A Tale of Two Diseases:

Trends in Heart Disease and Cancer Death Rates, 1980-2010

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ABSTRACT

Context: Trends in death rates are an important measure of public health progress in the United States. Despite advances in prevention and treatment, heart disease and cancer continue to be the first and second leading causes of death, respectively, responsible for half of all deaths in 2005.

Objective: To describe national trends in heart disease and cancer death rates for the past 25 years in the U.S., by sex, age group and state and project rates to the year 2010.

Design: Twenty-five years of mortality data (1980 to 2005) from the U.S. were obtained from the Centers for Disease Control and Prevention's WONDER database. Rates were calculated by cause of death, sex, age, and state. Death rates were age-adjusted to the 2000 U.S. population, and were projected to 2010 for the U.S. and all fifty states using linear regression of the trends from 1996-2005.

Results: From 1980 to 2005, heart disease death rates declined 49%, compared to only a 12% decline in cancer death rates. If these trends continue, cancer will become the leading cause of death in the U.S. in 2010. Heart disease death rates declined in all ages, whereas cancer death rates declined only for those under 75 years of age. Heart disease and cancer death rates declined more for men than for women overall and nearly every age group. The year in which cancer becomes the leading cause of death varies among states, from as early as 2000 in Minnesota to as late as 2022 for Alabama.

Conclusion: The clear and compelling progress in decreasing heart disease death rates over the past 25 years contrasts with a relative lack of progress in reducing cancer death rates. The nation needs to redouble its efforts toward cancer prevention, early detection, and treatment for women and men of all ages.

BACKGROUND

Death rates are an important measure of the burden of preventable diseases in the nation (1). One common measure used to portray priority health problems is the National Center for Health Statistics' "Ten Leading Causes of Death" (2). For the past century in the United States, heart disease and cancer have been the first and second leading causes of death, respectively (3). However, progress in prevention, early detection, and treatment of heart disease and cancer has varied significantly over the past 50 years overall, and by sex, age group, race, and region (4-7).

The 2005 National Vital Statistics Report, published in April 2008, reported that although heart disease continues to be the leading cause of death—with cancer as the second leading cause—the gap is narrowing (8). This paper describes trends in heart disease and cancer death rates over the past 25 years in the United States and by state, for men and women in each age group, and considers what this portends for the future.

METHODS

Data source

Data were obtained from the Compressed Mortality File produced by the Centers for Disease Control and Prevention (CDC) using the WONDER database (9,10). The database contains county-level national mortality and population data from 1968 to 2005. Data from 1980 to 1998 were categorized using the Ninth Revision of the International Classification of Disease (ICD-9) (11) for diseases of the heart (ICD 390-398, 402, 404, 410-429) and malignant neoplasms (ICD-140-208). Data from 1999 to 2005 were obtained using ICD codes from the Tenth Revision (ICD-10) (12) for diseases of the heart (I00-I09, I11, I13, I20-I51) and for malignant neoplasms (C00-C97).

Statistical Analysis

Death rates (per 100,000 population) were calculated for diseases of the heart and malignant neoplasms from 1980 to 2005. Death rates were age-adjusted to the 2000 U.S. standard population and grouped by sex, calendar year, and age group by 10-year age intervals, ages 35 and older. Data from 1980 to 2005 was presented using three-year moving average trend lines (e.g., 1980-1982, 1981-1983, etc.), and projected five years (to 2010) using linear regression to extrapolate the trends of the past ten years (1996-2005) (13,14).

RESULTS

Trends in U.S. Death Rates

Age-adjusted death rates for heart disease and cancer in the U.S. from 1980 to 2005 are presented in Figure 1. From 1980 to 2005, age-adjusted heart disease death rates decreased 49%, from 412 to 211 deaths per 100,000 persons. In contrast, cancer death rates declined only 12%, from 208 to 184 deaths per 100,000. If these trends continue, cancer will become the leading cause of death for the United States in 2010.

Trends by Age Group

Death rates are presented by 10-year age groups and cause of death in Figure 2. Heart disease death rates declined for all age groups between 1980 and 2005, although these rates of decline have slowed more recently for those under the age of 55. Cancer death rates have declined steadily for those 35-54 years of age, but only since about 1990 for those 55-74 years of age. In contrast, cancer death rates increased from 1980 to about 2000 for those ages 75 and older, with only slight declines since 2000. Heart disease death rates declined at a greater rate than cancer death rates in every age group (Table 1).

Cancer has been the leading cause of death since at least 1980 for those aged 35-54, and became the leading cause of death for those ages 55-64 in 1985 and ages 65-74 in 1992. Cancer is projected to become the leading cause of death for those ages 75-84 in 2009, but not until 2027 for those ages 85 and older.

