PAA 2011 Extended Abstract

Trends in breast, prostate, and colorectal cancer incidence and mortality among 50+: U.S. and Europe

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Introduction

Recent studies on cancer in the U.S. and Europe show an overall decline in cancer mortality in recent years; however the magnitude of the decline is variable across Europe and between the U.S. and other high-income European countries (Jemal at al., 2010; La Vecchia et al., 2010). Declines in screened cancers including breast, prostate, and colorectal cancers have played important roles in the reduction in overall cancer mortality (Jemal et al., 2010; Preston & Ho, 2010; Karim-Kos et al., 2008; Boyle & Ferlay, 2005b; Baade et al., 2004; Quinn et al., 2003).

Public health policies related to cancer screening have been integrated into preventative health care in the U.S. and Europe, however screening guidelines for particular cancers vary considerably across countries. Screening practices have had large influences on cancer diagnosis, in that early screening will result in diagnosis of more localized, curable cancers, but will also identify clinically insignificant tumors which would never be identified without screening (Bangma, Roemeling, & Schroder, 2007), leading to an artificial increase in cancer incidence. Studies have shown fluctuations in cancer incidence parallel major changes in screening test utilization (Mettlin, 2000; Glass et al., 2007). In addition, cancer treatment both differs across countries and has changed over time. Given that the primary purpose of early detection and treatment is to reduce the number of deaths attributable to cancer, site-specific cancer mortality is assumed to be the most important indicator of the effectiveness of screening and treatment practices, and the most basic measure of progress against cancer (Hakama et al., 2008; Jatoi & Miller, 2003).

With age being the single most important risk factor for developing cancer, older adults bear a large portion of the burden of cancer as the risk of incidence and mortality from most cancers increases substantially with advancing age (Yancik & Ries, 2004). Screening adults for these three cancers beginning at age 50, along with improved diagnostic methods, and therapeutic advances are thought to be responsible for site-specific cancer declines, however the extent to which each of these factors is responsible for the declines remains largely unknown and controversial.

Our study examines temporal changes in age-standardized incidence and mortality rates from 1980-2005 for breast, prostate, and colorectal cancer among persons aged 50 years and older in the U.S. and several countries in Europe. Joinpoint regression analysis is used to identify significant changes in trends from 1980-2005. We address disparities in cancer incidence and mortality across several countries and examine differences in cancer prevention, care, and treatment in the U.S. and Europe.

Methods

Our study compares site-specific cancer incidence trends from 1980-2002 and mortality trends from 1980-2005 for the U.S. and nine European countries (Austria, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden, and the United Kingdom). High income countries with an established nationwide cancer registry or a network of regional cancer registries in the European Union were included in this analysis. Joinpoint regression is used to calculate the average annual percent change (AAPC) to assess whether cancer mortality rates in the U.S. have declined at a faster rate than those in the comparison countries.

Incidence Data

We use incidence data from the Cancer Incidence in Five Continents Annual Dataset (CI5*plus*) (Ferlay et al., 2010), which provides crude and age-standardized annual incidence based on data from national and regional cancer registries (Ferlay et al., 2010). The 10th revision of the International Classification of Diseases for Oncology (ICD–10, WHO, 1992), now in its third edition (ICD-O-3) was used. In this present volume, the data were recoded when necessary into ICD-O-3 (Fritz et al., 2000), using the international standard to distinguish new primary cancers from existing extensions/recurrences as defined by the International Agency on Cancer Research.

Mortality Data

Mortality data for the U.S. and selected European countries were obtained from the World Health Organization (WHO) Mortality Database for the years 1980-2005. Data were available up to 2003 for Spain. Mortality rates are based on the number of deaths occurring in a given time period in a specified population and expressed per 100,000 persons per year. The original data (registered deaths in national vital registration systems and statistical offices, reported by each member state) have been converted and/or recoded to a common system using the International Classification of Diseases 10th Revision. The estimated completeness and coverage of mortality data for the latest year is 100 percent for each country except Austria and Italy, which each have an estimated 98 percent coverage.

