URBAN HEALTH PENALTIES

Estimates of life expectancies in Belgian cities, 1846-1910

- Isabelle Devos & Tina Van Rossem -

Research on the nineteenth century has demonstrated that the direct consequences of urbanisation and industrialisation are likely to be negative for the health of urban populations. Most researchers have examined the urban penalty by focusing on the differences in life expectancies between urban and rural areas, but rarely on the differences between towns and cities. This article is the first contribution towards a comparative study of mortality trends in Belgian towns and cities during the late nineteenth and early twentieth centuries. In this article we look at ten urban areas of various population sizes and present a rigorous set of estimates of life expectancies and age-specific mortality risks for each of these urban environments. We examine whether there were substantial differences in survival chances between them, how these evolved over time, and which sex and age groups experienced the heaviest penalties. By focusing on the mortality experiences of urban men, women, and children during the era of the industrial revolution, a key period in the evolution of living standards, we deliver an important contribution to the historical debate on the relationship between urban growth, industrialisation, and mortality change.

I. Introduction

The decline in mortality since the late eighteenth century, usually known as the mortality transition, is a widely studied topic in historical demography. At present, it is clear this transition cannot be regarded as a continuous process of decline. Historical research for a number of European countries has revealed a stagnation and, in some cases, even an increase in mortality during the period of industrialisation[1]. According to the English historian Simon Szreter, the obvious notion that economic growth due to industrialisation directly benefited the population's health is misleading[2].

Urban mortality appears traditionally to have been substantially higher than mortality in the countryside for a number of reasons. High population densities, as well as high levels of migration to urban centres, contributed to the rapid transmission of infectious and epidemic diseases. Moreover, the specific composition of urban populations (lower working class), together with the presence of urban institutions such as hospitals and orphanages etc. pushed mortality upwards[3]. The differentials between urban-rural mortality in the nineteenth century, furthermore, have been linked to rising mortality levels in industrialised urban areas. Such urban penalties have been observed in Britain and in several countries in continental Europe[4]. For Belgium, comparative research has focused exclusively on Wallonia, the southern part of the country which was the most industrialised part during the nineteenth century. Studies by

The authors would like to thank Ewout Depauw for his assistance in the data collection and the presentation of the paper at the European Conference of Historical Demography in Alghero, September 2014. **1.** Roger Schofield, David Reher & Alain Bideau (eds.), *The decline of mortality in Europe*, Oxford, 1991, p. 270. For Belgium, see Isabelle Devos, *Allemaal beestjes. Mortaliteit en morbiditeit in Vlaanderen, 18de-20ste eeuw*, Gent, 2006, p. 264. **2.** Simon Szreter, *Health and wealth. Studies in history and policy*, Rochester, 2005, p. 506; Id., "Industrialization and health", in *British Medical Bulletin*, no. 69, 2004 (1), p. 75-86. **3.** Michael Haines, "The urban mortality transition in the United States, 1800-1940", in *Annales de Démographie Historique*, no. 101, 2001 (1), p. 33-64; William Hubbard, "The urban penalty : towns and mortality in nineteenth-century Norway", in *Continuity and Change*, no. 15, 2000 (2), p. 331-350; Samuel Preston & Etienne van de Walle, "Urban French mortality in the nineteenth century", in *Population Studies*, no. 32, 1978 (2), p. 275-297; David Reher, "In search of the 'urban penalty' : exploring urban and rural mortality patterns in Spain during the demographic transition", in *International Journal of Population Geography*, no. 7, 2001 (2), p. 105-127; Robert Woods, "Urban-rural mortality differentials : an unresolved debate", in *Population Development Review*, no. 29, 2003 (1), p. 29-46. **4.** They were studied quite extensively for Britain : Roderick Floud, Bernard Harris, "Health, height and welfare : Britain, 1700-1980", in Richard Steckel, Roderick Floud (eds.), *Health and welfare during industrialization*, Chicago, 1997, p. 91-126; Simon Szreter, Graham Mooney, "Urbanization, mortality and the standard of living debate : new estimates of the expectation of life at birth in nineteenth-century British cities", in *Economic History Review*, no. 51, 1998 (1), p. 84-112; Jörg Vögele, *Urban mortality change in England and Germany, 1870-1913*, Liverpool, 1998, p. 299; Jeffrey Williamson, "Was the industrial revolution worth it ? Disamenities and death in 19th century British towns", in *Explorations in Economic History*, no. 19, 1990 (3), p. 221-245; Robert Woods, Nicola Shelton, "Disease environments in Victorian England and Wales", in *Historical Methods*, no. 33, 2000 (2), p. 73-82; Edward Wrigley, Roger Schofield, *The population history of England 1541-1871 : a reconstruction*, London, 1981, p. 779. For France, see Lionel Kesztenbaum, Jean-Laurent Rosenthal, "The health cost of living in a city : the case of France at the end of the 19th century",

Thierry Eggerickx, Michel Oris, and others have revealed a large mortality gap between the countryside and towns up until the early twentieth century. Excess mortality was seen in Wallonia in areas with more than 20,000 inhabitants[5].

In contrast to the considerable body of literature on the urban-rural divide, only a limited number of studies have discussed the differences *between* towns and cities. Population size is often suggested as an explanation for prevailing health conditions. Researchers have found a positive correlation between urbanisation and mortality in nineteenth-century England and Wales[6], France[7], and the United States[8]. Rather than population numbers, some authors stress overcrowding[9] or the absence of specific sanitation projects, such as piped water supply and sewer systems[10]. Szreter, on the other hand, cites industrialisation as the most important factor, since the industrial towns in England consistently exhibited the lowest life expectancies until the early twentieth century[11]. For Belgium, apart from life table calculations made by the pioneer of government statistics, Adolphe Quetelet, and

in *Explorations in Economic History*, no. 48, 2011 (2), p. 207-225; David Weir, "Economic welfare and physical well-being in France, 1750-1900", in Richard Steckel, Roderick Floud (eds.), *Health and welfare during industrialization*, Chicago, 1997, p. 161-200. For Germany, see Jörg Vögele, "Urbanization and the urban mortality change in imperial Germany", in *Health & Place*, no. 6, 2000 (1), p. 41-55. For Norway, see William Hubbard, *The urban penalty*…, p. 331-350. For Poland, see Grazyna Liczbinska, "Diseases, health status, and mortality in urban and rural environments : the case of catholics and lutherans in 19th-century Greater Poland", in *Anthropological Review*, no. 73, 2010 (1), p. 21-36. For Spain, see David Reher, *In search of* …., p. 105-127. For the Netherlands, see Jan Willem Drukker, Vincent Tassenaar, "Paradoxes of modernization and material well-being in the Netherlands during the nineteenth century", in Richard Steckel, Roderick Floud (eds.), *Health and welfare during industrialization*, Chicago, 1997, p. 331-377. **5.** Thierry Eggerickx, "La mortalité dans le bassin industriel de Charleroi aux 19ème et 20ème siècles : un handicap socio-demographique recurrent", in *Espace, Populations, Sociétés*, no. 19, 2001 (3), 351-368; Thierry Eggerickx, Marc Debuisson, "La surmortalité urbaine : le cas de la Wallonie et de Bruxelles à la fin du XIXe siècle (1889-1892)", in *Annales de Démographie Historique*, 1990 (1), p. 23-41; Muriel Neven, "Mortality differentials and the peculiarities of mortality in an urban-industrial population : a case study of Tilleur, Belgium", in *Continuity and Change*, no. 15, 2000 (2), p. 297-329; Id., "Epidemiology of town and countryside. Mortality and causes of death in East Belgium, 1850-1910", in *Belgisch Tijdschrift voor Nieuwste Geschiedenis*, no. 27, 1997 (1-2), p. 39-82; Michel Oris, "Mortalité, industrialisation et urbanisation au 19e siècle. Quelques résultats des recherches liégeoises", in Claude Desama, Michel Oris (eds.), *Dix essais sur la démographie urbaine de la Wallonie au XIXe siècle*, Bruxelles, 1998, p. 289-322. **6.** Jörg Vögele, *Urban mortality*…., p. 299; Jeffrey Williamson, *Was the industrialization*…, p. 221-245. **7.** Lionel Kesztenbaum, Jean-Laurent Rosenthal, *The health cost*…, p. 207-225. **8.** Louis Cain, Sok Chul Hong, "Survival in 19th century cities : the larger the city, the smaller your chances", in *Explorations in Economic History*, no. 46, 2009 (4), p. 450-463; Michael Haines, *The urban mortality*…, p. 33-64. **9.** R.A. Cage, John Foster, "Overcrowding and infant mortality : a tale of two cities", in *Scottish Journal of Political Economy*, no. 49, 2002 (2), p. 129-149; Lilli Stein, "A study of respiratory tuberculosis in relation to housing conditions in Edinburgh", in *British Journal of Social Medicine*, no. 4, 1950 (3), p. 143-169. **10.** Samuel Preston, Etienne van de Walle, *Urban French mortality*…, p. 275-297. **11.** Simon Szreter, *Health and wealth : studies in history and policy*, Rochester, 2005, p. 506.

prison reformer Edouard Ducpétiaux for the capital city of Brussels in the early nineteenth century, there have been no *systematic* attempts to compare the life expectancies of urban populations by contemporaries or historians[12]. This article is the first to present a large-scale comparative study of urban mortality for Flemish and Walloon cities, as well as the Belgian capital, Brussels, between the second half of the nineteenth century and the eve of the First World War. The following questions are discussed : Were survival chances between towns very different ? How did these evolve over time ? Which sex and age groups experienced the heaviest penalties ? And were these groups the same in every urban context ? Although it is not our intention to offer a full analytical framework for the differences observed in this article, we do examine if and how these could be related to the urban and industrial contexts of the cities involved. The comparative approach enables the delineation of more general processes, as well as the identification of distinctive features of each town within the Belgian mortality decline. Moreover, as industrialisation and urbanisation in Belgium acted independently to some extent, the Belgian case is particularly helpful in understanding the connection between industrialisation and urban mortality[13].

The focus here is on the mortality experiences of men, women, and children in the three largest cities in Flanders (Antwerp, Bruges, and Ghent) and in the city of Brussels from 1846 until 1910, which are compared – if the data is available – with other Belgian cities. In total, the article incorporates mortality figures for ten urban areas of various sizes : the large cities of Antwerp, Ghent and Brussels (respectively c. 89,000, 103,000 and 124,000 inhabitants in 1846), the medium-sized cities of Bruges, and Liège (c. 50,000 and 75,000) and the smaller towns of Torhout, Waregem, Charleroi, Huy, and Seraing (ranging between 7,500 and 10,500 inhabitants). The location of these towns and cities is shown in figure 1.

12. Edouard Ducpétiaux, *De la mortalité* à *Bruxelles comparée* à *celle des autres grandes villes*, Bruxelles, 1844, p. 84; Adolphe Quetelet, "Mémoire sur les lois de naissances et de la mortalité à Bruxelles", in *Mémoires de l'Académie royale des Sciences et des Belles Lettres de Bruxelles*, no. 3, 1826, p. 495-512. **13.** Hilde Greefs, Bruno Blondé, Peter Clark, "The growth of urban industrial regions : Belgian developments in comparative perspective, 1750-1850", in Jon Stobart, Neil Raven (eds.), *Towns, regions and industries : urban and industrial change in the Midlands, c. 1700-1840,* Manchester, 2005, p. 210-227.

