Recent Improvements in Life Expectancy in France: Men are Starting to Catch Up

France MESLÉ*

Since the end of the Second World War, French life expectancy has risen steadily. From 1950 to 2005, it rose from 66.4 to 80.3 years. At first this was due mainly to a decline in infectious disease mortality at all ages, primarily among children. At the end of the twentieth century, life expectancy continued to rise as a result of lower mortality at older ages thanks to lower cardiovascular mortality. Until the 1980s, women gained more from this improvement than men and the gap between the sexes widened. In the last twenty years, however, this widening has stopped and the gap has begun to close (Meslé, 2004). This can be attributed to an acceleration in the improvement among men, though some slowing in improvement in women under 60 is also perceptible. At the oldest ages, on the other hand, improvement continued to be more rapid for women than men. The 2003 heat wave caused a sharp but brief halt in the mortality decline, though the trend resumed in 2004 and 2005 (Pison, 2005).

After a comparison between current developments and historical trends in mortality in France, we focus on two features of the last twenty years: the closing gap between men and women of working age and the substantial gains in life expectancy at older ages. We examine trends in causes of death to identify the main factors behind these changes, and consider how life expectancy in France is likely to evolve in the future.

I. Progress is now faster for men

Is the continuing rise in life expectancy due to declining mortality at all ages? Which causes of death are the main factors in French mortality? How and why do the trends differ between the sexes in terms of age and cause of death? Let us begin by analysing the main mortality trends since 1950.

*Institut national d'études démographiques
Translated by Roger Depledge

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1. A continuous rise in life expectancy

At all ages, life expectancy has risen almost continuously for both sexes in France since the early 1950s (Figure 1). Life expectancy at birth increased by 14.6 years for women and 13.3 years for men between 1950 and 2005.

The gains are perceptible at every age. Women's life expectancy increased 11 years at age 15, 10 years at age 35, 7.5 years at age 65 and even 4.1 years at age 80. For men, the respective figures are 9, 8.1, 5.5 and 3.1 years. Throughout the period, women's gains were higher than men's and the gap in life expectancy was much greater in 2005 than in 1950 at all ages. However, the annual change in the gap varies with age (Figure 2).

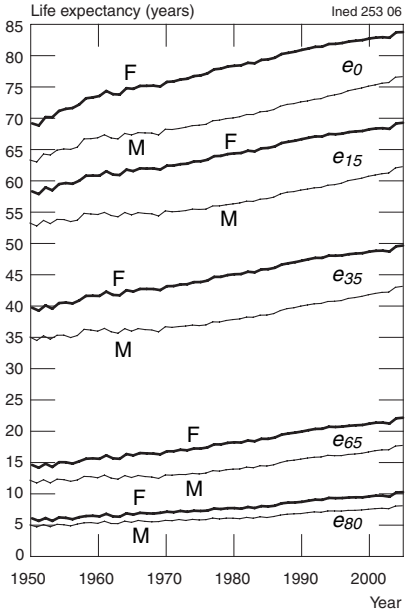

Figure 1.– Life expectancy by sex at selected ages since 1950.

Source: Updated French life tables (Vallin and Meslé, 2001).

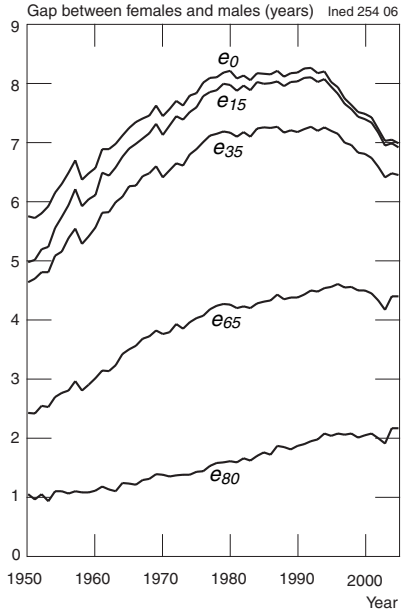

Figure 2.– Life expectancy gap between the sexes at selected ages, since 1950.

Source: Updated French life tables (Vallin and Meslé, 2001).

For life expectancy at birth, 15 and 30 years of age, the gap between the sexes has reversed its movement. After increasing rapidly until the early 1980s, the female advantage levelled off for a decade and then shrank significantly in the closing years of the twentieth century. At age 65, the gap in life expectancy between men and women continued to widen until the mid-1990s, but has been shrinking since 1997. In 2003, excess mortality during the heat wave caused a dip that was larger for women than for men, though the

previous trend resumed in 2004. The heat wave effect is even more visible in the life expectancy gap at age 80, since it briefly interrupted a trend that is still moving upward.

To understand the reasons for these recent developments, which vary by age, it is useful to examine trends in the major causes of death.

2. Cancer: the leading cause of death for both sexes

Classification changes

To analyse trends in mortality by cause of death since 1950, we used the cause-of-death series based on a constant medical definition reconstructed at INED (Vallin and Meslé, 1988, 1998). The database on causes of death[(1)] contains deaths by sex and age coded according to the Ninth Revision of the International Classification of Diseases (ICD-9) for 1925 to 1999. Since 2000, causes of death have been coded according to the Tenth Revision of the ICD. This change, which accompanied the adoption in France of an automatic coding system, has caused breaks in the statistical series that would require systematic reconstruction of constant medical definition series, as was done after the Ninth Revision. However, at present we have deaths coded by CIM-10 for only four years (2000-2003), a period too short for a reconstruction of this kind. Fortunately, before the Tenth Revision was applied, INSERM coded a sample of deaths in 1999 under both the Ninth and Tenth Revisions of the ICD (Pavillon et al., 2005). The Centre d'épidémiologie sur les causes médicales de décès (centre for the epidemiology of medical causes of death, CépiDc) compared the results and identified the main transfers between groups of causes brought about by the coding change (Pavillon et al., 2004).

The most striking difference concerns infectious and parasitic diseases in ICD Chapter 1. Using the Tenth Revision rather than the Ninth, the number of deaths coded as belonging to Chapter 1 increases by nearly 40%. A small proportion of this increase is due to transfers from headings that had been in other chapters in the earlier revision. This is the case of chronic hepatitis, which came under Chapter 9, "diseases of the digestive system" in ICD-9, and is now classified with viral hepatitis in ICD-10 Chapter 1. This type of problem is easily handled: in the groups of causes we have defined for analysis (Table 1), the corresponding ICD-10 headings have been included with digestive diseases.

Unfortunately, most of the discrepancies are due to changes in coding practice, probably related to the adoption of automatic coding, which have led to infectious diseases being more frequently considered to be the cause of death, whereas these deaths had previously been attributed to a host of other cardiovascular, respiratory, digestive and other conditions (Pavillon et al., 2004). The CépiDc report is not exhaustive enough to reclassify deaths with a

(1) Available on the INED website at http://www-causfra.ined.fr

TABLE 1.– CODES OF THE NINTH AND TENTH REVISIONS OF THE INTERNATIONAL CLASSIFICATION OF DISEASES CORRESPONDING TO THE GROUPS OF CAUSES USED

