EPIBEL. Epidemics & Inequality in Belgium from the Plague to Covid-19: What can we learn about societal resilience?

State of the Art & Interim Report 2022-2023

Table of Contents

Introduction: Why we need to study inequalities in past epidemic mortality

From the slums of a Delhi to the White House in Washington, DC: no one was really safe for COVID-19, and especially in the Western World the pandemic induced a feeling of vulnerability, also among those populations which traditionally thought to have been well protected against epidemic diseases by medicine, science and social security. At the same time, however, the pandemic was and is profoundly unequal: not everyone is equally vulnerable to become seriously ill, to die or to suffer from long-lasting impacts on health, income or wellbeing. In 2021, the availability of vaccines created new inequalities, as both the access to and uptake of vaccines showed profound regional and social divergences.

These inequalities in epidemic vulnerability are crucial in our understanding of pandemics, and this knowledge in turn is needed to advice on policies meant to foster recovery, to limit long-term consequences and to limit vulnerability to future outbreaks of epidemic diseases. As the COVID-19 pandemic is still unfolding, an investigation of epidemic inequalities during health emergencies in the past, can significantly improve our insight in:

1. The excess mortality caused by different epidemic health emergencies.
2. Social and spatial inequalities in this excess mortality
3. The impact of epidemic policies on both epidemic mortality and broader socio-economic inequalities during health emergencies.

The second point – social differences in epidemic health emergencies – is the cornerstone of EPIBEL. To what extent did higher income – or higher socio-economic status (SES) – protect against epidemic disease during past epidemic health emergencies in Belgium/the Southern Low Countries? Do we see differences in social gradient between epidemic diseases, for instance between diseases which were strongly connected to nutritional status and others which were not? And do these differences in vulnerability still persist when controlling for age, gender and place of residence? Connected to this: the role of poverty as a major driver of epidemic disease. Is there a 'super-mortality' among the poorest groups in society (and if so, why would this be the case)? And were the policies implemented to contain epidemic health emergencies mitigating or exacerbating the inequalities in mortality?

Strong socio-economic inequalities in (epidemic) mortality are *not* a given: according to some studies, they would mainly originate after the Second World War (Bengtsson, Dribe, and Helgertz 2020). Before that period, strong differences in life expectancy between town and countryside, and between different regions would have existed, but not per definition between social classes. Other research suggests that epidemic mortality presented almost invariably a strong social gradient, as social elites often learned rapidly how to protect themselves from its impact (see for an extensive overview Clouston and Link 2021). Here, policies play a quintessential role.

So, what do we really know about epidemic inequalities in the past? Who was vulnerable and why were people vulnerable? In what follows the research agenda of EPIBEL is presented along the (adjusted) work packages of the original project, each time indicating the progress, the challenges, and the key findings so far.

WP1. INEQUALITIES IN COVID-19 MORTALITY

1.1 Spatial disparities in COVID-19 mortality

<u>Goal?</u> The geography of an epidemic can provide information on its mode of spread (hierarchical and/or contiguous) as well as on certain factors explaining its virulence (proximity to communication routes, population density, poverty, etc.). The analysis is based on several questions: were certain territories, residential areas and neighbourhoods more severely affected than others by COVID-19-related mortality? Are the spatial patterns of the different waves the same? What are the local characteristics that may explain the excess/under-mortality observed in certain areas?

<u>Method?</u> For the time being, the method is based on the calculation of excess mortality indices centred on the first two waves of the epidemic at the scale of Belgian municipalities. Spatial smoothing maps have been produced based on a method that calculates an excess mortality value for any point on the national territory by taking into account the neighbouring values (here within a radius of 15 kilometres).

<u>Challenges?</u> Beyond identifying the most affected areas, understanding the geography of COVID-19-related excess mortality remains complex.

⇨ **Preliminary findings**
- The spatial pattern of excess mortality during the first two waves of the epidemic does not correspond to the classic spatial pattern of mortality in Belgium.
- In both waves, some areas were hit earlier and harder than others. Understanding the spatial geography of this excess mortality is complex; for example, excess mortality is not correlated with population density, the socio-economic characteristics of communes, or health care provision.
- In addition, the geography of the first wave differs from that of the second wave. In the first wave, the main clusters were located in the Mons region, in Limburg and eastern Flemish Brabant, in the province of Liège and in Brussels. In the second wave, the main clusters of excess mortality were located mainly in border areas.

<u>Future plans?</u> We are still waiting for data on causes of death, which will allow us to refine the analyses by accurately identifying COVID-19-related deaths. Secondly, we would like to complete the analyses already carried out by approaches at the neighbourhood level of the large urban agglomerations in Belgium.

<u>Publications and presentations:</u>

‒ Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Sanderson J.-P. (2020), "Surmortalité liée à la Covid-19 en Belgique: variations spatiales et socio-démographiques", *Document de Travail 17*, Centre de recherche en démographie, Louvain-la-Neuve, 42 p. (https://cdn.uclouvain.be/groups/cms-editors-demo/isa/DT172s1.pdf).

‒ Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Rees A., Rizzi E., Sanderson J.-P., Schlüter B. (2021), "Variations spatiales et sociodémographiques

de mortalité de 2020-2021 en Belgique. L'effet de la pandémie Covid-19", *Document de Travail 27*, Centre de recherche en démographie, Louvain-la-Neuve, 39 p. (https://cdn.uclouvain.be/groups/cms-editors-demo/isa/DT272s1NV.pdf).

− Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Sanderson J.-P., (2021-1), "La surmortalité lors de la première vague de l'épidémie de Covid-19. Des territoires plus touchés que d'autres", *La démographie en question*, Centre de recherche en démographie, Louvain-la-Neuve, 2 p. (https://cdn.uclouvain.be/groups/cms-editors-demo/isa/Fiche-DEMO%202021%231%20fr.%20v7.pdf).

− Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Sanderson J.-P., (2021-1), "Excess mortality during the first wave of the Covid-19 epidemic. Some regions were more affected than others", *Demography in questions*, Centre de recherche en démographie, Louvain-la-Neuve, 2 p. (https://cdn.uclouvain.be/groups/cms-editors-demo/isa/Fiche-DEMO%202021%231%20eng.%20v8.pdf).

− Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Plavsic A., Sanderson J.-P., *Les variations spatiales de la mortalité due à la Covid 19, L'apport des démographes à la compréhension de la pandémie en Webinaires du 19-20-21 mai 2021*, AIDELF.

1.2 Socio-demographic disparities in COVID-19 mortality

Goal? Like major epidemics of the past, the COVID-19 epidemic has disrupted the functioning of our society and revealed a number of latent social antagonisms. Epidemics are generally indicative of socio-demographic inequalities, affecting gender, age, social groups, and areas of residence. More specifically, the aim will be to highlight the socio-demographic inequalities in mortality created by the COVID-19 epidemic, to analyse the socio-demographic context in which it developed and to measure its effect on the evolution of the social differential in mortality.

Method? The methodology used is based, on the one hand, on the classic tools of demographic analysis (mortality rates, calculation of mortality tables, etc.) and, on the other, on logistic multilevel models.

Challenges? The main challenge we face is the availability of data by cause of death and the updating of data by Statbel.

⇨ **Preliminary findings according to "classic" approaches**
- Age was an important determinant of mortality in both waves of 2020. People aged 65 and over were particularly affected by the excess mortality. Nevertheless, the mortality gradient according to age was more marked in the first wave than in the second.
- People living in collective households (i.e. the vast majority in nursing and/or care homes) were hard hit by COVID-19-related mortality. This excess mortality, higher in the first wave than in the second, can be explained by the age and state of health of the residents, but also by the proximity between individuals in relatively enclosed spaces. The health crisis highlighted the structural weaknesses of these facilities, including a lack of financial and human resources.
- No social group escaped COVID-19-related excess mortality. Nevertheless, a social gradient emerged, with the most disadvantaged social group showing the highest index of excess mortality. This social gradient is more marked for the population aged 40-79 than for those aged 80 and over.