Figure 1. Location of the towns and cities under study

Source : Map created by Torsten Wiedemann, Ghent University.

The body of this article consists of six sections. First, we look deeper into the demographic and economic contexts of the cities before turning, in the second section, to the sources and methodology used. In the third section, we discuss the crude mortality rates of the different cities and towns. Because crude death rates can be significantly distorted by the age structure of the populations, in the fourth section, we present life expectancies. Next, we focus on the age- and gender-specific mortality risks and examine the differences between men, women, and children in the various urban environments in sections five and six. While this article is essentially a summary of descriptive findings, we do suggest some possible explanations for these differences. By focusing on the mortality experiences of urban populations in Belgium during the era of the industrial revolution – a key period in the evolution of the standard of living – we aim to offer a contribution to the historical debate on the relationship between urban growth, industrialisation, and mortality change.

II. Urbanisation and industrialisation in Belgium

Historically, Belgium has been known for its high degree of urbanisation. The north, in particular, has long been characterised by large textile centres, such as Ghent and Bruges in the high Middle Ages, and Antwerp in the early modern period. By the end of the eighteenth century, nearly a third of the population lived in an urban settlement with at least 5,000 inhabitants, compared to only 16 percent in France and 25 in England[14]. Besides this earlier strength of urban populations, many Belgian cities and towns in the nineteenth century owed their expansion to industrial development. Belgium was the first country on the European continent to follow the British example and enter the Industrial Revolution. Yet, geographic differences in its industrialisation process were large[15]. As a result, the ten cities in this article represent a series of interesting local studies for the Belgian case, and beyond. We discuss the health penalties of traditional cities that industrialised during the nineteenth century (Ghent and Liège), those that turned into metropolitan areas (Antwerp and Brussels), and those that were characterised by deindustrialisation (Bruges). Besides new industrial towns (Charleroi, and Seraing), we are also interested in the hazards of living in small regional service centres (Torhout, Waregem, and Huy).

The industrial heart of the country in the nineteenth century was situated in the Walloon region around Liège and Charleroi which saw the development of important coal mining activities[16]. Once a small fortified city, Charleroi grew into a major centre of steel and glass production, triggering a steep population growth[17]. Besides Charleroi, the area around Liège became another economic motor in the Belgian economy, based on growing demand for coke and steel. One of the most impressive examples of urban growth took place in Seraing. During the nineteenth century, the population in this village near Liège exploded, rising from about 2,000 to more than 40,000 inhabitants[18]. This remarkable growth was due primarily to the figure of John Cockerill, a British industrialist who built a steel-making and machine empire around Liège. He constructed the first coke-fuelled blast furnace in Seraing in 1817[19]. Huy also industrialised early and throughout the nineteenth century it remained a rather traditional small town, with the service industry gaining importance[20].

14. Isabelle Devos, Thijs Lambrecht, Richard Paping, "The Low Countries, 1000-1750", in Eric Vanhaute, Isabelle Devos,Thijs Lambrecht (eds.), *Making a living : family, labour and income*, Turnhout, 2011, p. 159-161. **15.** Marinette Bruwier, *Industrie et société en Hainaut et Wallonie du XVIIIe au XXe siècle,* Bruxelles, 1996, p. 414; Guido De Brabander et al., *De industrie in België : twee eeuwen ontwikkeling, 1780-1980,* Gent, 1981, p. 327. **16.** René Leboutte, Jean Puissant, Denis Scuto, *Un siècle d'histoire industrielle. Belgique, Luxembourg, Pays-Bas, industrialisation et sociétés, 1873-1973*, Paris, 1998, p. 298. **17.** Thierry Eggerickx, *La mortalité*…, p. 351-368. **18.** Michel Oris, *Mortalité, industrialisation et urbanisation*…, p. 298-322. **19.** Matthias Hennies, "Over de industriële geschiedenis van België", in *European route of Industrial Heritage* (http://www.erih.net/nl/industriele-geschiedenis/belgie.html) last accessed February 24, 2015. **20.** Michel Oris, "La transition de la mobilité au XIXe siècle : l'expérience de Huy-sur-Meuse (Belgique) entre 1847 et 1900", in *Annales de Démographie Historique*, 1993, p. 191-225.

In Flanders it was the collapse of the rural linen industry that led to the shift of economic and demographic growth to towns in the first half of the nineteenth century. Ghent, in particular, with its mechanised cotton industry, was able to absorb many rural migrants and experienced strong population growth. At the time of Belgian independence in 1830, roughly 16,000 textile workers, mainly women and children, were employed in some 63 factories[21]. In Brussels, Antwerp, and Bruges, little attention was paid to technical innovation despite the presence of their traditional textile industries until the late eighteenth century. In the first quarter of the nineteenth century, they began to deindustrialise[22]. Net migration was nevertheless substantial in the city of Brussels, established as Belgium's capital in 1831. It soon became the administrative and financial centre of the new kingdom and the construction of the canal between Brussels and Charleroi in 1832 fostered new industrial growth. Antwerp also underwent a rapid transformation as its harbour developed into an international port in which the transport and trade-related sectors boomed. As a result, an important axis of economic power arose in Belgium from Antwerp, through Brussels, to Charleroi[23]. In West Flanders, economic development was more or less absent during the nineteenth century. The collapse of the rural linen industry and a spectacular increase in food prices led to the impoverishment of broad sections of the population, especially after the severe agricultural depression of the 1840s when first potato and later cereal harvests failed[24]. Bruges, a major urban centre, could offer no alternative employment to the lace industry. Small cities like Torhout and Waregem were also involved in the textile industry. Until the beginning of the twentieth century, the flax industry remained the region's prime economic activity[25].

The development of these clearly defined areas of economic growth created many poles of attraction for the population surplus of the countryside. In 1846, 33 percent of the Belgian population lived in an area with more than 5,000 inhabitants, whereas by 1910 this percentage had increased to 57 (table 1). The traditional urban centres were initially the main beneficiaries of these developments but the increase also shifted to their suburbs and new medium-sized towns. As table 1 shows, population development after 1846 was diversified.

21. Juul Hannes, "Industrialisation without development : some aspects of the history of Ghent", in Pim Kooij, Piet Pellenbarg, *Regional capitals. Past, present, prospects*, Assen, 994, p. 13; Chris Vandenbroeke, *Sociale geschiedenis van het Vlaamse volk*, Leuven, 1984, p. 301. **22.** Yves Segers, "Oysters and rye bread : polarising living standards in Flanders, 1800-1860", in *European Review of Economic History*, no. 5, 2001 (3), p. 304. **23.** René Leboutte, Jean Puissant, Denis Scuto, *Un siècle d'histoire industrielle*…, p. 298. **24.** Chris Vandenbroeke, *Sociale geschiedenis*…, p. 301. **25.** Aline Balcaen, *Mortaliteitsstudie van een kleine stad : Waregem tijdens de tweede helft van de 19de eeuw-1ste helft van de 20ste eeuw,* unpublished MA thesis, Ghent University, 2006, p. 313; Elke Vanthuyne, *Een eeuw sterfte in Torhout, mortaliteitsstudie van een kleine stad (1846-1947),* unpublished MA thesis, Ghent University, 2006, p. 113.

Table 1. Population distribution by size of community in Belgium, 1846-1910

	1846	1910
< 5,000	67.3	43.5
5,000-10,000	12.4	15.4
10,000-20,000	5.4	11.5
20,000-50,000	5.8	12.3
50,000-100,000	3.9	6.3
100,000+	5.2	11.0

Sources : Calculations based on the censuses of 1846 and 1910, obtained from LOKSTAT, *Historical database of local statistics*, Ghent University.

At the start of the twentieth century, large urban centres with more than 100,000 residents comprised 11 percent of Belgium's population, double the level of 1846. Still, although most of the population growth took place in large cities such as Antwerp, Brussels, Charleroi, Ghent, and Liège, table 1 shows that there was also a sharp increase in communes of between 10,000 and 50,000 inhabitants. These accounted for nearly a quarter of the population by 1910. Their rise reflects the expansion of suburbs on the one hand, and regional service centres and new industrial towns on the other. Nineteenth-century Belgium was characterised by a process of 'conurbanisation'[26].

26. Instead of permanent migration, the Belgian population seems to have preferred to commute to their new places of employment or to resort to seasonal migration. According to Deprez and Vandenbroeke, the smallness of the country together with an efficient railway system and road network made this choice easier. Weekly commuting and seasonal migration (to Wallonia and northern France) were very popular in Flanders, whereas daily commuting was more prevalent in Wallonia. When Belgians did decide to move, they generally preferred small regional centres or suburbs to large cities. Paul Deprez, Chris Vandenbroeke, "Population growth and distribution, and urbanization in Belgium during the demographic transition", in Robert Lee, Richard Lawton (eds.), *Urban population development in Western Europe, from the late 18th to the early 20th century*, Liverpool, 1989, p. 232.

Industrialisation had a strong impact on demographic developments in Belgium. It led directly to further urbanisation but never brought about the emergence of mammoth cities, or at least not to the same extent as elsewhere in Western Europe. In 1846, Brussels and Ghent were the only cities in Belgium that exceeded the 100,000 level; by 1900 they had only been joined by Antwerp and Liège. These four cities remained the largest in the country throughout the period although their exact rankings changed (table 2). The rise of Antwerp was particularly spectacular, with the population more than tripling in the second half of the nineteenth century. Nevertheless, Antwerp was not exceptional. Figure 2 reveals that the new industrial towns of Charleroi and Seraing experienced a similar exponential growth. The figure also points to a second cluster among the ten towns discussed in this paper. For instance, the three cities in West-Flanders (Bruges, Torhout and Waregem) enjoyed only minimal growth. Bruges even experienced a population decline, as was the case for Torhout in 1866, probably as a result of the cholera epidemic that year. Finally, the 'middle' group saw large growth. In 1910, these cities registered a population size 1.4 to 2 times greater than in 1846. Besides Huy, these were Brussels, Ghent and Liège; three of the most populous cities in Belgium[27].

In the rest of the article we discuss the health consequences of these processes of urbanisation, industrialisation and deindustrialisation by taking into account the differences in economic features and population size across the towns and cities under study.

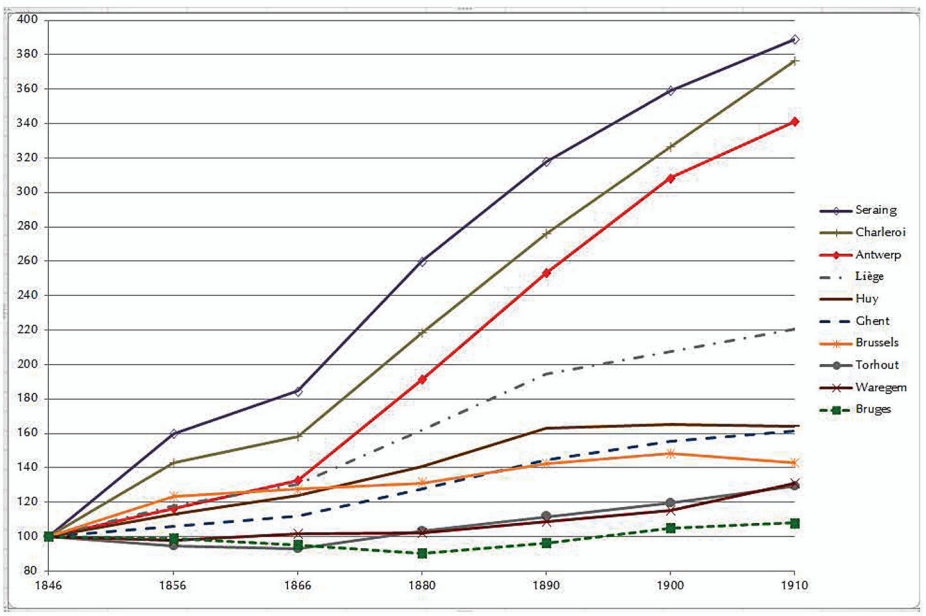
27. Although the population of these cities clearly rose substantially, we should take into account that their suburbs witnessed a similar or even larger increase. Consequently, by the turn of the century, an increasing number of communes on the periphery of Brussels appeared on the list of the most populous municipalities. This was the case, for instance, for Schaarbeek, Sint-Jans-Molenbeek and Sint-Gillis; all of which registered more than 50,000 inhabitants in 1900. See the 1900 census obtained from LOKSTAT and Thierry Eggerickx, "Transition démographique et banlieue en Belgique : le cas de Bruxelles", in *Annales de Démographie Historique*, 2013 (2), p. 51-80. Consequently, the population of the city of Brussels declined between 1900 and 1910.

