Trends in Belgian premature avoidable deaths over a 20 year period

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Abstract

***Study objectives*—To analyse over a 20 year period the level and trends in the "EC avoidable death indicators".**

***Design*—The Years of Potential Life Lost (YPLL) method applied to curative and preventive avoidable mortality indicators in Belgium for four successive five year periods, countrywide as well as by district, separately for women and men. Ratios of YPLL rates (age standardised) describe changes between 1974–78 and 1990–94.**

***Setting*—Belgium for the periods 1974–78, 1980–84, 1985–89, 1990–94.**

***Participants*—All avoidable death cases aged 1–64.**

***Main results*—Ratio of YPLL rates indicated a more favourable development between 1974–78 and 1990–94 in the EC avoidable indicators than in all causes premature mortality. The EC avoidable mortality indicators have been assigned to two categories, curative indicators and preventive indicators. The best ratio of YPLL rates was found in curative indicators for men but the largest gains in YPLL rates over the periods come from the "preventive indicators" in men. For women, malignant neoplasm of the breast rose to the first ranked in 1985–1989 and 1990–1994, where it contributed to more years of YPLL loss than motor vehicle accidents, and malignant neoplasm of the trachea, bronchus and lung had risen to the fifth ranked since 1985–89. The order of the top causes for men did not change between 1974 and 1994, except for cirrhosis of liver, which rose from the fifth to the fourth rank. In the particular case of one "preventive indicator", malignant neoplasm of the trachea, bronchus and lung, the regional analysis of time trend between 1974–78 and 1990–94 showed more districts with a favourable development for both men and women in the Flemish region than in Wallonia.**

***Conclusion*—The YPLL method combined with the avoidable mortality indicators enabled us to compare the changes of curative and preventive EC avoidable indicators between 1974–78 and 1990–94. In the case of malignant neoplasm of the trachea, bronchus and lung, which is of major concern to the health promotion policies, changes over the periods have widened a "north/south" health contrast.**

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A dramatic increase in interest in the socioeconomic foundations of population health has led to the development of theoretical models in which the contribution of medical care is lessened and the influence of health systems as such is emphasised. The so called "EC Avoidable Death Indicators" and calculations of Years of Potential Life Lost (YPLL) belong to the health services research seeking to increase the validity of using mortality statistics as health indicators. Both measures help in ranking priorities and, consequently, are relevant for health planners.

Avoidable mortality indicators mostly measure mortality for conditions in relation to health care effectiveness. Rutstein proposed the notion of avoidable mortality as stemming from biomedical knowledge of the effectiveness of treatment or prevention, or both, for some conditions.[1] Its use as an explicit criterion assumes that the occurrence of cases or variations in mortality rates indicate problems linked to the quality of health care, and as such may be considered as warning signals. Starting from Rutstein's list, the EC Concerted Action Project on health services proposed to use selected conditions for which effective curative treatment, primary prevention, or secondary prevention could be provided by health care services, and calculated the so called "EC Avoidable Death Indicators" within strict age group limits where preventable deaths could predominate even more. They have been used as indicators of the outcomes of health services at the population level, in particular in the European Union.[2–5] Avoidable mortality has been analysed as one category by itself in comparisons,[6 7] but this implicitly corresponds to the assumption that all remaining causes are "unavoidable" conditions, although this point is quite questionable.[8] Most studies using the EC avoidable mortality indicators have divided the indicators into two categories, according to the identifiable curative or preventive interventions reviewed as being effective by the EC research group.[3 4]

YPLL is a health indicator measuring the total number of life years lost because of premature death. YPLL is a synthetic measure of mortality that takes age at death into account. It is used to analyse premature mortality—whether or not the conditions are amenable to health care—and is calculated to facilitate comparisons of the importance of the causes of death in a population that are of public health significance.[9 10]

In this study, we chose the YPLL (age standardised rates) to analyse the level and trends in the EC avoidable death indicators between

Table 1 Avoidable mortality indicators: ICD codes (8th and 9th revision)

