Epidemiology of Town and Countryside

Mortality and Causes of Death in East Belgium, 1850-1910 (°)

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This paper is an addition to a mortality analysis in East Belgium done by George Alter, Michel Oris and Muriel Neven (1997) on nominal data and at the household level[1]. It emphasizes two main issues: the differential between town and country and causes of death. The analysis of epidemiology has inherent problems, such as statistical discontinuity, medical advancements, and so on. My aim however is to research the multiplicity of the pathological frame in past populations.

Mortality rates decreased in East Belgium between 1846 and 1910. This phenomenon, common in West European countries during the same period, has been the focus of many studies. A. Perrenoud, for example, distinguishes the first stage of diminution between 1750 and 1850 (Perrenoud 1985: 115; Mercer 1990: 1-19; André, Pereira-Roque 1974: 71-79)[2]. In Belgium and especially in Wallonie, we notice an early decrease in mortality rates that begins between 1700 and 1750 (Desama 1976: 148). Mortality decline slowed and even reversed as industrialization progressed prior to the epidemiological transition.

In a number of cities and industrial towns, recent studies have shown that the epidemiological transition did not take place before 1870 and that mortality instead, followed a more or less marked increase between 1850 and 1870

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2. In France, N. BROUARD notices the fall of the average mortality from 1790, rapid then slower from 1810 to 1850, a stagnation during the 20 following years and a new decrease quick and regular from 1895 to 1970 (BROUARD 1990: 3).

(Desama 1985: 114-115; Bruneel and al. 1987: 298). This situation seems to be general in the urban centers of Liège, but it does not appear to be uniform across Wallonie where mortality falls by 5% between 1846 and 1870 (Oris 1997). Apart from this indirect recording we have little information concerning the consistency of this phenomenon, few comparative studies and even less information about the situation in the countryside.

One of the goals of this paper is to shed light on a few obscure points about mortality in the city and in the countryside. We chose two essential places for our study: Verviers, a new town in the midst of industrial expansion, which grew from 23339 to 46948 inhabitants between 1846 and 1910; and Polleur-Sart, two adjacent rural villages of the Ardennes, situated at 7 to 14 km from the Verviers centre (see map). As they are small - 1338 people in 1846, 1286 in 1910 for the first one, 2376 and 2175 for the second one - we chose to calculate their yearly mortality rates by cumulating their populations. In the second part of this paper, the study of the causes of deaths is based on Polleur alone, because the quality of the data was not good for Sart (the percentage of «unknown diseases» was too important). On a period of sixty years (1851-1910), we observe 1455 deaths in Polleur and 52687 in Verviers.

We will also refer to a few districts, all located in the Province de Liège, for comparison. Liège and Huy represent the traditional cities; Seraing is an industrial suburb of Liège (mining and heavy industry); Dison and Limbourg are industrial suburbs of Verviers (textile) (see map).

First, we try to determine the trends of the mortality in the city and in the country: Is there a mortality differential? At what level does it appear? What is the impact of crises in the city and in the country? Do they have the same impact everywhere?

1. MORTALITY CONJUNCTURE IN TOWN AND COUNTRYSIDE

1.1. The urban/rural differential *(see Graph 1)*

In 1849, when there was an epidemic of cholera in many towns of the province de Liège, Verviers had the highest mortality rate (61.3‰). During the twenty years that followed, its death rate was only very rarely surpassed by other industrial suburbs such as Seraing (1854, 1857, 1865) and Dison (1856, 1858, 1866). In contrast, Polleur and Sart, both rural areas, share along with Limbourg, the privilege of having the lowest mortality rate, 23‰ on average for Polleur-Sart and 24.3‰ for Limbourg. These rates however did not decline.

This situation directly corresponds to the ideas that the people in the nineteenth century had: reinforcing the images of the unhealthy city and the pure, preserved countryside (Pinol 1994: 55-60). The disastrous effects of

intense demographic growth were mainly responsible. At the census in 1846, Verviers and Dison were two of the four towns of the Province de Liège (Liège has 329 localities in total) where there were the most inhabitants per house, 9.21 inhabitants in Verviers and 11.85 in Dison. The situation was also bad in Seraing because until the 1870s, the workers were obliged to live near the factories due to the lack of transportation (Oris 1990a: 90).

In 1869, Liège, Huy, Dison, Limbourg and Polleur-Sart had a similar mortality rate (24 to 25‰). Those of Verviers (27.8‰) and of Seraing (29‰) were slightly higher. After the smallpox epidemic (1870-1871), the geographical division of mortality rates in East Belgium changed. In the textile city of Verviers, an obvious decrease took place: the average mortality rates fell from 32.1‰ (1846-1873) to 19‰ for the period 1874-1910. In Seraing on the other hand, where industrialization took place later, the mortality rates varied between 26.2 and 30.4‰ in the years 1872-1876.

Yet, mortality rates became lower everywhere, especially in Verviers, Dison, Seraing and Polleur-Sart. In 1900, Verviers had the same mortality rate as the other urban and industrial centers (16.2‰) but the rural areas still remained lower (12.5‰). At the same time, Seraing was the only place where more than 20 people per 1,000 inhabitants died.

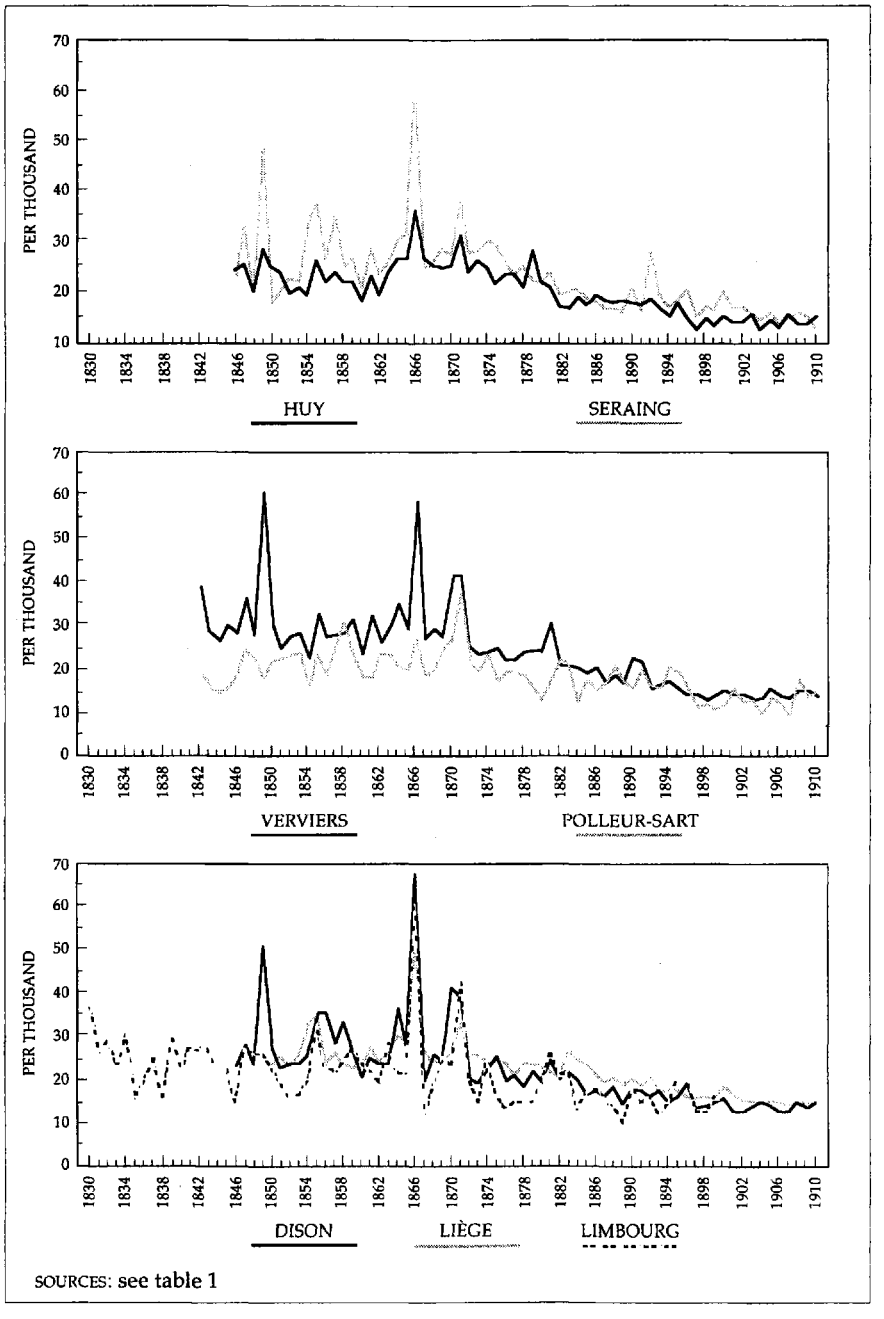
Just before the war, the situation was the same for all urban, industrial or rural areas, however the rates are surprising. Indeed, Seraing had the lowest mortality rate of all the sample cities (13‰). At the opposite end, the rural areas were the most affected by mortality, with rates that rose to 15.6‰. Of course, the values are now low and movements and hierarchy are therefore more uncertain. Globally, the epidemiological transition eradicated the old and new disparities between the city and the countryside.

Even if the decline did not begin everywhere at the same time, there is a correlation between some series. Liège is strongly correlated with the other cities (more than 0.8) such as Seraing, which is its industrial suburb (0.9) and also with industrial cities in the region of Verviers. Huy seems to have an evolution slightly different (correlation with other series 0.5 to 0.86), but nevertheless we can say that all of the urban and industrial towns are in the same epidemiological basin.

In contrast, the rural villages, represented here by Sart and Polleur, have a completely different mortality diagram. The evolution of their curve resembles no other. It has the best correlation with Liège (0.64) and yet even that is not very significant.

Is there a distinctiveness between the city and the countryside? Not only are the mortality rates in the nineteenth century very different, but they also seem to be influenced by different mechanisms. An analysis of the crises that appeared in the province between 1846 and 1910 will allow us to verify this. However, on the other hand, it is also important to notice that mortality rates rose in the countryside near Verviers between 1842 and 1873, a time when neither

GRAPH 1 EVOLUTION OF CRUDE MORTALITY RATES
IN EASTERN BELGIUM, 1830-1910



SOURCES: see table 1

industrialization nor urbanization could have been the cause. In fact, George Alter, Michel Oris and Muriel Neven (1997) have shown that life expectancy goes up and the rise in mortality rates is only an effect of age structure.

1.2. MORTALITY DURING CRISES

The general level of mortality can of course be more or less affected by the importance of crises in these specific places. We therefore chose to calculate a coefficient of variation (standard deviation/average) in order to measure the relative sensitivity to accidents for each locality, distinguishing between the period before the transition (1846-1873) and the period that followed (Poulain, Tabutin 1973: 49-86)[3].

In the first stage, the recent industrial centers of Seraing and Dison were particularly hard hit by epidemiological accidents, but after 1874, the situation became better, at least for Dison.

The crisis in 1866, which was the most significant in nineteenth-century Belgium, affected the new industrial centers (Dison, Seraing and Limbourg) more negatively than the old towns of Huy, Liège and Verviers. The ecology of the purely industrial towns was drastically changed due to the massive migration of workers into formerly rural areas which were not prepared to welcome them. The recent industrial areas had a poorer sanitation infrastructure than the traditional urban centers; they had to organize hygiene committees quickly in order to combat progressing illnesses (Oris 1995: 990, 1007; Potelle 1987: 127-136). In contrast, the rural areas of Polleur and Sart did not experience a mortality crisis during that year.