No.	Chapter or heading	ICD-9 codes	ICD-10 codes
I.	**Infectious and parasitic diseases**	**001 – 139**	**A00 – B178, B190 – B99**
II.	**Neoplasms**	**140 – 239**	**C00 – D48**
6	Cancer of the upper aerodigestive tract	140 – 149	C00 – C14
7	Cancer of the oesophagus	150	C15
8	Cancer of the stomach	151	C16
9	Cancer of the intestine and rectum	152 – 154	C17 – C21
10	Cancer of the larynx, bronchus and lung	161 – 163	C32 – C34
11	Cancer of the breast	174,175	C50
12	Cancer of the uterus	179 – 182	C53 – C55
13	Cancer of the prostate	185	C61
14	Cancer of the blood and bloodforming organs	200 – 208	C81 – C96
15	Other neoplasms	155 – 160, 164 – 173, 183 – 184, 186 – 199, 210 – 239	C22 – C31, C37 – C49, C51 – C52, C56 – C60, C62 – C80, C97 – D48
III.	**Diseases of the circulatory system**	**390 – 459**	**I00 – I99**
16	Ischaemic heart diseases	410 – 414	I20 – I25
17	Other heart diseases	390 – 405, 415 – 429	I00 – I15, I26 – I52
18	Cerebrovascular diseases	430 – 438	I60 – I69
19	Other diseases of the circulatory system	440 – 459	I70 – I99
IV.	**Diseases of the respiratory system**	**460 – 519**	**J00 – J99**
V.	**Diseases of the digestive system**	**520 – 579**	**B180 – B189, K000 – K938**
VI.	**Other diseases**	**240 – 389, 580 – 779, 798 (below age 1),**	**D50 – H95, L00 – Q99, R95**
VII	**Violent deaths**	**800 – 999**	**V01 – Y98**
36	Road accidents	810 – 829, 846 – 848	V01 – V80, V82 – V89, V98 – V99
37	Accidental falls	880 – 888	W00 – W19
38	Suicide	950 – 959	X60 – X84
39	Homicide	960 – 969	X85 – Y09
40	Other violent deaths	800 – 807, 830 – 845, 850 – 879, 890 – 949, 970 – 999	V81, V90 – V97, W20 – X59, Y10 – Y98
VIII.	**Total all causes**	**001 – 999**	**A00 – R99, V01 – Y98**

fine degree of detail, however. For the purposes of this article, we have merely corrected infectious mortality rates for the years 2000 to 2002, holding constant the proportion of this group of causes at the 1999 rate. The difference between the corrected and observed rates was then divided into three equal parts and added to cardiovascular, respiratory and digestive diseases.

The second major difference concerns deaths attributed to senile dementia ("other diseases" chapter). Here too, the change to the new revision was accompanied by the more frequent choice of dementia as main cause of death, usually in place of acute diseases of the respiratory system (Pavillon et al., 2004). We estimated the rate of mortality from senile dementia in 2000-2002 by extrapolating the 1990-1999 trend line. The difference between the estimated and observed rates was allocated to acute diseases of the respiratory system.

For 2003, to avoid masking the effects of the heat wave, which weighed upon certain causes of death more than others, we estimated mortality rates from infectious diseases and senile dementia by applying to the corrected 2002 rates the same ratio as that between the observed rates for 2002 and 2003.

An overall decline but new rankings

Figure 3 shows that recent developments in mortality by major group of causes are highly positive for both sexes(2). Over the last fifteen years, mortality has steadily decreased for cardiovascular diseases, neoplasms, violent deaths and digestive diseases and remained nearly stable for diseases of the respiratory system. Only two groups of causes of death have resisted the trend: infectious diseases and “other diseases”.

The decline in infectious disease, quite rapid in the 1950s and 1960s, had already slowed by the 1970s. The arrival of AIDS in the early 1980s caused a sharp increase in fatal infections, especially among men. Fortunately, as a result of preventive measures and, above all, the development of increasingly effective treatments, this increase did not last long and within a few years infectious mortality returned to the slight downward pre-AIDS trend line.

It is harder to understand the recent upturn in mortality from the various pathologies grouped under the heading “other diseases”. Most of the increase may be due to a higher quality of diagnosis recorded on death certificates, which may identify a specific disease as the main cause, where previously the cardiovascular or respiratory complications of that disease had been considered as the main cause. This explanation is particularly valid for mental disorders, especially senile dementia, where mortality has regularly risen in the last twenty years and it is impossible to distinguish between a real increase in incidence and more accurate diagnosis.

By comparison with the two above-mentioned causes, trends for the two leading causes gives more cause for optimism. First, the reduction in mortality from cardiovascular diseases is striking for both men and women. From 1950 to 2003, the mortality rate was divided by 3 for men and by 4 for women. Since 1985, the decline has even accelerated. Mortality from cancer has evolved in a less consistent manner. For men, after a long period of increase, the trend finally turned down in the late 1980s and is now clearly

(2) The standardized mortality rates are based on the age structure of the WHO “standard European population”.

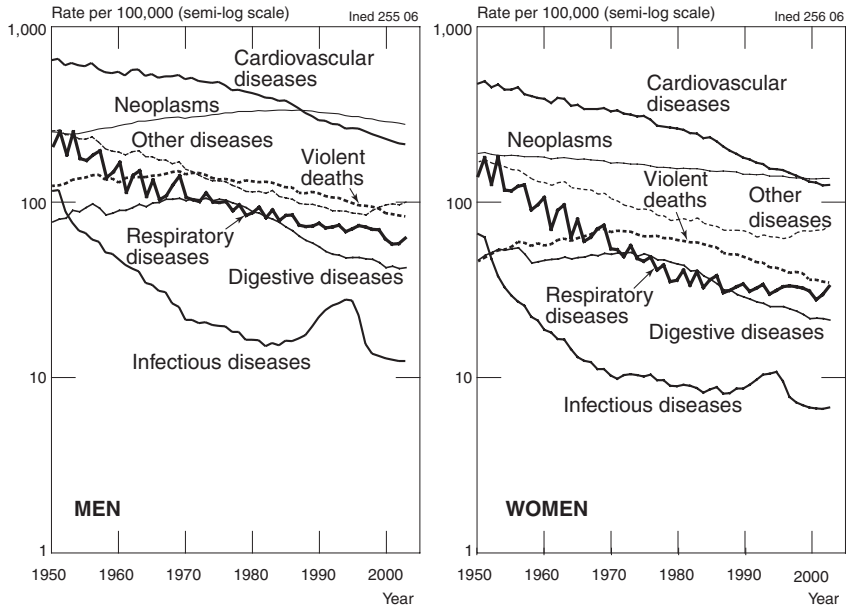

Figure 3.– Standardized sex-specific mortality rates by major cause of death since 1950.

Source: INED, Database on causes of death in France; INSERM, CépiDC.

declining. Although women's mortality from cancer fell regularly until the late 1990s, the trend in recent years gives more cause for concern. We do not have enough data to see if the stagnation since 2000 is the sign of a more permanent change in the trend, but the question deserves closer examination. We will return to this point in the second part of the article.

In sum, the less positive trend in mortality from cancer compared with that from cardiovascular disease has made cancer the leading cause of death at all ages for both men and women.

3. Men and women: improvements vary by age

Sofar, we have examined trends in life expectancy and standardized mortality which are general indicators that cover all ages. The improvements vary, however, by sex, age and period (Figure 4).