	ICD-8	ICD-9
Curative indicators:		
Tuberculosis	010-019	010-018,137
Malignant neoplasm of the breast	174	174
Malignant neoplasm of the cervix/uterus body	180,182	179-180,182
Malignant neoplasm of the testis	186	186
Hodgkin's disease	201	201
Chronic rheumatic heart disease	393-398	393-398
Hypertensive and cerebrovascular disease	400-404,430-438	401-405,430-438
Asthma	493	493
Peptic ulcers	531-534	531-534
Appendicitis	540-543	540-543
Abdominal hernia	550-553	550-553
Cholelithiasis and cholecystitis	574-575	574-575.1,576.1
Maternal mortality	630-678	630-676
Preventive indicators:		
Malignant neoplasms of the trachea, bronchus and lung	162	162
Malignant neoplasm of the skin (non melanoma)	173	173
Ischaemic heart disease	410-414	410-414,429.2
Cirrhosis of liver	571	571
Motor vehicle accidents	E810-823	E810-825

1974 and 1994 in Belgium and to assess the relative impact of the avoidable causes of death on premature mortality. Overall curative and preventive indicators were considered as well for reasons linked to the recent implementation of the Belgian health policy. Indeed, since 1986, the regions became responsible for preventive medicine and health promotion while curative care and social security remained a national policy responsibility. We analysed the evolution of the EC avoidable causes and of the overall curative and preventive indicators at the national level between 1974 and 1994, separately for men and women. We investigated further the geographical trends over time for one preventive indicator, malignant neoplasm of the trachea, bronchus and lung. This regional analysis was justified by the recent contrasting negative trend of this condition in women,[11] and was aimed at producing results to be used for health promotion at the corresponding level of public health decision in Belgium.

Methods

The avoidable death indicators used are comparable with EC indicators published by the EC study group.[3] The Eighth Revision of the International Classification of Diseases (ICD-8) was used during the period 1974–1978. The Ninth Revision (ICD-9) was introduced in 1979 in Belgium, as was the case in the European countries participating in the EC Concerted Action Project. The EC group decided to skip 1979 for reasons of instability in coding practices and analysed the impact of the new classification's introduction in England and Wales in 1979.[3] Since 1980, mortality statistics have been coded with the ninth revision (table 1).

The method of calculating YPLL and the age adjusted rates follows Romeder.[9] The YPLL age adjusted rates were standardised with the direct method, using Belgium's population in the five year period 1985–1989 as the reference population. The age adjusted rates of YPLL for the EC avoidable death causes were analysed for four successive five year periods, 1974–78, 1980–84, 1985–89, and 1990–94. The ratios of YPLL rates were used to describe the changes between 1974 and 1994. A YPLL ratio higher than 100 indicates an increased rate of YPLL per 100 000 persons aged 1–64 in 1990–94 compared with 1974–78, and a ratio smaller than 100 a decreased rate of YPLL per 100 000 persons aged 1–64 in 1990–94 compared with 1974–78. YPLL ratios were also used to describe the changes from a geographical perspective. The 43 Belgian districts were characterised by the ratios of YPLL age adjusted rates calculated separately by sex and by district for 1974–78 and 1990–94. The geographical distribution of YPLL ratios is presented on maps with six shading intervals based on a sextile grouping method.

National data on deaths occurring in Belgium were obtained from the National Institute of Statistics (NIS). The last period, 1990–94, covers the last years for which national mortality data are available for Belgium.[12]

Table 2 YPPL rates attributable to curative and preventive EC indicators in Belgium over time, for men and women

	YPLL (standardised rates/100 000)				
	Period 1 1974–1978	Period 2 1980–1984	Period 3 1985–1989	Period 4 1990–1994	Ratio P4/P1*100
Curative indicators:					
Men	443.1	325.4	266.0	208.3	47.0
Women	671.8	589.6	534.6	472.5	70.3
Preventive indicators:					
Men	2395.1	2131.0	1833.1	1658.6	69.2
Women	636.5	551.3	500.5	466.6	73.3
Total avoidable causes					
Men	2838.2	2456.4	2099.1	1866.9	65.8
Women	1308.3	1140.9	1035.1	939.1	71.8
All causes					
Men	6051.6	5537.1	4919.8	4697.5	76.1
Women	3223.2	2882.7	2542.2	2362.9	73.3

