

# Longer Life but Worsening Health? Trends in Health and Mortality of Middle- aged and Older Persons

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OVER THE PAST DECADE, THE UNITED STATES population has enjoyed rapidly declining mortality rates at all ages and for both sexes. This was an unanticipated phenomenon; it followed two decades (the 1950s and 1960s) of virtually stationary rates for males and slowly declining ones for females. Reasons for the new decline are not known with certainty, but scientists believe that early diagnosis and treatment of life-threatening chronic diseases has been a major factor.

If people's chances of survival improve, especially at middle and older ages, what happens to the health profile of the population? Does it worsen because the people "rescued" from death are ill, and their retention in the living population boosts prevalence rates of chronic conditions?

This article discusses trends in health for middle-aged (45–64) and older (65+) persons in the United States since 1957. The principal data source is the National Health Interview Survey, which covers the noninstitutional population of the United States. Initiated in 1957, the survey now has time series of 20–25 years for indicators of acute and chronic morbidity, restricted activity and bed disability, and long-term limitations from chronic conditions.

The article is organized as follows. First we examine the data and note a worsening health profile for middle-aged and older people, for both the leading fatal diseases and the leading nonfatal conditions. We then state possible reasons for the morbidity trends—namely, increased incidence of chronic diseases, increased awareness by individuals of their health problems, earlier accommodations in activities for health problems, longer duration and greater severity of diseases due to improved survival, increased chances of developing new diseases because of improved survival, changes in institutionalization rates, and changes in survey questions. We evaluate these reasons, especially the possible effects of lower mortality rates on health. Finally, we speculate about the health of middle-aged and older persons in the future and how this will be reflected in health and mortality statistics.

## Data Source

The National Health Interview Survey (NHIS) provides a continuous series of information about the United States population's health since 1957. Annual reports contain rates for acute condition incidence; restricted activity, bed disability, and work loss for acute conditions; restricted activity, bed disability, and work loss for all conditions (acute and chronic combined); and limitations in major or secondary activities due to chronic conditions. Limitation rates for specific chronic conditions are not published annually, but are available for selected years. Since the late 1960s, questions about the presence of specific chronic conditions have been included each year; this permits computation of prevalence rates. In the early 1970s, an item on self-rated health status was also added to the core questionnaire.

In this analysis, we review the following NHIS indicators: self-rated health status, incidence of acute conditions and disability for them, total short-term disability (for acute and chronic conditions combined), limitations due to chronic conditions (in general), and prevalence and limitations for specific chronic conditions.

All NHIS indicators are derived from individuals' reports of their health problems, not from medical records. Thus, factors such as individuals' awareness of a disease and willingness to report known disease enter into incidence and prevalence rates. The National Center for Health Statistics has conducted several studies that compare self-reports of chronic conditions with medical reports (Balamuth 1965;

Madow 1967, 1973). These show both substantial underreporting (conditions in the medical record but not the interview) and overreporting (conditions in the interview but not the medical record). The studies were conducted more than 20 years ago and reporting gaps may be quite different now (possibly smaller?). In any case, NHIS rates should be viewed as a social record of health, different than and not inferior to a medical or clinical record.

## Self-rated Health Status

Middle-aged people rated their health about the same throughout the 1970s. In 1972, 21.5 percent reported "fair" or "poor" health status; in 1979, 21.9 percent (National Center for Health Statistics 1980, 1981). Older people also showed no trend; 31.0 percent reported "fair" or "poor" health in 1972; 31.4 percent in 1979. Percentages for the intervening years were similar to the 1972 and 1979 rates, for both age groups. Thus, there has not been a rapid change in people's evaluation of their health during the 1970s. Because the series is short, we cannot know if self-rated health has changed in the past 25 years. All of the other NHIS indicators we shall review have longer series and virtually all do show trends since the late 1950s.

## Acute Conditions and Associated Disability

Compared to children and young adults, people aged 45 and older experience fewer acute conditions. Incidence rates for men aged 45 and older are now about 110 conditions per 100 persons per year, and for women aged 45 and older they are 150 per 100 persons. More than half of the conditions are respiratory; injuries and "other acute conditions" (such as headache, acute skin and musculoskeletal problems, genitourinary problems) rank next; infective/parasitic diseases and digestive conditions are infrequent.

Since the late 1950s, incidence rates for all acute conditions have declined for men and women aged 45 and older (figure 1). Lower incidence of respiratory conditions largely accounts for this decline. Injury rates have remained constant for men but increased for women.

We would expect short-term disability to reflect the incidence trends and thus to decline over time. Restricted-activity rates for

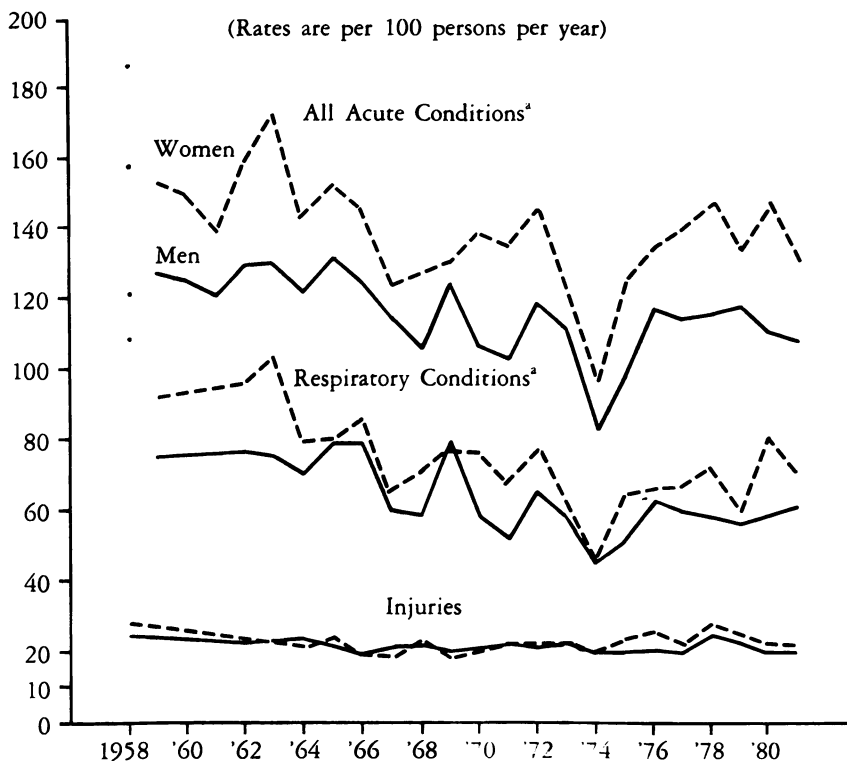


FIG. 1. Incidence of acute conditions, for persons 45 and older, United States, 1957–1981 (per 100 persons per year).