Incidence and mortality rates are based on the number of cancer cases and deaths occurring in a given time period in a specified population and expressed per 100,000 persons per year. To increase comparability, incidence and mortality rates among persons aged 50 years and older are adjusted to the World standard population (Segi, 1960). Anatomical sites examined include malignant neoplasms of the breast (C50), prostate (C61), and colon, rectosigmoid junction, rectum, anus, and anal canal (C18-21).

Data Analysis

Trends in age-standardized breast, prostate, and colorectal cancer mortality rates from 1980-2005 were analyzed using Joinpoint regression (Joinpoint Version 3.3; National Cancer Institute, Bethesda, MD). We estimate average annual percent change (AAPC) to summarize mortality trends over the fixed pre-specified intervals 1980-1989 and 1990-2005. The AAPC is computed as a weighted average of the average percent changes (APC), with the weights equal to the length of each segment over the interval. Negative AAPC values represent decreasing trends over fixed time periods.

Results

Both levels and trends in incidence vary widely between the U.S. and Europe, and across Europe as well. From 1980-2002, breast and prostate cancer incidence rates have been highest in the U.S., while declining trends are observed for colon cancer. From 1990-2005, the U.S. has experienced one of the fastest declines in cancer mortality for breast, prostate and colorectal cancer, -2.2%, -3.2%, -2.4% per year, respectfully.

Breast Cancer

After 1980, there was a gradual increase in the incidence of breast cancer among women aged 50 years and older in the U.S. and Europe. From 1980-2002, breast cancer incidence rates have been highest in the U.S. compared to many European countries. Differences in screening prevalence and in oral hormone therapy use may contribute to the disparities in breast cancer incidence between American and European women.

From 1980-1989, significant increases in breast cancer mortality rates are observed in most countries except for Sweden, where a significant decrease in mortality is observed. Despite rising mortality rates throughout the 1980s, significant declines in mortality rates are observed in all countries from 1990-2005. In this time period, breast cancer mortality rates decreased by an average annual percentage of –0.7 % to –2.5% per year.

Prostate Cancer

Since the 1990s, many European countries appear to have experienced a gradual increase in the incidence of prostate cancer among men aged 50 years. However, in the U.S. and Austria (Tyrol), prostate cancer incidence rates rose rapidly in the early 1990s and then declined in the late 1990s. Despite these declines, recorded prostate cancer incidence rates remained substantially higher in the U.S. and Austria compared to other European countries. This pattern parallels the introduction and widespread use of the PSA test as a screening tool in the U.S. the implementation of a mass prostate screening program in Tyrol, Austria.

From 1980-1989, significant increases in prostate cancer mortality rates are observed for all countries except Sweden. Despite rising mortality rates from prostate cancer throughout the 1980s, significant declines in mortality rates are observed in most countries from 1990-2005. In this period, mortality rates decreased by an average annual percentage change of –0.9 % to –3.2% per year among men aged 50 years and older.

Colorectal Cancer

From 1980-2002, colon cancer incidence among men and women aged 50 years and older remained stable or gradually increased in the European countries examined, whereas colon cancer incidence decreased among both men and women in the U.S. over this period. It is interesting that in spite of increased screening for colorectal cancer in the U.S., the incidence decreased. It is possible that there have been real declines in incidence at the same time as there has been increased screening. Progressive adoption of colonoscopy in the U.S. is consistent with declining colon cancer incidence trends.

From 1980-1989, some countries experienced significant increases in colorectal cancer mortality among men, while other countries experienced stable or small declines in mortality. In this same time period, most countries experienced significant decreases in colorectal cancer mortality at a faster rate among women. From 1990-2005, most countries experienced declines in colorectal cancer mortality among both men and women.

Conclusion

The reduction of cancer death rates over the past two decades in the U.S. and other high-income European countries with high levels of screening appears to be a persuasive argument in support of screening and early detection. However, the recent declines in cancer mortality are not attributed only to screening, but a combination of factors such as improved diagnosis, implementation of more effective therapy, and public and private investments in cancer prevention and care.