From 1950 to 2004, the mortality risk fell significantly at all ages for both sexes, but improvement was not uniform over the period. From 1950 to 1980, young children enjoyed the best improvement. Around the age of 20, the decline halted, with even an increase in male mortality and an only slight fall in female mortality. This poor result was due to the particularly sharp increase in road accidents in the 1950s and 1960s. Above age 25, male

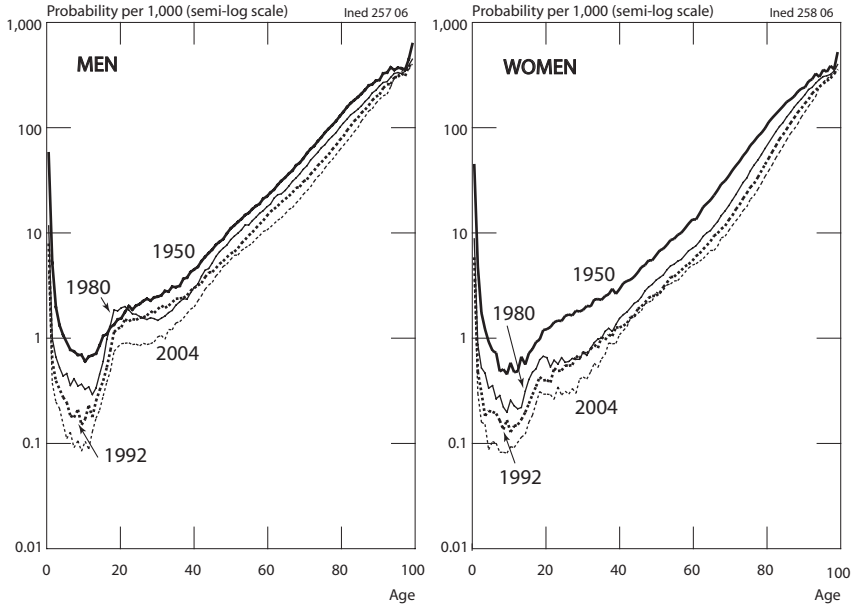

Figure 4.– Mortality by age and sex, 1950-2004.
Source: Updated French life tables (Vallin and Meslé, 2001).

mortality risk declined in a uniform manner, whereas among women the decrease was greater at all ages, and particularly so between ages 30 and 70. From 1980 to 1992, a levelling off in the decline was observed at ages around ten years higher. Around the age of 30, the mortality risk stabilized for women and increased slightly for men. This was due to the arrival of AIDS, which hit this age group in particular. At other ages, mortality continued to decline, with especially large improvements for both sexes between ages 60 and 80. From 1992 to 2004, improvement slowed for the 45-50 age-group, especially among women, whose mortality stabilized, while at other ages the mortality risk pursued its sharp downtrend.

The contribution by age group of causes of death to the increase in life expectancy can be calculated(3) to understand the changes in the age-specific mortality curve (Figure 5).

From 1950 to 1980, it is striking to see the contribution of infant mortality alone (before age one) to improved life expectancy(4). It accounted

(3) Calculation based on the method devised by Andreev *et al.* (2002) and carried out with software kindly provided by Evgueni Andreev.

(4) Figure 5 only partially reveals the contribution of mortality before age 1 to improved life expectancy, compared with that of other age groups. The reason is that the gain from lower infant mortality only covers the single year from birth to age 1, whereas gains due to lower mortality in the other age groups aggregate the effects of four (ages 1-4) or five years of age (ages 5-9 and above). To obtain a fully comparable representation, the gains at ages 1-4 would need to be divided by 4 and those of the other age groups by 5.

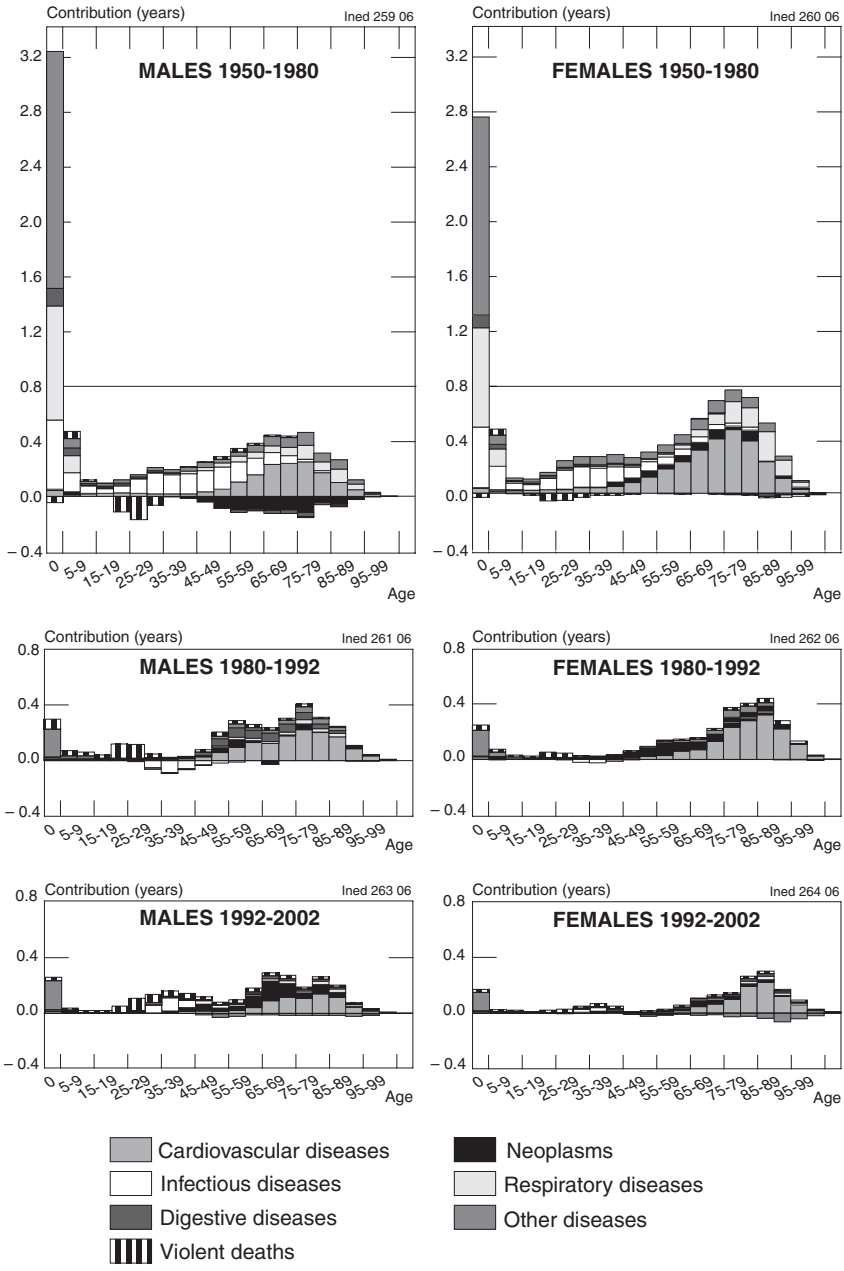

Figure 5.– Contribution of 7 major causes of death to variations in life expectancy by sex, 1950-1980, 1980-1992 and 1992-2002.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

for nearly half of male gains and 30% of female gains. This is due to the decline in mortality from infectious and respiratory diseases and, above all, from "other diseases", which at that age are mainly congenital anomalies and infant diseases. In the 1980s and 1990s, lower infant mortality played a smaller part, though it is interesting to note that mortality changes at that age continue to count as much as changes at much higher ages. In the two periods studied here, 1980-1992 and 1992-2002, the contribution of the under-1s to male life expectancy improvement is 0.3 years, the same as that of the 65-69 age group. Among women, the infant mortality contribution is lower in these two recent periods but is still higher than the gains due to lower mortality of all age groups below 70.

Although the contribution of infant mortality is far from insignificant, analysis of gains due to lower adult mortality sheds more light on recent developments. From 1950 to 1980, all major causes of death, except violent deaths, contributed to the improvement in female life expectancy. The decline in infectious diseases accounted for most of the gains between ages 5 and 40. From ages 40 to 80, the decline in cardiovascular diseases lay behind much of the improvement, while over 80, lower mortality from respiratory diseases was the preponderant factor. The negative effect of violent deaths, significant between ages 15 and 25, made only a minor dent in the largely positive results. Among men, the picture was different. Lower infectious, cardiovascular and respiratory mortality among adult men produced improvements in life expectancy that were substantial but smaller than for women. In particular, negative trends in violent deaths (between ages 15 and 30) and cancer mortality (between ages 40 and 85) considerably slowed down the improvement in life expectancy. These different trends in sex-specific causes of death explain the widening life expectancy gap between men and women that peaked in the early 1980s (Figure 2).