Table 1 shows that the sensitivity to crises goes down after the epidemiological transition, which is usually described, even if not accurately, as the change of a mortality of crises into a much lower endemic mortality. Polleur-Sart and Huy are the only localities where the coefficient of variation rises slightly after 1874. We must admit, however, that the crises did not radically influence the level of mortality in these cities in previous years. Moreover, the decrease in the number of deaths tends to create random variations on the local scale.

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3. We also calculated a coefficient of variation without taking into account the years during which crises occurred. Calculated by this way, the coefficient is of course lower but the hierarchy of localities remains the same. However, except for Dison, the coefficient is always higher for the second period (1874-1910) than for the first one. This observation must be interpreted with carefulness. Indeed, during the epidemiological transition, even the annual numbers of death decrease and this can lead to an increase of the variability of the annual mortality rates, which could be only a statistical artifice.

TABLE 1 THE SENSITIVITY TO CRISES IN EAST BELGIUM, 1846-1910.

	Huy	*Seraing*	*Dison*	*Liège*	*Limbourg*	*Verviers*	*Polleur-Sart*
				Period 1846-1873			
Standard deviation (STD)	3,752	9,216	10,515	6,083	9,518	9,205	4,573
Average (AV)	24,483	29,178	29,633	27,780	24,283	32,116	23,067
STD/AV	0,153	0,316	0,355	0,219	0,392	0,287	0,198
				Period 1874-1910			
Standard deviation (STD)	3,697	4,337	3,454	3,654	3,979	4,277	3,580
Average (AV)	17,725	19,481	17,508	19,307	17,143	18,978	16,754
STD/AV	0,209	0,223	0,197	0,189	0,232	0,225	0,214

SOURCES:

1. Ministère de l'Intérieur, *Mouvement de l'état civil*, 1831-1855;
2. *Exposé de la situation administrative de la Province de Liège*, 1856-1880;
3. I.N.S., *Le mouvement de la Population*, 1881-1910;
4. *Registres de population de Sart*, 1846-1866-1880-1890;
5. *Registres de population de Polleur*, 1846-1856-1866-1880-1890;
6. Ville de Verviers, *Exposé de la situation de la ville de Verviers sous le rapport de son administration*, 1842-1910;
7. ORIS (M.) 1991, annexe 125, p. 208;
8. CAPRON (C.) 1996.

If an historian wants to study the impact of the crises on different populations, he first has to identify them. For that, he can use several methods which Alberto Palloni addresses in his article "Les mortalités de crise, leur estimation et leurs conséquences" (Palloni 1988: 231-236).

The first method, which is the most traditional, consists of calculating the general trend of the mortality for the period we want to study. We then calculate u (average quadratic residue[4]) and consider as a crisis any event, which is not included between +u and -u on both sides of the trend. It is true that this system is simple and easy to visualize on a graph (see Graphs 2 and 3), but it is not applicable to a series whose trend is not constant for the entire period. In such a case, instead of calculating only one trend on a long time, we divide the period in order to distinguish different trends. The number of

4. $u=\sqrt{(\Sigma y^2/n).(1-r^2)}$

periods and their definition is an empiric exercise[5]. We have chosen this approach for Verviers and Polleur-Sart because the fall in mortality rates began only in the 1870s, after a period during which the rates either worsened or remained the same. Using just one trend to summarize these opposite tendencies was inadequate. As you can see on Graphs 2 and 3, we calculated a first trend until 1873, and the second trend concerns the years 1874-1910.

In addition, Dupâquier proposes a third method (Dupâquier 1979: 85-92). He developed an indicator based on the difference between the mortality rate of one year and that of the n years just before and just after. The result is balanced by the standard deviation[6]. The result he gets varies between 1 and 4: 1 reveals a minor crisis; 2 an average crisis; 3 a strong crisis; and 4 a major crisis.

Table 2 summarizes the information obtained by these three processes of crisis identification for Verviers and Polleur-Sart. It shows that, in Verviers, three crises are clearly isolated, those of 1849, 1866 and 1881. They are as well the only ones to reach index two status, in other words, the rank of middle crisis. The mortality peaks of 1870-71, which had a real impact on Verviers, as we will see later, are not dominant in the system developed by Dupâquier. This example perfectly illustrates the main flaw of this method: some crises are overlooked because of the importance of cholera in 1866. The latter intervenes both in the numerator (average of the Crude Mortality Rate during the 10 surrounding years) and in the denominator (bigger standard deviation of these CMR)[7]. We also notice mortality peaks in 1890-91. The other dates that appear in the table are unreliable, since they are only recognized by one of the three methods[8].

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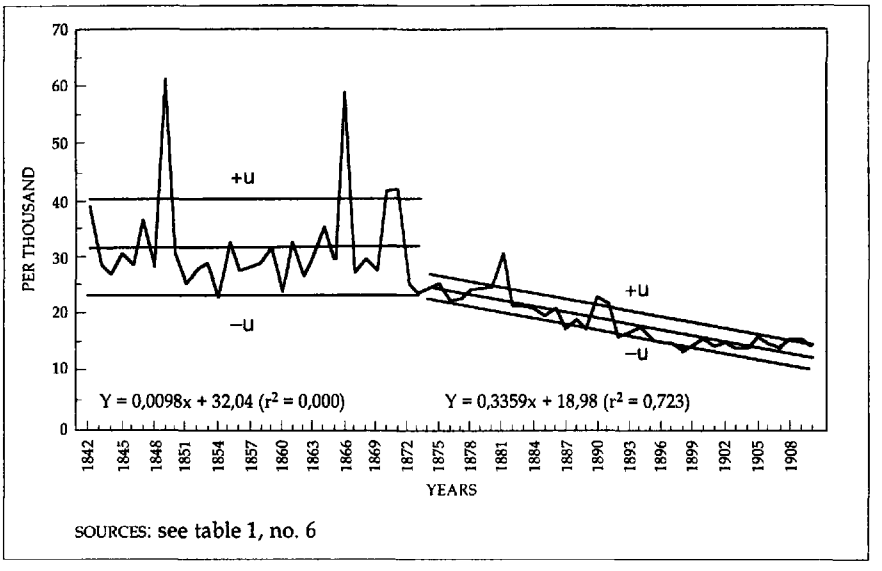
5. In fact, thanks to the computer and spreadsheets systems, we test different dates of beginning and of end to identify the best trend: this means the one for which the correlation between the time and the crude mortality rate is the highest.

6. $Ix=(Dx-Mx)/\sigma x$

7. Michel Oris observed this shortcoming in 1871 in Seraing (Oris 1997).

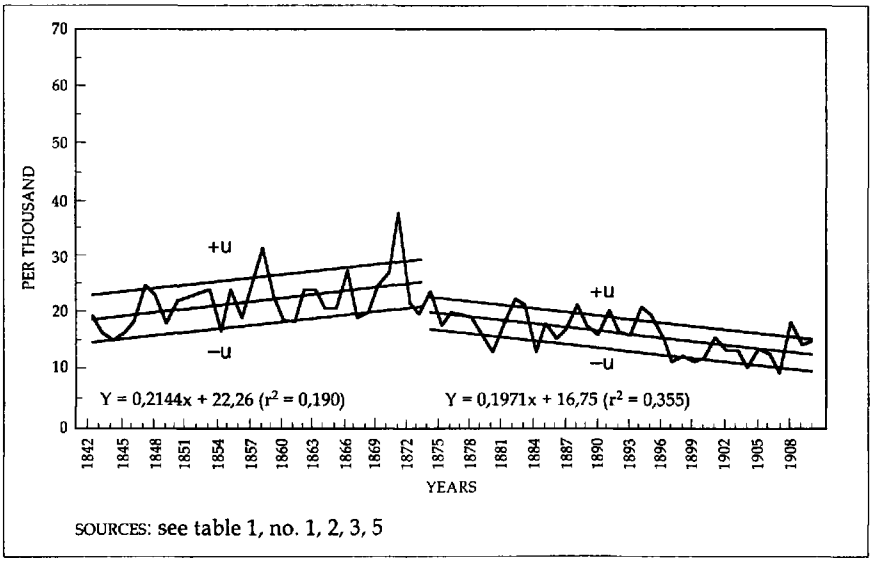
8. Since we chose to take the average of the ten surrounding years to calculate the index of Dupâquier, crises which appear after 1905 cannot be noticed by this method.

GRAPH 2 EVOLUTION OF CRUDE MORTALITY RATES IN VERVIERS, 1842-1910



SOURCES: see table 1, no. 6

GRAPH 3 EVOLUTION OF CRUDE MORTALITY RATES IN POLLEUR-SART, 1842-1910



SOURCES: see table 1, no. 1, 2, 3, 5

TABLE 2 IDENTIFICATON OF CRISES: VERVIERS AND POLLEUR-SART BETWEEN 1842 AND 1910.

Verviers				Polleur-Sart			
Years	*1 period 1842-1910*	*2 periods 1842-1873 1874-1910*	*Index Dupâquier*	*Years*	*1 period 1842-1910*	*2 periods 1842-1873 1874-1910*	*Index of Dupâquier*
				1847		c	1
1849	c	c	2				
1855			1				
				1858	c	c	2
1866	c	c	2	1866	c		
				1869	c		
1870	c	c		1870	c		
1871	c	c		1871	c	c	2
				1874	c		
1881	c	c	2				
				1882	c		1
				1883		c	1
				1888	c	c	1
1890		c	1				
1891		c	1	1891		c	1
				1894	c	c	1
				1895		c	1
1900			1				
				1901			1
1905			1				
1908		c		1908		c	
1909		c					

SOURCES:
- see table 1, no. 1, 2, 3, 4, 5, 6
- see also Annex 1

In Polleur-Sart, the number of crisis years is higher than in the nearby town. The most remarkable are those of 1858, 1871, 1888 and 1894; the first two reaching the rank of "middle crises", the other two being considered "minor crises". Six dates are doubtful, particularly those of 1866, 1869, 1870 and 1874, which are only isolated by the first method. But this trend based on the whole period is a poor summary of the general evolution of mortality between 1842 and 1910 which had two distinct periods in Polleur. In 1847, 1882, 1883, 1891, 1895 and 1901, the Dupâquier index only indicates minor crises.

For other districts, we based our study on the years during which the rate went beyond the "average quadratic residue" (which was calculated for 1 or 2 periods, depending on the case). Annex 1 shows the mortality crises that happened between 1842/1850 and 1910 in these Walloon localities.

The first obvious established fact is that two diseases were responsible for the significant epidemics: cholera (1849, 1855, 1866) and smallpox (1871, 1881 and 1890-91), the latter often went together with other childhood diseases. There are also some cases of typhoid fever but they had a smaller influence on mortality. Typhoid fever was regularly mentioned in the provincial annual reports of hygiene and epidemics and it functioned more as a seasonal disease than as a "crisis instigator"[9].