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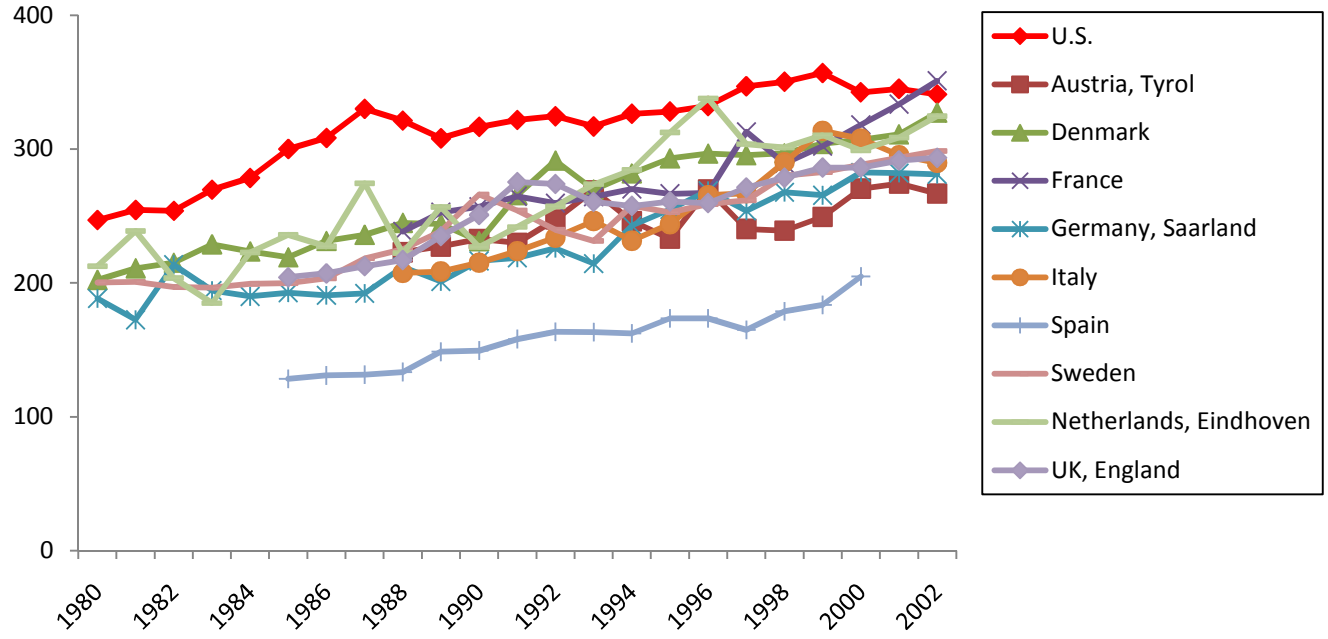
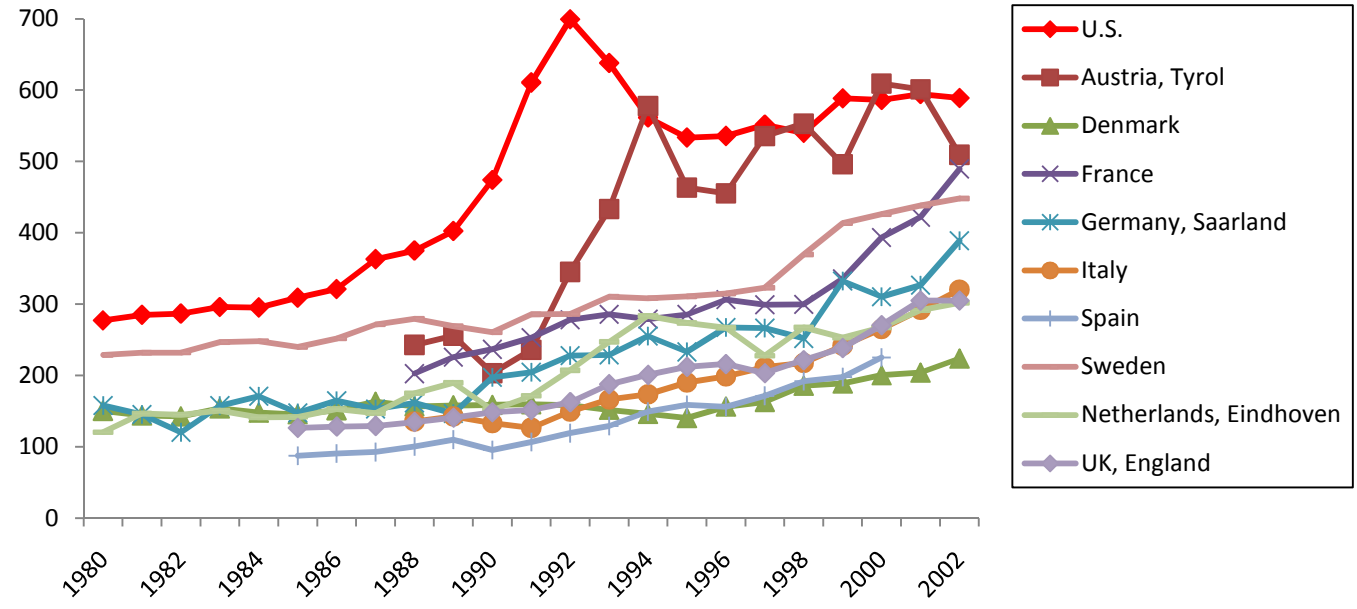
Figure 1. Age-Standardized Breast Cancer Incidence among Women 50+, 1980-2002