- The year 2020 means a one-year drop in life expectancy, but this decline is more marked among the disadvantaged than among the more advantaged group.
- The epidemic's effects on mortality are not socially neutral, but they have not altered the social profile of mortality.
-
- **Preliminary findings according to "multi-level" approach**
- In 2020, during the two waves of the COVID-19 pandemic, the individual probability of dying is mainly influenced by age, household type and gender in terms of individual variables. Added to this are other variables measured at the communal level, such as the proportion of isolated people, the proportion of disadvantaged people or the excess mortality of surrounding communes, although the weight of these variables is much smaller.
- Among the elderly, the type of household has a particularly high weight, given the high excess mortality observed in institutions for the elderly (MR, MRS, etc.), particularly during the first COVID-19 wave.
- Analysis of partial pseudo-correlations (variable weights) and individual mortality determinants also show that there is no real break between 2020 and 2019 mortality patterns, which correspond respectively to mortality patterns during or outside the pandemic period. The elderly, residents of collective households and the underprivileged remain systematically exposed to a high risk of death.

Future plans? 1) Refine analyses when causes of death become available. 2) Update life tables by social group to determine the impact of COVID-19 in the short and medium term on the evolution of social inequalities in mortality. 3) Continue the analysis of the situation of nursing homes in Wallonia with our colleagues from the ULB and the AVIQ (Walloon Region), in particular by comparing the effects of the first two mortality waves.

Publications and presentations:

- Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Sanderson J.-P. (2020), "Surmortalité liée à la Covid-19 en Belgique : variations spatiales et socio-démographiques", *Document de Travail 17*, Centre de recherche en démographie, Louvain-la-Neuve, 42 p. (https://cdn.uclouvain.be/groups/cms-editors-demo/isa/DT172s1.pdf)
- Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Rees A., Rizzi E., Sanderson J.-P., Schlüter B. (2021), "Variations spatiales et sociodémographiques de mortalité de 2020-2021 en Belgique. L'effet de la pandémie Covid-19", *Document de Travail 27*, Centre de recherche en démographie, Louvain-la-Neuve, 39 p. (https://cdn.uclouvain.be/groups/cms-editors-demo/isa/DT272s1NV.pdf)
- Hardy, Olivier J., Dubourg, Dominique, Bourguignon, Mélanie, Dellicour, Simon, Eggerickx, Thierry, Gilbert, Marius, Sanderson, Jean-Paul, Scohy, Aline, Vandael, Eline, & Decroly, Jean-Michel (2021). "A world apart: Levels and determinants of excess mortality due to COVID-19 in care homes: The case of the Belgian region of Wallonia during the spring 2020 wave.", *Demographic Research*, 45, pp. 1011-1040.
- Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Plavsic A., Rees A., Rizzi E., Sanderson J.-P., Schlüter B.-S. (2022), "Un an après. Analyse de la variation

sociodémographique de la surmortalité de 2020 liée à la Covid-19 en Belgique", *Cahier Québécois de Démographie*, accepted for publication.

− Eggerickx T., Sanderson J.-P., Bourguignon M., Damiens J., Doignon Y., Fontaine S., Plavsic A., *Inégalités sociales de mortalité et place des ainés dans la société, L'apport des démographes à la compréhension de la pandémie en Webinaires du 19-20-21 mai 2021*, AIDELF.

− Doignon Y., Sanderson J.-P , Damiens J., Bourguignon M., Eggerickx T., Plavsic A., Schlüter B.-S., "Les déterminants individuels et spatiaux de la mortalité pendant la pandémie de Covid- 19 en Belgique", Démographie et crise, XXIe colloque international de l'AIDELF, Athènes 24 - 27 mai 2022.

− Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Plavsic A., Sanderson J.-P., "What are the determinants of Covid-19 mortality in Belgium in 2020? A multi-level approach", in progress.

WP2. INEQUALITIES IN MORTALITY DURING PAST EPIDEMICS

2.1 Identifying epidemic health emergencies in the past

Goal? How can we define 'epidemic health emergencies', and how frequent were they? Annual excess mortality data per municipality are available per municipality through the HISSTER-infrastructure for the 19th and 20th centuries (with gaps), and for some provinces through STREAM. To adequately assess the intensity of an epidemic health emergency, a higher temporal resolution is needed, as the typical duration of an epidemic outbreak was 10 to 15 weeks for most diseases in the analysis (plague, dysentery, cholera, the 1918 flu). Moreover, by starting from individual deaths (rather than aggregate ones), we can also study inequalities in mortality.

Method? Thanks to family history, massive genealogical databases have been created on baptisms/births, marriages and burials/deaths from roughly the 1650s onwards. These 'genealogical big data' are very disparate and of unequal quality, but for some regions in Belgium, they have been integrated into larger databases. This is notably the case for West-Flanders and the Antwerp Campine area. Based on these data, we can map the frequency and intensity of epidemic crises on a weekly (or even daily) basis: how fast did epidemics (or more accurately: excess mortality) spread during an outbreak? Which geographical patterns emerge, and how do they differ from epidemic to epidemic, from century to century? By connecting these data to the STREAM and LOKSTAT data on parish/community level, the interpretation of spatio-temporal patterns becomes possible.

Challenges? The quality of the data is a concern, although we are confident that data cleaning can reduce the 'noise' significantly so that we can utilize the database's full potential. A list of 'quality checks' should be developed and applied, which can also be used in future research based on these genealogical big data (potentially turned into a *policy brief*?).

⇨ **Preliminary findings**
- Spatial autocorrelation, measuring to what extent observations are correlated with observations in regions in close geographic proximity, was lower than anticipated. Even though epidemic waves often started and 'migrated' in clusters, there was still strong spatial variance: some communities were frequently hit by early modern health emergencies, others barely or not at all.
- As expected from the literature, overall mortality rates were higher in West-Flanders than in the Antwerp Campine area.
- We have not been able yet to satisfactorily explain the differences in observed mortality patterns, neither between West-Vlaanderen and the Campine area, nor the variations within said regions.

Future plans? In 2022-23, this dataset is the basis for a Bachelor's thesis course at UAntwerp, taught by Wouter Ronsijn & Jord Hanus. Students are working on the data itself (quality control by means of sampling) and search for additional source material for micro studies along the lines of basically all the current and planned EPIBEL subprojects. Their findings will help EPIBEL identify the best case studies for our own research.

Presentations:

− Hanus, J., "Territorial pervasiveness of epidemics and health emergencies in the Southern Netherlands/Belgium, 1650-1920", Cambridge Group for the History of Population and Social Structure Seminar, 15 March 2023, Cambridge.

2.2 Inequalities in early-modern war-driven epidemics

Goal? Many of the major health emergencies between 1650 and 1794 coincided with war. Often dysentery was the cause, but other epidemic diseases (plague, typhoid fever…) might also lead to violent mortality crises. Often warfare caused widespread destruction and disruption, resulting in a catastrophic mix of war, disease and hunger. We want to know whether these war-driven health emergencies were socially neutral, or rather, exacerbated existing inequalities in mortality.