Sources: National Center for Health Statistics, *Health Statistics*, Series B, Nos. 6, 18, 33; *Vital and Health Statistics*, Series 10, Nos. 1, 10, 15, 26, 38, 44, 54, 69, 77, 82, 88, 98, 102, 114, 120, 125, 132, 136, 139, 141 (Washington).

<sup>a</sup> Rates for 1957–58 are unusually high because of a flu epidemic, and they are often disregarded in analyses of NHIS trends.

acute problems did drop for about 15 years but they then increased notably during the 1970s (figure 2). Bed-disability rates increased slightly over the whole period. These disability trends appear for respiratory conditions and injuries separately, as well as for all acute conditions. Women show sharper increases in short-term disability than men do.

The combination of lower incidence but higher disability rates means that middle-aged and older people spend more days caring for an acute condition now than in the 1950s. In figure 3, note how the numbers of reduced activity days and bed days *per condition* have increased over time, especially for women's injuries. This phenomenon

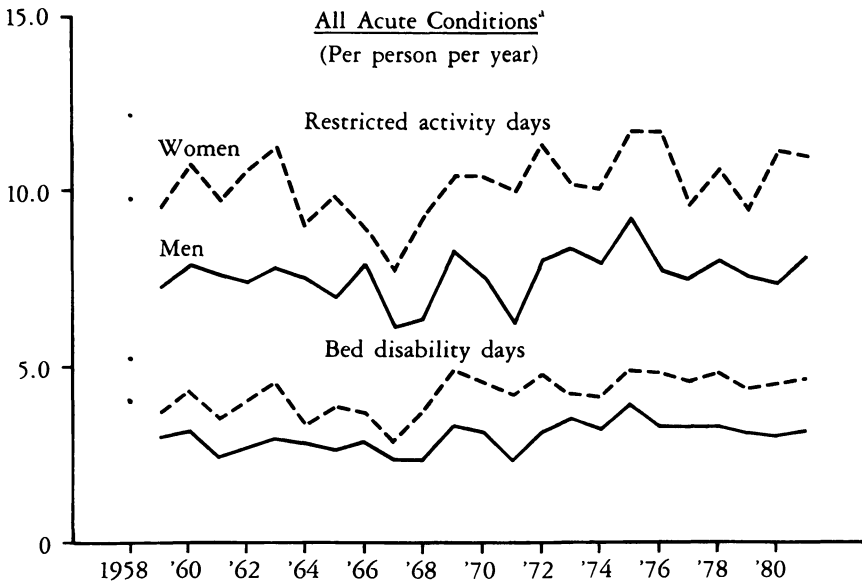


FIG. 2. Restricted activity days and bed disability days for acute conditions, for persons 45 and older, United States, 1957–1981 (per person per year).

Sources: Same as for figure 1.

\* Rates for 1957–58 are unusually high because of a flu epidemic, and they are often disregarded in analyses of NHIS trends.

also appears for younger adults (ages 17 to 44) but is less pronounced (not shown).

In sum, men and women aged 45 and older are experiencing fewer acute conditions than before (with the exception of injuries for women), but they are reducing activities for each acute condition more now.

### Disability Days for All Conditions

Short-term disability for health problems (acute and chronic combined) increases with age. Currently, adults aged 65 and older have three times more restricted-activity days per year than children under 17, and three times more bed-disability days. The rise with age reflects rapidly increasing prevalence of chronic conditions, offset only a little by decreasing incidence of acute conditions. Men aged 45 to 64 report an average of 25 restricted-activity days per year for health problems, and women those ages report 28 days. Older men report about 35 days per year and older women 43 days. For all four groups, about

