SUMMARY. This paper examines gender differences in life with and without six major diseases, including both mortal and morbid conditions. Disease prevalence and health behavior data are from the 1993-1995 National Health Interview Surveys for the United States. Vital registration data are the source of mortality rates used in computing life expectancy. The Sullivan method is used to estimate life lived with and without disease and risky behavior for men and women at various ages. Women live more years with each of the diseases examined, and, for arthritis, the extended years with disease are greatest. Women also live more years than men free of each of these diseases with the exception of arthritis. Gender differences in life without two health-risk behaviors are also discussed. Men spend more years of their lives overweight and have fewer years during which they see a doctor. [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address:]

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KEYWORDS. Healthy life expectancy, chronic diseases, gender differences

INTRODUCTION

Most research on active life expectancy has focused on life with and without disability (Branch et al., 1991; Crimmins et al., 1996, 1997; Crimmins and Saito, 2001; Manton and Stallard, 1991). This paper moves further back in the process of health change to examine gender differences in life with and without major diseases and differences in years with two health risk behaviors. A number of national and international groups have recognized the value of multiple approaches to measuring healthy life expectancy based on the multiple dimensions of health (World Health Organization, 1984). One reason to focus on diseases is that these are the conditions that often underlie disability and are the ultimate causes of death (Verbrugge and Jette, 1994). An additional reason for the focus on disease is that most medical care is directed at the treatment of underlying diseases; thus, the length of time lived with diagnosed disease is one factor determining the use of medical care, particularly prescription drugs. Gender differences in the length of healthy and diseased lives have implications for differential quality of life as well as resource utilization. Gender differences in the length of life with health risks are important in pointing to potential explanations for differential health outcomes.

BACKGROUND

Men and women have different patterns of both mortality and disease experience. The mortality of men exceeds the mortality of women at every age (National Center for Health Statistics, 1996). There are also marked gender differences in the age-specific pattern of disease prevalence. Men have higher prevalences of what can be termed mortal conditions like heart disease, while women are more likely to have higher prevalences of morbid conditions like arthritis (Verbrugge, 1986, 1989, 1990). Gender differences in disease presence and mortality are explained by a combina-
tion of social, behavioral, psychological, and biological factors (Nathanson, 1984).

How these factors combine to produce healthy and diseased life expectancy is the subject of this paper. Any state of health can be used as a basis for computing healthy life expectancy—years without some adverse health state. Estimates of life with and without disability have generally shown that women’s generally longer life consists of more years without disability, as well as more with disability (Branch et al., 1991; Crimmins et al., 1996; Hayward and Heron, 1999; Manton and Stallard, 1991). Differential mortality resulting in longer lives for women rather than a higher incidence of disability among women is the reason older women spend more years with disability (Crimmins et al., 1996).

Disability is an indicator of one dimension of health, the ability to perform socially accepted roles. Disability is also an end point in a process which often begins with the onset of disease (Verbrugge and Jette, 1994). Measures of the length of life with and without disease provide an additional indicator of how gender differences in health cumulate over the life cycle. Knowledge of differential disease burden in the population is very useful for health planners because most health treatment is disease-based. Major chronic diseases increasingly are treated pharmaceutically from the time of diagnosis until the time of death. Knowing how many years of treatment are likely to be required after diagnosis and being able to estimate how this would change with change in mortality rates or treatment and prevention provide valuable tools for health planners.

**DATA AND METHODS**

Data on the age-specific prevalence of diseases and health conditions come from the 1993-1995 U.S. National Health Interview Surveys. This is an annual survey designed to provide information on the nation’s health and health care usage. Disease prevalence is determined by dividing the sample into six parts and asking one sixth of the sample about a set of diseases representing one bodily system; thus people were not asked about multiple systems. In order to make the sample large enough for stable age-specific disease prevalence estimates, information on the prevalence of diseases is based on respondents from 1993, 1994, and 1995 surveys. In each of the years, the sample was more than 100,000 persons from almost 50,000 households. This annual sample is representative of community-dwelling persons in the United States (Adams and Marano, 1995).
The questions used to estimate disease prevalence take the forms, “Has anyone in the family ever had hypertension (heart disease)” or “During the last 12 months has anyone had asthma (bronchitis or emphysema, diabetes, arthritis)” (Adams and Marano, 1995). We examine differences in the length of life with six diseases or conditions: heart disease, diabetes, hypertension, asthma, bronchitis/emphysema, and arthritis. These diseases were chosen because they are major causes of mortality and morbidity. The age-specific disease prevalences for 5-year age groups used here were determined using individual level data for those 30 and above and published data for those less than 30. In addition to information on diseases, we also include information on height and weight and on the use of medical care which is collected in the 1994 survey. We use this information to determine the age-specific prevalence of being overweight and not using medical care in the past year. We define overweight as a body/mass index of greater than or equal to 25 (National Institutes of Health, 1998).