Table 2. Population size and ranking of the cities and towns under study, 1846-1910

	1846*	1866	1890	1910
Antwerp	88,487	117,269	224,012	301,766
	(3)	*(2)*	*(1)*	*(1)*
Bruges	49,308	47,015	47,497	53,285
	(5)	*(5)*	*(9)*	*(10)*
Brussels	123,874	157,905	176,138	177,078
	(1)	*(1)*	*(2)*	*(2)*
Charleroi	7,490	11,856	20,668	28,177
	(54)	*(30)*	*(26)*	*(26)*
Ghent	102,977	115,354	148,729	166,445
	(2)	*(3)*	*(3)*	*(4)*
Huy	8,871	11,008	14,486	14,545
	(36)	*(34)*	*(39)*	*(62)*
Liège	75,961	99,129	147,660	167,521
	(4)	*(4)*	*(4)*	*(3)*
Seraing	10,540	19,451	33,495	41,015
	(29)	*(17)*	*(14)*	*(16)*
Torhout	8,477	7,902	9,464	10,981
	(40)	*(63)*	*(80)*	*(95)*
Waregem	7,003	7,116	7,628	9,162
	(61)	*(75)*	*(103)*	*(117)*

Note : * refers to the *de facto* population. The ranking is given in brackets.
Sources : Calculations based on the censuses of 1846, 1866, 1890 and 1910. Data obtained from LOKSTAT, Ghent University.

Figure 2. Population growth in the towns and cities under study (1846=100)



Sources : Calculations based on the censuses of 1846, 1856, 1866, 1880, 1890, 1900 and 1910. Data obtained from LOKSTAT, Ghent University.

III. Data

In order to assess what the health conditions actually entailed, it is necessary to have access to reliable mortality figures for the urban populations in question. For the Walloon cities, we made use of published materials by Thierry Eggerickx and Michel Oris, supplemented with new data for the years 1890, 1900, and 1910[28]. For the Flemish cities and Brussels, the article draws on previously unpublished materials[29]. In this section we discuss the sources, the quality of the data, and the methods used.

Since we are interested in the mortality conditions prevailing in cities and towns during the late nineteenth and early twentieth centuries, period measures are the most appropriate. Period measures can be viewed as snapshots of 'current' mortality and present a summary description of mortality experiences in a particular year. For this article we relied on four measures : crude death rates, age-specific mortality rates, gender-specific mortality rates, and life expectancies.

Sources and methods

Whereas crude mortality rates require data on the annual number of deaths and the total population, the three other measures require the construction of period life tables. Two types of data are needed for a period life table : (1) the number of male and female deaths at each age, and (2) the number of men and women of these ages.

(1) Deaths by age and sex were collected from *Le Mouvement de la Population et de l'État Civil* stored at the Belgian National Archives[30]. This central register of vital events – kept up

28. Thierry Eggerickx, *La mortalité…*, p. 351-368; Thierry Eggerickx, Marc Debuisson, *La surmortalité urbaine…*, p. 23-41; Michel Oris, *Mortalité, industrialisation et urbanisation...*, p. 298-322. Since figures for the cities of Liège and Seraing in the years 1890, 1900 and 1910 were lacking, we collected the data ourselves using the HISSTER database, which contains Belgian mortality statistics at the local and regional level since 1841. See HISSTER, a database of Belgian mortality statistics for the nineteenth and twentieth centuries available at the local and regional level, Ghent University, History Department, supervised by Isabelle Devos. **29.** The data for Brussels were collected specifically for this article. The figures for the Flemish cities come from graduate research at Ghent University closely supervised by Isabelle Devos and comprises Master's Theses in History by Jeroen Backs, *Mortaliteit in Gent (1830-1950)*, Gent, 2003, p. 298; Aline Balcaen, *Mortaliteitsstudie….*, p. 313; Lawrence Van Haecke, *Bruges-la-Morte : differentieel mortaliteitsonderzoek voor de stad Brugge (2de helft 19de-1ste helft 20ste eeuw)*, unpublished MA thesis, Ghent University, 2004, p. 316; Tom Vanderheeren, *Een kwantitatieve analyse van de bevolking en mortaliteit in Antwerpen in de tweede helft van de 19e eeuw,* unpublished MA thesis, Ghent University, 2009, p. 135; Elke Vanthuyne, *Een eeuw sterfte….*, p. 113. Calculations of age-specific mortality rates and life expectancies were all based on the same methodology. The calculations were double-checked by comparing these with the data available through HISSTER, the population censuses, and *Le Mouvement*. Because the thesis on Antwerp lacked estimates for the year 1910, we collected the data ourselves using the HISSTER database. We also used data from the same source to construct estimates for Bruges for the years 1890, 1900, and 1910, since Lawrence Vanhaecke discovered significant registration errors in the city reports he used to construct the mortality figures in his master's thesis. See Lawrence Vanhaecke, *Bruges-la-Morte…*, p. 302. **30.** National Archives Belgium, *Nationaal Instituut voor de Statistiek. Beweging van de burgerlijke stand en loop der bevolking, Statistiques du Mouvement de la Population et de l'État Civil*, 1841-1976. Data partly available through HISSTER.

to date since 1886 – provides comprehensive figures for each of the 2,583 municipalities, 41 districts and nine provinces of Belgium. It delivers the total number of deaths by age and sex per year, as well as a whole range of other data[31]. Unfortunately, the mortality statistics published by the central government for the period before 1886 appear in a format that cannot be used to reconstruct life tables in a straightforward manner. However, this does not mean that there is no relevant evidence available in the municipal archives. In fact, the rediscovery of the bills of mortality (annual compilations of vital events by age and often also by sex) for the cities of Antwerp, Bruges and Ghent have allowed the calculation of mortality figures[32]. Although the original bills for the city of Brussels have not survived, we were able to derive age-specific mortality data from the *Bulletins communaux de la Ville de Bruxelles*[33]. For this article, the age-specific deaths of the cities were based on three-year samples to smooth out any irregular fluctuations[34]. Those samples were centred around the seven relevant census years, namely 1846, 1856, 1866, 1880, 1890, 1900, and 1910. In other words, this study is based on samples for 1845-47, 1855-57, 1865-67, etc.

(2) Figures on the male and female population by age were gathered through the decennial census volumes that were published from 1846 onwards for all cities with 10,000 inhabitants or more[35]. Such data is not available for small towns and municipalities, but this was remedied by using local population listings or manual counts from population registers (Torhout and Waregem)[36].

Subsequently, life tables were constructed according to the Wunsch and Termote method[37]. As most of the nineteenth-century bills of mortality and population censuses present data by five-year age groups only, we created abridged life tables which permitted us to assemble a set of life expectancies, and age- and gender-specific mortality rates, for the Flemish cities, as well as Brussels, at several intervals between 1846 and 1910. Eggerickx and Debuisson used the same method in their calculations for the Walloon cities of Charleroi

31. In the earliest registers, deaths were listed by single ages (and for the first years of life also by month or grouped months), and after age 25 by five-year age groups. From 1900 onwards, deaths were registered for single ages up to 100. **32.** The bills were either published (Ghent) or manually transcribed (Bruges) in the annual reports of the city authorities. In some cases, they were found among other historical documents at the municipal archives (Antwerp). **33.** Archives of the city of Brussels, *Bulletins communaux de la Ville de Bruxelles*, 1825-2001. In the volumes of 1836 to 1850, only the total number of deaths was included. From 1851 onwards, age-specific mortality data were also recorded. Although most of these data were sex-specific, there were some exceptions (e.g. the mortality figures for 1878 and 1879). **34.** Exceptions are the samples for Antwerp (age-specific mortality figures between 1846 and 1900 are based on one year) and Ghent (based on five years). **35.** Statistique de la Belgique, *Population. Recensement Général du 15 octobre 1846*, Bruxelles, Ministère de l'Interieur. **36.** As was the case for Torhout and Waregem : Aline Balcaen, *Mortaliteitsstudie…*, p. 313; Elke Vanthuyne, *Een eeuw sterfte…*, p. 113. Because such counts are very time-consuming, it was not possible to construct tables for each of the seven census years. For Torhout, the figures relate to 1846, 1880, and 1910 (based on data for the years 1911, 1912 and 1913); for Waregem, 1846, 1856, 1890, 1900, and 1910. **37.** Guillaume Wunsch, Marc Termote, *Introduction to demographic analysis*, New York, 1978, p. 93-105.

and Liège[38]. The methodology for Huy and Seraing, however, was not specified[39]. The same data sources provided us with our fourth measure, the crude mortality rate, which indicates the annual number of deaths per 1,000 inhabitants.

Data quality

Because historical population and mortality data can present some particular difficulties and biases, we did not take them at face value. In fact, we can identify four problems : two concern content errors and two relate to coverage errors.

First, historical data frequently display excess frequencies at ages ending in zero or five. This content error occurred because many (illiterate) people did not know exactly when they were born or were inclined to understate or exaggerate their age (to avoid military service for instance). Ron Lesthaeghe revealed, as early as the 1970s, that 'age heaping' was a common phenomenon in the earliest Belgian censuses (1846, 1856, 1866 and 1880). This related to the age of 30 onwards, in particular for multiples of 10[40]. The census most affected was that of 1846, after which the problem gradually disappeared. The data for the cities discussed in this article likewise showed some attraction for ages ending in zero. However the Whipple index, used to measure the tendency to round off ages, was never above 1.06. Taking into account that the index can range between one (no preference) and five (strong preference), we argue that the urban data was only slightly affected. Most errors diminish, moreover, by providing the life tables in an abridged form.

Lesthaeghe also pointed to the possible misreporting of the number of young people in the first Belgian censuses[41]. In the population pyramids of Antwerp, Bruges, Brussels, and Ghent, the number of children between two and 15 years of age seems to have been undercounted[42]. While it is not clear whether this deficiency is related to data registration, we are inclined to attribute it to the specificity of urban populations. Large cities had a particular attraction for young, single migrants (such as servants) and were less appealing to families with children. According to Deprez and Vandenbroeke, the low percentage of children in these urban populations might also be related to the severe economic crisis in Flanders during the 1840s, which resulted in lower birth rates[43].