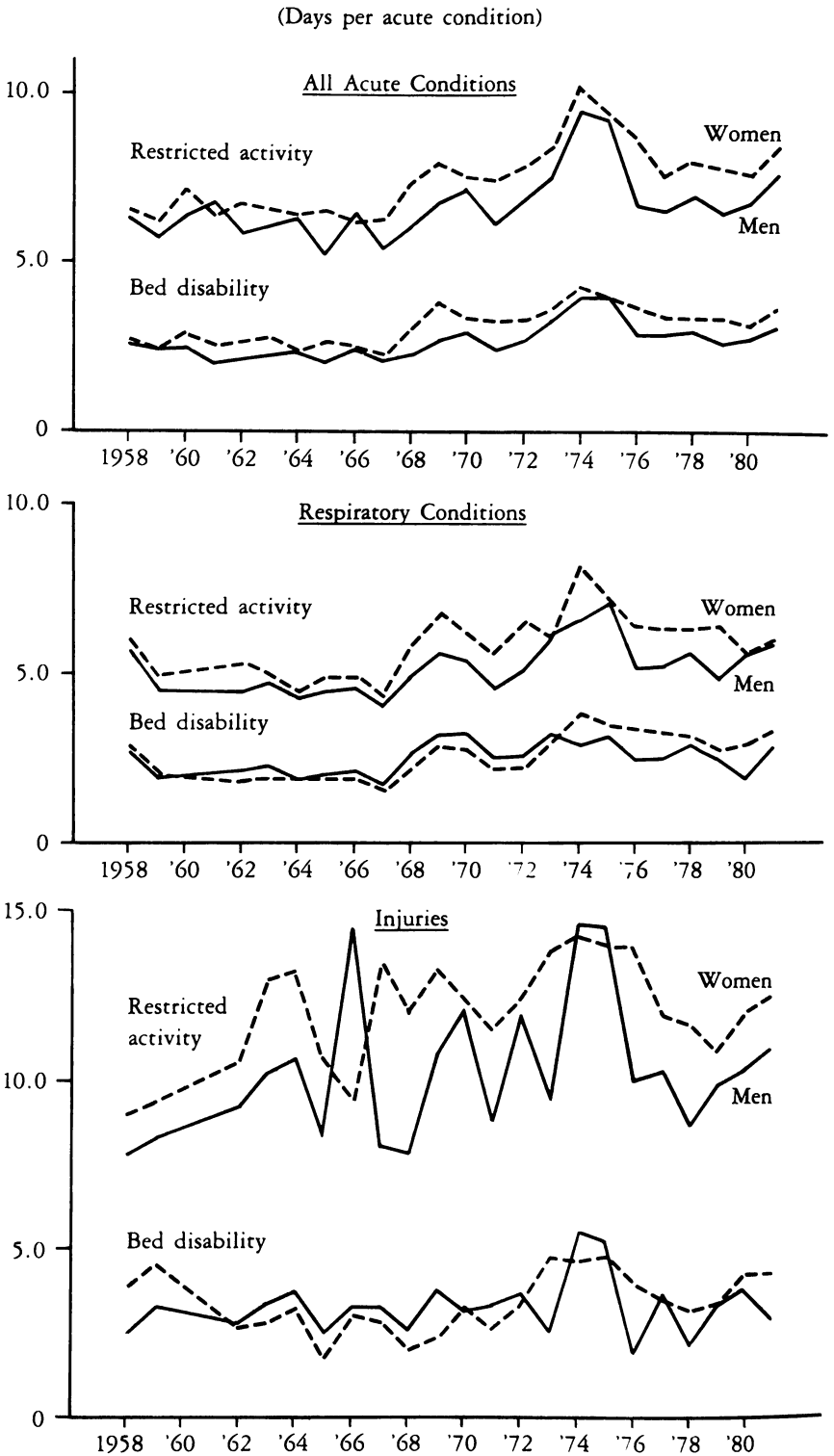


FIG. 3. Restricted activity days and bed disability days per acute condition, for persons 45 and older, United States, 1957-1981 (days per acute condition).

Sources: Calculated from sources of figure 1.

one-third of the days are spent in bed. Employed people aged 45 to 64 and 65 and older report about 3 to 5 work-loss days per year.

Since the 1950s, total restricted-activity days have increased notably for middle-aged and older people (figure 4). This occurred mostly in the 1970s and it has been larger for women than for men. Nonbed days—days a person reduces usual activities but does not stay in bed—are mostly responsible for the increase. (In figure 4, bed-disability rates show no trend for older people and only a small increase for middle-aged people.) Work-loss rates have dropped for middle-aged and older working men, and they have stayed constant for working women those ages. Younger adults (25 to 44) also show increases in short-term disability over the past 25 years, but the trends (not shown) are more modest than for middle-aged and older people.

The increase in *total* restricted activity is sharper than we found for acute conditions. This suggests a substantial increase in short-term disability for chronic conditions. Is this due to more chronic morbidity especially among older adults? Or does it reflect changed health attitudes, so people are more willing to cut down their activities for bothersome chronic conditions and acute ones? We shall evaluate these and other explanations shortly.

### Limitations Due to Chronic Conditions

In the National Health Interview Survey, respondents are asked what their major activity was in the past year (working, keeping house, retired, school, other). Men and working women are then asked if health problems now limit them in a job, and nonworking women are asked about housework limitations. People without major-activity limitation are asked about any limitations in their secondary activities, such as church, clubs, or shopping, due to health. The questions provide indicators of long-term disability due to chronic diseases and impairments.

The percentage of people with major-activity limitations rises sharply with age—from 2 percent for children, to 19 percent for middle-aged adults, and 39 percent for older adults in 1981. The percentages with secondary-activity-only limitations rise from 2 percent to 5 percent and 6 percent, respectively.

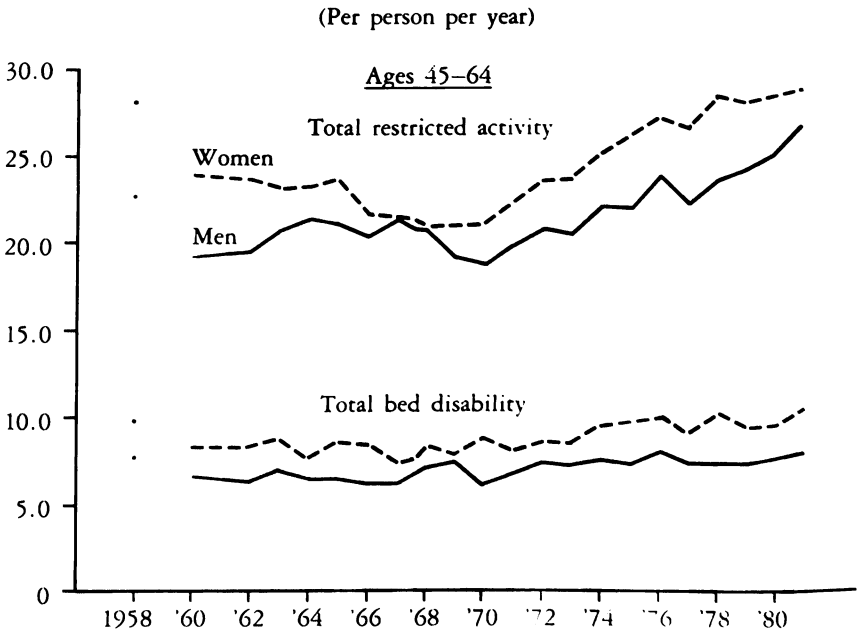
Since the late 1950s, major-activity limitations have risen steadily among middle-aged people, and secondary-activity-only limitations

have increased for them in the 1970s (figure 5). For older people, trends across the whole period are not clear because of highly variable rates in the earlier years. Looking just at the 1970s, we see increases in major-activity and secondary-activity limitations for older people. For young adults (17 to 44), the data suggest slowly rising limitations for both sexes (not shown).