Years with and without diseases and these health risks are calculated by linking the age-specific prevalence of health states to life table estimates of the length of life lived in each age group for men and women. Information on age-sex mortality comes from the Vital Registration System (National Center for Health Statistics, 1996). The Sullivan method of constructing health expectancy is used along with software developed by Jagger (1999). This method is a cross-sectional approach which uses estimates of the prevalence of health problems at each age to weight life table estimates of years lived in each age interval into years lived with healthy and unhealthy life. For this analysis, life is divided into years with no disease or health risk and years with disease or health risk. The standard error of the estimates is used to determine whether there are gender differences in the length of healthy and unhealthy life.

**RESULTS**

*The prevalence of disease.* The age-specific prevalences of diseases for men and women are shown in Figures 1a, b, and c. Figure 1a shows the prevalence of diseases that are not very age-related: asthma and bronchitis and emphysema. In fact, asthma prevalence is highest at the younger ages and lowest among the oldest members of the population. This is a cohort rather than an age difference and reflects the worldwide increase in asthma in recent decades (Anderson et al., 1994). Women have slightly higher rates of asthma than men at almost all ages. Bronchitis and emphysema prevalence is fairly constant across the early part of the age range,
but increases at late middle age to peak among those in their 60s. Women report more bronchitis and emphysema than men at all ages up to 75. The prevalence of bronchitis and emphysema is lower at the oldest ages for women. This is likely to reflect the increased mortality among those with these conditions.

Diabetes and hypertension (Figure 1b), heart disease and arthritis (Figure 1c) are diseases that are more age-related. Diabetes reaches prevalence levels of just over 12 percent for those in their 70s, while the other conditions reach levels of about 30 to 55 percent in old age. Diabetes and hypertension peak among those in their 70s and heart disease and arthritis among the oldest group, those in their 80s. The age-specific prevalence of diabetes is fairly similar for men and women across the age range. Women have a higher prevalence of arthritis at all ages; whereas men have a higher prevalence of heart disease at all ages over 50; on the other hand, women have a higher prevalence of hypertension after 55.

Mortality. Gender differences in age-specific survival based on the 1994 mortality rates are shown in Figure 2. The survival curve for women is above that of men indicating that a greater proportion of women in a cohort survives to each age. By age 76, only half of the original cohort of men is alive; the corresponding age for women is 82. The difference between the two survival curves reflects the longer life of women.
Life with disease. In Table 1, information is provided on total expected years of life at birth and at age 65, as well as life with and without major diseases for both men and women. The size of the gender gap along with the significance of the difference is also indicated. In 1994 in the United States, the average length of life without heart disease is 69 and the aver-
age number of years lived with heart disease is 6.7. Men live 6.3 years with heart disease while women spend 6.8 years with this condition. Looking at life without disease indicates that women have an age of heart disease onset almost 6 years later than that of men.

Arthritis is the condition that affects the total population the longest. Arthritis is a disease for which both men and women have an average age of onset of about 64; however, because women spend the rest of their longer lifespan with arthritis, the years lived with arthritis for women are almost double those of men (15.2 versus 8.8). Hypertension is the condition affecting men longer than any other condition, yet women live longer with hypertension than men. Women would require 12 years of monitoring or treatment for hypertension and men only 9.

The diseases which are not strongly associated with age—asthma and bronchitis/emphysema—have smaller gender differences in the length of diseased life. Women live just over 1.5 years longer with both of these conditions. Because diabetes prevalence is relatively low even at the older ages and fairly similar for men and women, the years spent with diabetes over the life cycle only differ by 0.7 for men and women. Women still live more years on average with diabetes.