CHOLERA

In the *Exposés de la province* and the *Rapports des Commissions Médicales*, cholera is only mentioned seven times between 1848 and 1910: in 1848-1849; in 1853 in Seraing; in 1854-55; in 1866; in 1877 (only a few cases); and in 1893-94. Contrary to most childhood diseases, it did not progress to an endemic stage[10]. When it did happen, it provoked real epidemics, which had a direct effect on the general mortality. Only the outbreaks mentioned in 1853 in Seraing and in 1893-94 in the whole province did not induce mortality peaks.

In reality, the first great attack of the disease in Belgium for the nineteenth century happened in 1833-34: Verviers experienced during those years one death from cholera in 113 inhabitants (Lafosse 1977: 223). The epidemic quickly spread to all the area and the countryside was not spared. On the contrary, Sart knew at this time the biggest mortality peak of the whole nineteenth century (Alter, Oris, Neven 1997). Then, a breaking occured between town and countryside, due to the end of the protoindustrialization[11], and this breach appeared during the crises of 1849, 1855 and 1866: it is interesting to notice that during these three big accidents, the rural villages of Polleur-Sart were never affected by a high mortality.

At the time of its 1849 foray, a complete count of victims was published in the *Exposés de la province*. Neither Sart nor Polleur were listed among the affected localities, while one person in 30 inhabitants died from cholera in Verviers (Lafosse 1977: 223). The epidemy affected the mortality in all the country: 1 person in 45 died in Dison, 1 in 52 in Antwerpen, 1 in 53 in Leuven, 1 in 86 in Mechelen and 1 in 100 in Namur (Oris 1988: 87-88; Van Hool 1893:

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9. Except in 1883, when it accounted for a great number of deaths in the city of Liège (*Exposé 1883*: 155).

10. This phenomenon has been observed on the whole continent, where it falls by «bouffées pandémiques» (pandemic waves), according to the expression of P. Bourdelais (Bourdelais 1988: 17-19; Bourdelais, Raulot 1987: 9-51).

11. This isolation finds expression in a lot of consanguinity among the marriages in Sart (see Hélin 1965).

110; Van Der Haegen, De Vos 1980: 199; Keulemans, Van Der Haegen 1987: 125). Six years later, the situation was the same but more understandable because the whole area of Verviers was less affected by cholera[12].

The absence of crises in 1866 in the countryside is more astonishing, all the more because it was the bigger epidemy of the nineteenth century in Belgium. This absence is evidently due to the exceptional preservation of Sart, where cholera was only responsible for one death among 362 inhabitants, and 1 among 89 in Polleur. Verviers, this time, paid again a heavy tribute to death (1 death in 36 people), but its industrial suburbs such as Dison and Limbourg were more affected (1 death in 24 inhabitants) (*Exposé 1866:* 225-229; Oris 1994: 311-338; Lafosse 1977; Capron 1996: 99). In a general way, big cities experienced a very high mortality due to cholera: Bruxelles (1 in 45); Liège (1 in 38/40); Antwerpen (1 in 41), but it seems that little provincial towns such as Mechelen (1 in 58), Huy (1 in 84) and Leuven (1 in 77) had been more preserved from the disease (Oris 1988: 87-88; Van De Vijver 1985: 31; Keulemans, Van Der Haegen 1987: 125)[13].

SMALLPOX

This disease, that mainly affects children, is mentioned 21 times in the *Exposés de la province* between 1848 and 1910, sometimes to simply point out that some cases had been counted, and other times because it created real epidemics. The most important are those of 1870-71, 1881, 1886 (Liège) and 1890-91. Although it is endemic at a regional level, smallpox reached epidemic proportions locally. Throughout the nineteenth century, its intensity and periodicity in different European areas varied (Darmon 1986: 57-60). In East Belgium, there was an obvious revival in the years 1870-80, when the global level of mortality began its decisive decline.

The importance of local autonomy, as far as hygiene was concerned, was obvious in the reactions smallpox provoked (Oris 1988: 103). In Belgium indeed, the "communes" (the smallest territorial divisions) have been liable

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12. The *Exposé de la situation administrative de la province* of 1857 mentioned fifteen deaths by cholera in Charneux, five in Ensival, and only one in Dison and Verviers.

13. In *Choléra des villes et choléra des champs. Faits et représentations,* Patrice Bourdelais showed that «it is the geography of the epidemic spread that explains why a town is affected, more than its particular characteristics, even if the latest can play a part in the epidemic» (Bourdelais 1991: 225.) Thierry Eggerickx et Michel Poulain noticed that during the epidemic of 1866, the industrial suburbs of Liège and Verviers were the most affected, while the rural suburbs of Waremme only recorded one death in 537 inhabitants. They conclude that «the most crowded areas were the main victims of cholera» that year (Eggerickx, Poulain 1991: 215).

since 1836 as far as health and sanitary questions are concerned. The *Exposés sur la situation administrative de la province de Liège* show evidence of this, since each time the epidemic raged, the Medical Commission gave a series of recommendations to local authorities and reminded them of some prophylactic rules to respect. The main points are as follows:

- they have to pay attention to (re-)vaccination(it is totally riskless and efficient) (*Exposé 1870:* 95; *Exposé 1878:* 221);
- in infected districts, schools must be closed and their doors only reopened to inoculated children (*Exposé 1871:* 105-106; *Exposé 1880:* 153).

This advice was usually heeded but timely action was limited depending upon the length of the epidemics (Oris 1995: 990, 1007)[14]. Thanks to those measures, crises were often brought under control and contained. According to the provincial reports, school closure and a vaccination campaign were enough to check smallpox (*Exposé 1871:* 105-106; *Exposé 1878:* 221; *Exposé 1880:* 153). This explains why this disease could cause a great increase in the number of deaths within a district without affecting the mortality of the area as a whole[15].

Yet there is an important exception. In 1870-71, the biggest smallpox epidemic of the nineteenth century struck the European continent (Darmon 1986: 358). It clearly influenced the death rate in the Liège area, all the more because in Belgium, vaccination was not compulsory (Darmon 1986: 365; Kuborn 1897: 30). In 1871, the crude mortality rate grew to 35.3 per thousand in Olne in the valley of the Vesdre; just two points less than in the Ardennes villages of Polleur-Sart, four points less than in the industrial neighborhood of Dison and seven points less than in Verviers. The last great epidemic of the nineteenth century was also the first to go beyond the epidemiological disparities between town and countryside in East Belgium. J.-N. Biraben explains that the devastation of smallpox that year was caused by a viral mutation which could kill people who had been previously immunized (Charbonneau, Larose 1979: 339).

What about the duality of town and countryside? The scheme of crises in rural villages has but a few points in common with the pattern of urban and industrial cities: in 1847, 1858, 1883, 1888, 1894 and 1895, Polleur and Sart survive local, weak crises. They only suffered from the consequences of smallpox in 1871, and in 1891 they experienced a mortality peak at the same time as Verviers. The intensity of the smallpox that year was once again responsible for the phenomenon.

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14. We can also remember that, before the vaccination, a pionneer of inoculation against smallpox in Belgium was a surgeon from the «Verviers Ardennes», Jean-Philippe de Limbourg (Bertholet 1984).

15. See table in Annex 1: Verviers in 1890, Polleur-Sart and Verviers in 1891 and Seraing in 1878 and 1892.

2. CAUSES OF DEATH

2.1. Method

The identification of causes of death is a real Gordian knot, as much for the present-day historian as it was for the doctors and statisticians of the nineteenth century. The establishment of nomenclatures, the compulsory declaration of contagious diseases, and the commitment to a breach of confidence were each stumbling blocks in this field (Biraben 1980; Velle 1985).

My aim is not to reconsider the compatibility of the ancient and modern classifications, nor to begin again the perpetual debate on their interpretation. In classifying causes of death, I chose to stay very close to the sources that were available, without betraying them. No matter how important the succession of medical discoveries for one century can be, it cannot allow past diseases to be classified in current medical framework[16]. For that reason, it was not possible to build a single nomenclature for Verviers and Polleur because the method of recording deaths in each locality differed greatly (Oris 1990b).

2.1.1. Verviers

In the industrial center, the recording of deaths by cause took place regularly after 1859, and the results were published every year in *the Exposé de la situation de la ville de Verviers sous le rapport de son administration*. This was a local initiative, based on information given by doctors who were relatively numerous in the town and who were directly interested in the statistics that resulted from it (Angennot 1850; Larondelle 1867; Patar 1891; Dupâquier 1985: 339-342). At the start, the table of causes of death was particularly detailed: about 130 diseases were indexed and put together in several headings. On this basis, we have built our own classification, summarized in Annex 2.

Some specific details about this nomenclature can be explained: the first category more realistically groups cerebral complaints and pathologies such as tetanus or meningitis; diseases called *skin diseases* were really mainly measles, smallpox and scarlet fever; finally, the term *weakness* meant degenerative diseases, such as old age, cancer, congenital weakness and infirmities. Although some changes in the presentation of the data appeared in 1867, then again in 1874,

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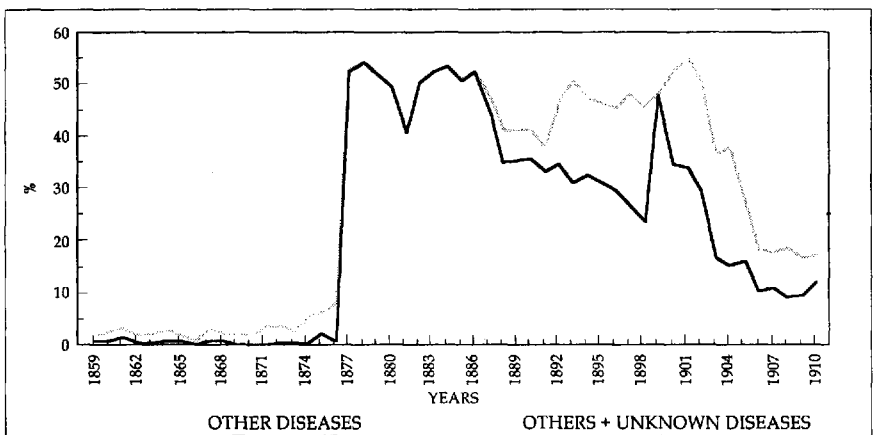
16. I have not used the method of statistic distibution elaborated by Vallin and Mestré, because it does not fit in with the statistics of causes of deaths in Polleur and Verviers. Our sample is much less numerous than in the French case and, moreover, the nomenclatures of the 19th century are sometimes much less detailed than those used after the First World War (Vallin, Mestré 1988).

categories remained stable until 1876 and the quality of the data is good. For the whole period, more than 96% of causes of death are clearly defined.

But in 1877, a great number of Belgian districts carried a common classification which was much less detailed. Instead of tables several pages long, doctors had to rank diseases among 16 headings. A total but exhaustive disorder was replaced by an intellectual construct that took for granted the pathological frame. Indeed, this classification indexed epidemic diseases, pulmonary complaints and digestive pathologies. A new heading appeared, *other diseases that are not indexed elsewhere* which made it possible for physicians who paid increasing attention to *déontologie* both to respect "the professional secret" and to avoid filling in the *unknown diseases* column, which would imply that they were incompetent. Graph 4 illustrates this sudden deterioration in the recording of causes of death. One should wait until 1906 to see the percentage of non-determinate diseases reaching a reasonable level of 20%, thanks to a change which occurred in the nomenclature by 1903 (Horrent et al 1994: 221).