Again, the trends could reflect rising chronic morbidity for adults. Or they could reflect more opportunities and willingness to make role accommodations for chronic health problems.

### Prevalence and Limitations for Specific Chronic Conditions

The leading chronic conditions for middle-aged men are hypertension (20 percent), arthritis (18 percent), chronic sinusitis (16 percent), hearing impairments (15 percent), and heart disease (13 percent) (table 1). The same five problems head the women's list (arthritis, 31 percent; hypertension, 22 percent; chronic sinusitis, 21 percent; heart disease, 13 percent; hearing impairments, 9 percent). Less frequent problems (3 to 7 percent) for men aged 45 to 64 are visual impairments, back and lower extremity impairments, hemorrhoids, hay fever, diabetes, and several digestive system conditions. For women aged 45 to 64, additional problems (4 to 8 percent) are back impairments, varicose





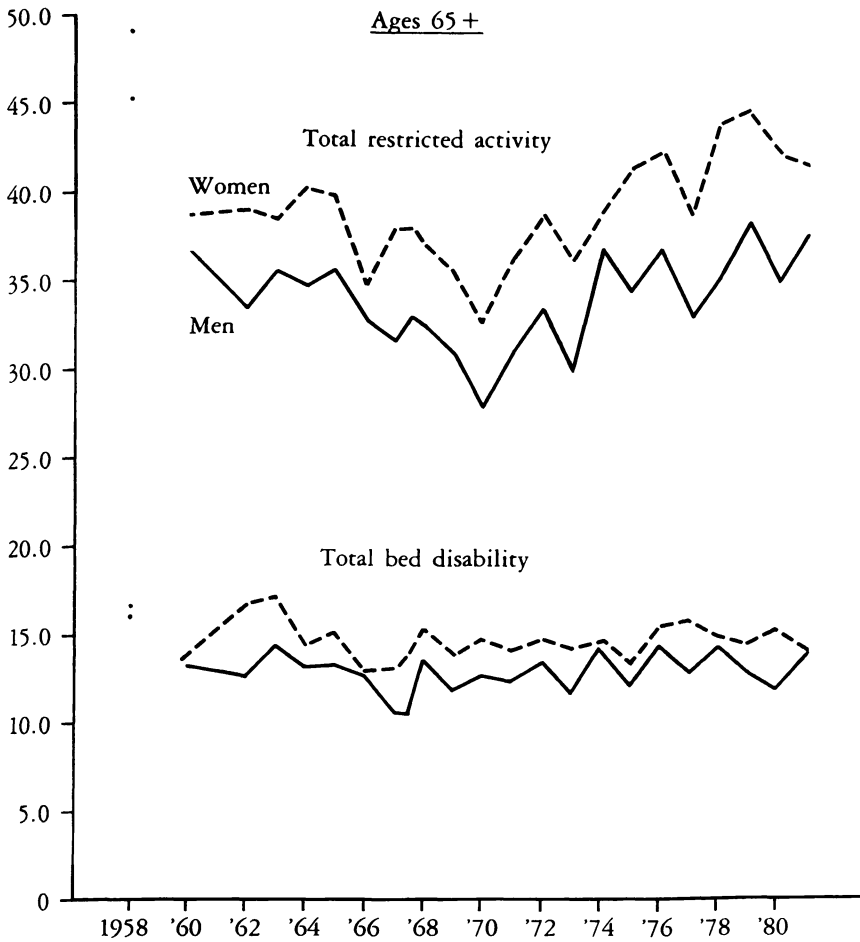


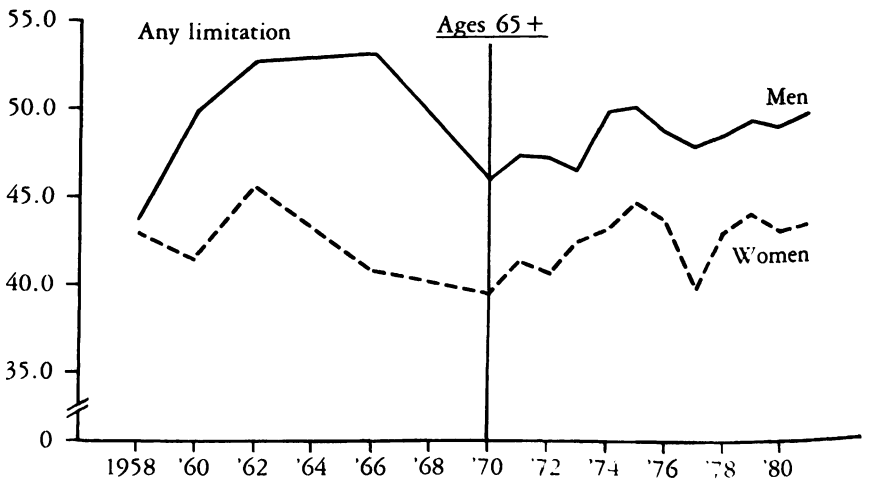
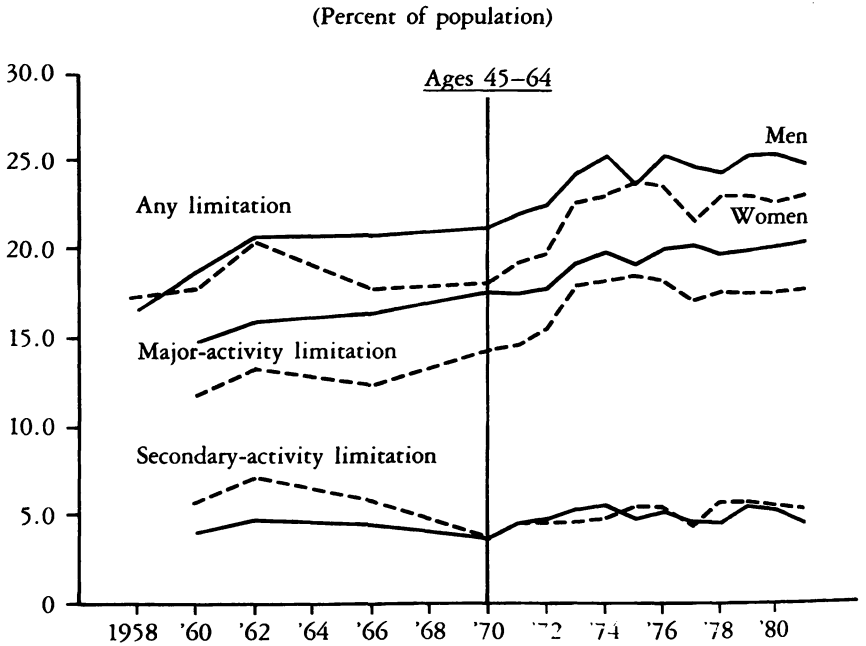
FIG. 4. Restricted activity days and bed disability days for all conditions, for persons 45 to 64 and 65 and older, United States, 1957-1981 (per person per year).