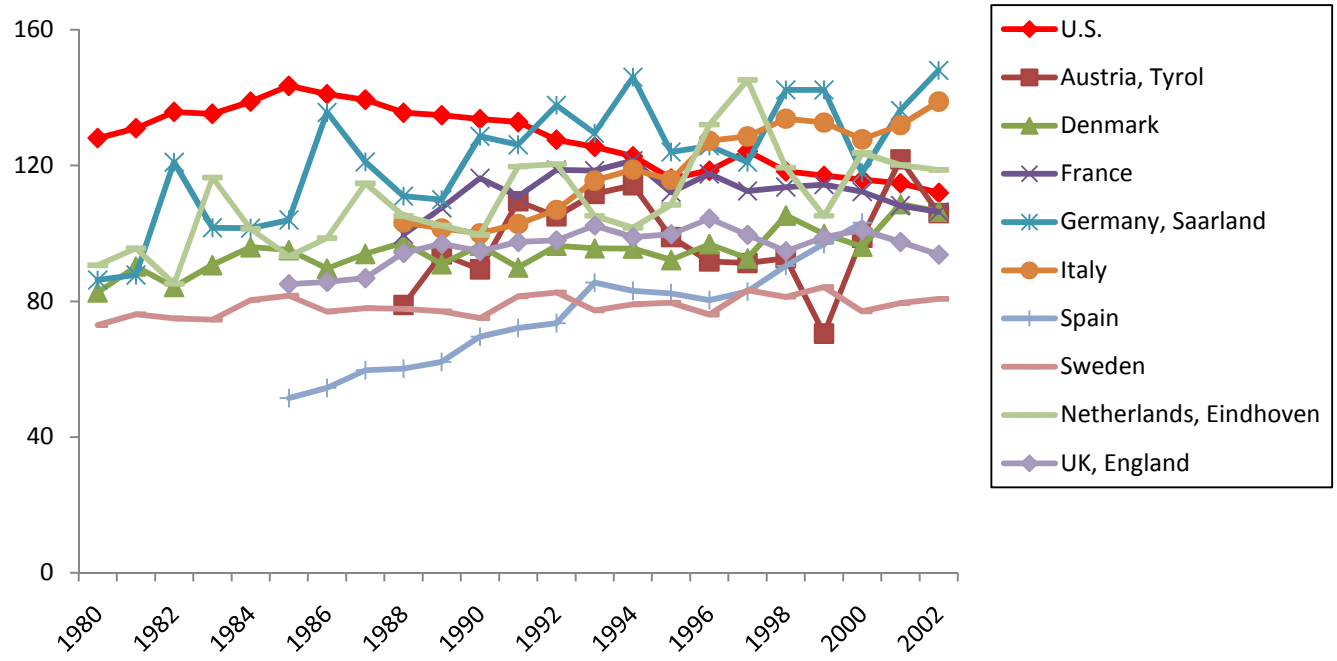
Source: Ferlay et al., Cancer Incidence in Five Continents, Volumes I to IX: IARC CancerBase No. 9 [Internet]. Lyon, France: International Agency for Research on Cancer; 2010. Available from: http://ci5.iarc.fr