After 1980, the gap stopped widening. And yet, between 1980 and 1992 one group of causes, that of infections diseases, negatively impacted the rise in male life expectancy between ages 25 and 45, while this effect was barely perceptible among women of that age. This is due to the emergence of AIDS mortality, already visible on the curve of mortality by age (Figure 4). But apart from that negative factor, falling male mortality from all the other causes provided men with greater increases in life expectancy than women between ages 15 and 25, with a reduction in violent deaths, and between ages 45 and 70, as a result of decreasing mortality from cardiovascular and digestive diseases. Only above age 70 did women's gains, mainly due to declining cardiovascular mortality, remain higher than men's.

In the final period selected, 1992-2002, men narrowed the gap further. Between ages 15 and 40, their life expectancy gains increased as a result of further decreases in violent deaths and a trend reversal in AIDS mortality. Between ages 55 and 70, lower cancer mortality provided substantial improvement (0.3 years, compared with 0.2 years for lower cardiovascular mortality). At the highest ages, women's gains remain greater than men's, but

the improvement due to declining cardiovascular mortality was slightly counteracted by an increase in mortality from "other diseases", to which we will return in the last part of this article.

Before we analyse adult and old-age mortality changes by sex in greater detail, Figure 6 illustrates the contribution of various causes of death to the life expectancy gap between the sexes.

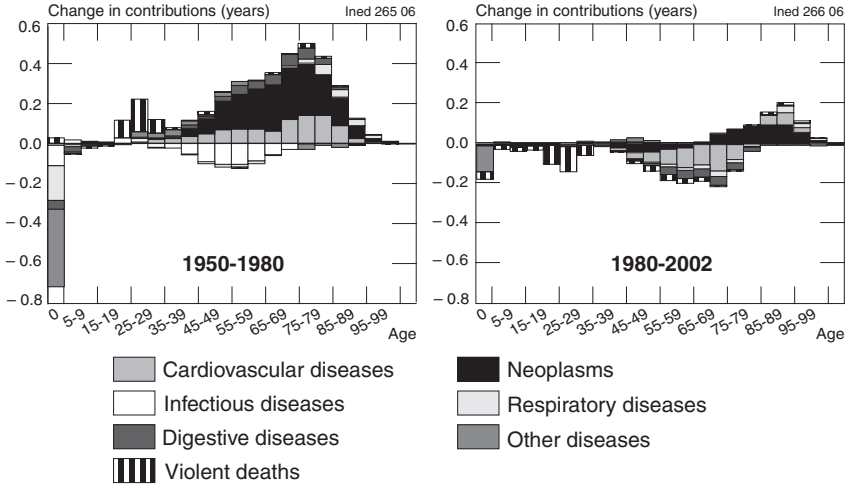

Figure 6.– Changes in the contributions of 7 broad groups of causes of death to the gap between male and female life expectancies, 1950-1980 and 1980-2002.

Interpretation: Over the period 1950-1980, the contribution of cancer mortality to the life expectancy gap between men and women increased by 0.14 years at ages 45-49, while that of infectious mortality decreased by 0.10 years. Indeed, in 1950, at ages 45-49, the difference between male and female cancer mortality accounted for 0.01 year of the difference in life expectancy, compared with 0.15 years in 1980. Conversely, the contribution of infectious mortality at these ages fell from 0.11 years in 1950, to 0.01 years in 1980.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

From 1950 to 1980, the life expectancy gap between the sexes widened as adult women experienced more favourable trends in mortality from all causes of death except infectious diseases, especially violent deaths around age 20 and cancer from age 40 onwards (Figure 6). Only changes in infant mortality and infectious mortality at all ages counteracted this widening gap between the sexes, with men recovering some of the ground lost over previous decades.

From 1980 to 1992, the narrowing gap was largely due to greater improvement among men of working age, while at the oldest ages women's gains were larger. The narrowing from age 15 to 70 was due, in order of age, to trends in violent deaths, cancer and diseases of the circulatory system. Above age 75, on the other hand, women continued to widen the gap thanks to greater gains in mortality from cancer and cardiovascular diseases.

II. Women are losing some of their lead at working ages

Whether around age 20 or 50, we have seen that developments observed in the last twenty years have benefited men more than women. Analysis of annual changes in mortality by broad group of causes of death, and then by individual cause, reveals the main factors behind these changes.

1. Sharp decline in violent deaths among young adults

At ages 15-34, mortality is dominated by violent death. This is particularly true of men. In the 1950s and 1960s, violent mortality increased while the risk of death from all other causes fell (Figure 7). The difference with respect to changes in infectious mortality is particularly striking. Whereas in 1950 men's violent mortality rate was only 1.4 times higher than the infectious mortality rate, by 1980 it was 100 times higher. Female infectious mortality fell from three times that of violent mortality in 1950 to a ratio of 1 to 60 in 1980. Since the end of the 1970s, however, the trend has reversed; violent death has declined, and even more sharply in recent years.

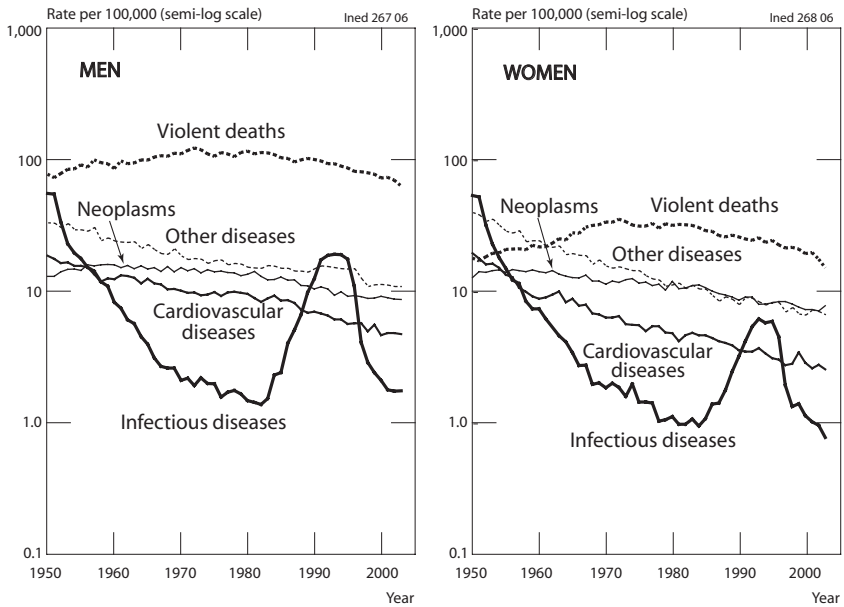

Figure 7.– Standardized sex-specific mortality rates at ages 15-34 by broad group of causes of death since 1950.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

Changes in mortality from cancer, cardiovascular and other diseases, all three trending down, are evidence of the general improvement in health among young adults over the period. In the last twenty years, the only exception – though a major one – has been infectious disease. At working ages, especially among men, infectious mortality rose strikingly in the 1980s. In the ten years from 1983 to 1993, it rose thirteen-fold among men and six-fold among women. At that age, the AIDS epidemic left a profound trace. In the early 1990s, infectious diseases moved up to become the second cause of male death, a ranking they had held just after the Second World War. Fortunately this resurgence of infectious mortality did not last long. By 1995, AIDS mortality had begun to fall thanks to the wider use of multi-therapy treatment (Bergouignan, 2005). This both delayed the onset of the full-blown disease and reduced its lethality (InVS, 2005). In addition, prevention campaigns probably stabilized the number of HIV-positive persons, although their numbers are still poorly known (Desenclos et al., 2005). In five years, infectious mortality fell back to the pre-AIDS rate for women aged 15-34, and a slightly higher rate for men of the same age.