Trends by Sex

Among women, the heart disease death rates declined by 46% from 1980 to 2005, compared to only a 7% decline for the cancer death rate. Heart disease death rates declined for women of all ages, whereas cancer death rates declined only for those women under the age of 65. By 2005, cancer became the leading cause of death for women 35-74 years old.

Among men, the heart disease death rates declined by 52% from 1980 to 2005, compared to only a 17% decline for the cancer death rate. Heart disease death rates declined for men of all ages. Although cancer death rates declined for men of all ages, the rate of decline was less than that for heart disease in every age group. Similar to women, by 2005, cancer was the leading cause of death for men 35-74 years old.

Trends by State

By 2005, cancer became the leading cause of death in eight states: Alaska, Maine, Massachusetts, Minnesota, Montana, New Hampshire, Oregon, and Washington (Figure 3). The first state to make the transition was Minnesota in 2000, followed a year later by Alaska, Montana, and Oregon.

DISCUSSION

Cancer will become the leading cause of death in the United States in 2010 if the trends from 1996 to 2005 continue for the next 5 years. The compelling progress in decreasing heart disease death rates over the past 25 years is contrasted with a relative lack of progress in reducing cancer death rates. By 2010, cancer death rates will be higher than heart disease death rates in all 10-year age groups under the age of 85. Heart disease death rates have decreased faster than cancer death rates for all age groups, for both men and women between 1980 and 2005. By 2010, 30 states are projected to experience a crossover between heart disease and cancer as the leading cause of death.

Heart disease death rates have declined significantly because of improvements in prevention and treatment. The initial decrease in heart disease death rates from the 1950s to the 1980s was due to a reduction in risk factors, such as hypertension, smoking, hypercholesterolemia, and physical inactivity (7,15). In the 1980s, further reductions were achieved through secondary prevention, by reducing the risk of death among those who already had a heart attack using drugs, invasive cardiac procedures and other treatments (16). According to a recent study, 47% of the total reduction in cardiovascular death rates was due to secondary prevention and 44% was due to primary prevention through the reduction in risk factors (7).

In contrast to the declines in heart disease deaths, cancer death rates increased from the 1950s to about 1990, and have declined about 1% per year since then. Most of this recent reduction has been due to improved prevention, early detection, and treatment of a select group of cancers: lung, prostate, and colorectal in men and breast and colorectal in women (17). However, these

encouraging declines have been offset by increases in other cancers, such as lung cancer in women, liver cancer, and Non-Hodgkin's lymphoma.

The greater progress in reducing cancer and heart disease deaths among men, compared with women, observed in this study has been reported previously (18). Reasons for these differences may include difference in the trends of disease risk factors (19) and disease treatment, such as lower rates of referral for invasive procedures (20) or under-representation in clinical trials (21). Many studies have shown ethnic disparities in death rates (6,22,23). Socioeconomic and educational-level disparities in death rates, and in death rate changes, have also been well-documented (6,22).

This study is subject to several limitations. Death certificate coding is not always an accurate description of cause of death (24,25). Also, ICD codes for this study were chosen to comply with the National Vital Statistics Report's breakdown of diseases of heart and malignant neoplasm death rates. These analyses included heart diseases such as rheumatic heart disease, pulmonary embolism, acute pericarditis, and endocarditis, all of which have different risk factors and treatments compared with ischemic heart disease. Finally, it examined only the underlying cause of death, and did not include the contribution of cancer and heart disease as contributing causes of death.

In addition, our projections for the U.S. and each state are based on the assumption that trends over the 10-year period from 1996 to 2005 will continue through 2010. Some have predicted that death rates may plateau due to an increase in obesity or a lack of new secondary preventions

(26). In addition, we did not examine the underlying reasons for state-specific variation in when cancer is predicted to become the leading cause of death (e.g., greater progress in reducing heart disease deaths versus less progress in reducing cancer deaths).

This information may be used in public health practice in several ways. It is a call to action to redouble efforts to reduce cancer death rates. The American Cancer Society set a goal to reduce cancer deaths by 50% between 1990 and 2015 (27). However, it has been estimated that this goal will only be half achieved by that time (28). Efforts must focus on cancer prevention by significantly reducing tobacco use, improving diet and physical activity patterns, and reducing disparities in the population. In contrast to heart disease, cancer treatments are more expensive, more rigorous, and less effective. Epstein and others have called for a change in approach from one of a "damage control mindset" focused on screening, diagnosis, and treatment of people who already have the disease—to one with a focus on prevention (29,30).

In conclusion, the giant strides that have been made to decrease heart disease death rates over the past several decades—contrasted with the modest declines in cancer death rates—will cause cancer to soon become the leading cause of death throughout the United States. This information should be used within each state and community to promote evidence-based cancer prevention, early detection, and treatment programs and policies. Successes in health and health care, such as the dramatic reductions in heart disease deaths, lead to new challenges and opportunities to redouble our cancer control efforts.