Further difficulties in analysing urban areas in the nineteenth century include boundary adjustments, which can significantly influence the size and composition of the population at risk. For the localities under study, however, there were only minor changes[44]. Finally, an additional difficulty with regard to the coverage

38. The only difference is that they used a five-year sample for the age-specific mortality data instead of a three-year sample. Thierry Eggerickx, *La mortalité…*, p. 358; Thierry Eggerickx, Marc Debuisson, *La surmortalité urbaine…*, p. 24. **39**. Michel Oris, *Mortalité, industrialisation et urbanisation…*, p. 298-322. **40.** Ron Lesthaeghe, *The decline of Belgian fertility*, Princeton, 1977, p. 234-235. **41**. *Idem*, p. 236. **42**. Jeroen Backs, *Mortaliteit…*, p. 41-43; Lawrence Van Haecke, *Bruges-la-morte…*, p. 59-60; Tom Vanderheeren, *Een kwantitatieve analyse…*, p. 39-42. **43**. Paul Deprez, Chris Vandenbroeke, *Population growth…*, p. 237. **44**. Sven Vrielinck, *De territoriale indeling van België 1795-1963*, Leuven, 2000, p. 1798-2033. For the city of Antwerp, there were minor changes in 1871, 1883, 1887, 1896, 1900, 1903, and 1906; for Bruges, 1899 and 1901; for Ghent, 1876, 1885, 1900, and 1901; for Liège, 1855, 1900; for

of the population at risk is that censuses after 1866 referred to the legal population (*de jure* population), i.e. those who were legal residents of the city, even though they might have been temporarily absent. The figures for 1846 and 1856 referred to *de facto* population, or those who were actually resident in the city at the time of the census, excluding absentees and including visitors. As is the case today, deaths related to *de facto* deaths[45]. Consequently, our mortality estimates from 1866 onwards probably involve a slight overestimation of the level of mortality, as in most cities the *de facto* population was larger than the resident legal population[46].

In order to estimate the extent of all these problems and detect other possible irregularities, we compared the historical mortality data with those provided by Ledermann's model life tables[47]. Comparisons of age-specific death probabilities (not shown in the article) reveal that data from the Flemish cities and Brussels did not display any major distortions[48]. The life expectancy figures should thus be considered reasonably robust.

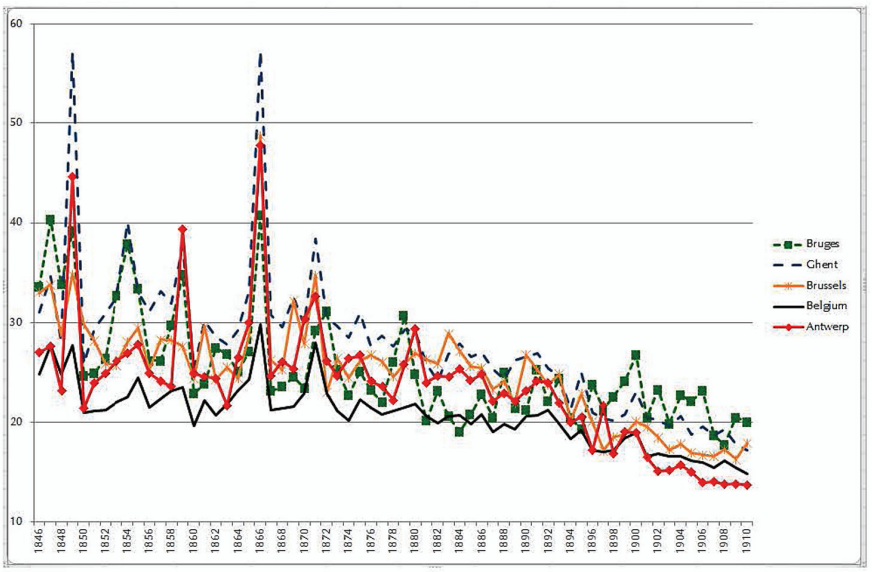
IV. Crude mortality rates

The focus of this article is on Brussels and the three largest Flemish cities. Figure 3 presents the crude mortality rates, the annual number of deaths per 1,000 inhabitants, for the four cities between 1846 and 1910, together with the national average. The cities recorded death

Brussels, 1851, 1853, 1864, 1875, 1877, 1880, 1897, 1903, and 1907; for Charleroi, 1846 and 1879. As these cities were expanded by, or separated from, parts of neighbouring communes, the changes only affected a small number of inhabitants. For Huy, Seraing, Torhout and Waregem, there were no changes in the period under study. **45.** For Antwerp, however, *de jure* deaths were used in the period 1866-1900. See Tom Vanderheeren, *Een kwantitatieve analyse…*, p. 16. **46.** Yet, an analysis by Eggerickx and Debuisson has shown that the differences between *de facto* deaths and *de jure* deaths were rather small, even for large cities, and did not affect life expectancies in a substantial way. This seems to be the case for the late nineteenth century at least, where source materials permit a comparison between the two types of deaths. See Thierry Eggerickx, Marc Debuisson, *La surmortalité urbaine…*, p. 24. Using data from the *Statistiques du Mouvement de la Population et de l'État Civil* for the year 1910, we concluded that differences between *de facto* and *de jure* deaths (as a percentage of *de facto* deaths) can be small in practice. For instance, in Antwerp it was less than one percent. In Bruges, however, it was nearly 15 percent. In other words, there were significantly more deaths of residents from outside Bruges. Very probably, provision for the elderly and medical services in Bruges played an important part. In Ghent, however, the situation was reversed and, for an urban setting, rather unusual. There were fewer *de facto* deaths, namely eight percent. This might be related to return migration of the elderly to the 'secure' surroundings of their native village in the countryside, or to infant mortality and the practice, among the Ghent bourgeoisie in particular, of sending urban infants to wet nurses in the countryside (Chris Vandenbroeke, *Vrijen en trouwen van de Middeleeuwen tot heden. Seks, liefde en huwelijk in een historisch perspectief*, Amsterdam/Brussel, 1986, p. 150-151). As the registers do not provide distributions of *de jure* deaths by age, it was not possible to verify our hypothesis. Nonetheless, we should take into account that our figures might overestimate the mortality experiences of the urban populations in question. In the case of Ghent, however, there is possibly an underestimation. **47**. Sully Ledermann, *Nouvelles tables-types de mortalité*, Paris, 1969, p. 260. **48.** These comparisons are not shown in the article but can be consulted in Aline Balcaen, *Mortaliteitsstudie…*, p. 124-127; Jeroen Backs, *Mortaliteit…*, p. 69-74; *Lawrence Van Haecke*, *Bruges-la-morte…*, p. 98-101; Tom Vanderheeren, *Een kwantitatieve analyse…*, p. 76-80; Elke Vanthuyne, *Een eeuw sterfte…*, p. 113. The figures for Brussels are available from the authors on request.

rates well above the national average, except for Antwerp after 1900. The crude mortality rate was particularly high in Ghent, but Bruges took the lead at the turn of the century. Still, between 1846 and 1910, mortality clearly declined in every city. In the late 1840s, the crude mortality rate fluctuated between 25 to 40 deaths per 1,000, whereas, by 1910, the rate was below 20. After the mid-1870s, the decline was particularly fast and the frequency and intensity of mortality crises also diminished. One of the last major outbreaks of epidemic disease was when smallpox ravaged Belgium in 1871. Previously there had been an outbreak of typhus, aggravated by a failed harvest, in 1846-47 and cholera epidemics in 1848-49, 1854, 1859, and 1866[49].

Figure 3. Crude mortality rates (deaths per 1,000 inhabitants) in Antwerp, Bruges, Brussels, Ghent, and Belgium, 1846-1910



Sources : For Antwerp, Bruges, Brussels and Ghent, see section III. For Belgium, HISSTER.

Yet, whereas crude mortality rates are relatively simple to calculate, do not require detailed source materials, and provide annual mortality figures in a straightforward way, they can easily be distorted by the age structure of the population – since mortality varies greatly with age[50]. Hence, when comparing mortality experiences, it is more appropriate

49. Robert André, José Pereira-Roque, *La démographie de la Belgique au XIXe siècle*, Bruxelles, 1974, p. 299; Isabelle Devos, *Allemaal beestjes*…, p. 264. **50.** During the period under study, Bruges had the largest percentage of people older than 65. The high death rate for Bruges can thus (partly) be explained by the general tendency for the elderly to face greater mortality risk. Antwerp, by comparison, had a very young population with a large proportion of children below 15. Brussels usually had the highest share of adults among the four cities and thus a relatively low crude mortality rate.

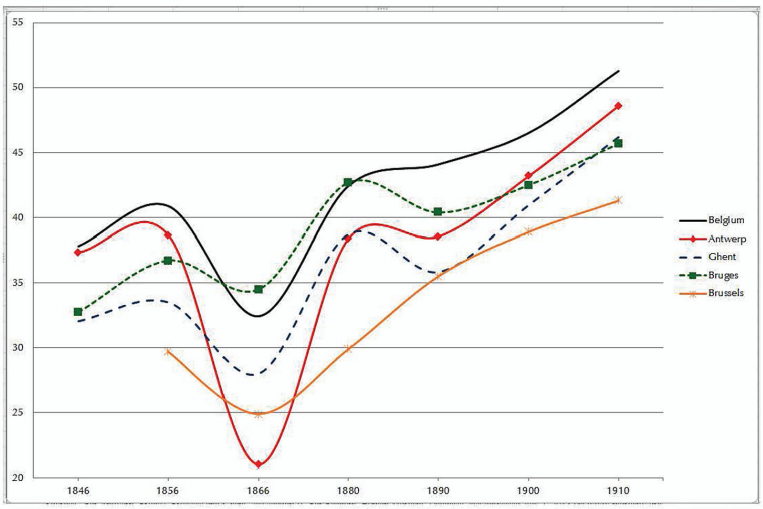
to calculate life expectancies (section four) and age-specific mortality rates (section five).

V. Life expectancy at birth

This section presents the life expectancy at birth for the seven census years between 1846 and 1910. Once again, we see a clear urban disadvantage (figure 4). All four cities display lower lifespans than the national average. In 1846, the lifespan was about 32 years in Ghent and Bruges, although Antwerp, with 37, was very close to the national average (see also table 3). The figures for 1856, the first census year in which age-specific mortality data for Brussels is available, reveal a major health penalty for the capital city's inhabitants; while the national average was more than 40, life expectancy in Brussels was below 30. Still, by 1910, it had increased by nearly 12 years. Overall, there was a strong rise between 1846 and 1910 : 11 years for Antwerp, 13 for Bruges, and 14 for Ghent. As a result, Bruges residents even reached a slightly higher life expectancy than the average Belgian in 1866 and 1880. Figure 4 also shows that it was not a sustained mortality advance. In fact, the decline in life expectancies in 1866 was quite spectacular. Following the outbreak of cholera, it dropped to 28 in Ghent, nearly 25 in Brussels, and just 21 in Antwerp. Cholera was the classic epidemic of the nineteenth century. In 1866 the disease struck Belgium, as it did the rest of Europe, for a fourth time. It was extremely ferocious, killing over 43,000 Belgians[51]. Antwerp, as a major port city, was clearly not spared[52].