Despite its decline over thirty years, violent death remains the number one cause of death for young adults. This heading covers a number of external causes that have evolved very differently (Figure 8).

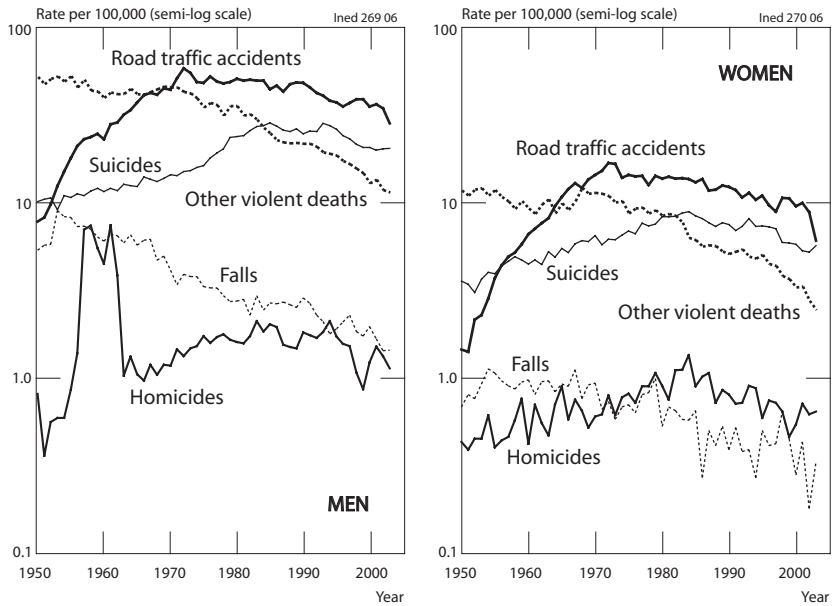

Figure 8.– Standardized sex-specific mortality rates at ages 15-34 by cause of violent death since 1950.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

The rise in road accident mortality, spectacular for both sexes in the 1950s and 1960s, was curbed in the early 1970s thanks to road safety measures, speed limits and lower volumes of traffic following the petrol price hikes of the first oil shock (Got, 2003). Road deaths for women fell regularly thereafter, and more sharply in 2002 and 2003, probably as a result of more effective enforcement of speed limits. The fall has been less striking among men, with a levelling off in the 1970s and a less pronounced decline in the most recent years.

Suicide is the second cause of death for this age group. It has not declined as road deaths have. Among women, suicide mortality rose until the mid-1990s and then started falling very slowly. Since the decline is less marked than that for road deaths, especially in recent years, suicide is set to become the leading cause of death among women aged 15-34. Among men, the sharp rise recorded in the early 1980s was followed by a long period of stabilization and a decline in the last ten years. The determinants of suicide are many and complex (Chesnais and Vallin, 1981; Nizard, 1998; Baudelot and Establet, 2006) and this is not the place to explain recent trends. Note, however, that many authors link suicide among the young to economic instability in France since the 1970s.

Deaths from falls have significantly declined for both sexes. Affecting men much more than women, such deaths at these ages are mainly due to excessive alcohol consumption and work accidents. Lower alcohol consumption and better worker protection probably explain the sharp reduction in these risks.

Homicide is very infrequent, except for men between 1956 and 1962, when conscripts were dying in Algeria. After rising until the early 1980s, homicide has been declining in the most recent years.

In all, at ages 15-34, mortality trends have favoured women more than men. However, the changes have caused larger life expectancy gains for men because of men's initially higher mortality rate. The pattern is different at older ages.

2. At ages 35-64, recent developments favour men

At ages 35-64, cancer is the leading cause of death (Figure 9). Among men, cancer mortality rose until the mid-1980s. Since then it has fallen to such an extent that by 2003 it had nearly returned to its 1950s level. Among women, the regular decline since 1950 has been followed by a flattening out in the most recent years. Male cardiovascular mortality has also developed in two phases (fairly slow decline from 1950 to 1985, then a steeper fall in the following twenty years), whereas for women, a steady improvement is observed throughout the period. Whatever these trend differences between men and women, the lines for the two leading causes of death at these adult ages arrive at the end of the period in the same order for both sexes: cancer

mortality is well ahead of all other causes, while the level of cardiovascular mortality is now very close to that of violent death, which is fairly flat for women and has fallen more sharply for men.

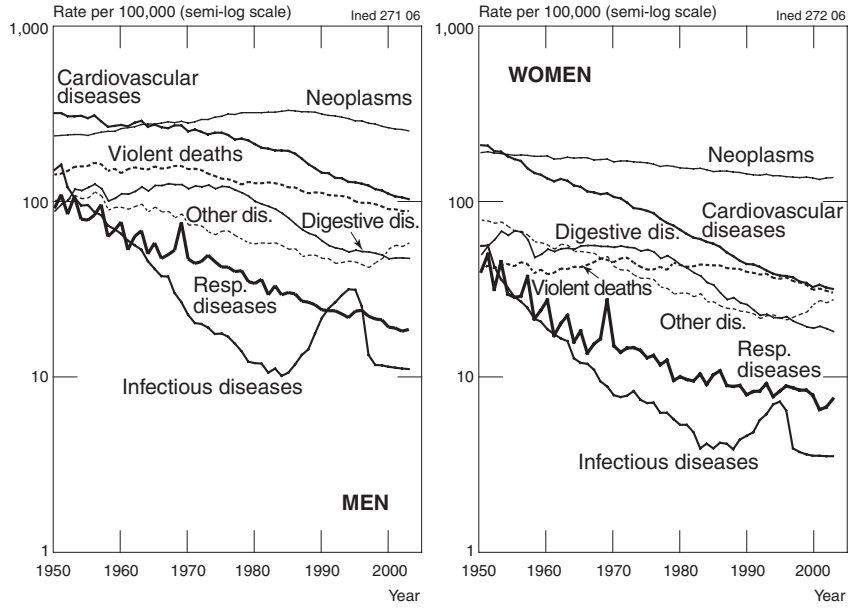

Figure 9.– Standardized sex-specific mortality rates at ages 35-64 by broad group of causes of death since 1950.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

At these ages, mortality from digestive diseases is dominated by cirrhosis of the liver, mainly due to alcohol. Its evolution mirrors that of alcohol consumption (Munoz-Perez and Nizard, 1998; Got, 2003). After falling from the mid-1970s, it appears to have flattened out in recent years. It is too soon to draw any conclusions about the reasons for this. First, the Tenth Revision of the ICD has moved chronic hepatitis from the digestive diseases chapter to infectious diseases. Although we have allowed for this change in the definition of groups of causes of death (Table 1), it may have caused some irregularities in the observed series. Second, in recent decades, the proportion of alcohol-related cirrhosis in total cirrhosis mortality has fallen, to be replaced by post-hepatitis cirrhosis. The role of alcohol in the recent flattening out of digestive mortality is thus far from proven.

As with the younger age group but to a lesser degree, the decline in infectious mortality was suddenly interrupted by the arrival of AIDS. For this age group too, the introduction of multi-therapy treatment brought about a rapid return to the trend line.