Method? By studying some of the worst health emergencies in early modern history, we can circumvent the need for cause-of-death registers: excess mortality reached such high levels during the peak of the epidemics, that we can leverage standard death registers (parish registers) to identify epidemic mortality, and compare the social profiles of the casualties during epidemic outbreaks with 'normal' deaths in the preceding years. For some case studies, we can combine the demographic information present in the parish registers (gender, age) with other socioeconomic indicators (occupation, fiscal capacity, location) to better understand inequalities before death. For Anzegem 1694 for instance, we could reconstruct the population at risk via a *status animarum*, and used a Cox proportional hazard regression to assess the relative risk of dying during the epidemic for different social groups.

Test-cases?

Period	Disease	Test-cases
1676	Dysentery	Lichtervelde; Westmalle, Wuustwezel, Rijkevorsel, Loenhout, Gierle
1694-96	?	Sint-Niklaas, Anzegem
1794	Dysentery	Antwerpen, Mechelen, Deinze, Loenhout, Westmalle, Rijkevorsel, Kortemark, Lichtervelde

Challenges? Because the epidemic outbreaks coincide with war, there is both major disruption of normal life and administration, and massive movement of people. To profile the victims, tax assessments right before the epidemic outbreak are needed, but these are often unavailable. In the case of 1794, the 1796 census offers a lot of information on household composition and income, but of course the adult deaths of 1794 are absent in the 1796 census. Finally, the nature of the epidemic diseases often remains uncertain. In 1694 for instance, the only symptom mentioned is that people were dying from 'contagious fevers'. Likely candidates are typhus, typhoid or dysentery. Dysentery reigned in the eastern Low Countries one year earlier, while an epidemic though to be typhus or typhoid afflicted large parts of France at the time. These diseases have different modes of contagion: either through lice (typhus) or through the fecal-oral route (typhoid and dysentery). The unknown nature of the illness complicates the interpretation of the social gradient found, and whether this is the result of e.g. nutritional status or living conditions.

> ⇨ **Preliminary findings**
> - For the devastating 1794 dysentery wave, the available evidence for Antwerp, Mechelen and a number of Campine villages, points to social gradients in mortality very similar during and before the epidemic. If anything, higher social groups appear to have been hit relatively harder during the epidemic outbreak than in 'normal' years.
> - The 1694-96 case studies of Sint-Niklaas and Anzegem, conversely, do suggest a stronger social gradient during the outbreak – even if we are still unsure on the exact nature of the pathogen: People with microholdings (>0 - <0.5 ha) and smallholdings (0.5 - <2 ha) exhibit a risk of dying that is resp. 5.2 and 3.4 times greater than people living in households with larger holdings (>= 5 ha). Young children (1-4 years old) had a significantly higher risk of dying, next to the elderly. Sex or household size made no difference, nor did sharing a house with another household.
> - Possible explanations for this discrepancy, further to be analyzed, include the nature of the disease (no smoking gun on either epidemic spell) as well as nature of the case studies.

Presentations:

- Hanus, J., Devos, I. & Soens, T., "Socioeconomic status and epidemic mortality in an urban environment: Mechelen (Belgium) 1600-1900", 4th Conference of the European Society of Historical Demography (March 2022, Madrid) & Economic History Society Conference (April 2022, Cambridge)
- Hanus, J., Devos, I. & Soens, T., "Socioeconomic status and epidemic mortality in an urban environment (Mechelen, Belgium): Were dysentery (1794) and cholera (1866) socially neutral diseases?", OsloMet Centre for Research on Pandemics & Society (PANSOC), 22 April 2022.
- Ronsijn, W., Devos, I. & Soens, T., "Social and demographic inequalities and the 1690s dysentery epidemic in the Southern Netherlands: the case of Sint-Niklaas", Posthumus Conference 2022, Rotterdam, 30 May 2022.
- Ronsijn, W., Devos, I. & Soens, T., "Social and demographic inequalities and the 1690s dysentery epidemic in the Southern Netherlands", European Social Science History Conference, Göteborg, 14 April 2023.
- Ronsijn, W., "Where are the landless? Evaluating the ommestellingen in rural Flanders, seventeenth-eighteenth century", Posthumus Conference, Antwerp, 25 May 2023.
- Ronsijn, W. & Devos, I., "The 1690s epidemic in Flanders (Anzegem)", Workshop Epidemics in Medieval and Early Modern Western Europe, Groningen, 5 June 2023.
- Ronsijn, W., Devos, I. & Soens, T., "Social and demographic inequalities and the 1690s dysentery epidemic in the Southern Netherlands", European Society of Historical Demography Conference, Nijmegen, 30 August-2 September 2023.

Future plans? The next goal is to turn this into two articles, concentrating on A) the 1794 (dysentery) epidemic and B) the 1694 Anzegem case.

2.3 Smallpox in Antwerp

Goal? Smallpox has been one of the deadliest infectious diseases in the past but has attracted comparatively less attention in the recent revived historiography on epidemics. Most studies on smallpox highlight the innovative ways in which the disease was eradicated by the invention of an effective vaccination and the role of authorities in organising vaccination campaigns. However,

smallpox outbreaks continued to plague several places in Europe during the nineteenth century, the 1870s outbreak being one of the largest and most famous upsurges. This was also the case in Belgium, in which some regions seem to have been more vulnerable than others. While differences between urban and rural areas as well as between cities are to a certain extent investigated, less attention has been given to intra-urban disparities in mortality. As such social differences in mortality are investigated by an in-depth study of the 1870s smallpox outbreak in the port city of Antwerp. We scrutinize how smallpox evolved in a long-term perspective and in which ways urban authorities dealt with the disease by organising health and vaccination campaigns before doing an in-depth inquiry into the 1870s outbreak. By investigating the scale, timing and geographical spreading of the 1870s outbreak across the city and looking at divergent socio-demographic (such as age, gender and occupation) and socio-spatial (such as living conditions and housing density) factors, we will argue that the smallpox epidemic was not socially neutral but had a divergent impact on the inhabitants of the port city.

Method? We have used individual causes-of-death registers (Citizen Science Projects Antwerp and also Amsterdam for the combined paper), yearly municipal reports combined with social data from census and land registers. Combination of historical demographic research methods (crude death rates, differences in death rate by age, gender) with spatial analyses (diffusion and concentration of smallpox deaths along the different districts; social differences based on land registers). As a disease which was particularly harmful for small children, results were also compared with scarlet fever and measles. Two students at UGent are currently entering deaths per municipality for the 1860s and 1870s in a database so that we can estimate excess mortality across Belgium before, during and after the smallpox and cholera epidemics.

Challenges? In the first stage, the impact of the smallpox epidemics in Antwerp and Amsterdam has been compared. The results diverged in the timing and rhythm of smallpox epidemics (more victims in Amsterdam in 1870 while several 'outbreaks' in Antwerp in the 1860s-1880s), although in both cities particularly small children in poorer and more densely populated districts were hit. In the second stage, a deeper social analysis of the occupational structure of victims has been carried out for Antwerp, as well as a comparison with other diseases that hit particularly children, such as measles and scarlet fever. Some challenges for future research: 1) we need to investigate if this has to do with differences in registration practices (for instance impact of measles, scarlet fever), or scale of vaccination campaigns; 2) timing and rhythm of smallpox epidemics over a longer period particularly for Antwerp (important outbreak in 1880); 3) deeper social analysis in relation to household density; 4) deeper spatial analysis also on street and household level; 5) more systematic research of qualitative material (such as reports of medical commission and newspapers); 6) comparison with the spatial and social impact of the cholera outbreak of 1866 in Antwerp.

Presentations:

- Buzasi, K. (Leiden University Medical Centre), Devos, I. (Ghent University), Greefs, H. (University of Antwerp); Muurling, S. (Radboud University) & Riswick, T. (Radboud University), "A deadly tale of two cities: smallpox, urban space, and social inequalities in Amsterdam and Antwerp, 1870-1872", ESHD Madrid, 2-5 March 2022.
- Devos, I. & Greefs, H., "The 1870s smallpox epidemic in Antwerp: intra-urban social inequalities in vulnerability", ESSHC, Göteborg, April 2023.