At age 65 there is no gender difference in the length of life with either heart disease or bronchitis and emphysema. Women live longer with each
of the other diseases in old age. Women live longer after age 65 without each of these conditions except arthritis.

Life with health risks. Lifetime differences in health risk for men and women can also be expressed in terms of years lived with and without risky behavior. Expected years with and without a doctor visit along with
years overweight, and not overweight are shown for men and women in the U.S. population in 1994 (Table 2). Both lack of medical care and obesity are risk factors for poor health outcomes including both disease onset, disability, and death. Until age 75, men are less likely to see a doctor than women (Kramarow et al., 1999). Summary indicators show that even though men live an average about 6 years less than women, they average 20 years during their lives with no doctor visit, while for women only 14 years are without a doctor visit. If an annual doctor visit is a health goal, this measure clearly indicates the gap between the current state and the goal for men. After age 65 the gender difference changes: the number of years men and women do not see a doctor is similar but for women the years with a doctor visit are greater. Both men and women see a doctor during most of the years lived after age 65. Because women live longer than men, their number of years with a doctor visit is greater.

### TABLE 2. Life Expectancy With and Without at Least One Doctor Visit per Year; Expected Life Obese and Not Obese: At Birth, Ages 20 and 65 (Standard Error in Parentheses)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Expected Life at Birth</strong></td>
<td>75.7</td>
<td>72.6</td>
<td>78.8</td>
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<tr>
<td>With a Doctor Visit</td>
<td>58.8 (.08)</td>
<td>52.4 (.12)</td>
<td>65.2 (.10)</td>
<td>**</td>
</tr>
<tr>
<td>Without a Doctor Visit</td>
<td>16.9 (.08)</td>
<td>20.2 (.12)</td>
<td>13.6 (.10)</td>
<td>**</td>
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<tr>
<td><strong>Total Expected Life at Age 20</strong></td>
<td>56.9</td>
<td>53.9</td>
<td>59.7</td>
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<tr>
<td>With BMI ≥ 25</td>
<td>29.1 (.10)</td>
<td>32.2 (.14)</td>
<td>25.8 (.14)</td>
<td>**</td>
</tr>
<tr>
<td>With BMI &lt; 25</td>
<td>27.8 (.10)</td>
<td>21.7 (.14)</td>
<td>33.9 (.14)</td>
<td>**</td>
</tr>
<tr>
<td><strong>Total Expected Life at Age 65</strong></td>
<td>17.4</td>
<td>15.8</td>
<td>18.8</td>
<td></td>
</tr>
<tr>
<td>With a Doctor Visit</td>
<td>15.3 (.05)</td>
<td>13.6 (.07)</td>
<td>16.7 (.07)</td>
<td>*</td>
</tr>
<tr>
<td>Without a Doctor Visit</td>
<td>2.1 (.05)</td>
<td>2.2 (.07)</td>
<td>2.1 (.07)</td>
<td></td>
</tr>
<tr>
<td>With BMI ≥ 25</td>
<td>8.7 (.07)</td>
<td>8.6 (.10)</td>
<td>8.8 (.10)</td>
<td>**</td>
</tr>
<tr>
<td>With BMI &lt; 25</td>
<td>8.7 (.07)</td>
<td>7.2 (.10)</td>
<td>10.0 (.10)</td>
<td>**</td>
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</tbody>
</table>

*p < .05, **p < .001
Men spend a greater number of years and proportion of their lives overweight than women. On average American men spend 32 years or 60 percent of their lives after age 20 with a body/mass index higher than 25. On average women spend fewer years, 26 years, and a smaller percentage, 43 percent, of their adult lives overweight. The number of years men and women spent being overweight is the same after age 65. Both women and men spend about 9 years after age 65, in the overweight state.