51. O. L. Standaert, "Cholera te Antwerpen. Een kwetsbare stad in de 19e eeuw", in *Geschiedenis der Geneeskunde*, no. 4, 1997, p. 126-136; M. Steels, "De cholera-epidemie van 1866", in *Ghendtsche Tydingen*, no. 8, 1979, p. 231-259; Karel Velle, "Gevolgen van de blauwe dood. De cholera in België", in *Geschiedenis der Geneeskunde*, no. 4, 1997, p. 95-105. **52.** Although the drop in life expectancy varied substantially between cities, the absolute number of deaths caused by cholera did not differ substantially. In 1866, 2,961 people in Antwerp died from cholera (50 percent of the total number of deaths), compared to 2,769 in Ghent (43 percent) and 3,469 in Brussels (43 percent). See Département de l'Intérieur, *Documents statistiques*, Bruxelles, 1868, p. 91-164. – If we relate these figures to the population size, 2.5 percent of the Antwerp population and 2.4 percent of the Ghent population died of cholera in 1866, compared to only 0.7 percent in Brussels. The large drop in life expectancy in Antwerp was most probably due to the large number of young cholera victims, as life expectancy measures are heavily influenced by the death of infants and young children.

Figure 4. Life expectancy at birth (in years) in Antwerp, Bruges, Brussels, Ghent, and Belgium, 1846-1910



Sources : For Antwerp, Bruges, Brussels, and Ghent, see section II. For Belgium, Human Mortality Database, last accessed July 7, 2015 via www.mortality.org.

The other Belgian cities for which comparable mortality figures are available for the period 1846-1910 display a very similar pattern : urban health disadvantages on the one hand, and except for 1866, mortality improvements on the other hand (see tables 3 and 4). The industrial town of Seraing, for instance, shows a substantial increase in lifespan (15 years)[53]. Yet most progress was made by regional service centres, such as Huy (19 years) and Waregem (25 years). Obviously industrialisation did not prevent a large increase in life expectancy but, during the second half of the nineteenth century, it was clearly more beneficial to be living in a small town or city where industrialisation was marginal.

Table 3 additionally shows that most health improvements in large cities happened at the turn of the century. Between 1890 and 1910, the average life expectancy in Liège rose by eight years and by as much as ten years in Antwerp and Ghent. This however came after Bruges and Ghent had already experienced a decline between 1880 and 1890 of two and three years respectively. This was in contrast with Brussels, which had registered a significant increase during the same decade, although the pace of progress slowed down in the following decades. With a life expectancy of 41 years in 1910, the capital still registered the shortest lifespan[54]. On average, people in Brussels were living four years less than those in Bruges, five years less than in Ghent, and seven years less than in Antwerp.

53. The low life expectancy in Seraing in 1856 was due to epidemics of scarlet fever and measles : Michel Oris, *Mortalité…*, p. 315. **54.** The reasons behind this low life expectancy are currently being examined by Tina Van Rossem in her doctoral dissertation *Bruxelles ma belle. Bruxelles mortelle. Determinants of the high mortality in Brussels at the turn of the twentieth century*.

Table 3. Life expectancy at birth (in years) in Belgian cities, 1846-1910[55]

e0	1846	1856	1866	1880	1890	1900	1910	46-10
Antwerp	37.3	38.7	21.0	38.4	38.6	43.2	48.6	+11.3
Bruges	32.8	36.7	34.5	42.7	40.4	42.5	45.7	+12.9
Ghent	32.1	33.5	28.0	38.7	35.8	41.0	46.2	+14.1
Torhout	33.8			43.8			47.5	+13.7
Waregem	35.8	39.4			49.9	51.7	61.1	+25.3
Brussels		29.7	24.9	29.9	35.5	38.9	41.3	(+11.6)
Charleroi					47.9		51.9	
Liège					42.7	45.0	50.7	
Huy	38.0	36.0	34.0	41.0	44.0	52.0	57.0	+19.0
Seraing	34.0	26.0		40.0	45.0	44.0	49.0	+15.0
Belgium	37.8	40.9	32.4	42.4	44.1	46.5	51.3	+13.5

Note : e0 refers to life expectancy at birth (year 0) .
Sources : For the cities, see section II. For Belgium, Human Mortality Database, last accessed July 7, 2015 via www.mortality.org.

Table 4. Life expectancy at birth in Belgian cities compared with the national average (=100), 1846-1910

e0	1846	1856	1866	1880	1890	1900	1910
Antwerp	99	95	65	90	87	93	95
Bruges	87	90	**106**	**101**	92	91	89
Ghent	85	82	86	91	81	88	90
Torhout	90			**104**			94
Waregem	95	96			**113**	**111**	**118**
Brussels		73	77	70	81	84	81
Charleroi					**109**		**101**
Liège					97	97	99
Huy	**100**	88	**105**	97	**100**	**112**	**111**
Seraing	90	64		94	**102**	95	96
Belgium	100	100	100	100	100	100	100

Note : e0 refers to life expectancy at birth (year 0). Life expectancies above the national average are in bold.
Sources : see table 3.

55. The figures for Charleroi refer to the industrial area around Charleroi and not specifically to the city itself. See Thierry Eggerickx, *La mortalité…*, p. 351-368.

VI. Age-specific mortality

In this section we analyse the figures in greater depth by looking at the age-specific mortality probabilities. We discuss infants, children, adolescents, and adults separately because this can provide information about the specific times of life when urban health conditions were most threatening.

Infants

In Belgium during the second half of the nineteenth century, an average of one in six infants died in their first year of life (see table 5). With a death probability of nearly one in four, the city of Ghent had exceptionally high infant mortality. Although high in every urban centre, Antwerp, Bruges, and even Brussels all scored better. In the industrial towns of Charleroi, Liège, and Seraing too, figures were substantially lower than in Ghent (except for the epidemic years of 1856 and 1866). Still, there was no apparent linear decline in any of the urban centres during the second half of the nineteenth century, a trend that has also been observed in many English and Dutch cities[56]. Infant mortality in most Belgian towns and cities started to increase again during the last quarter of the nineteenth century but in Brussels, Seraing, and Liège this began after the turn of the century.

Table 5. Infant mortality (per 1,000 births) in Belgian cities, 1846-1910[57]

1t0	1846	1856	1866	1880	1890	1900	1910
Antwerp	160	147	203	252	212	186	169
Bruges	170	159	161	139	202	208	170
Ghent	187	242	234	191	275	251	220
Torhout	218			199			224
Waregem	148	118			130	163	128
Brussels		216	196	225	194	207	208
Charleroi					149		140
Liège					171	142	145
Huy	124	191	190	105	185	143	137
Seraing	196	270	247	164	150	137	148
Belgium	175	148	164	187	174	178	141

Note : 1t0 refers to the mortality rate of newborns. It reflects the ratio of deaths of infants less than one year of age to the number of births in a given year. - Sources : see table 3.

56. Chris Vandenbroeke, Frans van Poppel, Ad Van Der Woude, "De zuigelingen- en kindersterfte in België en Nederland in seculair perspectief", in *Bevolking en Gezin*, 1983 (supplement), p. 85-115; Robert Woods, Patricia Watterson, John Woodward, "The causes of rapid infant mortality decline in England and Wales", in *Population Studies*, no. 42, 1989 (3), p. 348-59.

57. The figures in this table represent the mortality rate (instead of the mortality probability) of newborns. The infant mortality rate is probably slightly underestimated because of the registration of the so-called false stillbirths. Prior to 1956, infants who died within three days of delivery and before registration in the civil registers were listed as children *presentés sans vie* in the stillbirth records. As a result, some live births were registered as stillbirths. See Myron Gutmann, Etienne van de Walle, "New sources for social and demographic history : the Belgian population registers", in *Social Science History*, no. 2, 1978 (2), p. 121-143; Dana Glei, Isabelle Devos, Michel Poulain, "About mortality data for Belgium", in *Human mortality database* (http://www.mortality.org/hmd/BEL/InputDB/BELcom.pdf), last accessed July 22, 2015.

Earlier analyses into the causes have revealed that it was mainly related to diseases of the digestive system (especially chronic diarrhoea). Even though we must take account of potential problems with the reliability of diagnoses of the time, digestive diseases were responsible for half of all infant deaths in the early 1860s[58]. Because intestinal diseases are strongly related to poor nutrition, regional variations and shifts in infant mortality are often attributed to differences in feeding practices[59]. According to contemporary medical reports for Ghent, it was customary to feed infants a porridge made of bread and potatoes diluted with water, usually drawn from the polluted waterways or wells of the city. Although it appears that this type of artificial feeding was not very different to that in other cities, the sanitary conditions and local public health measures were. Research has revealed that improvements in drinking water supply and waste disposal were spread much more hesitantly in Ghent than, for instance, Bruges[60]. Furthermore, breastfeeding, a healthier and cheaper alternative, was not widely practiced in the city because factory work, which was a major occupation, made it almost impossible for working-class mothers to breastfeed and wealthier families sent their infants to wet nurses in the countryside around Ghent[61]. In fact, research has shown that when factory work for women became more common during the late nineteenth century, industrialisation appears as a crucial determinant of infant mortality[62]. At the time, the actual health consequences of (early) weaning depended strongly on the quality of the drinking water and the artificial feed. For instance, cow milk available in urban areas was usually unhealthy due to the lack of production and storage regulations[63]. It was not until the early twentieth century, when a range of initiatives – both private and public – were taken to improve infant care that infant mortality started to decline throughout Belgium, as table 5 demonstrates[64]. These measures included the free distribution of pasteurised milk, medical consultations for sick children, and the promotion of breastfeeding in working-class neighbourhoods.

Children and adolescents

Even though child mortality was less striking than infant mortality, it was still extremely high. In fact, in some towns and for the Belgian population as a whole, the risk of death for young children sometimes surpassed that of infants. Still, tables 6 and 7 show a substantial decline in child mortality from the last quarter of the nineteenth century onwards, which

58. Jeroen Backs, *Mortaliteit…*, p. 139; Tom Vanderheeren, *Een kwantitatieve analyse…*, p. 92. **59.** Marc Debuisson, "The decline of infant mortality in the Belgian districts at the turn of the 20th century", in *Belgisch Tijdschrift voor Nieuwste Geschiedenis,* no. 31, 2001(3-4), p. 497-527. **60.** Nele Verbaeys, *In de ban van de cholera : Brugge en Gent in 1866*, unpublished MA thesis, Ghent University, 2008, p. 121. **61.** Chris Vandenbroeke, Frans van Poppel, A Van der Woude, *De zuigelingen- en kindersterfte…*, p. 257-289. **62.** Marc Debuisson, *The decline of…*, p. 497-527; Robert Woods, Patricia Watterson, John Woodward, *The causes of…*, p. 348-359. **63.** Godelieve Masuy-Stroobant, "Mères et nourrissons. Aux origines de la protection maternelle et infantile en Belgique", in Thierry Eggerickx, Jean-Paul Sanderson, *Histoire de la population de la Belgique et de ses territoires*, Louvain-la-Neuve, 2010, p. 627-656. **64.** Id., *Les déterminants individuels et régionaux de la mortalité infantile. La Belgique d'hier et d'aujourd'hui*, Louvain, 1983, p. 68.

obviously predates the decline in infant mortality.

Looking at the figures from a comparative perspective, no noticeable pattern emerges. High child mortality was recorded in large cities as well as in smaller ones, in industrialising towns as well as in service centres. Still, a few trends can cautiously be discerned. Of the four cities we are focusing on, Bruges and Brussels saw the greatest mortality in the middle of the nineteenth century. Both also registered the sharpest decline in child mortality but they still provided the least healthy settings for youngsters in 1910. In Brussels, for instance, the mortality of children aged one to five was above 100 per thousand. For adolescents, differences between cities were less pronounced (tables 8 and 9).