Figure 2. Age-Standardized Prostate Cancer Incidence among Men 50+, 1980-2002



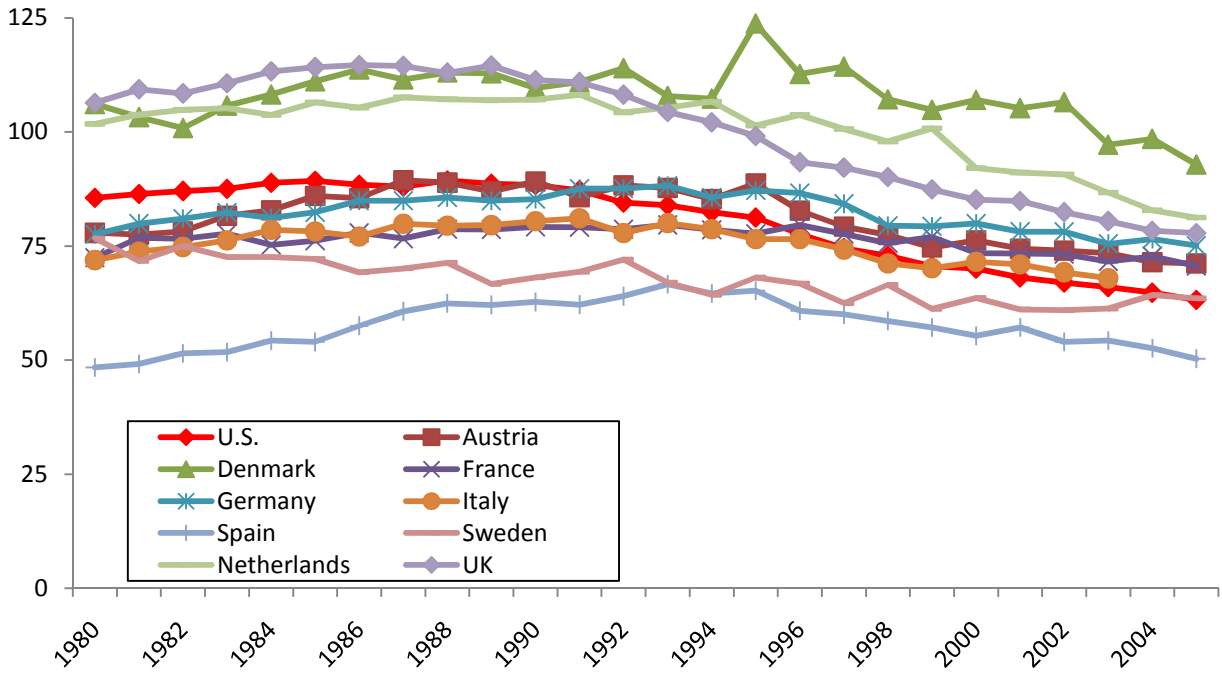
Source: Ferlay et al., Cancer Incidence in Five Continents, Volumes I to IX: IARC CancerBase No. 9 [Internet]. Lyon, France: International Agency for Research on Cancer; 2010. Available from: http://ci5.iarc.fr