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Supervision: Dr. Remington, Dr. Jones

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Table: Heart disease, cancer, and all-cause death rates and trends, by sex and age, 1980 to 2005, United States

	Death Rates#, 1980		Death Rates#, 2005		% change, 1980-2005	
	Cause of death		Cause of death		Cause of death	
Age/Sex	Cancer	Heart dis.	Cancer	Heart dis.	Cancer	Heart dis.
Women						
35-44	53	21	38	17	-28%	-19%
45-54	172	85	116	49	-33%	-42%
55-64	362	272	287	129	-21%	-53%
65-74	607	829	611	373	1%	-55%
75-84	903	2,497	1,020	1,211	13%	-52%
85+	1,256	7,351	1,325	4,611	5%	-37%
All ages*	**167**	**321**	**156**	**172**	**-7%**	**-46%**
Men						
35-44	44	69	29	41	-34%	-41%
45-54	189	283	122	132	-35%	-53%
55-64	521	747	370	307	-29%	-59%
65-74	1,093	1,728	899	692	-18%	-60%
75-84	1,791	3,834	1,650	1,829	-8%	-52%
85+	2,370	8,753	2,319	5,143	-2%	-41%
All ages*	**271**	**539**	**225**	**261**	**-17%**	**-52%**
Both genders						
35-44	49	45	33	29	-33%	-36%
45-54	180	180	119	90	-34%	-50%
55-64	436	494	327	215	-25%	-56%
65-74	818	1,219	743	519	-9%	-57%
75-84	1,232	2,993	1,275	1,461	3%	-51%
85+	1,595	7,777	1,638	4,778	3%	-39%
All ages*	**208**	**412**	**184**	**211**	**-12%**	**-49%**

*Age-adjusted to the 2000 US population
#Per 100,000 persons

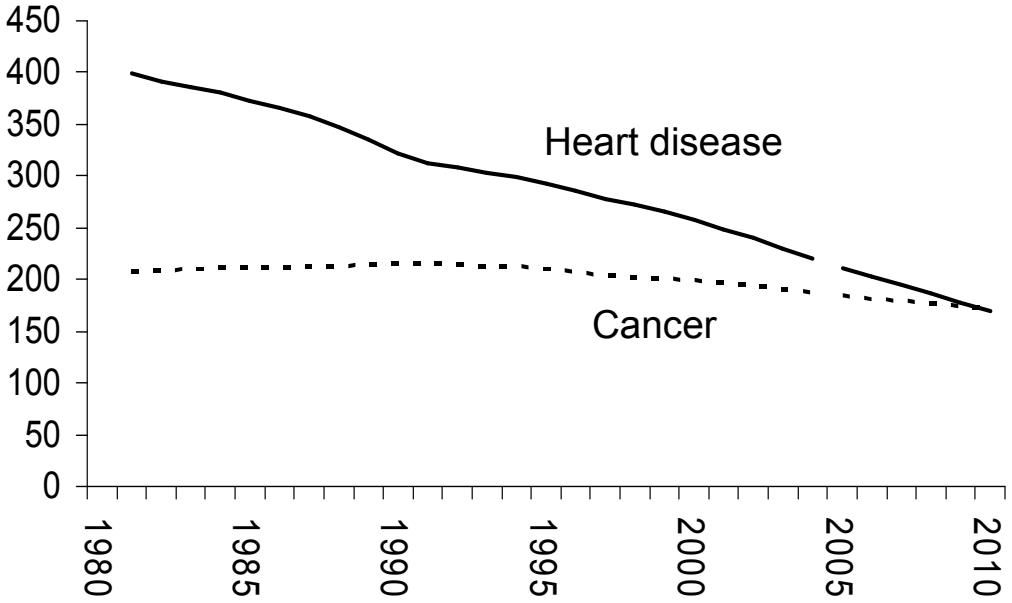
FIGURE LEGENDS

Figure 1: Trends in age-adjusted heart disease and cancer death rates per 100,000 population, 1980-2005 and projected from 2006-2010.

Figure 2: Trends in age-specific heart disease and cancer death rates per 100,000, 1980-2005 and projected from 2006-2010.

Figure 3: The year cancer becomes the leading cause of death in the 50 states. Each state is identified by its two-letter abbreviation within a box.