Although infant and child mortality are often placed under the same banner because of the high risk of dying, there are also major differences. The most striking is that diseases of the digestive system were less significant in child mortality. In the nineteenth century, most young victims died as a result of infectious diseases such as whooping cough and measles, or of diseases of the respiratory system such as pneumonia and bronchitis[65]. These diseases were usually caused by poor living and working conditions. Child labour was prevalent in many Belgian cities, since children were cheaper to employ than adults, and easier to discipline. In Ghent, for instance, around 1845 more than 20 percent of the labourers employed in the cotton mills were children of as young as six. In Bruges the percentage of young girls (10-19 years) active in the lace industry reached a similar level. In Brussels children worked long hours in the small workshops of sculptors, cigar makers, shoemakers, lacemakers, and in the building trade[66]. Although abuses remained, labour legislation on the protection of children from the 1890s onwards, together with sanitation projects in many cities, can probably explain the sharp decline in child mortality after the last decade of the nineteenth century[67].

65. Jeroen Backs, *Mortaliteit…*, p. 144; Robert André, José Pereira-Roque, *La démographie…*, p. 299. **66.** Jeroen Backs, *Mortaliteit…*, p. 86-87; Mieke De Neve, *Kinderarbeid te Gent 1830-1914*, unpublished MA thesis, Ghent University, 1991, p. 407; Éliane Gubin, "Le travail des femmes et des enfants en Belgique avant 1889", in *Les Cahiers de la Fonderie,* no. 7, 1989 (2), p. 2-11; Joseph Heyman, Daniel Mareska, *Enquête sur le travail et la condition physique et morale des ouvriers employés dans les manufactures de coton à Gand*, Gand, 1845, p. 267 ; Peter Scholliers, *Wages, manufacturers and workers in the nineteenth-century factory. The Voortman cotton mill in Ghent*, Oxford/Washington D.C, 1996, p. 93; Lawrence Van Haecke, *Bruges-la-morte…*, p. 117. **67.** The minimum age for factory work was set at 12 years and the maximum number of working hours at 12. Night work was forbidden. See, for example, Florence Loriaux, *Enfants-machines. Histoire du travail des enfants en Belgique aux XIXe et XXe siècles*, Bruxelles, 2000, p. 125.

Table 6. Child mortality (per 1,000) between the ages of one and five in Belgian cities, 1846-1910

4q1	1846	1856	1866	1880	1890	1900	1910
Antwerp	172	174	303	141	177	118	83
Bruges	237	247	222	151	110	92	95
Ghent	185	156	219	127	142	85	81
Torhout	171			97			86
Waregem	201	190			119	35	61
Brussels		261	314	171	174	115	106
Charleroi					90		59
Liège					97	96	73
Belgium	145	156	182	112	103	71	63

Note : 4q1 refers to the mortality risk between ages one and five. It reflects the ratio of deaths of people aged between 1 and 5 in a given year to the total time lived during this year by the people at these ages that have not yet experienced death.
Sources : see table 3.

Table 7. Child mortality (per 1,000) between ages five and ten in Belgian cities, 1846-1910

5q5	1846	1856	1866	1880	1890	1900	1910
Antwerp	40	34	133	36	25	17	14
Bruges	66	58	70	39	30	21	21
Ghent	54	67	79	27	25	20	15
Torhout	68			19			26
Waregem	43	99			27	12	17
Brussels		66	72	26	24	22	20
Charleroi					23		
Liège					20	21	17
Belgium	46	52	79	29	24	20	16

Note : 5q5 refers to the mortality risk between ages five and ten. It reflects the ratio of deaths of people aged between 5 and 10 in a given year to the total time lived during this year by the people at these ages that have not yet experienced death.
Sources : see table 3.

Table 8. Adolescent mortality (per 1,000) between ages ten and 15 in Belgian cities, 1846-1910

5q10	1846	1856	1866	1880	1890	1900	1910
Antwerp	22	17	65	14	10	10	9
Bruges	34	34	30	24	13	16	18
Ghent	32	31	31	16	16	12	9
Torhout	45			29			13
Waregem	34	28			22	8	8
Brussels		28	30	30	15	13	14
Charleroi					19		
Liège					11	13	11
Belgium	36	30	43	18	14	12	10

Note : 5q10 refers to the mortality risk between ages ten and fifteen. It reflects the ratio of deaths of people aged between 10 and 15 in a given year to the total time lived during this year by the people at these ages that have not yet experienced death.
Sources : see table 3.

Table 9. Adolescent mortality (per 1,000) between ages 15 and 20 in Belgian cities, 1846-1910

5Q15	1846	1856	1866	1880	1890	1900	1910
Antwerp	47	39	67	29	17	21	18
Bruges	43	35	31	31	30	28	21
Ghent	48	46	40	29	22	21	16
Torhout	56			36			7
Waregem	65	35			11	7	11
Brussels		47	56	33	25	23	21
Charleroi					28		
Liège					25	21	17
Seraing					19		24
Belgium	45	35	47	27	23	20	16

Note : 5q15 refers to the mortality risk between ages fifteen and twenty. It reflects the ratio of deaths of people aged between 15 and 20 in a given year to the total time lived during this year by the people at these ages that have not yet experienced death.
Sources : see table 3.

Adults

Adult mortality, measured here by life expectancies at age 20 and 40 (tables 10 and 11), displays similar tendencies to those of younger age groups. There was a clear urban health penalty. Throughout the period of observation, adult life expectancy was by far the lowest in Brussels, except for the year 1866 when cholera struck the port city of Antwerp particularly hard. Between 1846 and 1910, all four cities displayed a substantial improvement in health conditions but the advances were particularly significant in Ghent. By 1910, adults at age 20 in Ghent lived on average nine years longer than in 1846, as opposed to two years longer in Bruges, five in Brussels (compared to 1856 levels) and almost seven in Antwerp. For 40-year-olds, the increase in lifespan in Ghent (nearly five years) was much higher than that in Bruges (less than one year) and Brussels (nearly two years), and almost two-thirds higher than in Antwerp (three years). In other words, health improvements seem to have benefited adults in Ghent in particular.

Table 10. Life expectancy at age 20 (in years) in Antwerp, Bruges, Brussels, Ghent, and Belgium, 1846-1910

e20	1846	1856	1866	1880	1890	1900	1910
Antwerp	38.5	38.0	25.2	39.9	41.0	42.1	45.1
Bruges	39.7	42.3	38.3	42.4	38.0	39.9	42.1
Brussels		35.8	30.4	33.4	37.8	39.4	41.2
Ghent	36.8	38.5	34.9	40.2	41.2	42.9	46.1
Belgium	38.8	41.9	34.0	41.8	42.0	43.2	45.7

Note : e20 refers to life expectancy at age 20.
Sources : see table 3.

Table 11. Life expectancy at age 40 (in years) in Antwerp, Bruges, Brussels, Ghent, and Belgium, 1846-1910

e40	1846	1856	1866	1880	1890	1900	1910
Antwerp	25.9	26.0	16.9	26.5	26.2	27.3	28.9
Bruges	26.5	27.9	25.9	27.8	24.5	25.9	27.0
Brussels		24.7	20.5	21.9	24.2	25.4	26.3
Ghent	24.4	26.7	23.6	26.4	26.1	27.7	29.3
Belgium	25.8	28.1	23.3	27.8	27.4	27.9	29.6

Note : e40 refers to life expectancy at age 40.
Sources : see table 3.

During the nineteenth century, urbanisation and industrialisation had a profound impact on the urban environment. Living conditions deteriorated in many cities due to overcrowding, while the mechanisation of industry created many new challenges. Labour conditions in Belgium, particularly in cities, gradually improved by the turn of the twentieth century. The tense relationship between employers and the emerging labour unions, symbolised by violent strikes in 1886 and 1893, led to national and local regulation of working conditions and social security guarantees. This social legislation was supplemented with measures to improve public health, such as the establishment of health councils and inspectorates[68]. Urban living conditions also gradually improved as a result of sanitary measures and the installation or renewal of urban infrastructure, such as piped water and sewerage systems. Several parts of the city of Brussels had been sanitised as early as the 1870s, through the demolition of slums, the vaulting of the Senne river, and the construction of prestigious quarters and avenues[69]. Despite clear improvement in some sections of the capital city, life expectancy of the population as a whole remained very low. In Bruges as well, life expectancy was relatively low during the last decades of the nineteenth and first decade of the twentieth centuries. Despite the early distribution of clean water in Bruges, large-scale sanitation works were only undertaken at the end of the nineteenth century[70]. The figures here seem to suggest that the implementation of labour regulation, together with urban sanitation, were most successful in Ghent. Although improvements in water distribution and waste disposal occurred relatively late there, especially compared to Bruges, the city government undertook several major sanitation projects from 1866 onwards, such as the filling in of moats and sanitation of back-to-back houses. A distribution network for water was also created in 1879[71].

68. Jo Deferme, *Uit de ketens van de vrijheid. Het debat over de sociale politiek in België, 1886-1914*, Leuven, 2004, p. 512; Gita Deneckere, *1900 : België op het breukvlak van twee eeuwen,* Tielt, 2006, p. 237; Karel Velle, "Medikalisering in België in historisch perspektief : een inleiding", in *Revue Belge de Philologie et d'Histoire*, no. 64, 1986 (2), p. 256-285. **69.** Thierry Demey, *Bruxelles-Chronique d'une capitale en chantier. Tome I. Du voûtement de la Senne* à *la jonction Nord-Midi*, Bruxelles, 1990, p. 342; Michiel Wagenaar, *Stedebouw en burgerlijke vrijheid. De contrasterende carrières van zes Europese hoofdsteden,* Bossum, 1998, p. 279. **70.** Lawrence Vanhaecke, *Bruges-la-morte…*, p. 317; Nele Verbaeys, *In de ban van…*, p. 121. **71.** Jeroen Backs, *Mortaliteit…*, p. 298; Nele Verbaeys, *In de ban van…*, p. 121.

Table 12. Life expectancy at age 65 (in years) in Antwerp, Bruges, Brussels, Ghent, and Belgium, 1846-1910

e65	1846	1856	1866	1880	1890	1900	1910
Antwerp	10.2	11.5	8.0	11.1	11.1	11.2	11.7
Bruges	11.4	12.0	11.6	11.3	10.3	10.3	11.2
Brussels		10.3	9.2	9.4	9.9	10.4	10.9
Ghent	10.4	11.7	10.0	10.4	10.5	10.8	11.4
Belgium	10.5	11.3	10.1	11.2	10.8	10.8	11.7

Note : e65 refers to life expectancy at age 65.
Sources : see table 3.

The health improvements for the elderly were less significant (table 12). In Belgium, as in most European countries, the greatest progress in life expectancy for those of advanced age was registered during the second half of the twentieth century, when advances in medical technology (such as cardiology) and specific health care became widely available[72]. Between 1846 and 1910, nonetheless, the average life expectancy for Belgians over 65 increased by 1.2 years. Apart from Antwerp, the gains were somewhat less. Still, spatial variation is quite consistent with mortality at other ages. Again, the Brussels population came off worst, apart from the cholera year of 1866.