GRAPH 4 IMPORTANCE OF "OTHER DISEASES" AND "OTHER + UNKNOWN DISEASES". VERVIERS, 1859-1910



SOURCES: see table 1, no. 6

This brief survey of Verviers sources could lead us to think that causes of death were not well documented between 1877 and 1905. This is absolutely not the case. Some groups of causes remained particularly well recorded and coherent during this time, such as categories 2, 4 and 6 which we will focus on later. Moreover, to manage unknown data in the best way, we also completed the analysis by creating a second nomenclature, in order to see the evolution of some specific diseases - tuberculosis, childhood diseases, cholera

and cancers. We will see later that this simple, further classification yields some useful information.

2.1.2. *Polleur*

The systematic recording of causes of deaths began in 1851 in this rural district, but the method of acquiring statistics was very different. At the time, Polleur was a village without a doctor, as was the case in many rural towns[17]. Instead, the civil servant of the district had to index the causes of death according to the statements of parents or friends. Therefore, the causes were defined more roughly, following a more popular than erudite death reading[18]. Local authorities did not refer to a fixed nomenclature. Until 1869, the district administration lumped together diseases which had occurred throughout the year. Polleur only started a printed classification in 1870 and seven years later, one finds nearly the same categories as were used in Verviers.

We chose to use a nomenclature which respects the specificity of rural pathologies, and at the same time, tries to remain as close as possible to the classification of Verviers, in order to make comparisons easier. Because of the changes which occurred in the recording of the causes of death in 1870, we had to build a second classification from that date. Annex 2 summarizes the different nomenclatures used in each of these localities.

The codification of type 1 (1851-1869) is very close to the one we saw previously, since only one heading is different. *Childhood diseases* replaced *skin pathologies* and since no skin disease other than measles, smallpox and scarlatina were specified in Polleur, we chose to add deaths caused by whooping cough and croup. We therefore created thus a category *childhood diseases*. On the other side, category 10, *other diseases* mainly consists of abscesses, fevers and infections.

The introduction of a standard for recording causes of deaths favored more varieties of causes which was not the case in Verviers. We took this fact into account to fine tune our nomenclature, but no major change occurred in this codification of type 2 (1870-1910). Category 1 (*nervous system*) disappeared for the benefit of diseases transmitted by animals which make up category 12. These pathologies were not considered in an urban center such as Verviers. In Polleur, diseases such as rabies, glanders or typhus had their own category.

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17. A list of the people allowed to practice medicine in the province of Liège was published regularly in the *Memorial administratif de la province de Liège*. In the middle of the 19th centrury, there was no doctor, no midwife, nor even a chemist in Polleur. In 1900, there still was no doctor, but the district did have its own chemist now. At the same date, 42 doctors worked in Verviers.

18. In developing countries, it is often still the case (Zimicki 1988).

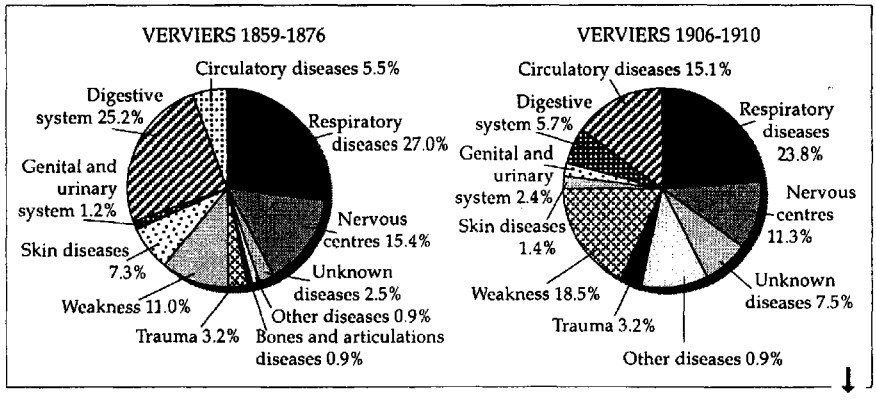
2.2. The trends: the breakdown of causes

2.2.1. *The components of the pathological framework in Verviers* (Graph 5)

During the first period (1859-1876), respiratory diseases constituted a large proportion of the mortality in Verviers, an average of 27% of the deaths. Although there was a drop, they remained the leading cause of death in this town in the beginning of the twentieth century (23%). The decline of these contagious diseases was real but slow.

Digestive complaints were responsible for one death in four in the textile urban center and explain the excess mortality observed in towns. Graph 6 clearly illustrates the seasonal pattern of these diseases. Tilleur [19], an industrial town which underwent great expansion, shows a high summer mortality (index of 146 in July) between 1847 and 1873. Providing clean drinking water (Delforge 1985: 194-195; Lafosse 1977: 211-212) and safe milk[20] was a real problem during hot summers. Most certainly, the heavy tribute paid to digestive diseases was enforced in Verviers, as well as in Tilleur, by the cholera epidemics of 1849 and 1866, but these two chief accidents can not be the sole causes[21].

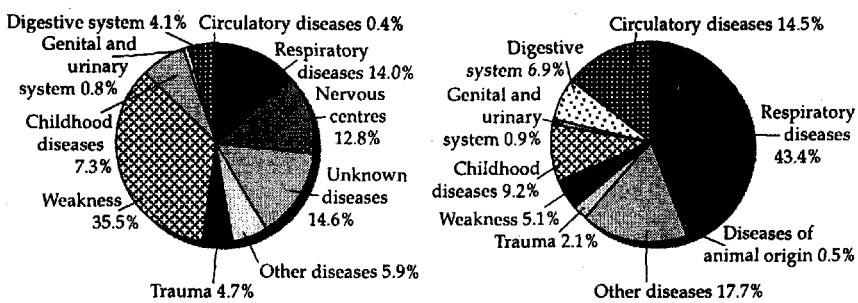
GRAPH 5 PATHOLOGICAL FRAMEWORK IN VERVIERS AND POLLEUR, 1851-1910. AN EVOLUTION



19. We chose to use Tilleur as the example of an urban centre because the data were available. It is an industrial town of the Liège suburbs (Derosas, Oris 1997).

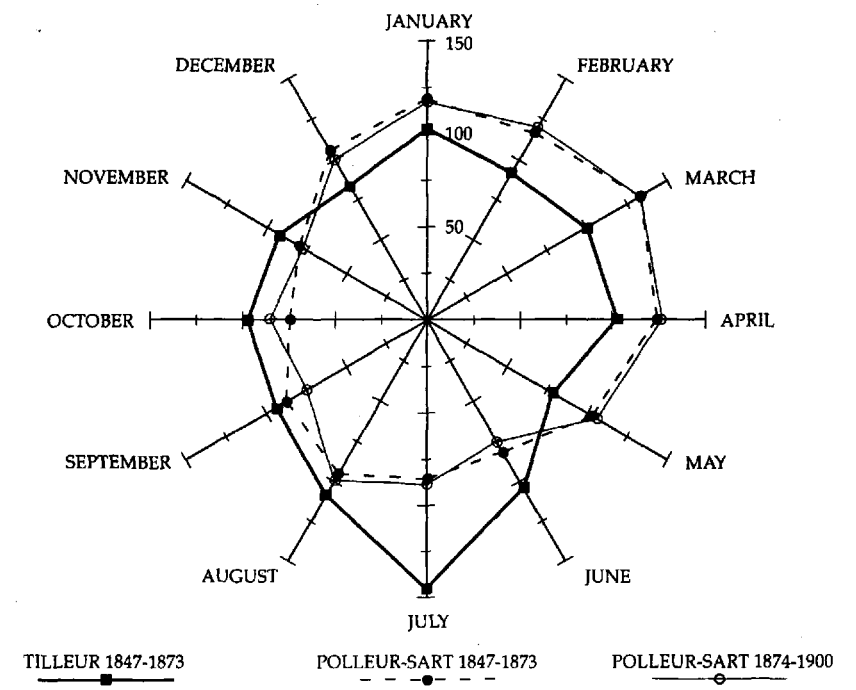
20. On the influence of bad quality milk, see Imhof 1984: 216-218; Oris 1988: 92-93; Kuborn 1908: 56; Leclerc 1906: 38-39. The latter considers that evaporated milks, more often used in the urban centres, were a cause of infant mortality.

21. Indeed, from 1847 to 1873, the index of mortality in July and in August is higher than 100 more often than every other year (Graph 6).



SOURCES: see table 1, no. 6, and table 7

GRAPH 6 MONTHLY MORTALITY INDEXES IN TILLEUR AND POLLEUR-SART, 1847-1900



SOURCES:

- *Registres de population de Tilleur, 1846 to 1866*
- *Registres de population de Sart et de Polleur, 1846 to 1890*

However, the relative importance of gastrointestinal diseases decreased radically since they caused less than 6% of deaths between 1906 and 1910 (see Graph 5). Epidemic diseases as a whole also show a favorable evolution since the group smallpox/measles/scarlatina dropped from 7.3% to less than 2% in 50 years.

On the contrary, degenerative diseases such as cancer and heart disease increased in relative importance: 18% of the Verviers inhabitants died from *weakness* at the beginning of the twentieth century and 15% from circulatory illnesses. The content of these categories will be analyzed later.

Globally, Verviers experienced a traditional epidemiological transition.

2.2.2. *The countryside: a different pathological framework?*

Since the typologies used in Polleur underwent more changes, it is much more difficult to follow the evolution of diseases even though the recording is good. On average, only one death in five was ranked under the headings of *other diseases* and *unknown diseases* (as compared to 33% from 1870 to 1890). At this stage, we can only make some general observations which we will try to refine later with the help of the analysis of mortality rates by age.

Illnesses of the nervous system concerned 13% of the deaths before 1870 (see Graph 5), after which they disappear from the nomenclature and we assume that they became encompassed in the category *other diseases*. This hypothesis would explain the sudden increase of 13% in this group.

Digestive system diseases, puerperal complaints and childhood ailments were not consistent phenomena in Polleur. They arose episodically and the peaks of mortality that they brought did not play a significant role, except perhaps for the childhood diseases of 1870-71 and 1878-79.

Three development must be noted. First, circulatory diseases were added to the nomenclature in 1903 and from 1906, are responsible for 15% of all deaths. Secondly, the incidence of respiratory diseases rose dramatically, from 14 to 43%. It is clear that a transfer happened in the recording of causes of death: indeed, weakness or old age, which accounted for 35% of cases before 1870, are only mentioned five times in 100 between 1891 and 1910. Illnesses which belong to these groups are very sensitive to seasons. The seasonal pattern in Polleur is one of a winter and spring mortality, with a peak in March (see Graph 6). Six months of "under-mortality" then follow six months of "over-mortality" (from December to May). This is clearly different from the monthly pattern of deaths that we observed in town (Tilleur [22]) before 1873.

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22. In Tilleur, we see an under-mortality from September to February (except an index of 101 in January).

In Polleur, the cold weather killed the weakest people until the beginning of the twentieth century. A more detailed yearly analysis does not show any decrease in this phenomenon. The winter excess mortality which exists during the epidemiological transition proves that, whatever the critical problems are, respiratory diseases were and remained a main component of the pathological framework in Ardennes.

The climate of towns in the Meuse valley is indeed less harsh than that of the Ardennes countryside [23] and in this coaly area, even the poorest workers did not suffer from a lack of fuel. Women often went on slag heaps to get coal dust.