**DISCUSSION**

Gender differences in the length of life with disease exist for all conditions examined. Women spend more years on average with each of these diseases. Because men have a higher prevalence of heart disease in middle and the young old ages and higher mortality rates, cardiovascular disease has been thought to be a men’s problem. When a life expectancy approach is used, however, women live more years on average with heart disease than men do. This makes heart disease a major problem for women as well as men. Of course, the problem for men is that they do not live long enough with their heart disease but rather they die from it. If women experienced the higher mortality rates of men, they would only spend 5.6 years with heart disease which would be less than the time spent by men. This is one indication of how the longer lives lived by women are the reason they live more years with some diseases.

This is also true for diabetes. If men and women had the same level of mortality, that of men in 1994, they would live 2.7 and 2.8 years with diabetes. It is women’s additional life span that adds 0.7 years to their average length of life with diabetes.

While heart disease is thought to be a problem for men, arthritis is thought to be a woman’s problem. Indeed, for women, the expected length of life with arthritis is more than twice as long as life spent with heart disease. However, even for men, the length of life with arthritis is longer than with heart disease. Hypertension is the only condition men live with longer than arthritis. The life cycle approach provided by health expectancy measures provides a different perspective on the relative importance of disease from that derived from gender differences in prevalence or incidence rates.

For both genders, the lifetime importance of asthma and bronchitis and emphysema is shown by the health expectancy figures. While these diseases are less common than the others in the population at older ages, they are higher at younger ages. Because most people with these conditions ac-
quire them in younger life, the lifetime accumulation in years represented by the life cycle approach indicates their importance as a population health problem.

The health expectancy approach is also useful in demonstrating the cumulative lifetime pattern of poor health behaviors. Both men and women spend too many years overweight and without medical care in the United States. However, the years with health risks for men exceed those for women. Men and women might need to be targeted separately in campaigns to improve their adherence to recommended behaviors for self care and prevention.

The life expectancy approach gives some idea of the likely cumulative effect of these health risks for projected individual lifespans. Other columns of the lifetable provide information which may be more relevant from a population or public health perspective. Table 3 shows the years lived with three diseases after ages 65 and 85 for cohorts of 100,000 men and women at birth. The difference between years lived and the life expectancy measure is that life expectancy is years per person while the years lived reflects the number of persons as well as how long each lives. Because more women survive to older ages, the gender differences in years lived with disease are even greater than those in life expectancy. A cohort of women will experience 70 percent more years of life after age 65 with hypertension than a similarly sized birth cohort of men. After age 85, the cohort of women lives more than three times as many years with hypertension. While the gender differences in heart disease are somewhat smaller than in hypertension, more years will be spent with heart disease among a group of older women than older men. This means that the modal patient undergoing treatment for cardiovascular conditions is likely to be a woman. The population importance of arthritis is evidenced by the fact

<table>
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<th></th>
<th>85+</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Hypertension</td>
<td>380,500</td>
<td>649,200</td>
<td>30,100</td>
<td>98,900</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>332,100</td>
<td>362,900</td>
<td>47,900</td>
<td>71,500</td>
</tr>
<tr>
<td>Arthritis</td>
<td>464,800</td>
<td>842,200</td>
<td>59,900</td>
<td>139,000</td>
</tr>
</tbody>
</table>

TABLE 3. Number of Years Lived with Disease After Age 65 and After Age 85 by Birth Cohorts of 100,000 Men and Women
that a cohort of 100,000 women will spend almost a million years with arthritis after age 65. For a similarly sized cohort of men, half a million arthritic years will be lived. These numbers indicate the reason behind the growing demands for medical care for conditions that are highly age-related.

Disease-specific life expectancy does not have direct policy implications without considering both the adverse consequences of disease presence and the potential for eliminating either the disease or its consequences. Most of the people diagnosed with the diseases listed here would be recommended for treatment or monitoring. For instance, treatment to reduce pain and improve mobility is usually recommended for arthritis. This treatment is relatively inexpensive and should lead to reductions in associated disability. Clearly, improvements in arthritis treatment or prevention will benefit women more than men.

Once a person has been diagnosed with hypertension, drug treatment is commonly prescribed. In fact, recently, there has been discussion of lowering the blood pressure level at which drug treatment is recommended for older people. After age 65, women spend about 50 percent more time with hypertension than men. This means that expenditures for drugs to treat this condition are likely to be more for women. Coverage of drugs under Medicare would thus improve the ability of women to cope with this condition more than men.

REFERENCES