Future plans? Draft an article on smallpox in Antwerp; if possible also comparative article Amsterdam/Antwerp.

2.4 Cholera in Belgium: spatial and social inequalities

Goals? Mapping by commune of the 1866 cholera epidemic across Belgium showed that the most densely populated areas (cities and industrial basins) had the highest cholera mortality rates. However, a significant cluster was also observed in rural areas in the south of the province of Luxembourg. The chronology of the epidemic suggests that this area was one of the main entry points of the epidemic into Belgium. The objectives are to analyze the spread of cholera in the rural provinces of Luxembourg and Namur, and the social and demographic characteristics of people who died of and recovered from cholera, and to compare them with those in other areas of residence (cities, industrial basins, etc.). The aim is also to understand why some areas suffered a very high mortality rate, while others, nearby, did not.

Method? Analyses will be based on individual data. The archives of the provinces of Namur and Luxembourg have preserved nominative registers, drawn up for all the communes in these provinces, of people infected with cholera, whether they had recovered or died. We have the surnames and first names of these people, their age and sex, their occupation, their social status, their address or district of residence. We also know whether they recovered/deceased in hospital or at home. It should be noted that we have the same information for the communes of Mons and Cuesmes (1,000 cases), in particular. We will use spatial diffusion analysis methods, classical demographic analysis (mortality rates and mortality tables) and multivariate analysis methods.

Challenges? The main challenges are methodological. First, we need to assess the value of the "social status" variable we have for all individuals. This is not the case for the "occupation" variable, for which information is generally only available for adult men and single women. Married women are most often identified as "housewives", and children of course have no declared occupation. This profession variable is important for reconstructing "social classes"; in this case, we can attribute the profession of the husband or father to the wife or child. However, this requires consultation of the civil registry records, which cannot reasonably be done for all the communes in the two provinces, but only for a few communes, those with the highest number of cases (cures and deaths).

Secondly, while we have the number of cures and deaths for each commune, we don't have the population at risk, an essential piece of information for demographic and multivariate analysis methods. While the reconstitution of populations at risk according to age and sex poses no problem, the same cannot be said for occupation and social status.

Future plans? We plan to write two articles based on this data. One will be more methodological and will refer to the challenges outlined above. The other will deal with the study of cholera in rural areas and will focus on the principles of the spread of the disease and the socio-demographic determinants of recovery and mortality.

2.5 Cholera in Brussels: spatiotemporal analysis

Goals? In a previous study on Brussels (video and blog), we showed the course of the epidemic by day between 26 May and 15 November 1866 (175 days) using descriptive statistics. In the past months, we did additional spatiotemporal analyses for Brussels in order to deliver more robust statistical results than the maps. In this follow-up study, we examine the issues revealed by Helgertz et al (2018) and by Phelps et al. (2017) to think beyond the water-supply (short-and long-term transmission cycle).

<u>Method?</u> Starting points are the nominative list of cholera deaths, cadastral income of the house of the deceased (Popp), Brussels GIS, and the population register of 1866. In the past months, we also collected and vectorized info on sewerage by street and on access to piped water by street. We then tested different spatial methods, two appeared rather useful. First, GI* and hot spot analysis reveal statistically significant concentration in the south of Brussels (Marolles) and to a lesser extent in the west (around the Senne). Much fewer cases were found in the (wealthy and less densely populated) center. Second, bivariate analyses (distance travelled by the disease by day and week) in ArcGIS show distinct patterns for children, adults and elderly, but overall we find a concave relationship between distance and time.

⇨ **Preliminary findings**

- The epidemic in Brussels lasted 25 weeks (26 May-15 Nov). As the epidemic unfolded, the distance 'travelled' by the epidemic across the city first increased, declined during the peak and then increased again. Mortality (more than average deaths per week) increased strongly after week 7. By week 12 most of the city territory was covered. The peak of the epidemic (more average deaths and less than average distance per week) was between week 12 and 17.
- - Spatial clustering (were some households repeatedly infected?) revealed that 70% of plots (households) only had single cases, but 30% had multiple cases (with a long time interval between deaths, on average 4-5 months between first and last deaths).

<u>To do?</u> Geographically weighted regressions including our data on sewerage and access to piped water network by house and street. We also want to include info on household size (1910 Brussels census per street?) and measures by the city government during the epidemic.

<u>Challenges?</u> In order to be able to compare epidemics (e.g water vs. airborne) in the same city or the same epidemic in different cities, we need 'new' spatiotemporal methods. Plotting deaths on maps does not deliver any added value. We collaborate intensively with Sophie Vanwambeke (UCL) to find the appropriate method(s).

<u>Future plans?</u> We plan to finalize this work on Brussels into two articles. If time permits, we would like to include comparisons with Antwerp and Mechelen. For both cities, all cholera deaths for the cholera outbreak of 1866 are identified (by using the cause-of death-registers). The data were cleaned and integrated into the GIS-infrastructure for socio-spatial analyses. In her master thesis, Lora Pannekoucke has done an in-depth study of cholera victims at household level for specific streets in Antwerp. These data can be included to get a glimpse of the impact of the illness and disease at household level.

<u>Presentations:</u>

- Devos I., Vrielinck S., Wiedemann T., "The cholera epidemic in the city of Brussel, 1866", European Social Science History conference, 24-27 March (online).
- Devos I., Vrielinck S., Wiedemann T., "The cholera epidemic in the city of Brussel, 1866", Annual Posthumus conference, 20 May 2021 (online).
- Devos I., "Spatial dynamics of infectious diseases: problems and possibilities", SHiP workshop, 16 December 2021 (online).

− Devos I., Vrielinck S., Wiedemann T., "Mapping the cholera epidemic in the city of Brussel, 1866", Conference of European Society for Historical Demography, Madrid, 2-5 March 2022.
− Devos I., Vrielinck S., Wiedemann T., Ronsijn W., Vanwambeke S., "The 1866 cholera epidemic in Brussel: a spatio-temporal reconstruction", Spatial humanities conference, Ghent, 9 September 2022.
− Devos I., Vrielinck S., Wiedemann T., Ronsijn W., Vanwambeke S., "Spatial analysis of cholera in 19th century Brussels", AIPRIL workshop, Antwerp, 16 September 2022.
− Devos I., Vrielinck S., Wiedemann T., Ronsijn W., Vanwambeke S., "The 1866 cholera epidemic in Brussel: a spatiotemporal reconstruction", Midi de Recherche, Departement de Demographie, UCL, 20 December 2022.
− Devos I., Doignon Y., Greefs H., Vrielinck S., Wiedemann T., "Challenges and opportunities of GIS for studying inequalities in disease and mortality", Posthumus Conference, Antwerp, 24-25 May 2023.
− Devos I., Vrielinck S., Wiedemann T., Ronsijn W., Vanwambeke S., "The 1866 cholera epidemic in Brussels: a spatiotemporal reconstruction", The State of Urban History Conference, Leicester, 11 July 2023.

2.6 Spanish flu in Belgium: a regional analysis

Goals? The geography of an epidemic can provide important information on its mode of spread (hierarchical and/or contiguous) as well as on certain factors explaining its virulence (proximity to communication routes, population density, poverty, etc.). Our analysis is based on several questions: were certain territories, residential areas and neighborhoods more severely affected than others by Spanish flu-related mortality? Was the spatial pattern of the different waves the same? What were the local characteristics that may explain the excess/under-mortality observed in certain areas?