Sources: National Center for Health Statistics. *Health Statistics*, Series B, Nos. 10, 29; *Vital and Health Statistics*, Series 10, Nos. 4, 5, 13, 25, 37, 43, 52, 60, 63, 72, 79, 85, 95, 100, 115, 119, 126, 130, 136, 139, 141 (Washington).

\* Rates for 1957-58 are unusually high because of a flu epidemic, and they are often disregarded in analyses of NHIS trends.

veins, hemorrhoids, hay fever, migraine, diabetes, and several skin and musculoskeletal conditions. For most chronic diseases, women aged 45 to 64 have higher prevalence rates than men do. The key exceptions are heart disease and some digestive diseases. Impairments tend to be more common for men, especially visual and hearing problems.

Limitations from chronic conditions are not common during middle age. Those which occur are mainly from heart disease (6 percent of men, 4 percent of women), arthritis (3 percent, 5 percent), various impairments (1 to 2 percent), other musculoskeletal conditions (2 percent, 2 percent), and hypertension (1 percent, 3 percent) (table 1).



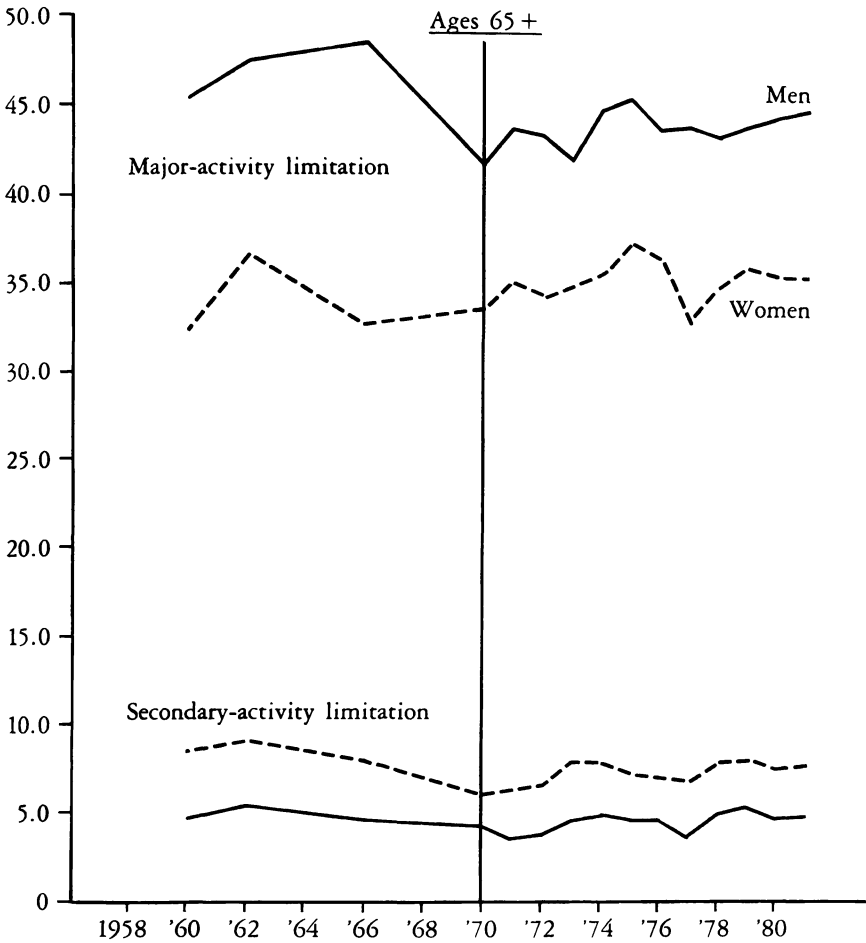


FIG. 5. Limitations in major activities and secondary activities due to chronic conditions, for persons 45 to 64 and 65 and older, United States, 1957-1981 (percent of population).

Sources: National Center for Health Statistics. *Health Statistics*, Series B, Nos. 11, 36; *Vital and Health Statistics*, Series 10, Nos. 17, 51, 61, 79, 80, 95, 96, 100, 115, 119, 126, 130, 136, 139, 141 (Washington).

At older ages, prevalence rates for virtually all chronic diseases and impairments increase, but there is little change in the leading problems. The leading health problems for both sexes are arthritis (36 percent of men, 50 percent of women), hearing impairments (33 percent, 25 percent), hypertension (32 percent, 43 percent), heart disease (26 percent, 28 percent), and chronic sinusitis (14 percent, 17 percent).