2.3. Mortality rates by cause in Verviers: a town under pressure, a not surprising transition

Before the epidemiological transition, Verviers experienced a particularly high mortality rate (32% being the average for 1859-1873). Table 3 gives a general view of the causes of mortality in this town during the pre-transitional period.

TABLE 3 MORTALITY RATES BY CAUSE AND AGE IN VERVIERS, AVERAGE 1859-1873.

Diseases	*< 1*	*1-9*	*10-19*	*20-39*	*40-59*	*60&+*	*Total*
Nervous system	58,29	10,96	0,54	0,83	2,75	15,76	5,31
Respiratory diseases	62,93	11,42	2,42	5,89	8,58	26,21	9,42
Circulatory diseases	1,82	0,21	0,23	0,44	2,92	15,21	1,87
Digestive system	119,89	11,34	1,53	2,95	6,01	17,68	8,59
Genital and urinary system	1,62	0,20	0,09	0,50	0,32	0,82	0,38
Skin diseases	13,47	10,19	0,88	0,77	0,45	0,41	2,71
Weakness	57,48	0,71	0,06	0,16	1,12	11,37	2,48
Trauma	1,92	0,59	0,19	0,66	1,79	3,71	1,00
Bones and articulations diseases	0,10	0,13	0,14	0,11	0,43	1,10	0,25
Other diseases	1,31	0,27	0,12	0,14	0,35	0,66	0,26
Unknown diseases	10,90	0,61	0,11	0,14	0,43	2,14	0,64
Total	263,46	45,01	6,27	12,48	24,65	88,21	32,05

SOURCES: see table 1, no. 6
+ Ministère de l'Intérieur, *Recensement de la population, 1866*

[23] On the other hand, working conditions in factories can not explain the lower sensitivity to pulmonary affections. On the contrary, a lot of witnesses noticed that factory and coal mine workers were often affected by this kind of diseases, most notably because of the sudden change in temperature that they often face. See Bidaut 1846: 269-270; Burggraeve 1846: 335, 337; Kuborn 1863: 84-85.

Deaths were mainly due to respiratory (9.4%) and digestive (8.6%) complaints and, to a lesser degree, nervous system diseases. These three kinds of illnesses adopt a U curve: the maximum rate of death existed for children under the age of one, then it decreased to its minimum in adolescence (10-19), only to rise again slightly at the adult ages, before experiencing a sharp revival among people of 60+.

Since these diseases represent more than half of the deaths in Verviers, the breakdown of mortality by age for the whole causes also reflects a U curve although the tail is shortened. Infant mortality reached 263.5‰ which is high, even for a nineteenth-century industrial town. One of the explanations is the high proportion of women working in this textile city which affected the time they spent breastfeeding or simply looking after their children (Masuy-Stroobant 1983: 124; Capron 1996: 106; Bresci, Livi-Bacci 1994: 172-174). The specific diseases of childhood - smallpox, measles and scarlatina - killed 13 children under the age of one in a thousand and 10 aged from one to nine in a thousand. For the first, these diseases were not a significant cause of death, but they were responsible for 25% of the deaths of older children (from 1 to 9).

Circulatory illnesses seem marginal (1.9‰), except among the sexagenarians, whose rate of mortality by heart disease reached 15‰ and constituted their fourth leading cause of death. Death by *weakness* was an important component of infant mortality (57.5‰), even if the stillborn children are not taken into account. Nervous system diseases were also important at that age: most of them were deaths due to convulsions, probably from gastric and intestinal disorders (58.3‰).

The mortality differential by age was very strong in Verviers although gender segregation was less important (see Table 5). Does this mean that the mortality of men and women was equal? Nearly, with a small advantage for females: their mortality rate was 30.6‰ as compared to 33.6‰ for males. This slight over-mortality among men was mainly due to nervous system diseases (brain haemorrhage, etc.) and pulmonary illnesses. In the latter case, the higher sensitivity of men to tuberculosis has often been observed in towns (Neven 1993: 60-62).

After 1873, mortality fell rapidly and the rate was only 15.3‰ at the beginning of the twentieth century (1906-1910). Some diseases contributed more than others to this clear medical and sanitary improvement. The roles of three kinds of pathologies are obvious: respiratory, digestive and, to a lesser extent, skin diseases (see Table 4).

Respiratory illnesses comprised 9.4‰ of deaths before 1873, which decreased to 3.6‰ thirty years later (1906-1910). They had a more or less regular decline, which happened in the same rhythm as general mortality in Verviers. Mortality by tuberculosis, an important component of respiratory diseases, fell more quickly in Verviers than in other towns of the country.

TABLE 4 MORTALITY RATES BY CAUSE IN VERVIERS, 1859-1910.

Diseases	*1859-1873*	*1874-1905*	*1906-1910*
Nervous system	5,31	0,50	1,74
Respiratory diseases	9,42	5,20	3,64
Circulatory diseases	1,87	0,92	2,33
Digestive system	8,59	1,63	0,88
Genital and urinary system	0,38	0,15	0,37
Skin diseases	2,71	0,63	0,26
Weakness	2,48	0,78	2,85
Trauma	1,00	0,45	0,49
Bones and articulations diseases	0,25	0,07	
Other diseases	0,26	6,12	1,67
Unknown diseases	0,64	1,33	1,15
Total	32,05	19,56	15,28

SOURCES:
see table 1, no. 6.

On the contrary, the near disappearance of the digestive system complaints from the pathological framework of Verviers did not take long and the extinction of cholera epidemics was directly linked to this abrupt fall. Moreover, other sicknesses less remarkable but not less deadly, such as dysentery or enteritis, became less prominent. The shift occurred in 1876, as Graph 7 shows[24]. From a basis of 100 in 1859-1864, the mortality rate in Verviers was 51 in 1906-1910, while digestive diseases alone reached 14.

This decline indicates a clear improvement in the urban ecology, linked on the one hand to new public health works in neighborhoods (Desama, Bauwens 1995: 103), and on the other hand to the drinking water providing system resulting from the construction of the La Gileppe dam. Opened in Verviers in 1866, this new means of water distribution took off after a few years:

> «500 connections between 1874 and 1877, more than 2,000 by 1881, and a regular progress of 1,000 connections every seven years until 1900» (Delforge 1985: 199).

By that date, 89% of houses in Verviers were connected. Gretchen Condran has shown the direct consequence of the water distribution on the evolution of digestive diseases in Philadelphia (Condran 1987: 125).

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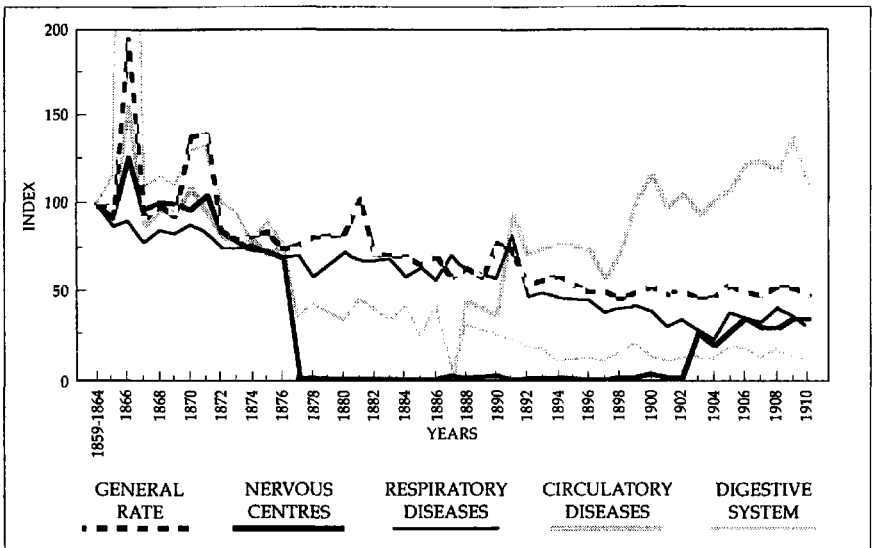
24. Graph 7 allows to compare the evolution of mortality rates by cause to the evolution of the general mortality rate in Verviers. The average 1859-1864 is the base 100. Thus the graph does not indicate a level of mortality.

GRAPH 7 EVOLUTION OF THE MORTALITY RATES BY CAUSE IN VERVIERS (INDEX 100 = AVERAGE 1859-1864)



SOURCES: see table 1, no. 6

The evolution of skin disease mortality rates has a much more irregular outline: smallpox, measles and scarlatina follow the characteristic pattern of epidemic diseases, beyond 1873. After a final mortality peak in 1890, this group of mainly childhood sicknesses decreased more rapidly than general mortality in Verviers. The rate is barely 0.26‰ between 1906 and 1910, as compared to 2.71‰ during the first period. The main episodes occurred every ten years, in 1870-71, 1880-81 and 1890. In each of these cases, smallpox must be the culprit and theses crises were so important that they influenced the average level of the mortality of Verviers.

Circulatory diseases, on the other hand, experienced an increasing evolution during these fifty years. Under this name, physicians of the nineteenth century lumped together different heart ailments. From 1859 to 1876, barely 10% of the illnesses recorded in this category are non-cardiac diseases such as varicose veins or aneurysms. From 1903, the circulatory diseases consist exclusively of heart problems and therefore the data of this series has remained more or less coherent [25]. So it is not only a simple relative progression, but it is also a

25. Of course it would be totally true if the conditions of the diagnosis had not changed between 1851 and 1910, what is not the case: «*Concepts about what constitutes heart disease*

real increase of cardiac diseases. The rise of the rate is not spectacular (from 1.87 to 2.33‰), but it is significant in a general context of decreasing mortality. This can be partly explained by an increase in the average life expectancy, because people lived long enough to die from diseases that needed time to develop (Howell 1993: 95).

The special evolution of weaknesses requires particular attention because its content changed a lot as time went by. Before 1876, 67% of weakness diseases were congenital illnesses (weak people, stillborn children, etc.). Around 12% were due to old age, and the incidences of cancers did not reach 10%. Thirty years later, the relative proportion of cancers is four times higher and that of old age increased threefold. In contrast, congenital causes represented less than 25% of the deaths in this category.

The heading *weakness* in 1906-1910 has thus few common points with the one of 1859-1873. In these circumstances, its mortality rates – 2.48‰ in the first period, 2.85‰ in the second – are not significant. It is simply important to notice that the mortality rates of this category remained more or less stable because cancers[26] and old age were taken into account after 1903.

Degenerative diseases – old age, cancer and heart ailments – replaced the microbial diseases which played a great part in the urban mortality pattern before 1873. But in spite of a large decline, respiratory illnesses remained the most important at the beginning of the twentieth century (3.6‰).

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have changed a great deal in the past century (...) Around the end of the nineteenth century, however, the conceptualization of heart disease changed fundamentally. (...) British physicians started to think about the heart in terms of its functional capacity rather than in terms of its anatomy» (Howell 1993: 94).

[26] Thanks to the nomenclature of type 2 established for Verviers, we can study more precisely the mortality rate of cancer, disease which was isolated in the nomenclature from 1859 to 1876 and from 1903 to 1910. During the first 15 years, it is 0.45 in average; just before the war, it reached 1.18 (1906-1910). But Olivier Faure underlines the difficulty in trusting the medical statistics, especially for cancer: «*...In the context of Pasteur discoveries(...), the trend to see the cancer where it has not been seen yet is so clear that the general statistics of European countries published in 1902 (except France) show an improbable doubling of cancer mortality ...*» (Faure 1994: 206).