Method? This part of the project is based on the exploitation of aggregated data available at the level of the municipalities (series 'Mouvement de la Population et de l'Etat Civil). The method used is based on excess mortality indices comparing the mortality observed in 1918 and 1919 with reference years (1909, 1910, 1912, 1913) in the former municipalities. A spatial smoothing technique was used to produce a mapping at the commune level.

⇨ **Preliminary findings**
- The spatial patterns of (over)mortality in 1918 and 1919 do not correspond to those of "normal" mortality (1909-1913) or "civilian" wartime mortality.
- The spatial patterns of Spanish flu (over)mortality for men and women are not strictly identical. For women, areas of high excess mortality were observed in the Kempen and in the rural regions of Hesbaye and Luxembourg. For men, the industrial basins are a major area of excess mortality.
- Possible explanations for the excess mortality caused by the Spanish flu include the link with tuberculosis (excess female mortality in these areas) and, more generally, with the status of women (nutritional and medical discrimination in favor of men), and (specifically for men) pathological vulnerabilities linked to working as a miner (silicosis, anthracosis, pneumoconiosis, etc.), making the respiratory system more fragile.
- The spatial pattern of the two main mortality waves shows similarities and some differences, which does not support the hypothesis of inter-wave immunity.

EPIB⊭L

Challenges? At the level of the aggregated communal approach, it is between areas of excess mortality and the existence of co-morbidities, such as tuberculosis or certain necessary to refine the understanding of the spatial patterns identified. There seems to be a clear relationship between diseases of the respiratory system, in the same areas. This requires the collection of causes of death at the commune level for several years before the First World War (currently being done, together with PDR project of Emmanuel Debruyne). Also, the analyses are based on de jure deaths. Considering war times conditions (men at war, refugees, etc.), de facto deaths are probably more appropriate, but unfortunately not readily available.

Presentations:

- Eggerickx, T., Bourguignon, M., Debruyne, E., Devos, I., Doignon, Y., Greefs, H., Hanus, J., Ronsijn, W., Sanderson, J.-P., Soens, T., "Disparités spatiales de l'épidémie de grippe espagnole (1918-19) en Belgique", *Démographie et crise,* XXIe colloque international de l'AIDELF, Athènes 24 - 27 May 2022.

Future plans? This presentation will be the subject of a journal article. Integration and use of a database compiled by students in a seminar run by E. Debruyne (UCLouvain) currently covering just under 20,000 deaths during the years of the Spanish flu (1918-1919) or the reference years (1912-1913) and addition of further municipalities in the summer of 2023 to obtain data from a representative sample of Belgian municipalities (in collaboration with E. Debruyne).

2.7 Spanish flu in Belgium: social inequalities. Case studies Antwerp & Châtelet

Goals? As a follow-up to our state of the article (published in HSR 2021), we want to identify the socio-demographic profile of the victims of the Spanish flu and to verify whether the impact of the epidemic on mortality is socially neutral or not (Who was most at risk? And why?). We first focus on Antwerp (port) and Châtelet (industrial). In the second stage, we will also include Zele (rural) and La Louvière (data collection nearly finished). These four places are among the limited number of municipalities where cause-of-death registers have been preserved.

Method? The analyses are based on our newly compiled datasets of individual data (age, sex, cause of death, occupation) from the cause-of-death registers and death certificates (occupation of spouse and parents in case of child deaths) and linked to other sources such as population registers (Châtelet). We compare the socio-demographic profile of the people who died of flu-related disease (Antwerp) or diseases of the respiratory system (Châtelet). For Antwerp we used logistic regression models based on the probability of dying from flu-related causes versus the probability of dying from other causes during the epidemic. Competing risk models are also being explored (flu vs. bronchitis, tb). Because of small number issues, we focus for Châtelet on excess mortality from respiratory diseases during the epidemic compared to pre-epidemic figures (1907, 1908, 1915, 1916,1917).

⇨ **Preliminary findings**
- Antwerp: hardly any flu-related deaths were registered before July 1918. The epidemic (July 1918-March 1919) consisted of 3 waves, with the second (Oct-Nov. 1918) being the strongest. There were strong similarities between flu-related diseases and bronchitis-pneumonia (similar chronology and peaks), much less with TB. However, the demographic profile strongly matched TB deaths (young adults) and not bronchitis (old age). Few soldiers died during the

second wave (German soldiers mostly died of violence). Belgian soldiers dying of flu mainly die in the last wave (February 1919). Interestingly, the data revealed that when soldiers are included in the analysis, the classically observed excess male mortality of Spanish flu disappears.
- We examined occupational differences (focus on proximate determinants of disease and exposure) and used the HISCO-classification. Logistic regression analyses revealed higher odds for flu-related death for employed in the service or sales sector (HISCO 4 and 5) compared to labourers/dock workers. Higher odds for TB for production workers (HISCO 7 en 8). No stat. significant results for bronchitis. The exposure indicator (indoor, outdoor, interaction and not) developed by Rijpma et al. (2022) did not reveal any stat. significant results. Our data suggest that exposure to disease is an important determinant, as people employed in sales and service (and their family members) have double the risk of dying from flu-related diseases compared to other diseases. Yet, mortality clustering remained limited: there were few multiple cases within the same household (the time interval between first and last death was small: median of 4 days for flu compared to 14 days for TB).
- Châtelet: Similar chronology as Antwerp (3 waves). We examined the social gradient (focus on distant determinants of disease) and used an adapted version of the HISCLASS5-classification. There is heterogeneity in the risks of death, with particularly high mortality among men, at active adult ages (with the W-shaped age-specific mortality curve classically observed during Spanish flu) and among certain socio-professional groups exposed to vulnerabilities (confined occupations, lung/respiratory system fragility, etc.), although this is not a social gradient in the strict sense.

Challenges? Firstly, the definition of flu-related deaths. We define 'flu' deaths as all flu deaths with flu as first, second or additional cause of death. But what are we actually measuring in terms of causes of death? Registration practices and/or real differences? How could physicians establish the cause of death (diagnostic practices: flu vs. bronchitis)? Secondly, the comparisons of Antwerp, Zele, Châtelet and La Louvière. If Antwerp reveals the distinct profile of the victims of flu, TB and bronchitis-pneumonia, can we still compare and consider these as one cause-of-death group when examining/comparing with other localities (cf. Chatelet: respiratory diseases, because no reporting of 'flu'). We don't have population-at-risk by occupation or class.

Future plans? We are currently finalizing a journal article on the Spanish flu in Antwerp. Next, we will publish our results on the case of Châtelet, and finally another comparing the situation of Antwerp, Zele, Châtelet and La Louvière.

For Châtelet, we want to extend the basis of comparison to the years 1920-1922 and 1909-1913, include the variable "type and size of household" at the time of death (to be discussed) and rework the "occupation" variable. Additional data collection to test the effect of household type and size and also to reproduce geographical analyses of the spread of the disease at the city level (this stage is currently underway). Application of a "synthetic population" reconstitution method to determine a population at risk of dying and to derive duration models from it (EHA)

Taking into account the case of the town of La Louvière (data processing is almost complete) and reproducing analyses similar to those carried out by Châtelet to inflate the numbers in these industrial regions of Hainaut.

Presentations:

− Devos, I., Bourguignon, M., Debruyne, E., Doignon, Y., Eggerickx, T., Greefs, H., Hanus, J., Ronsijn, W., Vrielinck, S., Sanderson, J.-P., Soens, T., "War, Peace and Epidemics: the Spanish flu in Belgium, 1918-19", Monthly Seminar Rural and Environmental History, Wageningen University, 14 April 2022.