TABLE 1  
 Leading Chronic Conditions among Middle-aged and Older Persons, Based on Respondent Reports in Health Surveys,  
 United States (percent of population)<sup>a</sup>

Prevalence (had condition in past 12 months)	Limitations (has condition which limits major or secondary activities)
	<i>Men 45-64</i>
1. Hypertensive disease, <sup>b</sup> NEC, 20.3%	Heart conditions, 6.1%
2. Arthritis, NEC, 18.8	Arthritis and rheumatism, 3.2
3. Chronic sinusitis, 16.4	Other musculoskeletal disorders, <sup>c</sup> 2.0
4. Hearing impairments, 14.8	Impairments (except paralysis) of back or spine, 1.9
5. Heart conditions, 13.2	Impairments (except paralysis) of lower extremities and hips, 1.8
6. Visual impairments, 7.4	Hypertension without heart involvement, <sup>b</sup> 1.5
7. Orthopedic impairments (except paralysis or absence) of back or spine, 7.2	Diabetes, 1.4
8. Hemorrhoids, 6.0	Mental and nervous conditions, <sup>d</sup> 1.3
9. Hay fever, without asthma, 5.8	Emphysema, 1.3
10. Diabetes, 5.6	Paralysis, complete or partial, 1.0
11. Hernia of abdominal cavity, 5.0	Visual impairments, 1.0
12. Synovitis, bursitis, and tenosynovitis, 4.6	Other circulatory system conditions, <sup>e</sup> 0.9
13. Orthopedic impairments (except paralysis or absence) of lower extremity or hip, 3.6	Other respiratory system conditions, <sup>f</sup> 0.9
14. Functional and symptomatic upper gastrointestinal disorder, 3.6	Other digestive system conditions, <sup>g</sup> 0.8
15. Ulcer of stomach and duodenum, 3.4	Cerebrovascular disease, 0.8; Hernia, <sup>h</sup> 0.8

Women 45-64

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Arthritis, NEC, 31.2%</li> <li>2. Hypertensive disease, NEC, 22.5</li> <li>3. Chronic sinusitis, 21.2</li> <li>4. Heart conditions, 12.6</li> <li>5. Hearing impairments, 9.3</li> <li>6. Hay fever, without asthma, 7.9</li> <li>7. Orthopedic impairments (except paralysis or absence) of back or spine, 7.7</li> <li>8. Varicose veins, NEC, 7.7</li> <li>9. Hemorrhoids, 6.9</li> <li>10. Migraine, 6.3</li> <li>11. Diabetes, 6.0</li> <li>12. Corns and callosities, 5.7</li> <li>13. Synovitis, bursitis, and tenosynovitis, 5.6</li> <li>14. Diseases of urinary system, 4.5</li> <li>15. Eczema, dermatitis, and urticaria, NEC, 4.4</li> </ol> | <ol style="list-style-type: none"> <li>Arthritis and rheumatism, 5.2%</li> <li>Heart conditions, 3.6</li> <li>Hypertension without heart involvement, 2.7</li> <li>Other musculoskeletal disorders, 1.8</li> <li>Impairments (except paralysis) of back or spine, 1.6</li> <li>Mental and nervous conditions, 1.5</li> <li>Diabetes, 1.4</li> <br/> <li>Other circulatory system conditions, 1.0</li> <li>Impairments (except paralysis) of lower extremities and hips, 1.0</li> <li>Other digestive system conditions, 1.0</li> <li>Malignant neoplasms, 0.9</li> <li>Visual impairments, 0.9</li> <li>Asthma, with or without hay fever, 0.7</li> <li>Paralysis, complete or partial, 0.6</li> <li>Hernia, 0.6</li> </ol> |
|---|---|

Men 65 +

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Arthritis, NEC, 35.5%</li> <li>2. Hearing impairments, 32.7</li> <li>3. Hypertensive disease, NEC, 31.5</li> <li>4. Heart conditions, 26.6</li> <li>5. Chronic sinusitis, 13.5</li> <li>6. Arteriosclerosis, 12.2</li> <li>7. Visual impairments, 12.0</li> <li>8. Orthopedic impairments (except paralysis or absence) of back or spine, 7.7</li> </ol> | <ol style="list-style-type: none"> <li>Heart conditions, 12.5%</li> <li>Arthritis and rheumatism, 7.7</li> <li>Visual impairments, 4.3</li> <li>Emphysema, 3.9</li> <li>Hypertension without heart involvement, 3.0</li> <li>Cerebrovascular disease, 2.9</li> <li>Diabetes, 2.9</li> <li>Other circulatory system conditions, 2.7</li> </ol> |
|--|---|

TABLE 1 (cont.)

Prevalence (had condition in past 12 months)	Limitations (has condition which limits major or secondary activities)
9. Diabetes, 7.4	Impairments (except paralysis) of lower extremities and hips, 2.5
10. Hernia of abdominal cavity, 7.1	Paralysis, complete or partial, 2.1
11. Emphysema, 6.8	Other respiratory system conditions, 1.6
12. Diseases of prostate, 5.8	Hernia, 1.6
13. Hemorrhoids, 5.2	Impairments (except paralysis) of back or spine, 1.6
14. Orthopedic impairments (except paralysis or absence) of lower extremity or hip, 4.8	Other musculoskeletal disorders, 1.5
15. Hay fever, without asthma, 4.5	Mental and nervous conditions, 1.5
<i>Women 65 +</i>	
1. Arthritis, NEC, 50.4%	Arthritis and rheumatism, 12.7%
2. Hypertensive disease, NEC, 43.4	Heart conditions, 9.6
3. Heart conditions, 28.1	Hypertension without heart involvement, 4.7
4. Hearing impairments, 25.0	Visual impairments, 4.6
5. Chronic sinusitis, 17.1	Diabetes, 3.3
6. Varicose veins, NEC, 12.6	Impairments (except paralysis) of lower extremities and hips, 3.0
7. Arteriosclerosis, 12.5	Other circulatory system conditions, 2.7
8. Visual impairments, 11.8	Other digestive system conditions, 1.9
9. Orthopedic impairments (except paralysis or absence) of back or spine, 10.9	Cerebrovascular disease, 1.8
10. Diabetes, 8.4	Mental and nervous conditions, 1.6
11. Frequent constipation, 8.0	Other musculoskeletal disorders, 1.5

- |     |   |  |
|-----|---|--|
| 12. | Hemorrhoids, 7.6  | Impairments (except paralysis) of back or spine, 1.4 |
| 13. | Corns and callosities, 7.4  | Paralysis, complete or partial, 1.4                  |
| 14. | Diseases of urinary system, 7.1   | Hernia, 1.0  |
| 15. | Orthopedic impairments (except paralysis or absence) of lower extremity or hip, 6.2 | Hearing impairments, 0.9                             |

*Sources:* For prevalence: Unpublished tabulations from the 1979 National Health Interview Survey, provided by the National Center for Health Statistics. For limitations: Calculated from National Center for Health Statistics, *Vital and Health Statistics*, Series 10, No. 111, Table 4. Rates are for 1974.