On the other hand, it is harder to explain the recent rise in mortality from "other diseases". Again it may be that the classification change has involved new coding rules that affect the identification of the cause of death, as we explained above.

The impact of cancer mortality in this age-group justifies breaking down this leading cause of death into the cancer sites that have most impacted recent trends. Analysis of cancer mortality by cohort will provide a clearer picture of likely future developments.

The ranking of cancer sites differs considerably from one sex to the other (Figure 10). Among men, the main cancers are closely related to behaviour, mainly excessive consumption of alcohol (oesophagus, upper aerodigestive tract) and tobacco (lung and bronchus, upper aerodigestive tract). These three cancers follow quite similar patterns: a sharp rise then a downturn, first for cancer of the oesophagus in the late 1970s, then for that of the upper aerodigestive tract in the mid-1980s, and for bronchial and lung cancer in the early 1990s. Men's adoption of healthier behaviour has brought down their cancer mortality.

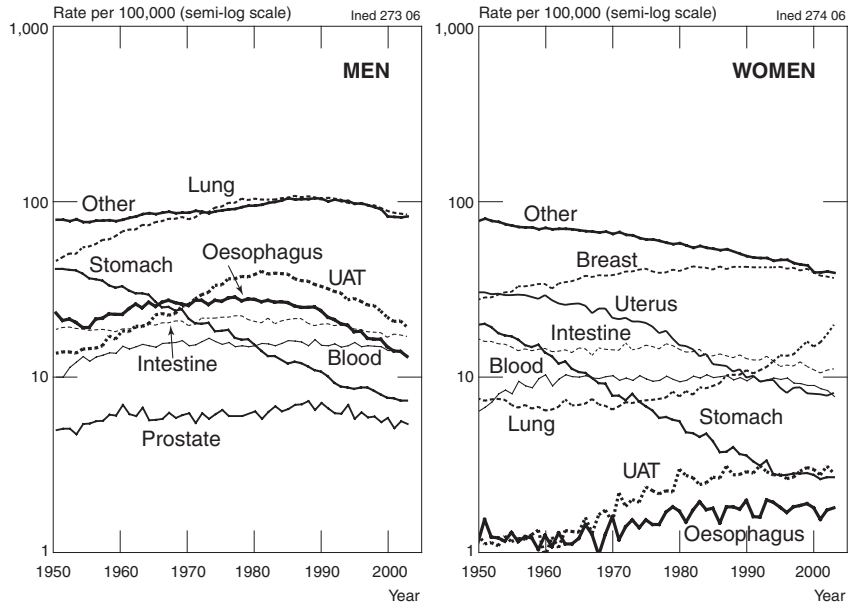

Figure 10.– Standardized sex-specific mortality rates at ages 35-64 by main cancer site since 1950.

UAT: Upper aerodigestive tract.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

Among women, at least until recently, the main cancers were of the uterus and breast. Although uterine cancer mortality has fallen significantly,

breast cancer mortality has followed a much less favourable pattern, rising until the mid-1990s and falling slightly since then. This recent decline does not make up for the striking rise in bronchial and lung cancer. It is only because of lower mortality for the other cancer sites, mainly the uterus and stomach, that there has not been an increase in total cancer mortality but merely a flattening out. However, if these trends continue, women's cancer mortality may well start rising over the long term.

The adoption of harmful behaviour, such as smoking, is often a generational phenomenon. In order to anticipate future developments, we will look at cancer mortality by cohort.

Using cause-of-death data series available since 1925, it is possible to analyse variations in cancer mortality not by year but by cohort. Figure 11 compares sex-specific cancer mortality rates by age group from the 1901-1905 cohorts to the 1961-1965 cohorts. For greater clarity of interpretation, the rates for each cohort group are presented as a ratio of the 1901-1905 figures.

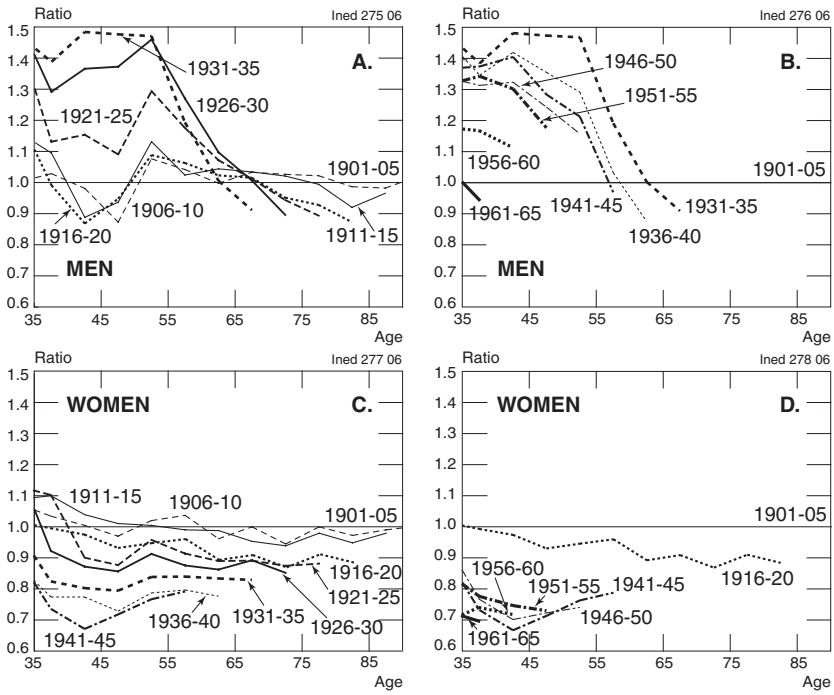

Figure 11.– Cancer mortality by cohort and age-group (1901-1905 cohorts = base 1).

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

The male cohorts separate clearly into two groups (Figures 11A and 11B). For men born in the first thirty years of the twentieth century, the risk of

death from cancer rose continuously until the age of 60 and fell slightly thereafter. During their working ages, most of this rise was due to the rapid expansion of bronchus and lung cancer as smoking became more popular. Starting with the 1931-1935 cohorts, the risk of death declined. The cohorts born later were under 40 when the fight against smoking really began in France, with the first anti-smoking law passed in 1976. The decline in male cancer mortality is especially pronounced between the 1951-1955 and the 1956-1960 cohorts. The Evin law, passed in 1991, probably had particularly beneficial effects on the under-35s. Even if the decline is insufficient so far, it does look as if the 1961-1965 cohorts are benefiting from a major decline in cancer mortality, with a rate at the age of 35-39 that is lower than for cohorts born 60 years earlier. Given these developments, it looks as if the observed decline in cancer mortality among men is likely to continue in the years ahead.

The picture is different for the female cohorts (Figures 11C and 11D). On the one hand, from cohort to cohort, cancer mortality has declined significantly at all ages. However, for women born after the Second World War, this improvement has ceased and developments among younger women are not clear. For the latest cohorts, for whom we have only a few data points, the levels that can be measured do not appear to differ from those of earlier cohorts. It would seem, therefore, that these new cohorts will not be exposed to a considerable increase in cancer mortality. But this hypothesis remains to be confirmed and the development of cancer mortality among young women needs to be closely monitored.

III. Considerable improvement at advanced ages

Although premature deaths are the hardest for society to accept and there is pressure on the authorities to prevent them more effectively, they are now relatively rare events that have less and less impact on the general mortality trend. This is particularly true for women, whose pre-65 mortality is now very low. To predict the future development of life expectancy, it is essential to study the mortality trends at old and oldest-old ages, when most deaths now occur.