− Devos, I., Bourguignon, M., Debruyne, E., Doignon, Y., Eggerickx, T., Greefs, H., Hanus, J., Ronsijn, W., Vrielinck, S., Sanderson, J.-P., Soens, T., "War, Peace and Epidemics: the Spanish flu in Belgium, 1918-19", Webinar Series European Society for Historical Demography, 17 May 2022.

− Bourguignon, M., Debruyne, E., Devos, I., Doignon, Y., Eggerickx, T., Greefs, H., Hanus, J., Paeps, P., Plavsic, A., Ronsijn, W., Sanderson, J.-P., Soens, T., "La grippe espagnole (1918-19) en Belgique : une maladie socialement neutre ?", Démographie et crise, XXIe colloque international de l'AIDELF, Athènes 24 - 27 May 2022.

− Devos, I., Bourguignon, M., Debruyne, E., Doignon, Y., Eggerickx, T., Greefs, H., Hanus, J., Ronsijn, W., Vrielinck, S., Sanderson, J.-P., Soens, T., "Social gradient in flu-related mortality during the 1918-19 pandemic in Antwerp and Chatelet", Symposium, Epidemics, space & inequality, IEM Zurich, 21 Nov. 2022.

− Devos, I., Bourguignon, M., Debruyne, E., Doignon, Y., Eggerickx, T., Greefs, H., Hanus, J., Ronsijn, W., Vrielinck, S., Sanderson, J.-P., Soens, T., "The Spanish Flu in Belgium (1918-19): a Socially Neutral Disease?", European Social Science History Conference, Göteborg, 12-15 April 2023.

− Devos, I., Bourguignon, M., Debruyne, E., Doignon, Y., Eggerickx, T., Greefs, H., Hanus, J., Ronsijn, W., Vrielinck, S., Sanderson, J.-P., Soens, T., "The Spanish Flu in Belgium (1918-19): a Socially Neutral Disease?", Belgian Demography Day, UCL, 26 April 2023.

2.8 SES and plague mortality (14th-15th centuries)

Goal? EPIBEL cannot ignore the 'second plague pandemic' and the massive mortality caused by its initial outbreaks from 1349 onwards. Reliable data on mortality are rare, and not for every outbreak the identification of Yersinia Pestis as cause of the outbreak has been established. For the Low Countries, Roosen and Curtis (2019) give the most recent synthesis, with new data for Hainaut, once again correcting the idea that plague spared the Low Countries (although there still are indications that the initial 1349 outbreak was less devastating than in other parts of Europe, certainly not killing 50% of the population, hence confirming what for instance Thoen and Devos stated in earlier publications. But what about plague and inequality? While a lot of research has been done on the impact of plague *on* inequality (notably by Guido Alfani and his team at Bocconi), there is limited research on the inequalities in plague mortality, at least for the initial 14th- and 15th-century outbreaks. The preliminary conclusion, mainly based on Italian evidence, is that the 14th-century outbreaks did not know major social distinctions, but that from the 1399-1401 outbreak onwards, a clear social distinction became visible, with the rich being able to protect themselves (seemingly confirming what Fundamental Cause Theory is suggesting).

Method? We focus on the first major plague waves (1349-51 to 1399-01) in the best documented regions of the Southern Low Countries: Flanders and Hainaut. As systematic registration of burials is absent, we have to rely on proxy data to reconstruct mortality: A) expenditure for funerals registered in some parish churches (with Douai offering the best case so far); B) mortmain (a death fee) payable by certain categories of people, notably in Hainaut (Roosen and Curtis, 2018); C) registration of

inheritances (mostly probate inventories, available for some cities (Oudenaarde, Ghent) from the 1350s onwards); rotation of tenants (to be reconstructed via rentals). Combining these sources we can investigate A) levels of mortality; B) gender; C) social differentiation (via the cost of the funeral, the price of the life annuity, or the size of the holding).

Challenges? Data have yet to be compiled, and of course scarce and scattered. Most series present large gaps (often during plague years, which is probably not a coincidence); Most sources are biased towards the middle and higher social groups (which however can be interesting). So, the challenges are great, but… the 14th-century plague waves remain the deadliest of the past millennium, and any contribution to a better understanding of SES in plague mortality is very welcome.

Presentations:

− Soens, T., Espeel, S. & Ronsijn, W., "Was there a social bias in plague mortality? Reexamining the diffusion and impact of Plague in the Southern Low Countries between 1349 and 1550", European Rural History Conference, Cluj (Romania), 11 –14 September 2023.

Future plans? A first version of the paper is presented in September 2023 in Cluj by Tim Soens, with Stef Espeel and Sam Geens. Afterwards, the paper will be published as article.

WP3. EPIDEMIC POLICIES AND THE SOCIO-ECONOMIC IMPACT OF PANDEMICS

Note: this WP combines the original WPs 3 (economic resilience), 4 (social resilience) and 5 (policy).

3.1. The economic impact of epidemics

Goal? The initial goal was to measure disruptions in the labour market during and after major epidemic outbreaks. However, it quickly became clear that A) many of the mortality crises coincided with periods of war (and/or famine) and B) that the economic impact depended on the policies put in place. Therefore it was decided to concentrate on the pandemic policies, and how these policies dealt with epidemic inequalities (and/or created them).

Future plans? Two more direct enquiries into the economic impact of a pandemic will be launched, in close collaboration with EPIBEL:

- Stef Espeel (UAntwerpen) has been granted an FWO postdoctoral fellowship supervised by Tim Soens (1/10/23-30/09/26) to investigate the economic disruption caused by plague waves between 1349 and 1500 (based on a comparative study of elite households and their estates, comparing Flanders with Toulouse and Norwich).
- For the 19th century wage administration of major companies (and/or organisations) has been preserved, with daily wages (ex. The Voortman factory in Ghent). These will be explored for the major outbreaks of cholera (and the Spanish Flu, as far as possible due to the war conditions).

3.2 Targeting the poor? A long-term analysis of epidemic policies

Goal? The goal of this WP is to investigate the way epidemic policies explicitly targeted poverty, and how this might have interacted with inequalities in mortality. In literature, attention has been paid to scapegoating, in which the poor (or other marginalized groups) were made responsible for epidemic outbreaks. On the other hand, epidemics or often seen as catalysators of social policies, especially in the Cholera Years of the 19th century (ex. Baldwin, Contagion and the State). This WP aims for a long-term analysis of 'non-pharmaceutical' interventions during major health crisis in the history of Belgium and the Southern Low Countries, questioning whether the poor were explicitly targeted. We question whether there was any 'Low Countries' model in epidemic policies, which might have been different from better studied models from the Mediterranean and England, and also might have resorted a different impact on poverty.

Method? Non-pharmaceutical interventions by cities and/or the central government have sometimes been collected and published (ex. Van Schevensteen 1931 on Antwerp), but never in a systematic way. We compare the discourse on poverty in medieval plague ordinances, the measures related to dysentery in the 17th and 18th centuries, and during Cholera-outbreaks in the 19th century, questioning whether there is indeed a separate 'Low Countries' model. A preliminary exploration of the material has been presented at

Challenges? Epidemic policy-making remained a regional or local task well into the 19th century. As such a systematic analysis of all cities and regions over five centuries is impossible. Moreover, while the corpus of 'non-pharmaceutical' interventions is fairly well delimited, 'pandemic policies' are much

broader, and the reactions of welfare and charity organisations should be taken into account. This is outside the scope of the present analysis (but will be tackled for the 19th century in WP 3.3).