KEY POINTS

- In women, malignant neoplasm of the breast contributed to more YPLL than motor vehicle accidents from 1985–89.
- Between 1974 and 1994, the YPLL rate for the overall "EC avoidable causes" was nearly twice as high among men as among women.
- In men, the avoidable premature mortality declined faster than all causes premature mortality, and this favourable development was largely attributable to the decrease in the overall curative indicator

Results

The YPLL method revealed large variations in the EC avoidable mortality indicators for women and men between 1974 and 1994. The YPLL ratios indicated a favourable development, as they were under 100% (table 2). Compared with the YPLL ratios of all causes mortality, the ratios of the total avoidable causes indicated a more favourable development. This was especially the case in men (ratio of 65.8% compared with 76.1%), but also in women (ratio of 71.8% compared with 73.3%). In men, the more favourable development was largely attributable to the overall curative indicator that decreased even more (ratio=47.0%).

Table 3 Relative importance of avoidable death causes (EC list) for women by time period. Belgium. Standardised YPLL rates/100 000

EC avoidable causes (in decreasing order for Period 1)	YPLL (standardised rates/100 000)				Ranks		Ratio P4/P1*100
	Period 1 1974–1978	Period 2 1980–1984	Period 3 1985–1989	Period 4 1990–94	P1	P4	
Motor vehicle accidents	355.2	297.7	265.8	245.9	1	2	69.2
Malignant neoplasm of the breast	266.7	282.4	277.2	262.1	2	1	98.3
Hypertensive and cerebrovascular disease	194.2	151.3	136.6	106.7	3	3	54.9
Ischaemic heart disease	166.5	135.7	103.8	80.8	4	4	48.5
Malignant neoplasm of the cervix/uterus body	70.3	57.5	52.8	49.2	5	7	70.0
Cirrhosis of liver	65.2	67.4	71.8	64.6	6	6	99.1
Malignant neoplasm of the trachea, bronchus and lung	46.8	48.5	57.4	73.1	7	5	156.2
Asthma	34.5	35.4	25.5	21.4	8	8	62.0
Congenital cardiovascular anomalies	29.1	24.5	14.3	12.8	9	9	44.0
Hodgkin's disease	20.9	14.1	12.8	5.2	10	10	24.9
Chronic rheumatic heart disease	15.7	3.3	1.7	0.8	11	16	5.1
Maternal mortality	12.7	7.6	4.5	4.9	12	11	38.6
Tuberculosis	11.0	5.4	2.7	2.7	13	13	24.5
Cholelithiasis and cholecystitis	6.3	2.8	1.5	1.1	14	15	17.5
Peptic ulcers	6.1	3.4	3.3	4.4	15	12	72.1
Malignant neoplasm of the skin (non-melanoma)	2.8	2.0	1.7	2.2	16	14	78.6
Appendicitis	2.6	0.6	0.9	0.7	17	17	26.9
Abdominal hernia	1.7	1.3	0.8	0.5	18	18	29.4
All causes	3223.2	2882.7	2542.2	2362.9			73.3
Total EC avoidable causes	1308.3	1140.9	1035.1	939.1			71.8
In % of all causes	40.6%	39.6%	40.7%	39.7%			

Analysis of the relative importance of the EC avoidable causes of death separately for women (table 3) and men (table 4) over the different periods of time detected substantial gender related differences. In women (table 3), the rank of malignant neoplasm of the breast as the second leading cause of premature death in 1974–78 was maintained during 1980–84, but rose to the first ranked in 1985–1989 and 1990–1994, where it contributed then to more years of YPLL loss than motor vehicle accidents. Malignant neoplasm of the trachea, bronchus and lung, which ranked seventh in YPLL rates during the first two periods, rose to the fifth place in the period 1990–94, replacing malignant neoplasm of the cervix/uterus, which fell to the seventh rank. The YPLL ratio of all causes indicated a favourable development of premature mortality (ratio=73.3%). However, according to YPPL, between 1974 and 1994, the relative importance of the total "EC avoidable causes" for women accounted for more or less 40% of all causes and this ratio remained unchanged over the four periods covered by this study (table 3).