1. The decline in cardiovascular diseases is more pronounced at advanced ages

At ages 65-79, cardiovascular diseases and cancer are by far the leading causes of death (Figure 12). In 1950, cardiovascular diseases ranked first, but by 2003 they had been overtaken by cancer. The two lines crossed in the mid 1980s for men and at the end of the 1980s for women.

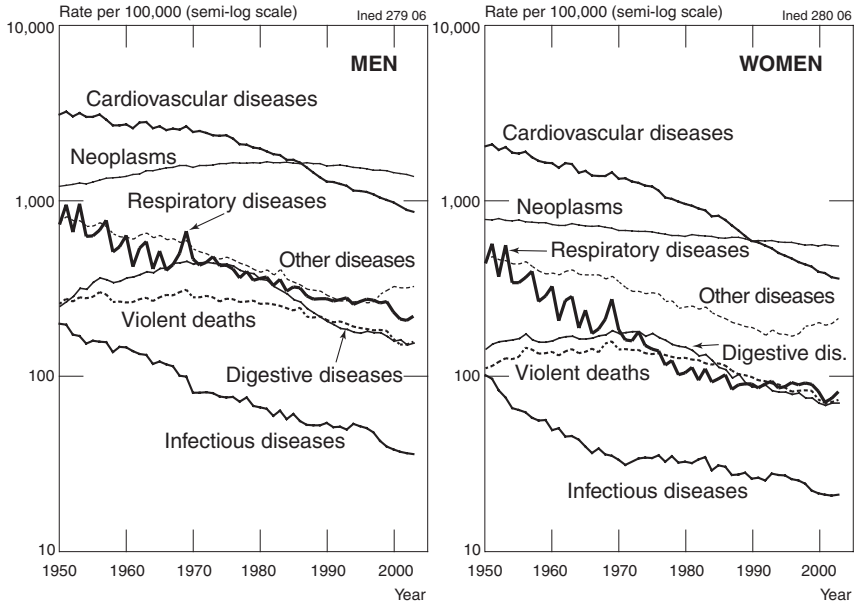

Figure 12.– Standardized sex-specific mortality rates at ages 65-79 by broad group of causes of death since 1950.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

At these advanced ages, when most deaths occur, the pattern is comparable to that described for standardized rates for all ages. This is where the reduction in cardiovascular mortality has had most effect. However, its various components have evolved differently (Figure 13).

Only mortality from "other heart diseases" declined regularly for both sexes over the period. This heterogeneous group includes rheumatic heart disease of infectious origin (rheumatic fever, heart valve disease), on which antibiotics have had a decisive impact. It also includes less clearly defined conditions (heart failure, pulmonary oedema) that often occur during the terminal phase of other diseases, particularly respiratory disease, that have become less frequent.

Cerebrovascular disease and "other diseases of the circulatory system" have declined in a similar manner: mortality from these causes fell over the entire period, relatively slowly until the early 1980s and more rapidly since then. This acceleration is probably due to the reduction in alcoholism (see previous section) and a number of preventive measures taken in the 1970s, particularly to screen for and monitor high blood pressure, one of the major risk factors for stroke. More recently, the reduction in male smoking has most certainly contributed to lower mortality from arterial disease, which is the main component in "other diseases of the circulatory system".

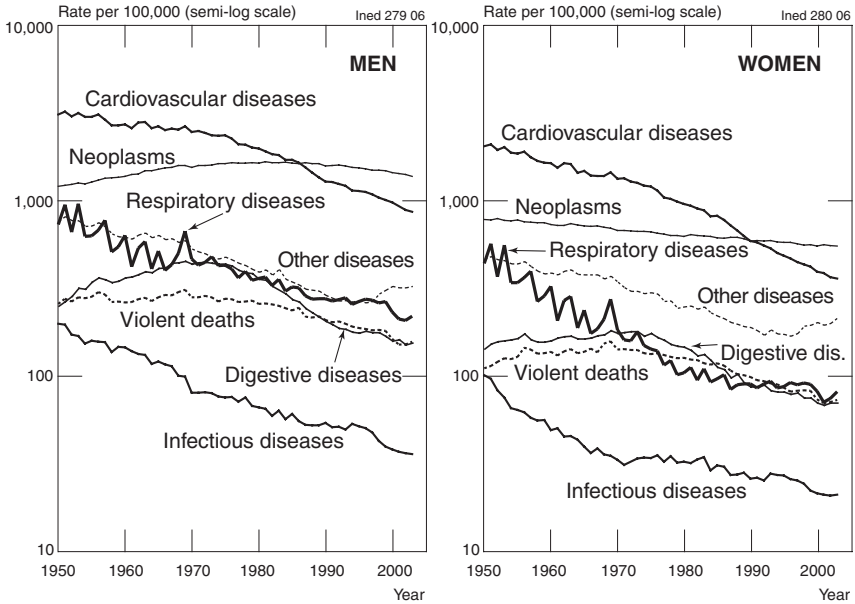

Figure 13.– Standardized sex-specific mortality rates at ages 65-79 by main components of cardiovascular mortality since 1950.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

Mortality from ischaemic heart disease (angina pectoris, acute myocardial infarction) has moved in two directions among persons aged 65-79: from 1950 to the mid-1970s, it increased sharply, doubling in a quarter-century; it then flattened out for men and declined slightly for women for ten years or so before falling sharply from the late 1980s. Though the increase in these diseases was to some extent only apparent, as the identification of stroke improved, it also reflected higher incidence, due largely to increased smoking and growing consumption of foods with high fat and sugar content. The decline illustrates the success of a broadly-based public health policy involving preventive campaigns (anti-smoking, healthy eating), systematic screening (cholesterol and blood pressure), new drug treatments (beta-blockers, aspirin), surgical operations (coronary by-pass, balloon dilatation) and the development of emergency services (mobile emergency medical services, single emergency call number).

The combination of these two downward trends, a steeper decline in the risk of stroke and a trend reversal in ischaemic heart disease, explain the spectacular fall in cardiovascular mortality and its role in driving the recent sustained rise in life expectancy.

2. *The heatwave: a temporary setback*

Despite this fairly optimistic description of recent trends in mortality at advanced ages, it is impossible to ignore the high excess mortality caused by the heatwave in the summer of 2003. The 15,000 excess deaths that occurred in the first half of August (Hémon et al., 2003; Toulemon and Barbieri, 2006, forthcoming) shocked public opinion and forced the authorities to pay closer attention to the elderly. In 2003, as a result of the heatwave, the rise in male life expectancy slowed down and female life expectancy fell by 0.1 years (Figure 1). In 2004, however, the trend bounced back: 0.8 years more for men and 0.9 for women, and this improvement was maintained in 2005 (Pison, 2005; 2006). Life expectancy at age 80 was particularly affected by these phenomena: in 2003 it fell from 7.7 to 7.6 years for men and from 9.7 to 9.5 years for women, while in 2004, it made an exceptional improvement to 8.0 and 10.2 years respectively. This spectacular positive reversal can probably be attributed to better health care for the elderly as a result of the health watch systems introduced by many local authorities, and in retirement homes and long-stay institutions (Toulemon and Barbieri, 2006, forthcoming).

Since the cause-of-death statistics for 2004 are not yet available, it is not possible to analyse the components of this further improvement. However, INSERM has published the detailed causes of death for 2003 and it is possible to study oldest-old mortality trends by cause of death until 2003 (Figure 14).