NEC Not elsewhere classified.

<sup>a</sup> Prevalence rates from the NHIS Supplements are available for numerous chronic conditions, except for neoplasm and mental disorder conditions. Limitations rates from the standard NHIS questionnaire are available for 30 titles; many are broad groupings, such as "Other respiratory system conditions." All body systems are encompassed in the limitations rates. In this table, rounded rates are shown; rankings were based on rates before rounding.

<sup>b</sup> Commonly known as hypertension, or high blood pressure.

<sup>c</sup> Includes osteomyelitis and other bone diseases, vertebrogenic pain syndrome, bunion, synovitis/bursitis/tenosynovitis, and several other titles.

<sup>d</sup> This category is for mental disorders; it does not include nervous system conditions.

<sup>e</sup> Includes pulmonary embolism, phlebitis/thrombophlebitis, and several other titles.

<sup>f</sup> Includes chronic pharyngitis, chronic laryngitis, pleurisy, bronchiectasis, and several other titles.

<sup>g</sup> Includes oral and salivary gland diseases, gastritis/duodenitis, intestine and peritoneum diseases, cirrhosis of liver, cholelithiasis, pancreas disease, and several other titles.

<sup>h</sup> The titles have identical rates.

Several conditions which were not important at ages 45 to 64 now become so; they are arteriosclerosis, emphysema, and prostate disease among men, and visual impairments among women. Women aged 65 and older have higher prevalence rates than men do for most chronic diseases. Important exceptions are emphysema and hernia. Compared to middle-aged people, older men and women are more similar in impairment rates; older women sometimes have higher rates than older men. For more discussion of sex differentials in health, see Verbrugge [1982, 1983a, 1984].

Limitations are also much more common at ages 65 and older. The principal causes of limitation are heart disease (12 percent of men, 10 percent of women) and arthritis (8 percent, 13 percent). Among men, lesser causes (3 to 4 percent) are visual impairments, emphysema, hypertension, cerebrovascular disease, and diabetes (table 1). Among women, lesser causes (3 to 5 percent) are hypertension, visual impairments, and diabetes.

The rankings for prevalence rates and limitation rates are similar; in other words, the most common conditions also cause the most limitations in the population. This is *less* true for middle-aged people than for older ones. The reason is that, for people 45 to 64, chronic diseases are often not serious enough to force limitations, so they do not figure prominently in the list of limiting conditions. In their "absence," impairments and assorted musculoskeletal symptoms take high ranks. But for older people, chronic diseases are more severe and often require accommodations. Diseases, therefore, become prominent in the limiting conditions list, and impairments (except visual) and musculoskeletal symptoms become relatively less so.

We shall consider morbidity trends for two kinds of chronic conditions—those which are the leading causes of death and those which seldom cause death. We label them "killers" and "nonkillers" respectively.

### *Killer Conditions*

Table 2 records the leading causes of death for middle-aged and older people. Most of them (11 titles) are chronic diseases; only a few are acute diseases (influenza/pneumonia) or external causes (accidents, suicide, homicide). Our attention centers on the chronic diseases. Choosing the same or most similar title in NHIS, what trends appear for these



diseases *as causes of morbidity*? Do the morbidity trends mirror mortality trends for the diseases?

For middle-aged people, morbidity has *risen* for all but one of the diseases in the past 20 years (table 3). Cancer, diabetes, heart disease, and hypertension show especially large increases in prevalence and limitations. (The sole title with declining morbidity is kidney/ureter diseases, which includes nephritis/nephrosis.) By contrast, mortality has *declined* for most (8) of the diseases over the same period.

The situation is similar for older people. Morbidity has *risen* for most titles, especially for cancer, diabetes, heart disease, hypertension, and arteriosclerosis. At the same time, mortality rates have *dropped* for most (7) of the diseases.

Four patterns of change are possible: (1) rising morbidity and declining mortality, (2) rising morbidity and mortality, (3) declining morbidity and mortality, and (4) declining morbidity but rising mortality. The list below shows how often the patterns have occurred for killer diseases. The pattern indicated applies to all four age-sex groups unless otherwise noted.

#### Pattern 1: Rising Morbidity and Declining Mortality

Diabetes

Diseases of heart

Hypertension

Cerebrovascular diseases (45 to 64, maybe 65 and older)

Arteriosclerosis

Bronchitis, emphysema, and asthma (45 to 64)

Hernia (45 to 64, women 65 and older)

Nephritis and nephrosis (maybe women 65 and older)

#### Pattern 2: Rising Morbidity and Mortality

Malignant neoplasms (men, mortality rise for women is slight)

Other diseases of arteries, arterioles, and capillaries (45 to 64, unclear 65 and older)

Bronchitis, emphysema, and asthma (65 and older)

Cirrhosis of liver (45 to 64)

#### Pattern 3: Declining Morbidity and Mortality

Hernia (men 65 and older)

TABLE 2  
Leading Causes of Death for Middle-aged and Older Persons, United States 1978 (per 100,000 population)