In contrast with women, the ranking order of the top three causes for men did not change between 1974 and 1994: motor vehicle accidents, ischaemic heart disease and malignant neoplasm of the trachea, bronchus and lung respectively (table 4). The rate for cirrhosis of the liver increased between 1974–78 and 1980–84 and decreased afterwards, and these movements changed the ordering from the fifth to the fourth rank. The YPLL ratio for all causes mortality indicated a less favourable development for men (ratio=77.6%) than for women, and unlike women, when looking at the YPLL, the relative importance of the total EC avoidable causes in all causes deaths decreased for men from 46.9% in 1974–78 to 39.6% in 1990–94.

The particular case of malignant neoplasm of the trachea, bronchus and lung showed a decreasing YPLL rate between 1974 and 1994 for men while it increased in women (table 3 and table 4). The changes in YPLL rates were analysed geographically for the preventive indicators at the district level (Flanders=22 districts; Wallonia=20; Brussels Region=1). Regionally, the trends between 1974 and 1994

Table 4 Relative importance of avoidable death causes (EC list) for men by time period. Belgium. Standardised YPLL rates/100 000

EC avoidable causes (in decreasing order for Period 1)	YPLL (standardised rates/100 000)				Ranks		Ratio P4/P1*100
	Period 1 1974–1978	Period 2 1980–1984	Period 3 1985–1989	Period 4 1990–94	P1	P4	
Motor vehicle accidents	1149.7	1015.0	887.8	861.6	1	1	74.9
Ischaemic heart disease	753.8	603.5	452.6	343.8	2	2	45.6
Malignant neoplasm of the trachea, bronchus and lung	366.2	370.4	355.1	316.0	3	3	86.3
Hypertensive and cerebrovascular disease	243.7	188.9	170.4	128.8	4	5	52.9
Cirrhosis of liver	122.2	140.0	134.6	132.7	5	4	108.6
Congenital cardiovascular anomalies	39.2	26.6	22.0	18.2	6	7	46.4
Asthma	35.2	36.7	31.8	27.0	7	6	76.7
Hodgkin's disease	34.4	29.8	13.9	12.7	8	8	36.9
Tuberculosis	30.0	14.0	7.7	4.1	9	12	13.7
Chronic rheumatic heart disease	18.8	3.0	1.1	0.8	10	14	4.3
Peptic ulcers	18.7	14.3	10.3	8.9	11	9	47.6
Malignant neoplasm of the testis	12.4	8.4	6.5	6.1	12	10	49.2
Appendicitis	5.1	1.6	0.6	0.2	13	16	3.9
Malignant neoplasm of the skin (non-melanoma)	3.2	2.1	3.0	4.5	14	11	140.6
Cholelithiasis and cholecystitis	3.2	1.3	0.9	1.0	15	13	31.3
Abdominal hernia	2.4	0.8	0.8	0.5	16	15	20.8
All causes	6051.6	5537.1	4919.8	4697.5			77.6
Total EC avoidable causes	2838.2	2456.4	2099.1	1864.6			65.7
In % of all causes	46.9%	44.4%	42.7%	39.6%			