TABLE 5 MORTALITY RATES BY CAUSE AND SEX IN VERVIERS AND POLLEUR, BEFORE THE EPIDEMIOLOGICAL TRANSITION.

	Verviers (1859-1873)			Polleur (1851-1869)		
Diseases	*men*	*women*	*total*	*men*	*women*	*total*
Nervous system	5,89	4,75	5,31	2,9	2,3	2,6
Respiratory diseases	9,97	8,89	9,42	3,2	2,1	2,6
Circulatory diseases	1,67	2,06	1,87	0,1	0,1	0,1
Digestive system	8,98	8,22	8,59	1,0	0,6	0,8
Genital and urinary system	0,23	0,52	0,38	0,0	0,3	0,2
Skin diseases	2,78	2,65	2,71	1,3	1,0	1,1
Weakness	2,42	2,53	2,48	6,7	7,3	7,0
Trauma	1,40	0,62	1,00	0,8	0,3	0,5
Bones and articulations diseases	0,31	0,19	0,25			
Other diseases	0,25	0,27	0,26	1,2	1,6	1,4
Unknown diseases	0,64	0,64	0,64	3,7	3,0	3,4
Total	33,61	30,56	32,05	20,5	18,4	19,5

SOURCES:
- see table 1, no. 6,5
- Ministère de l'Intérieur, *Recensement de la population*, 1866
- Archives de l'Etat à Liège, *Communes: Polleur, no.* 33-37, 44

2.4. Polleur

This small rural area already had low mortality in the nineteenth century, with an average rate of 23‰[27] in 1851-1873. With a rate of 7‰, weakness pathologies constituted the main component of mortality for the residents of Polleur (see Table 6). The impact of other diseases was clearly lower, since nervous system and respiratory troubles caused no more than two deaths per 1,000 inhabitants. Childhood and digestive diseases played an even smaller role (respectively 1.1 and 0.8‰).

The children of Polleur were more protected from death than those of Verviers in the same period, since the infant mortality rate is only 127.6‰, two times less than in the nearby town. The gap between town and countryside is created here: respiratory diseases, digestive troubles and convulsions, which

27. The rate is 19.5 % when we do not take into account the smallpox epidemic of 1871 (period 1851-1869). The table 6 stops in 1869 and not in 1873 because the data by age are not detailed enough beginning in 1870.

particularly affect the mortality of children under the age of one in Verviers, are much less significant in the Ardennes countryside. However a high proportion of undefined diseases at this age prevents a more precise analysis.

The mortality rate of children aged from 1 to 10 (15‰) is three times lower than in Verviers. This is also the case for the other age categories, except for people over 60, whose death rate is comparable with that of the urban center. Yet, in Polleur, the cause of death is rarely given: the elderly simply die of old age.

TABLE 6 MORTALITY RATES BY CAUSE AND AGE IN POLLEUR, AVERAGE 1851-1869.

Diseases	*< 1*	*1-9*	*10-19*	*20-39*	*40-59*	*60&+*	*Total*
Nervous system	30,1	2,7	0,4	0,7	1,6	9,0	2,6
Respiratory diseases	12,6	2,5	0,9	1,0	2,5	10,5	2,6
Circulatory diseases	0,0	0,0	0,0	0,0	0,4	0,5	0,1
Digestive system	3,6	0,4	0,4	0,7	0,8	2,0	0,8
Genital and urinary system	0,0	0,0	0,0	0,6	0,0	0,0	0,2
Skin diseases	14,4	3,5	0,2	0,0	0,2	0,0	1,1
Weakness	14,4	1,4	1,5	3,0	2,9	53,1	7,0
Trauma	0,0	0,4	0,0	0,6	1,2	0,5	0,5
Other diseases	0,0	0,2	0,2	0,9	1,8	8,5	1,4
Unknown diseases	65,0	4,1	0,2	0,9	2,5	1,5	3,4
Total	127,6	15,0	3,9	8,2	13,8	81,6	19,5

SOURCES:
- see table 1, no. 5
+ Archives de l'Etat à Liège, *Communes: Polleur, no. 33-37-44*

The male/female differential is not bigger in the countryside than in the town. Once more, men have a slightly higher rate (20.5 versus 18.4‰) and here again, they are more affected by respiratory problems. Women are only more susceptible to weakness diseases which seems logical since female life expectancy is higher.

TABLE 7 MORTALITY RATES BY CAUSE IN POLLEUR, 1851-1910.

Diseases	*1851-1873*	*1874-1890*	*1891-1905*	*1906-1910*
Nervous system	2,19	0,00	0,00	0,00
Respiratory diseases	3,88	6,07	7,70	5,77
Circulatory diseases	0,07	0,00	2,19	3,13
Digestive system	0,69	0,44	0,92	1,88
Genital and urinary system	0,24	0,13	0,15	0,16
Childhood diseases	3,36	2,06	1,63	1,25
Weakness	6,05	0,00	0,46	2,04
Trauma	0,80	0,13	0,36	0,31
Other diseases	1,98	5,68	2,75	3,60
Unknown diseases	2,50	0,00	0,00	0,00
Diseases from animal origin	0,03	0,31	0,10	0,00
Total	23,02	19,03	15,82	16,95

SOURCES:
Archives de l'Etat à Liège, *Communes: Polleur, no. 33-37-44.*

Table 7 summarizes the evolution of mortality in Polleur. The rate fell thanks to the decline of two diseases: childhood ailments and weakness. The childhood diseases were the third leading cause of death in the locality before 1873 (3.36‰) with the years 1871-72 being the worst (18‰). Scarlatina, measles, smallpox, whooping cough and croup were very common in the 1870s, but their influence decreased quickly. In 1906-10, the mortality rate of childhood sicknesses was only 1.25‰.

Weaknesses pathologies also decreased during these sixty years, but we have a recording problem to consider. During the first period, more than a third of the deaths was due to old age or to debility, the main components of the seventh category. The latter was an exception in that it contained one case of cancer, rheumatism or congenital weakness. However when the district set up a fixed nomenclature, old age and cancer completely disappeared from the statistics until 1903 and, during this time, they were ranked among respiratory illnesses or the *other diseases* heading [28].

The evolution of the mortality rate by respiratory affections was largely determined by the classification criteria of the causes of death. It probably suffered in the first years from under-registration, since chronic chest diseases were considered more often as debility or progressive degeneration than as respiratory pathologies. From 1870, the mortality rate of pulmonary illness

28. Concretely, its rate goes from 6.05‰ in 1851-73 to 2.04‰ in 1906-10.

doubled, but has been over-estimated. The best reference we have is the period 1906-1910, during which deaths due to old age, cancer and respiratory disease were counted separately. Rates were as follows: 5.8 inhabitants in a thousand die from a respiratory ailment which is more than in Verviers and two in a thousand die from old age or cancer.

Heart diseases (heading 3) also increased significantly in the Polleur statistics. Seldom mentioned in the first years, they appeared in the tables beginning in 1891 and immediately reflect high mortality (2.19‰). Between 1906 and 1910, the rate climbed to 3.13‰.

The development of digestive diseases in Polleur was very different from the pattern observed in Verviers. The rate rose from 0.69‰ (before 1873) to 1.88‰ (after 1906). Of course, this is not a large increase but, since the 1851-73 period is influenced by the cholera crisis, this relative augmentation of mortality by stomach diseases is not negligible[29]. Yet, these diseases remained a marginal component of mortality in the High Fagnes.

3. DISCUSSION

3.1. An epidemiological depression increases the gap between town and countryside (1830-1873)

The pressure of urbanization, induced by the industrial revolution, increased the differences between town and countryside. The urban centers had to face to an epidemiological depression from which the countryside was more or less protected. A mortality level which was nearly 10‰[30] higher during the pre-transitional period was the first sign of this, and the large gap between infant mortality rates in Polleur and Verviers confirms it. On the other hand, the sensitivity to crises had no common measure in urban areas and neighboring countryside: the clear influence of cholera in Verviers, and its quasi-absence in Polleur sheds light on the town and countryside differential.

The first cause of the epidemiological depression was the industrial revolution, but it was not a direct consequence. This revolution mainly led to rapid urbanization which created spaces without any structure. Overcrowded slums where the working population without resources huddled together and the non-existence of public hygiene were the problems of new towns in the middle of the nineteenth century that prevented them from realizing their extraordinary economic growth potential.

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29. Excluding the epidemic of 1866, the rate of the first period would have been of 0.26‰ rather than 0.69‰.

30. 32.05‰ in Verviers, 23.02‰ in Polleur.

Cholera was the emblem of the epidemiological depression of the second third of the nineteenth century, but it was not its only component. According to Alfred Perrenoud (quoted by Capron 1996: 105), there were three main culprits responsible for mortality in pre-transitional populations: respiratory and pulmonary infections, gastric and intestinal diseases, and eruptive fevers. Verviers indeed had a similar mortality pattern, with a mortality rate around 9‰ for respiratory and digestive diseases. The third position was not held by fevers, but by nervous pathologies, such as convulsions of the newborn (probably from a digestive origin) and brain diseases or accidents of the aged. In Polleur, old age and weakness illnesses held first place (7‰), before respiratory infections and infant accidents. On the contrary, digestive diseases had almost no influence on the mortality of the inhabitants of Polleur.

3.2. Divorce between economic and mortality conjunctures

Theories of price and wage influence on deaths have been largely adopted by historians of "Ancien Regime" mortality [31], but there has been much debate, most notably by Massimo Livi-Bacci. Livi-Bacci emphasizes that the nutrition/mortality link, usually used by actual researchers, is thought to be predominant, but instead it is insufficient in explaining the mortality of the past. One of his arguments is that

> «...the majority of the episodes of extraordinary and catastrophic mortality are independent of famine, hunger, and starvation» (Livi-Bacci 1985: 96).

This is particularly true when we consider the nineteenth century, a period during which modern economic growth was built that radically changed the relationship between population and subsistence.

The correlations between prices[32] and mortality in several localities of East

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31. Roger Schofield notices that *«(...) most recent writers have emphasised mortality rather than nuptiality and fertility as the dynamic demographic variable determining the relationship between population and the economy, at least until the demographic transition in the late nineteenth century»* (Schofield 1985: 69).

32. To determine the index of prices, we used four series: the first one was established by F. Michotte for Belgium as a whole (Michotte 1936: 345-357). The second one is a correction of Michotte recently done by Scholliers (1993). The third and the fourth ones were based on the «Average prices of grains and other food products sold in Verviers», which where published every year in the *Exposé de la situation de la ville de Verviers*. One of them concerns all the products, the other one only bread and potatoes. Michotte and Verviers series are closely connected, Scholliers series beeing more independant but connected with Verviers prices of bread and potatoes.

Belgium between 1846/50 and 1910, show a common trend: the mortality rates of two old towns, Huy and Liège, were modestly but significantly related to prices (more than 0.6); and Verviers, Seraing and Polleur-Sart also show a correlation (more than 0.5).

This first impression however is not confirmed by a further inquiry and the old saying "comparisons are odious" has once again proven to be true. Actually, these positive correlations simply indicate similar trends. In Belgium, from about 1840 to 1872-73, prices rose. After 1873, American wheat entered the Belgian market, which led to a slump in agricultural prices (Bruneel and al. 1987: 293-324; Oris 1991: 518-519; Gadisseur 1981: 70-72). Likewise, the shift in mortality experienced in several places reflects a similar evolution: we saw that in industrial localities, and even in Polleur-Sart, the level of mortality worsened slightly during the years 1846-1870/73, before the beginning of the real decline. The diseases which created this effect were particularly those associated with the respiratory system and weakness.