Figure 3. Age-Standardized Colon Cancer Incidence among Men 50+, 1980-2002



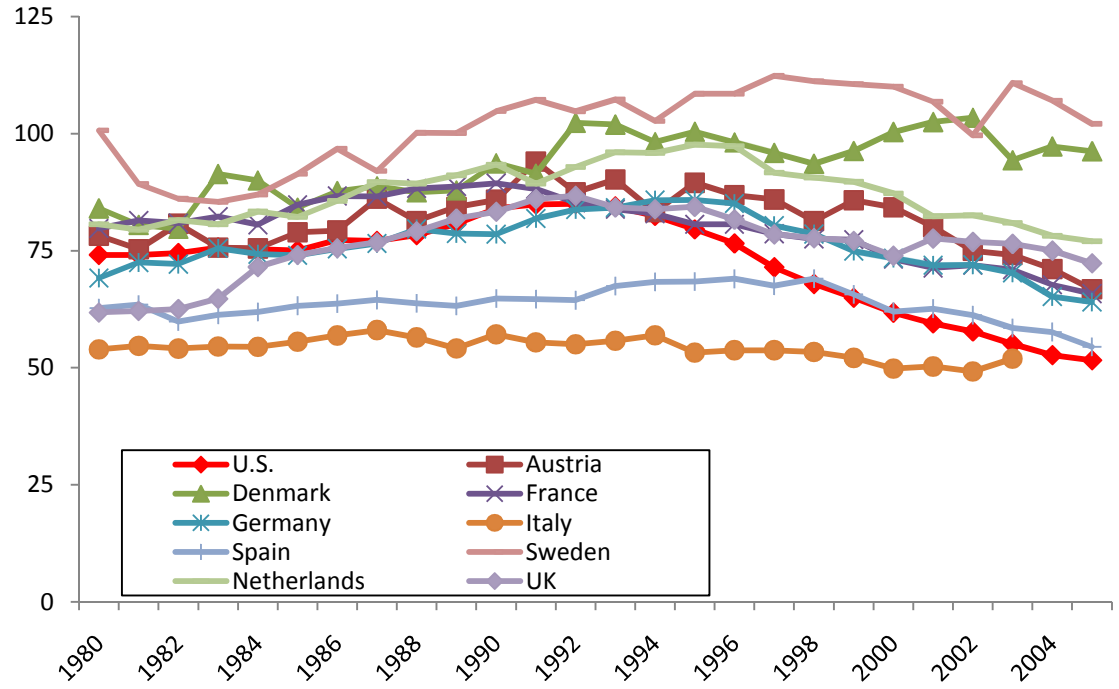
Source: Ferlay et al., Cancer Incidence in Five Continents, Volumes I to IX: IARC CancerBase No. 9 [Internet]. Lyon, France: International Agency for Research on Cancer; 2010. Available from: http://ci5.iarc.fr