> ⇨ **Preliminary findings**
> - Between the 15th and the 19th centuries, non-pharmaceutical interventions during health crises were cumulative, and traces of an active memory were clearly present.
> - Overall, the non-pharmaceutical interventions seem less intrusive than in mediterranean cities (ex. very reluctant to impact on the economy and/or to restrict the movement of 'healthy' people).
> - Epidemic policies are often more pronounced in times of 'minor' health emergencies, compared to the most lethal epidemics. The latter often occurred in times of war, hence impeding radical and/or novel interventions.
> - Scapegoating of the poor, as causes of an epidemic, which was clearly visible in Italy from the 15th/16th centuries onwards, only appears in the Southern Low Countries in the 18th century, notably during the (relatively minor) 1770s outbreaks (Bruneel, 1979).
> - During the 19th century cholera outbreaks, the association with poverty is frequently made (moral prejudices against the filth of the poor), but in practice little action was taken (as the Belgian central and local governments were not very eager to intervene in the private housing market for instance).

Presentations:

- Soens, T., "Epidemics and inequality in Belgium, 15th century to present", Symposium, Epidemics, space & inequality, IEM Zurich, 21 November 2022.

Future plans? The paper underpinning the 21/11/22 conference will now be turned into an article.

3.3 Epidemics and inequalities in 19th-century social policymaking

Goal? The goal of this work package is to investigate social policymaking and the circulation of epidemic policies by using governmental reports and correspondence alongside the demographical data that has been collected and analysed in the above-mentioned EPIBEL-studies. Previous historical research into policymaking mainly focuses on the implementation of social policy and the listing of general and repetitive measures imposed during a specific epidemic outbreak such as quarantine, isolation and hospitalisation. A thorough analysis of policymaking in the long term and the circulation of epidemic policies between central, regional and local governments and the motivation behind the policies is thus still missing. Additionally, the link between epidemics and poverty is strongly visible in the historical research on epidemic mortality and policymaking. However, recent demographical research shows that this link is not as straightforward as often supposed and research into social policymaking reveal a wide variety in the extent to which governments and authorities linked epidemics to poverty. Additional research is thus necessary to investigate when and why epidemics and the problem of poverty were seen as urgent and what motivations lay behind the stigmatisation of population groups during health crises.

<u>Method?</u> This will be investigated through a discourse analysis of correspondence, reports and other documents formed by governments, medical authorities, and poor relief institutions at the local and regional levels. Besides that, the discourse on social policymaking will be compared with mortality data that is linked with data on the socio-economic status of victims. This allows us to give meaning to the impact of social policies during epidemics on the mortality of socially disadvantaged groups and examine which actors and factors determined policymaking. By doing this, EPIBEL will not limit itself to an analysis of knowledge circulation during epidemics but will try to identify which actors, such as local and regional stakeholder groups, and factors influenced policymaking and the stigmatisation of socially disadvantaged groups.

<u>Challenges?</u> The main challenges of this research will be the finding of a methodological framework and adequate case studies.

<u>Future plans?</u> This research is part of a PhD which started in October 2022. Future papers and presentations will follow.

PUBLICATIONS

– Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Rees A., Rizzi E., Sanderson J.-P., Schlüter B. (2021), Variations spatiales et sociodémographiquesde mortalité de 2020-2021 en Belgique. L'effet de la pandémie Covid-19, Louvain-la-Neuve, Centre de Recherche en Démographie. Documents de Travail, 27.

– Bourguignon, M., Damiens, J., Doignon, Y., Eggerickx, T., Fontaine, S., Lusyne, P., Plavsic, A., Sanderson, J-P. (2020): *Surmortalité liée à la Covid-19 en Belgique variations spatiales et socio-démographiques. Document de travail, 17. Centre de Recherche en Démographie, Louvain-La-Neuve,* 42 p. https://uclouvain.be/fr/instituts-recherche/iacchos/demo/documents-de-travail.html

– Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Sanderson J.-P., (2021-1), La surmortalité lors de la première vague de l'épidémie de Covid-19. Des territoires plus touchés que d'autres, *La démographie en question*, Centre de recherche en démographie, Louvain-la-Neuve, 2 p. (https://cdn.uclouvain.be/groups/cms-editors-demo/isa/Fiche-DEMO%202021%231%20fr.%20v7.pdf)

– Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Plavsic A., Rees A., Rizzi E., Sanderson J.-P., Schlüter B.-S. (2022), "Un an après. Analyse de la variation sociodémographique de la surmortalité de 2020 liée à la Covid-19 en Belgique", *Cahier Québécois de Démographie*, accepté pour publication, à paraître.

– Bourguignon M., Damiens J., Doignon Y., Eggerickx T., Fontaine S., Lusyne P., Plavsic A., Sanderson J.-P., (2021-1), Excess mortality during the first wave of the Covid-19 epidemic. Some regions were more affected than others, *Demography in questions*, Centre de recherche en démographie, Louvain-la-Neuve, 2 p. (https://cdn.uclouvain.be/groups/cms-editors-demo/isa/Fiche-DEMO%202021%231%20eng.%20v8.pdf)

– De Herdt Tom, Deweerdt Joachim, Soens, Tim. "COVID-19 : de grote gelijkmaker? Een globaal en historisch perspectief", in: *Armoede en sociale uitsluiting : jaarboek 2021* / Coene, J. [edit.]; et al. Brussel : UPA , 2021, p. 286-306

– Devos, Isabelle, Mélanie Bourguignon, Emmanuel Debruyne, Yoann Doignon, Thierry Eggerickx, Hilde Greefs, Jord Hanus, Wouter Ronsijn, Jean-Paul Sanderson, and Tim Soens. 2021. "The Spanish Flu in Belgium, 1918-1919 : A State of the Art = Die Spanische Grippe in Belgien 1918-1919 : Ein Stand Der Technik." HISTORICAL SOCIAL RESEARCH-HISTORISCHE SOZIALFORSCHUNG suppl. 33: 251–83. https://doi.org/10.12759/hsr.suppl.33.2021.251-283

– Hardy, Olivier J., Dubourg, Dominique, Bourguignon, Mélanie, Dellicour, Simon, Eggerickx, Thierry, Gilbert, Marius, Sanderson, Jean-Paul, Scohy, Aline, Vandael, Eline, & Decroly, Jean-Michel (2021). A world apart: Levels and determinants of excess mortality due to COVID-19 in care homes: The case of the Belgian region of Wallonia during the spring 2020 wave. *Demographic Research*, 45, pp. 1011-1040. doi :10.4054/DemRes.2021.45.33

– Ronsijn, Wouter (2022), Historische Epidemieën: Cholera in 1849 in Oudenaarde, *G|OUD*, 2 (1): 30–40.

– Soens, Tim, De Bont Raf, De Keyzer, Maïka (2020), "At the edge of resilience: making sense of COVID-19 from the perspective of environmental history, *Journal for the history of environment and society - ISSN 2506-6730 - 5(2020),* p. 9-20. Full text (DOI uitgever): https://doi.org/10.1484/J.JHES.5.122459

– Soens, Tim Rampen doen (n)iets met de samenleving: over de mogelijkheden en beperkingen van rampengeschiedenis. *Hermeneus : maandblad voor de antieke cultuur / Nederlands Klassiek Verbond* - ISSN 0165-8158 - 95:4(2021), p. 12-17

SCIENCE COMMUNICATION: ACADEMIC

20 May 2021. Annual Posthumus conference (online), papers:

- Devos, I., Vrielinck, S., & Wiedemann, T. - The cholera epidemic in the city of Brussel, 1866.
- Soens, T. - EPIBEL. Epidemics & Inequalities in the History of Belgium/the Southern Low Countries.

1 September 2021: European Association for Urban History (online), paper:

- Soens, T. - Epidemic Inequalities in the City from the Plague to Covid-19.