VII. Sex-specific mortality rates

Ever since John Graunt analysed the London bills of mortality in the late seventeenth century, scholars have been aware that women enjoy a longer life expectancy than men[73]. Yet, summary measures such as life expectancies conceal the fact that women did not experience a health advantage at every stage of life. In fact, gender mortality differences vary substantially according to age and over time. In tables 13 to 17, the mortality risks for males and females are compared across age groups by calculating the risk ratios for the three Flemish cities, the capital, and Belgium as a whole for the period 1846-1910. The ratio expresses the risk of dying for men, divided by the risk of dying for women. Ratios below 100 indicate an excess mortality of women and ratios above 100 an excess mortality of men.

72. Isabelle Devos, *Allemaal beestjes…*, p. 264. **73.** Louis Henry, "Mortalité des hommes et des femmes dans le passé", in *Annales de Démographie Historique*, 1987, p. 87-118.

Tables 13-17. Sex ratio of mortality in Antwerp, Bruges, Brussels, Ghent, and Belgium, 1846-1910

Antwerp	1846	1856	1866	1880	1890	1900	1910
1q0	119	104	135	111	124	129	134
4q1	115	100	104	100	109	127	107
5q5	**88**	**71**	**97**	**79**	109	**72**	136
5q10	135	**75**	**95**	**66**	100	113	110
5q15	102	108	113	134	126	**94**	129
5q20	163	**93**	130	**86**	131	118	169
5q25	134	**88**	136	141	156	**86**	102
5q30	101	103	167	130	161	137	117
5q35	131	104	113	136	197	214	134
5q40	**99**	134	135	250	200	177	150
5q45	206	139	134	163	196	179	150
5q50	121	139	174	192	183	203	154
5q55	138	150	153	167	168	162	192
5q60	127	102	165	184	140	160	149
5q65	106	139	119	138	128	136	133
5q70	130	100	**88**	164	151	135	131
5q75	103	**93**	114	129	142	133	125
5q80	100	165	119	**61**	104	128	127
5q85	**79**	**92**	107	100	118	104	**96**
10q90	100	100	100	100	100	100	100

Bruges	1846	1856	1866	1880	1890	1900	1910
1q0	143	138	120	145	111	130	125
4q1	106	113	102	118	121	101	**96**
5q5	105	130	120	109	100	104	116
5q10	**62**	**76**	101	123	**78**	103	105
5q15	**89**	**54**	**96**	**93**	**82**	**69**	**99**
5q20	**87**	**42**	**91**	**98**	**93**	156	**77**
5q25	**73**	**67**	117	105	104	110	**83**
5q30	**92**	**76**	158	168	122	**81**	129
5q35	**86**	**96**	140	134	167	126	119
5q40	134	141	144	194	124	149	107
5q45	102	**83**	181	271	147	111	140
5q50	119	153	140	165	161	161	148
5q55	123	111	127	122	185	112	114
5q60	150	137	106	145	149	133	148
5q65	132	104	129	123	137	148	145
5q70	114	118	106	146	121	117	130
5q75	106	118	120	125	131	138	112
5q80	130	**90**	133	119	110	106	101
5q85	**95**	**86**	117	102	101	134	108
10q90	100	100	100	100	100	100	100

Brussels	1846	1856	1866	1880	1890	1900	1910
1q0		123	132	140	120	111	122
4q1		105	105	**88**	100	105	109
5q5		**83**	105	120	125	112	**68**
5q10		**99**	104	123	**89**	**83**	**87**
5q15		**90**	106	108	**98**	109	115
5q20		**80**	119	139	106	111	104
5q25		**82**	110	135	135	101	130
5q30		**84**	112	176	161	145	120
5q35		118	126	176	191	155	140
5q40		121	128	197	208	153	158
5q45		146	148	192	234	162	170
5q50		139	152	194	213	183	184
5q55		133	126	200	182	174	202
5q60		120	121	166	155	177	148
5q65		121	113	168	143	151	156
5q70		121	114	125	131	139	139
5q75		114	102	134	116	103	116
5q80		112	111	111	109	114	125
5q85		**95**	**91**	131	**94**	**96**	120
10q90		100	100	100	100	100	100

Ghent	1846	1856	1866	1880	1890	1900	1910
1q0	113	115	113	116	114	116	120
4q1	**98**	100	**97**	102	109	105	109
5q5	**94**	100	**96**	104	117	100	131
5q10	**85**	**89**	**79**	**88**	120	140	**90**
5q15	**84**	**93**	**82**	**97**	120	105	129
5q20	**95**	100	**91**	103	**93**	115	**95**
5q25	**93**	**98**	**91**	**98**	115	103	100
5q30	**96**	100	**96**	100	123	106	109
5q35	108	107	108	110	137	118	116
5q40	118	120	119	121	163	134	114
5q45	132	131	133	131	148	120	133
5q50	132	132	133	133	165	173	137
5q55	129	130	128	131	130	148	156
5q60	122	124	122	124	158	139	126
5q65	115	117	115	118	122	130	136
5q70	112	113	112	108	108	121	134
5q75	110	110	109	112	112	119	125
5q80	106	106	106	101	101	132	123
5q85	103	103	103	107	107	**95**	112
10q90	100	100	100	100	100	100	100

Belgium	1846	1856	1866	1880	1890	1900	1910
1q0	118	120	117	115	120	119	119
4q1	**97**	100	101	100	105	107	104
5q5	**82**	**89**	**98**	**90**	**96**	100	102
5q10	**67**	**69**	100	**89**	**87**	**92**	**88**
5q15	**68**	**79**	**98**	**93**	**92**	**90**	**91**
5q20	116	100	113	105	117	100	107
5q25	**91**	**88**	104	103	106	**94**	**96**
5q30	**84**	**85**	**97**	109	110	100	**97**
5q35	**84**	**84**	**95**	111	127	111	106
5q40	**94**	**95**	110	120	136	132	118
5q45	121	115	120	146	145	141	134
5q50	121	119	121	144	143	145	138
5q55	131	116	114	136	133	131	143
5q60	127	108	114	135	124	124	126
5q65	126	108	108	118	115	120	121
5q70	116	102	**99**	117	115	114	119
5q75	112	103	**99**	106	108	108	110
5q80	106	105	102	107	107	106	108
5q85	104	104	101	104	108	104	104
10q90	100	100	100	100	100	100	100

Note : Excess female mortality (= ratio below 100) is in bold. 1q0 refers to the mortality risk between birth and the first year of life, 4q1 to the risk between ages one and five, 5q5 to the risk between ages five and ten, etc. Sources : see table 3.

Infants

The tables clearly show that in Antwerp, Bruges, Brussels, and Ghent, as well as in the rest of Belgium, more boys died in infancy than girls. Male infants were about 20 to 40 percent more likely to die than females in their first year of life. Excess male mortality among infants is well established in historical – and even contemporary – populations, which suggests that the underlying causes do not stem from environmental conditions. Indeed, the phenomenon is usually associated with a number of genetic and biological differences. Medical research, for instance, has shown that male foetuses are more likely to die in utero and that male infants have an increased risk of dying from respiratory problems and infectious diseases[74].

Children and adolescents

Despite these inherent female advantages, women at other ages had higher mortality rates than men. Looking at table 17, we see this was the case in Belgium for females at

74. According to Ingrid Waldron, this is related to X-linked immunoregulatory genes which contribute to a greater resistance to infectious diseases. Females have two X chromosomes, whereas males have one X and one Y chromosome, so males appear to be inherently more vulnerable. Ingrid Waldron, "The role of genetic and biological factors in sex differences in mortality", in Alan Lopez, Lado Ruzicka (eds.), *Sex differentials in mortality, trends, determinants and consequences*, Canberra, 1983, p. 141-164.

young and childbearing ages (from age one to 45). In the 1840s and 1850s, for instance, mortality for girls between ten and 19 years old was a third higher than for boys. This phenomenon of excess female mortality gradually declined over time, but was still present at the beginning of the twentieth century. At the city level, the ratios for Ghent and Bruges suggest a similar pattern of excess mortality for young women (tables 14 and 16). In Bruges, however, it started at higher ages (after age 10) and was particularly strong. For some age groups, the mortality risks for girls were more than double those of young males. In Ghent they were generally lower and ended at younger ages (by age 35) but the female bias was substantial. Excess female mortality in Antwerp and Brussels, in comparison, was less pronounced (tables 13 and 15).

The geographical variation of the phenomenon clearly points to environmental disadvantages for females. In fact, historians as well as contemporary social scientists have supposed that excess female mortality at young ages reflects social and economic discrimination against women[75]. It could be present in the countryside, in cities, and in industrial areas, in particular where textile production was common[76]. Evidence from Belgium and some other European countries has shown that much of the excess female mortality was caused by respiratory tuberculosis[77]. Some have related the disease's increase to poor levels of female nutrition associated with the indulgence of male breadwinners in the context of scarce resources[78]. Others argue that unhealthy living and working conditions, and in particular overcrowding, contributed to the spread of the disease[79]. Others claim this

75. Alfred Perrenoud, "Surmortalité féminine et condition de la femme (XVII-XIXe siècles) : une vérification empirique", in *Annales de Démographie Historique*, 1971, p. 89-105; Dominique Tabutin, Michel Willems, "Differential mortality by sex from birth to adolescence : the historical experience of the West (1750-1930)", in United Nations (ed.), *Too young to die : genes and germs*, New York, 1998, p. 17-52. **76.** Until recently, excess female mortality was considered an essentially rural problem, associated with the modernisation of agriculture during the nineteenth century. Monetisation of agriculture did indeed lead to a relative decline in the economic position of women and girls, which in turn reduced their share of survival-related resources, such as food, within the household. See Sheila Johansson, "Deferred infanticide", in Glenn Hausfater, Sarah Hardy (eds.), *Infanticide : comparative and evolutionary perspectives*, New York, 1984, p. 463-485. – Regional analyses for Belgium and England have nevertheless shown that excess female mortality could be present in urban and industrial areas as well. Isabelle Devos, "La régionalisation de la surmortalité des jeunes filles en Belgique entre 1890 et 1910", in *Annales de Démographie Historique*, 1996, p. 300-333; Thierry Eggerickx, Dominique Tabutin, "La surmortalité des filles vers 1890 en Belgique. Une approche régionale", in *Population*, no. 49, 1994 (3), p. 657-684; Kirsty Mc Nay, Jane Humphries, Stephen Klasen, "Excess female mortality in nineteenth century England. A regional analysis", in *Social Science History*, no. 29, 2005 (4), p. 649-681. **77.** Isabelle Devos, "Te jong om te sterven. De levenskansen van meisjes in België omstreeeks 1900", in *Tijdschrift voor Geschiedenis*, no. 26, 2000 (1), p. 65-67; Thierry Eggerickx, Dominique Tabutin, *La surmortalité…*, p. 657- 684. **78.** Caren Ginsberg, Alan Swedlund, "Sex-specific mortality and economic opportunities : Massachusetts, 1860-1899", in *Continuity and Change*, no. 1, 1986 (3), p. 415-45; David Weir, "Parental consumption decisions and child health during the early French fertility decline, 1790-1914", in *Journal of Economic History*, no. 53, 1993 (2), p. 259-297. **79.** Isabelle Devos, *Te jong om te sterven…*, p. 65-67; Alfred Perrenoud, *Surmortalité feminine…*, p. 89-105; Dominique Tabutin, "La surmortalité féminine en Europe avant 1940", in *Population*, no. 33, 1978 (1), p. 121-148.

might be related to women's inherent susceptibility to the disease independent of economic and social conditions[80].

