must take into account a number of ways in which the data are flawed.

Based on this dataset, Roosen is able to argue his main point, namely that the late medieval recurring outbreaks of plague, following the fourteenth-century Black Death, cannot be considered less severe and less selective than the Black Death itself. Regarding selectivity criteria, Roo-

sen first tests the notion that populations which had been struck by the Black Death acquired immunity that protected them during consecutive incidences of the disease. Secondly, Roosen examines the argument that the recurring epidemics were more selective as far as age and pre-plague health status are considered; this argument is related to the idea that the Black Death hit an immunologically naïve population. Thirdly, Roosen looks at the sex-selective mortality effects of the Black Death and the recurring plague cycles.

None of the three selectivity factors is able to survive Roosen's analysis. Based on the data employed here, the conclusion clearly should be that the burdens of disease of the recurring plague outbreaks were not less universal than its major predecessor. The Black Death and most of the recurring plagues during the late Middle Ages had a tendency to kill more women than normal. Similarly, the Black Death and the recurring epidemics were selective in terms of the age groups that were the hardest hit, although important variations in terms of age between the various incidences appeared to exist. Finally, Roosen offers indications of a higher severity of certain recurring plague outbreaks, despite prolonged contact of the local population with the plague pathogen. With these conclusions, Roosen challenges the received wisdom in his field. The tolls exacted by the recurring late medieval plague outbreaks might have been as heavy as the Black Death itself, and there is no reason to assume important differential degrees of selectivity in the burden of this disease across time. His analysis also throws an entirely different light on the immunological status of the European population first hit by the Black Death, as well as the assumption that humans could build up immunity over time against this disease. This article is therefore a major and indispensable contribution to both the historical and contemporary segments of the international plague studies.

The article by Vervaeke and Devos also focuses on a hugely infectious disease, smallpox, which wreaked havoc in many populations around the world until as late as the twentieth century by killing, scarring and blinding large numbers of people, primarily children. As was explained previously, vaccination against smallpox started early in the nineteenth century, but the disease was not eradicated worldwide until well into the twentieth century. In their article, the authors also address a heated debate about the burden of 'their' disease on a particular population, in this case, based not on the impact of the disease on the level of mortality within the population but on the effect of height. Did smallpox im-

pact the height of its victims, at least on those who survived the disease? This is an important debate because it concerns the impact of this disease on the health and well-being of the survivors. Stunted growth and diminished height are indicative of scarring and reductions in individual and social well-being. Moreover, if we are able to identify the effect of the disease on height, we are also able to move the debate on the increases in height over the nineteenth and twentieth centuries, which is an important step forward.

The case examined by the authors may be a small one, i.e. the nineteenth century town of Thielt in Flanders, but the quality of the source material ensures that important conclusions may be drawn which are definitely hard to ignore. The sources used in this study are from the town's military records, providing an indicator for height for the entire male population at a single moment in time. The real innovation lies in the fact that they are able to link these registers with smallpox listings through which they can discriminate between those individuals surviving the disease and those who had never been struck by it. Did the height of these two groups differ in the town of Thielt? By linking the two sources, the authors can bring to the table various individual and familial attributes of their sample subjects, such as the death of the father and the father's occupation. Height is strongly influenced by living conditions during childhood, so the information on family background is of essential importance to filter out compositional effects. The study by Vervaeke and Devos indeed shows that the father's occupation is of decisive importance for the son's height at the time of military conscription, as is the father's early death. Clearly, the failure to take into account these social and familial differences will introduce high levels of fuzziness in the effect of smallpox on height; this study demonstrates the extent of that fuzziness. Moreover, having this information also enables the authors to show that smallpox did make a distinction between social classes. It struck hardest at the poorest section of the population. One other important aspect of the sources used here is that the authors are able to pinpoint exactly at what age the disease struck the population under study and to keep this aspect of the study under control. All members of the sample population had survived the disease at a similar age.

Having all the relevant individual- and familial-level data available, the authors are also able to conduct complex multivariate analysis, which unequivocally shows that smallpox has no significant impact on height. The analysis identifies social and environmental factors as ma-

major confounders in the research on smallpox and height. The international debate on the impact of smallpox has thus acquired an important new contribution on the relations between this disease and nutrition, environment and human growth. Their study also demonstrates the strength of micro-level studies. Such an approach may lack the lure of the vast vistas presented by large national or international projects, but it is superior in terms of analytical power and precision, even when confronted with the difficulties of small numbers.