Figure 4. Breast Cancer Mortality among Women 50+, 1980-2005



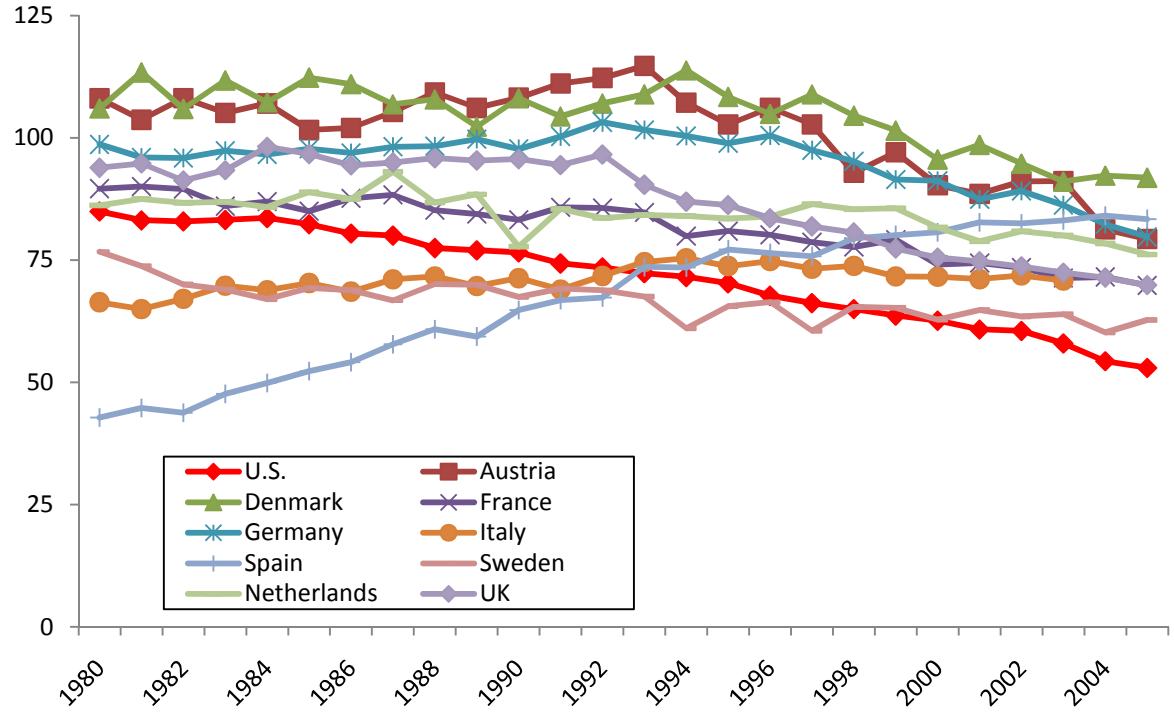
Source: WHO Mortality Database [http://www.encr.com.fr]

Figure 5. Prostate Cancer Mortality among Men 50+, 1980-2005



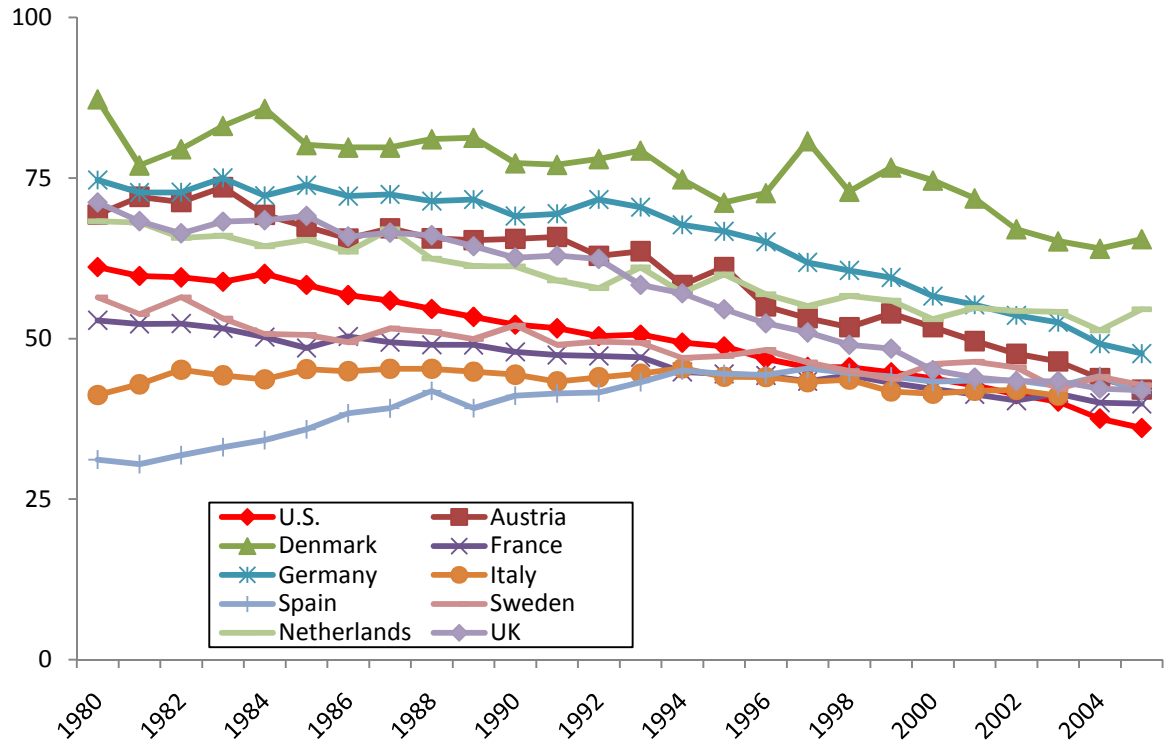
Source: WHO Mortality Database [http://www.encr.com.fr]