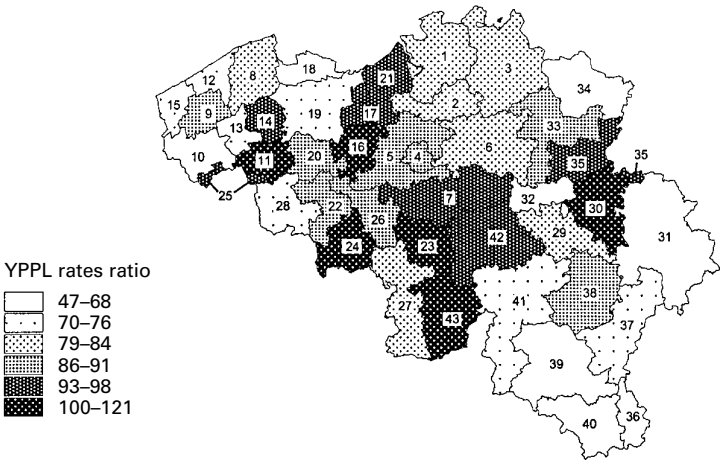

Figure 1 Malignant neoplasm of the trachea, bronchus and lung (men): ratio of YPLL rates between 1974–78 and 1990–94 at the district level (Regions: Brussels Region: number 4; Flanders: numbers 1–3, 5–21, 33–35; Wallonia: numbers 22–32, 36–43).

were expressed in separate male and female YPLL ratios for each district (figs 1 and 2). More favourable trends were noted in Flanders than in Wallonia. At the district level, three districts with increasing YPLL rates for both men and women were situated in Wallonia (numbers 23; 24; 30), while seven districts with decreasing YPLL rates for both men and women were found in Flanders (numbers 2; 10; 13; 14; 15; 20; 21) but only one in Wallonia (number 22).

Discussion

The use of YPLL to measure the trends and level of the EC avoidable mortality indicators over a 20 year period needed some adaptations. The age limits of the indicators were adapted to fit the YPLL method requirements of setting common limits. In the YPLL method, the choice of 65, 70 or 75 years as the upper limit for premature death is considered rather arbitrary.[13 14] We chose the upper age of 64 years, because it was recognised in the EC indicators as a limit related to the assumption of avoidability. This was the case of all EC indicators, except those concerning children under 15 (table 1). For intestinal infections (0–14), leukaemia (0–14) and respiratory diseases (1–14), the assumption of their avoidability made by the EC study group for the ages of 0 or 1 year to 14 years was not necessarily relevant between ages 1 and 64. They were removed from the YPLL analysis on the grounds that choosing to calculate their YPLL with an upper age of 64 years like the other ones would have introduced a large overestimation and an alteration of the avoidable indicator concept.

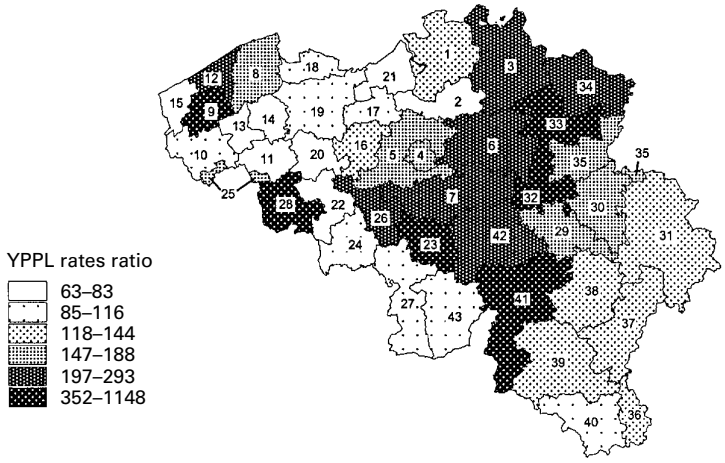

Figure 2 Malignant neoplasm of the trachea, bronchus and lung (women): ratio of YPLL rates between 1974–78 and 1990–94 at the district level (Regions: Brussels: number 4; Flanders: numbers 1–3, 5–21, 33–35; Wallonia: numbers 22–32, 36–43).