The evidence for Ghent and Bruges supports the view that excess female mortality was related to the nature of women's work and women's conditions. As young women constituted the bulk of factory workers in Ghent, the higher death rates for girls were probably related to wretched working conditions in the cotton industry. Contemporary medical reports have time and again pointed to the unhealthy environment : the dust and fibres that were released during the processing of raw cotton were especially harmful. The machines with rapidly rotating driving parts also frequently led to life-threatening injuries[81]. In Bruges, factory work for women was marginal, but since it was one of the most important lace centres in the world, the participation of young girls in the female labour force was extremely high[82]. One in three girls in Bruges worked in the lace industry and, by 1890, (shortly after child labour was restricted) it was still one in four[83]. Unlike factory work, the profession was not considered unhealthy by doctors but the hours worked were long and the pay was extremely low. In any case, the results here suggest that much of the work available to women and girls in these cities involved exposure to dangerous and unhealthy working conditions with consequent adverse effects on their well-being.

Adults

For adults, there is a remarkably consistent pattern of higher male mortality in cities as well as in Belgium as a whole. In fact, every table (13 to 17) shows excess male mortality at adult ages and even provides evidence of some increase during the last quarter of the nineteenth century. Moreover, the urban penalty for adult males was clearly higher in Antwerp and Brussels than elsewhere. Mortality for men in these metropolises was often 30 to 60 percent higher than mortality for women and at some ages it was more than double. Maternal mortality (or rather female mortality at childbearing ages) was even completely masked by excess male mortality.

Men's disadvantages in Antwerp can be linked to the working conditions in the port. Research has shown that the transformation of Antwerp into a booming international port and service centre had fundamental implications for employment opportunities. Antwerp's labour market was heavily segmented according to gender, age, and origin. Most of the emerging employment in port and trading sectors was taken up by single male migrants. These migrants found their way to hazardous occupations, such as loading and unloading

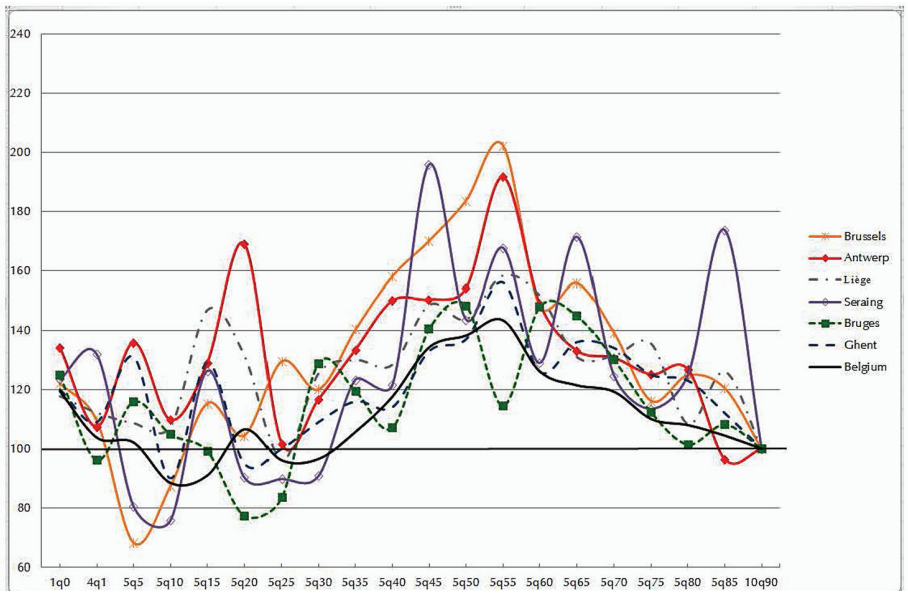
80. Robert Woods, *The demography of Victorian England and Wales*, Cambridge, 2000, p. 476. **81.** Joseph Heyman, Daniel Mareska, *Enquête sur le travail…*, p. 267. **82.** Whereas lacemaking by older women was mostly done at home, young girls worked and were taught the techniques in lace schools. Around 1850 there were c. 82 such schools in Bruges. Sarah Van de Cappelle, *Een Brugs kantje : de Brugse kantwerksters, 1875-1910*, Universiteit Gent 2000, unpublished MA thesis, Ghent University, 2000, p. 162-163. **83.** *Idem*, p. 89.

ships, which demanded physical strength and endurance[84]. In Brussels, construction and printing were among the leading employment industries for men[85]. Although printers and typesetters were relatively well paid, their occupation involved certain hazards, as the ink, glue, and metal used to make type letters were particularly toxic[86]. Contemporary reports, moreover, noted that employees in the printing industry experienced high mortality from pulmonary tuberculosis[87]. Roofers and bricklayers were also struck by the disease. Because of the lack of adequate safety measures though, the occupational hazards of the construction industry were mostly related to accidents and falls[88].

Hence, although dangerous and unhealthy working conditions are generally associated with heavy industry, it appears from figure 5, which incorporates sex ratios for the industrial cities of Seraing and Liège in 1910, that conditions there were not necessarily worst. Because lethal diseases associated with mining were mainly chronic, the mortality burden especially affected middle-aged and older males. By the end of the nineteenth century there were strict labour regulations in the mining industry, which probably reduced the number of accidents[89]. In short, excess male mortality was most pronounced in the two largest cities in the country. The cumulative effects of urban life were clearly detrimental for adult males living in Antwerp and Brussels, which might reflect the housing problems, the predominance of unskilled work, and exposure to dangerous working conditions in the port of Antwerp and in the Brussels industries.

84. Stephan Vanfraechem, *Een sfeer om haring te braden ? Arbeidsverhoudingen aan de Antwerpse haven, 1880-1972*, Gent, 2005, p. 553; Karel Van Isacker, *De Antwerpse dokwerker 1830-1940*, Antwerpen, 1966, p. 254; Anne Winter, *Migrants and urban change : newcomers to Antwerp, 1760-1914*, London, 2009, p. 328. **85.** Anne-Marie Bogaert-Damin & Luc Marechal, *Bruxelles, développement de l'ensemble urbain 1846-1961. Analyse historique et statistique des recensements*, Namur, 1978, p. 337; Michel De Beule, "Bruxelles, une ville industrielle méconnue", in *Les Dossiers de la Fonderie*, no. 1, 1994, p. 72. **86.** Sven Hernberg, "Lead poisoning in a historical perspective", in *American Journal of Industrial Medicine*, no. 38, 2000, p. 244-254. **87.** Jacques Bertillon, "De la morbidité et de la mortalité par profession", in *Journal de la Société Statistique de Paris*, no. 33, 1892, p. 382-406. On the link between tuberculosis and the printing industry, see also Margaret Cairns & Alice Stewart, "Pulmonary tuberculosis mortality in the printing and shoemaking trades, historical survey, 1881-1931", in *British Journal of Social Medicine*, no. 5, 1951, p. 73-82. **88.** See, for instance, Jacques Bertillon, *De la morbidité…*, p. 382-406. **89.** Frank Caestecker, "Arbeidsmarktstrategieën in de Belgische mijnindustrie tot 1940", in *Tijdschrift voor Sociale en Economische Geschiedenis*, no. 5, 2008 (3), p. 30-52.

Figure 5. Sex ratio of mortality risks in Belgian cities, 1910



Sources : see table 3.

VIII. Conclusions

Using new and published estimates of life expectancies, we were able to make an assessment of the prevailing health conditions in Belgian cities and towns during the late nineteenth and early twentieth centuries. The focus was on the mortality experiences of the populations in Antwerp, Bruges, Ghent, and Brussels, but estimates for other Belgian towns were incorporated as well. The comparative approach adopted in this paper has proven that the urban health penalty was clearly visible between 1846 and 1910, but not in every city and not to the same extent for every sex and age group. The pace of health improvements also differed greatly between the various towns and cities. While it is not the ambition of this article to explain the differences, the results here clearly suggest that there is no unequivocal explanation.

It appears from our analysis that the inhabitants of the Belgian capital consistently exhibited the largest urban health penalty. Brussels registered the lowest level of life expectancy at birth, ranging from 30 years in 1856 to 41 in 1910, when the national average was respectively 11 and ten years higher. The negative health risks associated with urbanisation and industrialisation were clearly reflected in the mortality figures for the city of Ghent, which show lifespans substantially lower than for the other towns in Flanders : 32 years in 1846 and 46 in 1910. Antwerp, the largest Belgian city by the turn of the century, was relatively healthy for such a big city, with a life expectancy of around 37 years

in the 1840s and 49 years in 1910. Large and rapidly-growing cities witnessed important improvements in lifespan during the period of study. In that sense, they shared the same trend experienced by smaller towns although small towns seem to have escaped the worst health problems of the nineteenth century and life expectancies were considerably higher. Regional centres in particular recorded better conditions than average, as was the case for Huy and Waregem, but there were also substantial health improvements for rapidly growing industrial towns such as Seraing, Charleroi, and Liège. While the former doubled in size and the latter two even tripled, life expectancy at birth in all three was well above 50 by 1910. As such, the figures seem to refute the idea that urban growth and industrialisation were the principal determinants of mortality change. The rise in life expectancy was not a continuous process either. In fact, urban mortality only truly declined in the 1870s and even showed a peak in the 1860s. The cities of Antwerp and Ghent, for instance, were particularly ravaged by the cholera epidemic of 1866. Compared to 1856 levels, life expectancy in Ghent dropped by five years and in Antwerp by as much as 17 years. Mortality was only slightly worse than before in other towns and cities. Clearly, in times of mortality crisis, there were also substantial urban differences.

This study clearly shows that urban penalties affected men, women, and children in each town and city differently. As such, the urban environments that were unfavourable for young women were not identical to those that were disadvantageous for older women or for young men. Analyses of age- and sex-specific mortality risks, for instance, reveal that urban hazards were particularly severe for infants in Ghent, for girls in Bruges, for adult males in Antwerp and Brussels, and for elderly men in Liège and Seraing. Differences in the economic features of the cities appear to be responsible for at least some of these divergences. We can refer to the female factory workers in Ghent who were not able to breastfeed their infants, the girls employed in the Bruges lace industry, and the men working in dangerous conditions in the port of Antwerp, the industries of Brussels, and the Walloon mines.

In short, the figures in this article demonstrate that the relationship between urban growth, industrialisation, and mortality change is not as straightforward as is generally assumed. The divergences point towards employment conditions. Clearly, the specificity of the urban labour markets, and their associated health hazards, deserve more attention in comparative mortality research. From the same perspective, it is important to examine how local governments managed the health situations and what measures they took to control the spread of infectious diseases. As such, an analysis of the medical causes of death and the disease environment would seem the next logical step. This should allow for structural comparisons between health environments, and help to determine how these developed within the framework of specific socio-economic determinants. Brussels, as the city with the largest health penalty, needs further research along these lines.

ISABELLE DEVOS (°1968) is a historian and demographer. She is Associate Professor at the History Department of Ghent University. Over the years her research has revolved around social and economic issues of the early modern period and the long nineteenth century in a comparative perspective, with a particular focus on mortality and living standards.

TINA VAN ROSSEM (°1991) graduated as a Master in Sociology in 2013. Since then she has been working as a doctoral researcher at the History Department of Ghent University and the Research Group Interface Demography of the Vrije Universiteit Brussel. She is preparing a PhD on the determinants of the health penalty of the Brussels' inhabitants at the turn of the twentieth century. Her PhD is financed by FWO, The Research Foundation – Flanders.