Figure 6. Colorectal Cancer Mortality among Men 50+, 1980-2005



Source: WHO Mortality Database [http://www.encr.com.fr]

Figure 7. Colorectal Cancer Mortality among Women 50+, 1980-2005



Source: WHO Mortality Database [http://www.encr.com.fr]

Table 1. Breast Cancer Mortality among Women ages 50+, 1980-2005

	Mortality Change (%)		
	Annual		Overall
	1980-1989	1990-2005	1980-2005
Austria	1.6	-1.4	-8.6
Denmark	0.7	-1.0	-12.5
France	0.5	-0.7	-2.5
Germany	0.8	-1.0	-3.2
Italy	1.1	-1.4	-5.5
Spain	2.9	-1.4	3.9
Sweden	-0.8	-0.8	-17.2
Netherlands	*0.3	-1.7	-20.1
U.K.	0.6	-2.5	-26.8
U.S.	0.4	-2.2	-26.1

* AAPC is statistically insignificant (two-sided $p > 0.05$).

Source: WHO Mortality Database [http://www.encr.com.fr]

Table 2. Prostate Cancer Mortality among Men ages 50+, 1980-2005

	Mortality Change (%)		
	Annual		Overall
	1980-1989	1990-2005	1980-2005
Austria	1.6	-1.7	-14.6
Denmark	1.5	*0.3	14.5
France	1.2	-1.9	-17.4
Germany	1.4	-1.5	-7.4
Italy	0.5	-1.0	-3.6
Spain	0.6	-1.1	-13.2
Sweden	*0.2	*0.1	1.4
Netherlands	1.4	-1.2	-4.5
U.K.	3.2	-0.9	17.0
U.S.	1.0	-3.2	-30.4

* AAPC is statistically insignificant (two-sided $p > 0.05$).

Source: WHO Mortality Database [http://www.encr.com.fr]

Table 3. Colorectal Cancer Mortality among 50+, 1980-2005

	Mortality Change (%)		
	Annual		Overall
	1980-1989	1990-2005	1980-2005
Males			
Austria	0.5	-1.9	-26.6
Denmark	*-0.1	-1.2	-13.3
France	-0.4	-1.3	-22.1
Germany	0.4	-1.4	-19.2
Italy	0.8	*-0.1	6.7
Spain	4.2	1.9	94.8
Sweden	-0.6	-0.6	-18.2
Netherlands	-0.4	-0.4	-11.7
U.K.	*0.3	-2.2	-25.6
U.S.	-1.0	-2.4	-37.6
Females			
Austria	-1.0	-2.7	-39.3
Denmark	-0.9	-0.9	-25.0
France	-1.2	-1.2	-24.6
Germany	-0.5	-2.5	-36.2
Italy	*0.9	-0.6	-0.2
Spain	3.5	*0.2	33.2
Sweden	-1.0	-1.0	-24.2
Netherlands	-1.1	-1.1	-20.1
U.K.	*-1.1	-2.7	-41.1
U.S.	-1.3	-2.5	-41.0

* AAPC is statistically insignificant (two-sided $p > 0.05$).

Source: WHO Mortality Database [http://www.encr.com.fr]