The use of somewhat modified avoidable indicators is far from being exceptional. The EC indicators are characterised by some variability in definition. The method's sensitivity to the selection of causes of death in the studies on avoidable mortality trends was emphasised,[7] just as the fact that variability in avoidable mortality's definition had an impact on the assessment of its contribution to total mortality.[15] Converging lists of causes of death are used as indicators of curative care whereas there is some diversity for the primary and secondary prevention indicators. For instance, the particular case of malignant neoplasm of the trachea, bronchus and lung divides: some authors have included it in the preventive indicators,[7 15 16 18–20] but others have not.[3–5 21 22]

In this study of Belgium, a faster decline than all causes premature mortality was observed for men and women in the EC indicators. It was especially true for the overall "curative indicators" in men, but it was also the case for the overall "preventive indicators" in men and women. However, dividing the indicators into two categories was less effective with regard to the magnitudes of the losses. The largest gains in YPLL rates over the periods came from the preventive indicators in men too. The genders experienced different evolutions. Genders differed according to the importance of the different avoidable death causes. In women, one "curative indicator" and one "preventive indicator" are becoming more important: malignant neoplasm of the breast contributed more years of YPLL loss than motor vehicle accidents in 1990–94, and the rank of malignant neoplasm of the trachea, bronchus and lung was rising regularly. These differences of trends could be treated as warning signals and as a starting point for in depth studies on gender health variations.

Since 1986 the Communities are in charge of coding and verifying the causes of deaths separately.[23] On this basis differences in coding practice between the two Communities are to be suspected. But different coding exercises have shown that the impact on mortality statistics comparability between regions is far from explaining the whole difference observed.[24]

These results are coherent with those observed in studies of other countries, and support the validity of avoidable mortality statistics as health indicator. Nearly all studies described a faster decline for avoidable death indicators than for all causes mortality.[15 18 21] Important decreases in avoidable mortality rates have been shown in time period comparisons for many Western and Eastern European countries[22] as well as for regions such as

Quebec[21] or Valencia (Spain).[15] The general improvement in the EC indicators led health planners to consider that a lack of improvement in these health indicators was a warning signal in itself[20] or to consider that a widening gap in avoidable mortality between countries could indicate potential fields for improvement of the health systems.[17] However, after having demonstrated a risk of false positive warning signals, Westerling suggested to use the indicators for monitoring, but to limit them as starting points for in depth studies.[19] Indeed, the different indicators used may vary according to the weight of incidence related factors and of all other factors related to case fatality.[25 26]

In the studies where the EC avoidable mortality indicators have been divided into two categories, generally, the changes over time differed in the group of treatable compared with the group of preventable causes of deaths. In Sweden, during the 12 year period stretching from 1974 to 1985 inclusive, treatable causes in men declined more than total mortality, and preventable causes decreased for both sexes when malignant neoplasm of the trachea, bronchus and lung was excluded from the mortality rates.[7] In Lithuania between 1970 and 1990, treatable causes mortality rates fell while preventable causes mortality increased.[20] This was also the case in Valencia (Spain) between 1975 and 1990.[15] In eastern European countries between 1950 and 1987, the "causes of death amenable to medical care" decreased regularly though less rapidly than in western countries, but the "causes non-amenable to medical care" exhibited worsening rates and seemed to be the more important reason for lack of improvement in all cause mortality trends from 1970 on.[22]

The division between curative indicators and preventive indicators is also justified for reasons rooted in health policy organisation. With the example of malignant neoplasm of the trachea, bronchus and lung, we have shown that the dynamics of change of premature avoidable mortality over time and space has played a part in bolstering the developing specific mortality patterns in Flanders and Wallonia. It has contributed to widen the national "north/south" (inter-regional) health gap between Flanders and Wallonia. Nearly all European studies showed large geographical differences.[2–4 16 19 21 26 27 28] A better health situation in Flanders than in Wallonia has been regularly observed.[28 29] The same conclusion was found in previous studies on EC avoidable mortality indicators.[16 30]

This study has shown the interest of mortality indicators that combine the avoidable death concept and premature mortality (YPLL method) into a synthetic and comparative approach. It supplies health indicators to health planners at regional and local levels. In the Belgian context, which permitted health promotion policies decentralisation, these indicators are very useful to help identify health priority problems and to prioritise and to target health promotion strategies.

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