The correlation for the years 1846-1910 indicates the parallel trends, but does not mean that there were similar annual fluctuations[33]. To demonstrate this, we need to calculate the correlations inside the trends - that is, by distinguishing the periods before and after the epidemiological transition. These are almost equal to zero. Moreover the correlation of mortality with the index of real wages in Belgium is also very low (calculated by Scholliers 1989: 238). In industrial societies, real wages are the best indicator for the standard of life since they take into account the difference between the cost of living and the level of wages (Morsa 1989: 96-100).

Before the epidemiological transition, the correlations of death rates by cause in Verviers and Polleur with these economic indicators give insignificant and even absurd results. For example, the highest correlation in Verviers indicates that respiratory diseases are negatively linked to the index of real wages, which corresponds to several observations made by other researchers (Bruneel and al. 1987: 315). However, this relation appears uncertain. Indeed, a contradictory correlation of -0.59 shows that mortality tends to increase when prices decrease, and conversely, which seems absurd. Between 1874 and 1910 in Verviers, the correlations give better results. The epidemiological depression seems to have broken the link between mortality and economy, but this relation reappears during the transition for a number of diseases such as respiratory infections, gastrointestinal troubles and weakness. In Polleur, on the contrary, there is no clear correlation either before or after 1873.

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33. We have also computed several correlations with a one year time lag between prices and mortality series.

Prices did not significantly influence mortality after 1816-1821[34] in East Belgium[35]. Studying the period 1866-72 in Sweden, J. Söderberg did not succeed in establishing a clear link between the incidence of changes in poverty level and mortality[36]. This lack of sensitivity towards the economic conjuncture can have several explanations. It seems to me that the most convincing one is the evolution of the wages during this period: in the Belgian industries, they rose throughout the nineteenth century and particularly after the depression of the years 1873-76. Their levels remained high enough, even in a crisis period, to wipe out the effects of the prices increase. On the other side, poor country people often went to towns and those who stayed in the countryside were close to food production. They could benefit from the rise in prices.

This absence of relationship can be considered as a classical component of the modernisation process, when people escaped from hunger and uncertainty (Bengtsson, Saito 1998). However, in a way, it is strange to observe this absence in East Belgium: indeed, Martine Goosens explains in her thesis that the industrial revolution in East Belgium induced an increase of the Malthusian tensions and a rise of the cereals prices, particularly important during the first decades of the nineteenth century when Verviers experienced the most intense phase of its industrial growth. This town knew this difficult situation first because of a poor agriculture of subsistence, unable to supply for the local needs of an increasing population and, on the other hand, because of its geographical position. The city was isolated, far from any navigable river, and this increased the cost of imported cereals (Goosens 1992, Deprez 1948).

However, Marcel Deprez noticed a trend to prices homogenisation in the 1810-1820's, due to the improvement in transport systems and to the struggle of the administrative authorities against speculation. From the middle of the nineteenth century at least, it is clear that the East of Belgium was «integrated» in a national market: prices were hardly higher (less than 10%) than those observed in the country as a whole and they experienced perfectly similar variations (correlations of 0.94 to 0.99).

It was of course a consequence of the settlement of a new railway net - which had standardised prices inside Belgium - but we should also take into account the establishment of an efficient trade structure, whose aim was to meet the needs of an urban and industrial population. From this point of

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34. For all the Belgium, the period 1846-47 must be chosen as the last year of famine, but it has particularly affected the mortality in Flanders (Jacquemyns 1929: 342). See also André, Pereira-Roque 1974: 77.

35. Yet, some effects on several age groups could have remained (Alter, Oris, Neven 1997).

36. *«The connection between poverty and mortality must be regarded as weak. The death rate seems to have been influenced more by other demographic conditions than by economic structure and welfare»* (Söderberg 1984: 267).

view, Michel Oris (1990a) showed that, in 1910, Verviers was particularly well equipped.

These elements show that if no clear contingency relationship appeared anymore between mortality and economy, we should not however neglect the fundamental role played by the industrial revolution as a structural change. It provided indeed the necessary and sufficient basis to the technical conception and the financing of the utilitarian equipments. This can be extended to a lot of urban substructures of public health[37]. As Robert Woods noted:

> «On the one hand, urbanization is likely to have a deleterious effect on public hygiene, but, on the other, once investments have been made in sanitary provision, the effects should be immediate, substantial, influence large numbers of citizens, and thus prove more cost-effective than similar units of investment in sanitary facilities for a scattered rural population» (Woods 1991: 235).

The impact of a modern water distribution in Verviers is a perfect illustration of this British analysis.

Hunger and, even more obviously, war were absent during this second half of the nineteenth century: the extreme answers of mortality are thus entirely determined by the epidemiology.

3.3. An epidemiological transition at a local and worldwide scale

Irrespective of the critical problems raised, we observe a decrease of infectious processes after 1873 (very clear in Verviers) and a rise of degenerative diseases such as cardiac conditions and cancer (both in Verviers and Polleur).

This transition takes place in the framework of the microbial unification of the world, which appeared clearly in the previous period through the great cholera epidemics. It transcends the socioeconomic, ecological, cultural gaps and happens in very different places such as Verviers and Polleur-Sart. All of the mechanisms of this transition can not be understood at a local level, since it took place on a much larger scale (Oris 1997). The most classic example is the mutation of the cholera virus – the *vibrio cholerae* becomes the *vibrio El Tor*, much less deadly, around 1900 (Bourdelais, Dodin, 1987: 55) –: at this level, Verviers and Polleur are only small elements in a world-scale area.

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37. We thank the anonymous reader of the *Revue Belge d'Histoire Contemporaine* who called our attention to this point. Most of the elements of this discussion above come from an unpublished note on the economy in East Belgium, written by Michel Oris for the needs of the Eur-Asian Project for the comparative Study of Population and Family.

Nevertheless, what we can try to understand at a local scale, is how the difference between town and countryside, which increased during the years 1840-1873, nearly disappeared just before the First World War. Once again, the transition has to be situated in terms of spatial relations and unification. In 1871 and 1891, smallpox which had been a local phenomenon for thirty or forty years, raged again in epidemic proportions both nationally and internationally. Checked during several decades thanks to local measures, it eventually spread and affected the countryside severely.

The simultaneous attack of Polleur and Verviers in 1871 was a completely new phenomenon. It can be explained not only by a mutation of the virus, but also by the development of cheap transportation between town and countryside. In the 1870s, a system of regular and intense relations reappears between Verviers and its surroundings (Mahain 1910)[38]. Of course, important links existed during the proto-industrialization period (from the eighteenth century between Verviers and the neighboring villages), but they seem to break off around 1835-1845. The differences in the evolution of mortality between Verviers and Polleur-Sart tend to prove it.

Another consequence of the unification, but positive in nature, is that thanks to the railway, the local tramway, and the development of continental transportation, the goods imported by towns were better in quality than those of the middle of the nineteenth century. Not only the quantity, but rather the quality of food and drinks (milk) used in town prompted the growth of urban population. This element was a part of a geographical restructuring: after the most important period of growth, industrial towns - the "mushrooms" towns - tried to react. They were equipped with institutions, markets and an urban policy; in a word, they became real cities (Oris 1988: 103). A direct consequence of these measures was the disappearance, observed in Verviers, of digestive diseases, which were responsible for the summer peak in mortality. On the contrary, in the remote countryside, the improvement in public hygiene - notably in providing water - happened much later, usually after 1945. Thus, the intestinal infections followed opposite paths in Verviers and Polleur. As they decreased clearly in town between 1860 and 1910, their mortality rate grew in Polleur. These developments however hide different realities; indeed, Polleur had a lower level in 1851-1873 than the rate Verviers reached between 1906-1910.

While the summer digestive diseases disappeared in town, in Polleur the respiratory sicknesses linked to winter weather declined slower than in

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38. Improvements in school attendance in the countryside were also linked to this «microbial unification»: most of the childhood diseases were contagious before the first symptoms appeared and school became the perfect place for transmission.

Verviers. In reality, mortality by tuberculosis, one of the major components of respiratory diseases, fell quicker in towns than in the countryside (Smith 1988: 234-238, 242)[39]. This phenomenon, observed in Belgium as well as France and England (Smith 1988; Lequin 1983: 281-282), may have been the result of a natural selection: the contagion, more intense in urban centers, caused in the short-term high mortality, but it increased at the same time, the proportion of those immunized as people developed the necessary antibodies. The decline started later in rural areas since their complete contamination was more belated and was also linked to the improvements in communication, which integrated them into the "common epidemiological basin" of the towns of East Belgium from 1840-1850. This explains the over-mortality due to pulmonary disease in Polleur in comparison with Verviers at the beginning of the twentieth century (Oris 1997). It is a temporary phenomenon which belongs to a process of transition where spatial relations and the unification of the linkages between human and viral populations appear decisive.

In the future, it is clear that to improve our knowledge, we should observe mortality in nominative data, in the manner of life course studies. One of the first aims will be to understand better the relationship between mobility and mortality.

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39. G. Kearns, in a study on the decline of the mortality in England, does not have the same opinion on this subject (Kearns, 1993: 100).

ANNEX 1 CONSPECTUS OF MORTALITY CRISES IN EAST BELGIUM, 1846-1910.

Years	*Polleur-Sart*	*Verviers*	*Dison*	*Limbourg*	*Seraing*	*Huy*	*Liège*
1847	x						
1849		x cholera	x cholera		x cholera		x cholera
1855				x	x cholera		x cholera
1858	x						
1866		x cholera	x cholera	x cholera	x cholera	x cholera	x cholera
1870		x smallpox	x smallpox				
1871	x smallpox	x smallpox		x smallpox		x smallpox	x smallpox
1873						x	
1875			x				
1876					x		
1878					x smallpox		
1879						x	
1881		x smallpox typhus fever	x smallpox	x smallpox			
1883	x		x				x typhus fever
1888	x						
1890		x smallpox					
1891	x smallpox	x smallpox					
1892					x smallpox		
1894	x						
1895	x						
1896			x measles typhus fever		x		
1900					x		
1908	x	x	x				
1909		x					