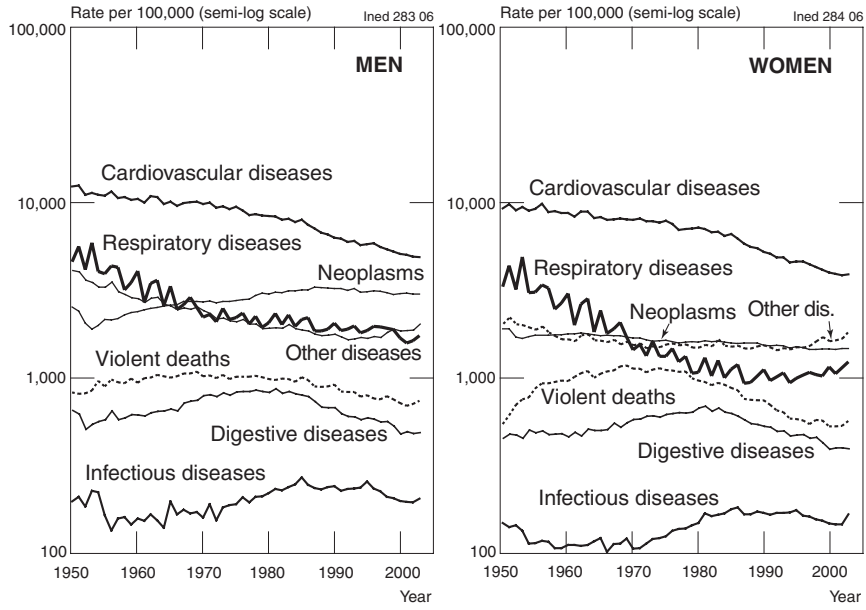

Figure 14.– Figure 14. Standardized sex-specific mortality rates at age 80 or over by broad group of causes of death since 1950.

Sources: INED, Database on causes of death in France; INSERM, CépiDC.

On the 50-year scale of mortality at age 80 and over, the 2003 crisis appears as little more than a blip. The increase in mortality shows up mainly among women for infectious disease, respiratory disease, "other diseases" and violent deaths. For the other groups of causes of death, mortality remained the same from 2002 to 2003. If doctors had strictly observed the rules for declaring cause of death, the heatwave should have been declared to be the main cause of the 15,000 excess deaths in August 2003. These deaths should therefore be counted under accidental deaths. For 2003 there is indeed a much larger number of deaths coded X30, "exposure to excessive natural heat", than in previous years (1,669 compared with 41 in 2002, for example), but most of the heatwave deaths were attributed to other causes. In most cases, the doctor probably only declared on the death certificate the consequences of the heatwave on the functioning of particular organs, and may or may not have mentioned the heatwave as an associated cause. An analysis of multiple causes of death would probably identify more accurately the deaths due to the heatwave and confirm the estimated excess mortality. Since the 2003 data have only recently become available, it was not possible to carry out that analysis for this article.

Although the 2003 setback is visible on the curves of most causes of death, it does not appear to require a reassessment of the positive trends in mortality at oldest-old ages. The dominant factor is cardiovascular mortality, which has declined at an accelerated rate since the mid-1980s. Developments in cancer mortality are fairly similar to those at earlier ages: a slow decline throughout the period among women; a rise followed by a fall among men. Among the oldest-old, mortality from respiratory disease is still high. At the start of the period, it was the second cause of death after cardiovascular disease. After falling sharply in the 1950s and 1960s, it is now only fourth, but in recent years the improvement among men has slowed down and virtually stopped among women. Mortality from "other diseases" has also increased significantly in recent years. These less positive developments have so far only moderately slowed the continued improvement in the health of the elderly, but whereas improved healthcare and social welfare services for the elderly have been highly effective in controlling cardiovascular disease at advanced ages, they are probably less effective in combating the degenerative diseases of ageing, such as senile dementia, and the final consequences of these conditions, which often affect the respiratory system (Meslé and Vallin, 2006). Alongside the further progress to be expected, in the fight against cancer especially, it is certain that one of the major health challenges of the twenty-first century will be to control the degenerative diseases that are taking an increasing toll among the elderly.

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MESLÉ France – **Recent Improvements in Life Expectancy in France: Men are Starting to Catch Up**

Life expectancy for both sexes and all ages has risen almost without interruption in France since the early 1950s. Women's life expectancy at birth increased by 14.6 years from 1950 to 2005, and men's by 13.3 years. In the last twenty years, the gap in life expectancy between the sexes has stopped widening and begun to close. This is mainly due to an acceleration in the improvement among men, but some slowing in improvement among women under 60 is also perceptible. At later ages, on the other hand, improvement continued to be more rapid for women than men. Although cancer mortality is falling for both men and women, cancer is now the leading cause of death, overtaking cardio-vascular disease, for which mortality has considerably reduced. Among the oldest groups, the exceptionally high mortality due to the 2003 heat wave caused only a brief interruption in the positive trend brought about mainly by lower cardio-vascular mortality. Future improvement will depend on success in the control of cancer and neuro-degenerative disease.

MESLÉ France – **Progrès récents de l'espérance de vie en France : les hommes comblent une partie de leur retard**

Quels que soient le sexe et l'âge, l'espérance de vie n'a quasiment pas cessé d'augmenter en France depuis le début des années 1950. À la naissance, les femmes ont ainsi gagné 14,6 ans d'espérance de vie entre 1950 et 2005 et les hommes 13,3 ans. Au cours des deux dernières décennies, l'écart d'espérance de vie entre les sexes s'est stabilisé et a même commencé à se réduire. Cette réduction tient pour l'essentiel à une accélération des progrès masculins, mais un essoufflement des progrès féminins avant 60 ans est également perceptible. Aux âges les plus élevés, en revanche, les progrès se sont poursuivis à un rythme plus rapide pour les femmes que pour les hommes. Bien que la mortalité tumorale soit en baisse aussi bien pour les femmes que pour les hommes, les cancers arrivent désormais au premier rang des causes de décès, devant les maladies cardio-vasculaires pour lesquelles la mortalité a considérablement diminué. Aux grands âges, la surmortalité exceptionnelle due à la canicule de 2003 n'a interrompu que brièvement une évolution très favorable, essentiellement liée au recul de la mortalité cardio-vasculaire. Les progrès à venir dépendront des succès remportés dans la lutte anti-cancéreuse et dans le contrôle des maladies neuro-dégénératives.

MESLÉ France – **Progresos recientes de la esperanza de vida en Francia : los hombres van recuperando parte de su retraso**

Independientemente del sexo y de la edad, la esperanza de vida no ha dejado casi de aumentar en Francia desde principios de los años 50. Al nacer las mujeres ya han ganado 14,6 años de esperanza de vida entre 1950 y 2005 y los hombres 13,3 años. A lo largo de las dos últimas décadas, la diferencia entre la esperanza de vida de los dos sexos se ha estabilizado e incluso ha empezado a reducirse y dicha reducción se debe fundamentalmente a una aceleración de los progresos masculinos y a una relajación de los progresos femeninos antes de los 60 años, fáciles de percibir en ambos casos. En las edades más avanzadas, en cambio, los progresos se han mantenido a un ritmo más rápido para las mujeres que para los hombres. A pesar de que la mortalidad tumoral está disminuyendo tanto para las mujeres como para los hombres, los cánceres siguen siendo la principal causa de los decesos, por delante de las enfermedades cardiovasculares, para las que la mortalidad ha disminuido considerablemente. En las edades avanzadas, la sobremortalidad excepcional debido a las altas temperaturas de 2003 no hizo más que interrumpir brevemente una evolución muy favorable, fundamentalmente vinculada al retroceso de la mortalidad cardiovascular. Los progresos venideros dependerán de los éxitos de la lucha contra el cáncer y del control de las enfermedades neurodegenerativas.

France Meslé, Institut national d'études démographiques, 133 boulevard Davout, 75980 Paris Cedex 20, tel.: 33 (0)1 56 06 21 43, e-mail: mesle@ined.fr