The contribution by Janssens and Van Dongen moves the focus to one of the modern diseases, tuberculosis, which is associated with the rise of urban and industrial societies. Their article does not attempt to explain the development, levels and/or patterns of the disease but rather focuses on the impact of tuberculosis and other nutrition-related diseases on maternal mortality. The debate they engage in concerns the issue of gender inequalities in survival in the European past, which has been framed as the question of 'missing women' by the famous Indian economist Amartya Sen. It is often assumed that 'missing women', due to higher mortality hazards for young girls and women compared to boys and men in certain age groups, were infrequent or insignificant in the European past. These higher mortality rates for girls and women lead to the phenomenon of excess female mortality. The image of 'missing women', or excess female mortality, also sits seriously at odds with assumptions concerning the gender effects of the European marriage pattern and the resulting strong position of European women generally in marriage, families and the labour market. In their article, Janssens and Van Dongen clearly demonstrate that survival inequalities for women did exist in the Netherlands in the final quarter of the nineteenth century for those aged 20 to 50. This female disadvantage seems to have been located primarily in rural areas, and only during the final years of the period under investigation does the gender disadvantage slowly begin to disappear.

The authors then go on to attack another often-used assumption put forward in research on the survival disadvantages of adult women, which is the suggestion that these disadvantages stem from the dangers of maternal mortality, i.e. the hazards associated with pregnancy and childbirth. Researchers often present these dangers as confounding factors which are able to explain away excess female mortality, framing maternal mortality as a 'natural disadvantage'. The analysis Janssens and Van Dongen put forward demonstrates that the level of maternal mor-

tality is seriously influenced by the female disease environment, consisting of tuberculosis and other nutrition-related diseases. This latter group of diseases encompasses important infections such as measles, whooping cough, dysentery and cholera. Tuberculosis and the other nutrition-related diseases lead to much higher death tolls for populations or groups within a population who do not have access to foodstuffs of sufficient nutritional quality.

The authors argue that maternal mortality is clearly related to social disadvantages in Dutch women's position in society and should be essential elements of the issue of female excess mortality. However, their analysis also has serious implications for the general debate on women's position in European societies and the assumed beneficial effects of the European marriage pattern. Furthermore, even though the authors did not aim to explain development and patterns of tuberculosis, their regional analysis does help to correct an important assumption concerning this disease, namely that it is strongly associated with an urban and industrial environment. The burden of this disease did not bypass the countryside; in fact, the countryside appeared to be just as dangerous as or even more dangerous than the urban areas.

The article by Van den Borre and Deboosere moves the focus back to Belgium and also further up in time to focus on one of the modern man-made diseases of our own time, the highly lethal type of cancer called mesothelioma. The authors even call mesothelioma a modern epidemic due to the 43,000 deaths every year worldwide. Belgium is in the top four of countries suffering from mesothelioma deaths. This type of cancer is exclusively related to asbestos exposure. Their study describes how public health has been sacrificed by authorities to the interest of the asbestos industry, even long after the deadly effects of asbestos became general knowledge. The worldwide death toll due to asbestos will rise as more than 100 countries today with more than 6 billion people have not yet taken the step to protect their populations from the health dangers of asbestos, testifying further to the strength of the vested interests of the asbestos industry. The contribution by Van den Borre and Deboosere demonstrates the urgency for a worldwide ban even as it shows how complicated and tenacious it is to get governments to take action in this field. Note that this conclusion does not only apply to the Belgian government.

However, before they throw light on that latter issue, Van den Borre and Deboosere offer new insights into the true extent of asbestos pro-

duction in Belgium between 1948 and 1998, when the ban on asbestos was proclaimed. They make use of unique records which enable them to determine that the yearly Belgian asbestos consumption was much higher than previously assumed. These new figures show that Belgium had the highest per capita asbestos consumption in the world from 1960 to 1969. At that time, the negative health effects of asbestos were already well known internationally, but Belgian research lagged behind. The authors demonstrate the sharp rise, with a time lag of about 40 years after first exposure, of malignant mesothelioma for the male population especially. The enormous sex differential for this disease indicates that the risk of exposure was mainly located in the male-dominated sector of asbestos production.

Why did it take the Belgian government so long to ban asbestos entirely? Where did major obstacles occur? The authors argue that the long latency period of asbestos diseases, which can be as much as several decades, is one factor. No doubt, this also helped to preserve the ignorance and lack of action amongst the general public. More important, however, was the global action programme of lobby groups set up by the international network of asbestos companies. The main strategy of these lobby groups consisted of what has come to be called 'manufacturing uncertainty'. The authors point to the tobacco industry as an example of where similar processes have been used and are still used today. Noteworthy insights produced by Van den Borre and Deboosere concern the important role of the good and strong relationships between the industry and international key policy players such as the European Union. The strong national position of asbestos manufacturers also impeded the rise of a claim culture of asbestos victims, which can be seen as an important factor of delay. Finally, the authors point to another obstacle from Belgian law which makes it impossible to hold asbestos companies accountable for any health damages. Their article demonstrates many lessons to heed in the fight against cancers due to tobacco consumption.

Together, the articles in this special issue have thus provided novel insights into the longer term development of certain diseases while also providing a perspective on structural and processual contexts of the historical societies studied here. This special issue therefore contributes to the development of the wider field of economic and social history in the Low Countries.