1 October 2021: MARUF Marmara Urban Forum 21 (Istanbul – Online), paper:

- Soens, T. - Epidemic Inequalities in the City from the Plague to Covid-19.

16-17 December 2021: SHiP workshop (online):

- Devos, I. - Spatial dynamics of infectious diseases: problems and possibilities.

2-5 March 2022 Conference of European Society for Historical Demography, Madrid:

- Buzasi, K., Devos, I., Greefs, H., Muurling, S., & Riswick, T. - A deadly tale of two cities: smallpox, urban space, and social inequalities in Amsterdam and Antwerp, 1870-72.
- Hanus, J., Devos, I., & Soens, T. - Socio-economic status and epidemic mortality in an urban environment: Mechelen.
- Devos, I., Vrielinck, S., & Wiedemann, T. - Mapping the cholera epidemic in the city of Brussel, 1866.

14 April 2022. Monthly Seminar Rural and Environmental History, Wageningen University:

- Devos, I. - War, Peace and Epidemics: the Spanish flu in Belgium, 1918-19.

April 2022: OsloMet Centre for Research on Pandemics & Society (PANSOC):

- Hanus, J., Devos, I., & Soens, T. - Socioeconomic Status and Epidemic Mortality in an Urban Environment (Mechelen, Belgium): Were Dysentery (1794) and Cholera (1866) Socially Neutral Diseases?

3 May 2022. Webinar Series European Social and Population Issues, Vrije Universiteit Brussel:

- Soens, T. - From Plague to Corona. A history of epidemics in Belgium.

17 May 2022. Webinar Series European Society for Historical Demography:

- Devos, I. - War, Peace and Epidemics: the Spanish flu in Belgium, 1918-19.

24-27 May 2022. Conference AIDELF, Athens, papers:

- Bourguignon, M., Damiens, J., Doignon, Y., Eggerickx, T., Fontaine, S., Plavsic, A., Sanderson, J.-P. - Les variations spatiales de la mortalité due à la Covid 19, L'apport des démographes à la compréhension de la pandémie en Webinaires du 19-20-21 mai 2021, AIDELF.
- Eggerickx, T., Sanderson, J.-P., Bourguignon, M., Damiens, J., Doignon, Y., Fontaine, S., Plavsic, A. - Inégalités sociales de mortalité et place des ainés dans la société, L'apport des

démographes à la compréhension de la pandémie en Webinaires du 19-20-21 mai 2021, AIDELF.

16 September 2022. AIPRIL workshop Spatial analysis of mortality and inequality, Antwerp:

− Devos, I., Vrielinck, S., Wiedemann, T., Ronsijn, W., & Vanwambeke, S. - Spatial Analysis of Cholera in 19th-century Brussels.

21 November 2022. Symposium, Epidemics, space & inequality, IEM Zurich, papers:

− Devos, I. - Social gradients in flu-related mortality during the 1918-19 pandemic in Antwerp and Chatelet.
− Hanus, J. - Social gradient and spatiotemporal reconstruction of the cholera epidemic of 1866 in Belgian cities (Brussels, Malines, and Antwerp).
− Doignon, Y. - Regional differences in excess mortality in Belgium during the first and second COVID-19 waves.
− Soens, T. - Epidemics and inequality in Belgium, 15th century to present.

20 December 2022. Midi de Recherche, Departement de Demographie, UCL:

− Devos, I., Vrielinck, S., Wiedemann, T., Ronsijn, W., & Vanwambeke, S. - The 1866 cholera epidemic in Brussels: a spatio-temporal reconstruction.

15 March 2023. Cambridge Group for the History of Population and Social Structure Seminar, Cambridge:

− Hanus, J. - Territorial pervasiveness of epidemics and health emergencies in the Southern Netherlands/Belgium, 1650-1920.

12-15 April 2023. European Social Science History Conference, Göteborg, papers:

− Devos, I., Bourguignon, M., Debruyne, E., Doignon, Y., Eggerickx, T., Greefs, H., Hanus, J., Ronsijn, W., Vrielinck, S., Sanderson, J.-P., Soens, T. - The Spanish Flu in Belgium (1918-19): a Socially Neutral Disease?
− Greefs, H., Devos, I. - The 1870s Smallpox Epidemic in Antwerp: Intra-Urban Social Inequalities in Vulnerability.
− Ronsijn, W., Devos, I., Soens, T. - Social and Demographic Inequalities and the 1690s Dysentery Epidemic in the Southern Netherlands.

26 April 2023. Belgian Demography Day, UCL, paper:

− Devos, I., Bourguignon, M., Debruyne, E., Doignon, Y., Eggerickx, T., Greefs, H., Hanus, J., Ronsijn, W., Vrielinck, S., Sanderson, J.-P., Soens, T. - The Spanish Flu in Belgium (1918-19): a Socially Neutral Disease?

24-25 May 2023. Posthumus Conference, Antwerp, papers:

− Devos, I., Doignon, Y., Greefs, H., Vrielinck, S., Wiedemann, T. - Challenges and opportunities of GIS for studying inequalities in disease and mortality.
− Ronsijn, W. - Where are the landless? Evaluating the ommestellingen in rural Flanders, seventeenth-eighteenth century.

5 June 2023. Workshop Epidemics in Medieval and Early Modern Western Europe, Groningen, paper:

— Ronsijn, W., Dev os, I. - The 1690s epidemic in Flanders (Anzegem).

11 July 2023. The State of Urban History Conference, Leicester, paper:

— Devos, I., Vrielinck, S., Wiedemann, T., Ronsijn, W., & Vanwambeke, S. - The 1866 cholera epidemic in Brussels: a spatiotemporal reconstruction.

30 August-2 September 2023. European Society of Historical Demography Conference, Nijmegen, paper:

— Ronsijn, W., Devos, I., & Soens, T. - Social and demographic inequalities and the 1690s dysentery epidemic in the Southern Netherlands.

11-14 September 2023. European Rural History Conference, Cluj (Romania), paper:

— Soens, T., Espeel, S., Ronsijn, W. - Was there a social bias in plague mortality? Reexamining the diffusion and impact of Plague in the Southern Low Countries between 1349 and 1550.

SCIENCE COMMUNICATION: GENERAL AUDIENCE, MEDIA & NEWS

Media

- Website: www.epibel.be
- 8 January 2022: Het Laatste Nieuws

Webinar/Seminar: Van Pest tot Corona. Een geschiedenis van epidemieën in Vlaanderen en België
(Isabelle Devos)

- 9 January 2021: Webinar Alumni History UGent
- 8 February 2021: Webinar Okra Oost-Vlaanderen
- 20 April 2021: Webinar Volunteers S.O.S. Antwerpen
- June 2021: Webinar Ferm (Boerinnenbond)
- 19 October: Lecture Heemkunde Evergem (postponed due to COVID-19)
- 13 December 2021: Lecture Familiekunde Gent (postponed due to COVID-19)
- 9 March 2022: Lecture Oudheidkundige Kring Land van Dendermonde
- 19 April 2022: Webinar Genootschap Antwerpse Geschiedenis
- 12 September 2022: Lecture Familiekunde Gent
- 17 October 2022: Lecture Heemkunde Torhout

Workshop Citizen Science: Hoe doe ik historisch onderzoek naar doodsoorzaken en epidemieën?
(Isabelle Devos, in collaboration with Histories vzw en SOS Antwerpen)

- 26 October 2021: Antwerpen
- 7 May 2022: Kampenhout
- 11 May 2022: Gent
- 30 May 2022: Tielt
- 21 June 2022: Bilzen

Seminar: Tussen Pest en Spaanse Griep. Grote Sterfte doorheen de Geschiedenis (Tim Soens)

- 27 April 2023: Deinze