Figure 1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Heart disease
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Figure 2

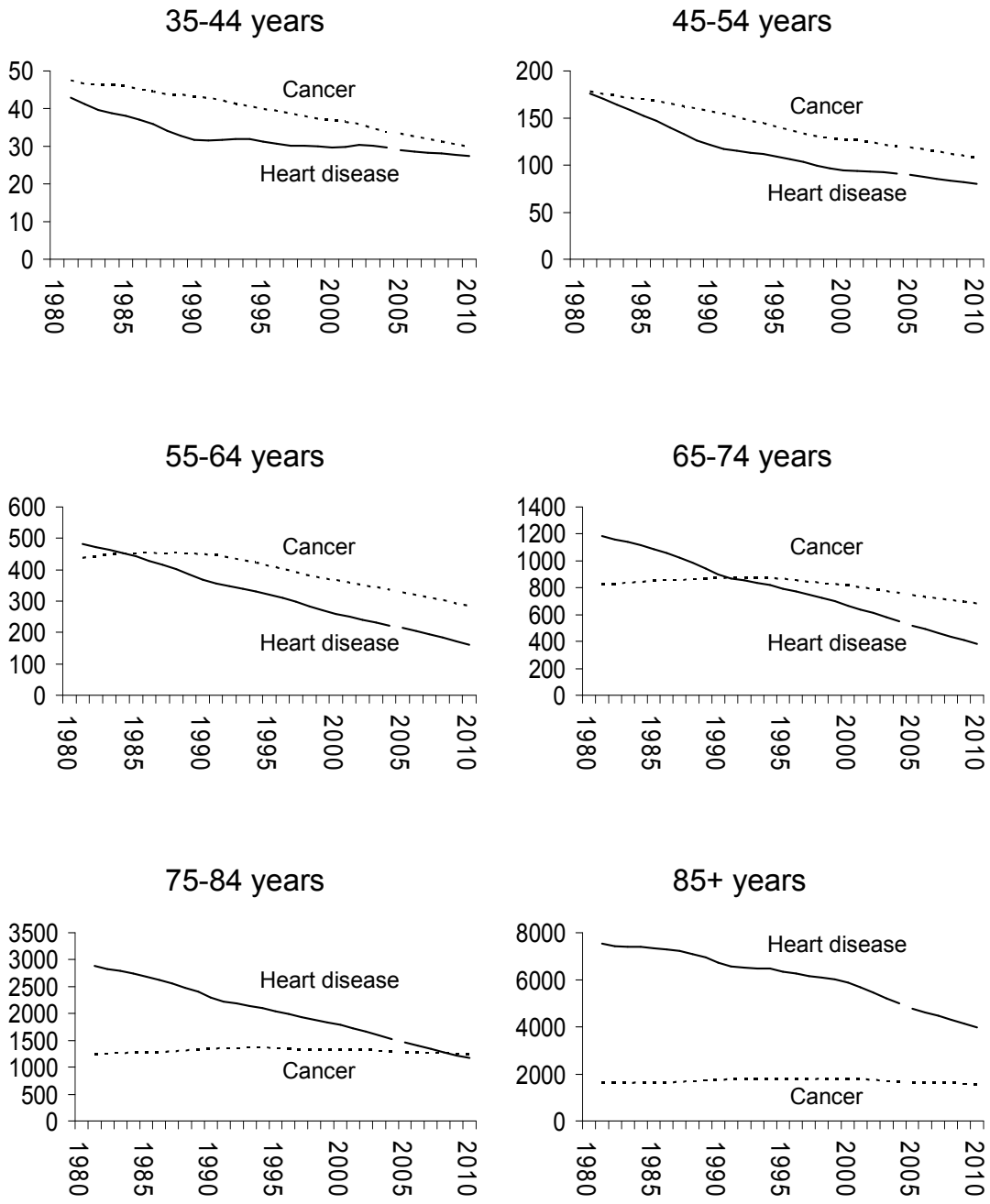
35-44 years
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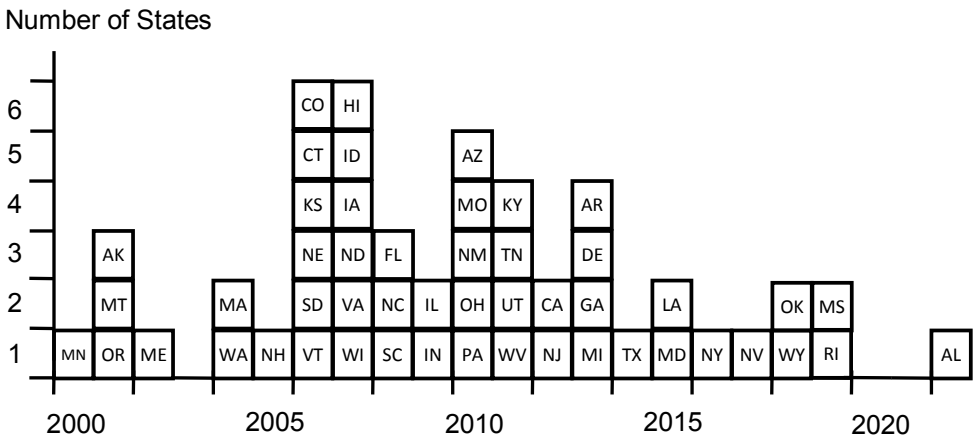
Figure 3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