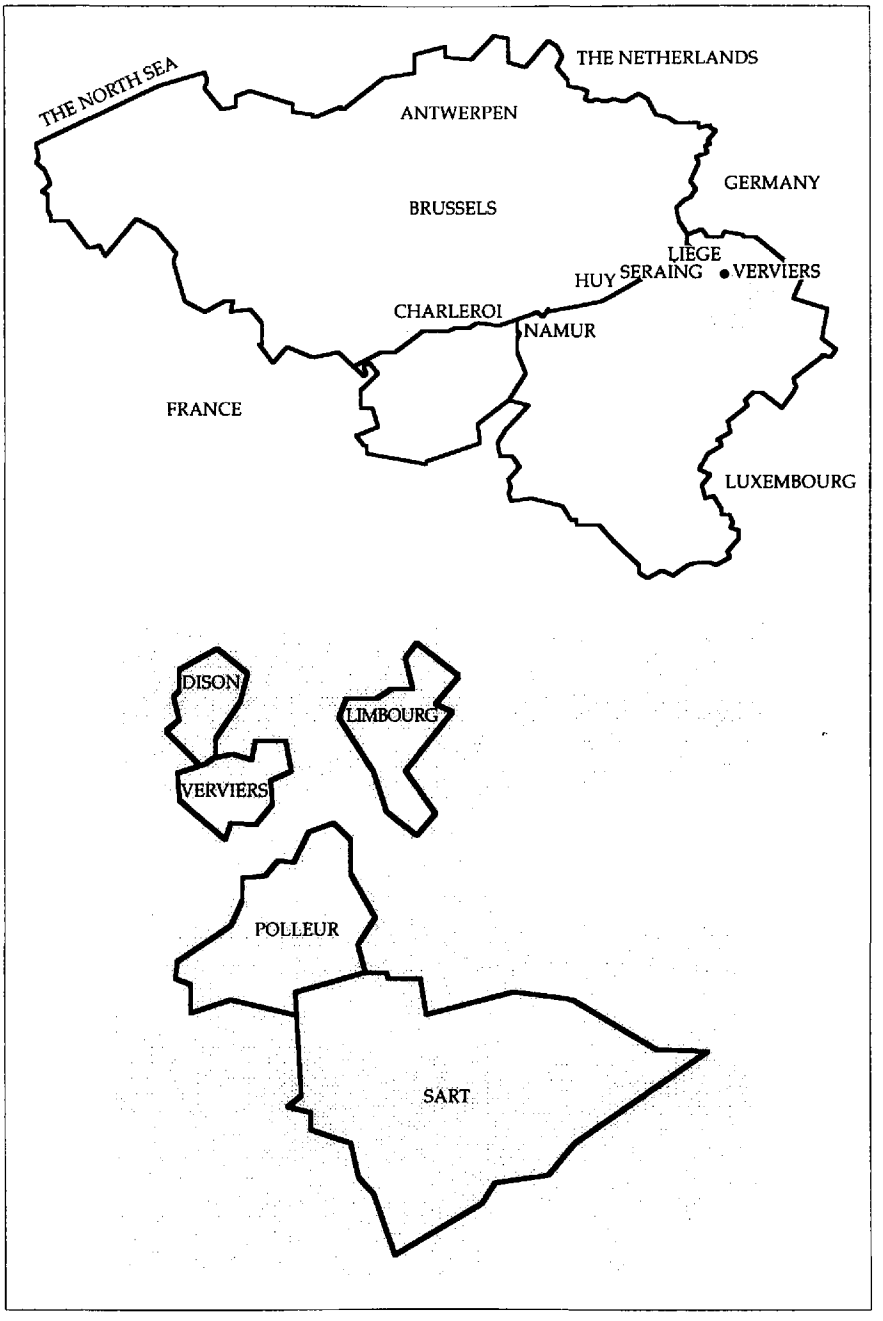
SOURCES:
see table1.

ANNEX 2 CAUSES OF DEATHS NOMENCLATURES IN POLLEUR AND VERVIERS.

Codes	*Verviers (1859-1910)*	*Polleur (1851-1869)*	*Polleur (1870-1910)*
1	Nervous system	Nervous system	
2	Respiratory diseases	Respiratory diseases	Respiratory diseases
3	Circulatory diseases	Circulatory diseases	Circulatory diseases
4	Digestive system	Digestive system	Digestive system
5	Genital and urinary system	Genital and urinary system	Genital and urinary system
6	Skin diseases	Childhood diseases	Childhood diseases
7	Weakness	Weakness	Weakness
8	Trauma	Trauma	Trauma
9	Bones and articulations diseases		
10	Other diseases	Other diseases	Other diseases
11	Unknown diseases	Unknown diseases	Unknown diseases
12			Diseases of animal origin
21	Tuberculosis		
22	Childhood diseases		
23	Cholera		
24	Cancer		

SOURCES:
see graph 5.

MAP: BELGIUM AND THE VERVIERS AREA



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Epidemiologie en economie in de stad en op het platteland. Mortaliteit en doodsoorzaken in Oost-België, 1850-1910

MURIEL NEVEN

SAMENVATTING

Het doel van dit artikel is de studie van de mortaliteit een stap verder te brengen door stad en platteland met elkaar te vergelijken. Er wordt getracht het algemene sterfteniveau te bepalen, de onderscheiden regio-gebonden ziektebeelden te beschrijven en de evolutie van het aantal overlijdens voor en na de epidemiologische transitie te bestuderen. Deze gevalstudie behandelt op de eerste plaats het textielcentrum Verviers en de nabijliggende dorpen Polleur en Sart, maar er worden ook enkele industriegemeenten en traditionele steden (alle gelegen in de provincie Luik) bij de vergelijking betrokken.

De epidemiologische inzinking van het tweede derde van de XIXde eeuw doet aanvankelijk het verschil tussen stad en platteland toenemen. De stadscentra krijgen af te rekenen met een verslechtering van de sanitaire leefomstandigheden, een kwaad waarvan de rurale gemeenten min of meer gespaard blijven: in Verviers ligt dan ook zowel de algemene als de kindersterfte veel hoger dan in Polleur, en ook de crises treffen de stedelijke gemeenten voor 1870 veel zwaarder dan de landelijke.

De studie van de doodsoorzaken te Verviers en te Polleur laat toe een beeld te schetsen van de regionaal gebonden ziekten, ook al kan geen volstrekt gelijkaardige nomenclatuur gebruikt worden. Het is o. i . zinloos bij de ontleding van de doodsoorzaken de statistische perfectie na te streven. De ziektebenamingen zijn evenzeer intellectuele constructies als weerspiegelingen van de werkelijkheid, en, zo bekeken, verschilt hun betekenis naar plaats (stedelijk/ruraal) en tijd. Uit de analyse komen enkele hoofdlijnen naar voren: in Verviers zijn vooral aandoeningen van de luchtwegen en het spijsverteringsstelsel (met een zomerpiek) verantwoordelijk voor de overlijdens voor de transitie, terwijl in Polleur spijsverteringsstoornissen en kinderziekten het sterftecijfer weinig beïnvloeden. Vanaf het midden van de XIXde eeuw zijn het vooral ademhalings- en zogenaamde ouderdomsziekten - zoals kanker - die zich in die landelijke gemeente doen gelden. Noch in Verviers, noch in Polleur is er een verband tussen de economische omstandigheden en het sterftecijfer vastgesteld: de prijzenevolutie heeft de algemene mortaliteitscijfers weinig beïnvloed en speelt zelfs geen rol bij zeer specifieke doodsoorzaken.

De epidemiologische transitie laat zich in de bestudeerde plaatsen aflezen uit een daling (vooral te Verviers) van de infectieziekten en een stijging van de ouderdomsziekten zoals hartaandoeningen en kanker. Hieruit blijkt de geleidelijke 'microbische eenmaking' van de wereld die alle sociaal-

economische, culturele, ecologische grenzen opheft en zich zowel in Verviers als Polleur-Sart manifesteert, ondanks het uiteenlopende karakter van die lokaliteiten. Naast wereldomvattende spelen toch ook plaatsgebonden factoren mee. De dank zij de uitbouw van goedkoop vervoer toegenomen contacten tussen Verviers en haar omliggende gemeenten leidden tot een vlugge verspreiding van de microben. De pokkenepidemie van 1870-1 is de eerste plaag die in Oost-België de grens tussen stad en platteland overschrijdt. Tegelijk vermindert de snellere toevoer van de landbouwproducten naar de stad - met name de melk voor de zuigelingen - samen met de verdeling van drinkwater te Verviers de kans op dodelijke buikloop en buikvliesontsteking. Daarom is er aan de vooravond van de Eerste Wereldoorlog zo goed als geen sterfteverschil meer tussen stad en platteland vast te stellen.

Epidémiologie à la ville et à la campagne. La mortalité et les causes de décès dans l'Est de la Belgique, 1850-1910

MURIEL NEVEN

RÉSUMÉ

Le but de cet article est d'éclairer l'étude de la mortalité en l'axant sur le différentiel ville et campagne. Il s'agit à la fois d'envisager le niveau général de la mortalité, de présenter un aperçu des paysages pathologiques respectifs, et d'étudier l'évolution de la mortalité avant et pendant la transition épidémiologique. Notre étude se focalise sur le centre textile de Verviers et les villages voisins de Polleur et de Sart, mais nous faisons aussi référence, à titre de comparaison, à quelques communes industrielles et villes traditionnelles, toutes situées dans la province de Liège.

La dépression épidémiologique du deuxième tiers du XIXe siècle accroît dans un premier temps l'écart entre ville et campagne. Les centres urbains doivent faire face à une détérioration des conditions sanitaires contre laquelle les localités rurales sont plus ou moins protégées: un taux de mortalité générale et infantile nettement plus élevé à Verviers qu'à Polleur, ainsi qu'un impact beaucoup plus fort des crises dans les communes urbaines avant 1870 en témoignent.

L'étude des causes de décès à Verviers et à Polleur permet de dresser un portrait de leurs paysages pathologiques respectifs, en utilisant des nomenclatures proches mais pas strictement identiques. Nous posons d'ailleurs que dans l'analyse des causes, il est vain de viser un perfection cartésienne et statistique. Les nosologies sont autant des constructions intellectuelles que des reflets de la réalité, et de ce point de vue, elles n'expriment pas un sens constant à travers le temps ou l'espace (notamment urbain-rural). Quelques traits majeurs se dégagent de l'analyse: à Verviers, les maladies respiratoires et digestives (pic d'été) sont les principales responsables de la mortalité avant la transition, tandis qu'à Polleur, les pathologies du système digestif et les maladies infantiles n'ont guère d'effet sur la courbe des décès. Dès le milieu du XIXe siècle, ce sont les affections respiratoires et les maladies dites de dégénérescence - comme le cancer ou, plus généralement, la vieillesse - qui affectent la mortalité de cette commune rurale. La relation entre l'économie et l'évolution de la mortalité n'a pu être mise en évidence ni à Verviers, ni à Polleur: les prix n'ont guère influencé le niveau de la mortalité en général, ni même favorisé les décès pour certaines causes de mortalité bien précises.

La transition épidémiologique se manifeste dans les localités étudiées par une baisse des processus infectieux, particulièrement à Verviers, et une augmentation des maladies de dégénérescence comme les maladies cardiaques

ou le cancer. Elle s'inscrit dans une unification microbienne du monde, qui transcende les clivages socio-économiques, culturels, écologiques et se produit dans des localités aussi différentes que Verviers et Polleur-Sart. Si ce phénomène s'inscrit dans une logique mondiale, certains facteurs permettent quand même de l'expliquer à l'échelle locale. Une intensification des relations entre Verviers et sa région, grâce au développement des transports à bon marché, conduit à une propagation rapide et étendue des microbes. L'épidémie de variole de 1870-71 est ainsi la première à dépasser le clivage ville-campagne dans l'est de la Belgique. Parallèlement, les produits consommés dans les villes - notamment le lait pour les nourrissons - bénéficient d'une plus grande rapidité d'approvisionnement ce qui, conjugué à la mise en place d'une distribution d'eau potable à Verviers, a considérablement réduit les entérites et diarrhées mortelles. C'est pourquoi, à la veille de la Première Guerre mondiale, le différentiel de mortalité ville-campagne a pratiquement disparu.