Cause of death	Ages 45-54		55-64		65-74		75-84		85+	
	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank
<b>MEN</b>										
All Causes	797		1906		4185		9385		17259	
Malignant neoplasms	192	2	522	2	1076	2	1849	2	2137	3
Diabetes mellitus	11	9	27	9	64	7	138	8	199	7
Diseases of heart	298	1	791	1	1762	1	4064	1	7991	1
Hypertension	—	—	—	—	—	—	—	—	78	10
Cerebrovascular diseases	29	5	85	3	290	3	984	3	2244	2
Arteriosclerosis	—	—	—	—	31	10	162	7	653	5
Other diseases of arteries, arterioles, and capillaries <sup>a</sup>	7	(10)	27	(10)	81	(7)	183	(5)	269	(7)
Influenza and pneumonia	13	8	33	6	96	4	371	4	1099	4
Bronchitis, emphysema, and asthma <sup>b</sup>	6	10	27	8	87	6	179	5	181	8
Hernia and intestinal obstruction	—	—	—	—	—	—	—	—	—	—
Cirrhosis of liver	43	4	62	5	64	8	48	10	—	—
Nephritis and nephrosis	—	—	—	—	—	—	53	9	95	9
Accidents	60	3	69	4	87	5	176	6	356	6
Suicide	23	6	28	7	33	9	48	10	—	—
Homicide	16	7	11	10	—	—	—	—	—	—

WOMEN									
All Causes	433	976	2138	5863	13541				
Malignant neoplasms	177	370	589	959	1139	2	2	3	
Diabetes mellitus	9	27	64	150	218	4	5	7	
Diseases of heart	85	280	823	2666	6674	2	1	1	
Hypertension	—	—	—	—	58	—	—	9	
Cerebrovascular diseases	26	64	208	866	2298	3	3	2	
Atherosclerosis	—	—	19	133	632	—	9	6	
Diseases of arteries, arterioles, and capillaries <sup>a</sup>	4	10	29	81	198	(10)	(7)	(8)	(8)
Influenza and pneumonia	7	16	42	196	722	8	5	4	4
Chronic bronchitis, emphysema, and asthma <sup>b</sup>	4	13	24	38	—	9	8	8	—
Ischemia and intestinal obstruction	—	—	—	25	59	—	—	10	8
Cirrhosis of liver	22	27	25	—	—	4	7	—	—
Nephritis and nephrosis	2	6	12	26	48	10	10	9	10
Accidents	20	26	41	101	241	5	6	7	6
Suicide	11	10	—	—	—	6	—	—	—
Homicide	4	—	—	—	—	10	—	—	—

Source: Unpublished tabulations provided by the National Center for Health Statistics.

— Not a leading (top 10) cause of death for this age group.

<sup>a</sup> In vital statistics publications, this collection of diseases is not considered when preparing "leading causes" lists. We show it here (with its rank if it were considered in the lists) because death rates are relatively high at middle and older ages.

<sup>b</sup> These diseases have been reclassified and are currently in the category "Chronic obstructive pulmonary diseases."



WOMEN 45-64											
Malignant neoplasms	NA	NA	—	2.4	8.9	+271	183.0	177.1	-3	(45-54)	(55-64)
Diabetes mellitus	44.4	59.7	+34	7.4	14.2	+92	337.7	369.7	+9		
Diseases of heart	81.0	125.5	+55	32.7	36.0	+10	43.7	26.6	-39		
Hypertension	149.6	225.0	+50	19.2	27.1	+41	429.4	279.7	-33		
Cerebrovascular diseases	10.4	17.2	+65	3.7 <sup>a</sup>	5.5	+49	4.8	1.1	-77		
Arteriosclerosis <sup>b</sup>	NA	15.3	—	6.6	10.2	+55	9.1	2.5	-73		
Other diseases of arteries, arterioles, and capillaries <sup>c</sup>	NA	NA	—	(5.3)	6.6	+55	46.3	26.2	-43		
Bronchitis, emphysema, and asthma	41.6	37.4	NCT	NA	2.0	—	131.8	64.1	-51		
Hernia and intestinal obstruction <sup>d</sup>	6.5	17.8	+174	2.4 <sup>d</sup>	4.1	+71	1.0	0.6	-40		
Cirrhosis of liver <sup>e</sup>	36.7	40.0	NCT	5.9 <sup>d</sup>	6.8	+15	7.7	3.3	-57		
Nephritis and nephrosis <sup>f</sup>	23.2	28.7	+24	4.3	6.0	+40	2.9	3.7	+28		
	3.2	5.0	+56	12.4	9.7	-22	6.6	9.9	+50		
	54.0	45.1	-16	1.9	3.8	+100	4.8	4.2	-13		
							8.5	12.9	+52		
							3.5	1.0	-71		
							7.5	2.6	-65		
							18.6	21.8	+17		
							17.9	27.3	+53		
							7.1	2.5	-65		
							11.6	5.9	-49		
All Causes:							526.7	433.2	-18		
							1,196.4	976.3	-18		

TABLE 3 (cont.)

Chronic disease	PREVALENCE (per 1,000) <sup>e</sup>			LIMITATIONS (per 1,000) <sup>e</sup>			MORTALITY (per 100,000) <sup>e</sup>		
	('68-73)	1979	%Δ	1961-63	1978	%Δ	1960	1978	%Δ
MEN 65 +									
Malignant neoplasms	NA	NA	—	7.8	13.9	+78	890.5	1,076.7	+21 (65-74)
							1,389.4	1,849.4	+33 (75-84)
							1,741.2	2,137.2	+23 (85 +)
Diabetes mellitus	60.3	73.7	+22	12.5	28.6	+129	76.1	64.4	-15 (65 +)
							144.6	137.6	-5
							170.6	199.4	+17
							99.1	93.3	-6 (65 +)
Diseases of heart	199.3	265.7	+33	118.0	125.1	+6	2,291.3	1,761.6	-23
							4,742.4	4,064.1	-14
							9,788.9	7,990.6	-18
Hypertension	141.2	315.0	+123	27.0	29.6	NCT	30.6	9.4	-69
							90.1	31.2	-65
							253.4	78.2	-69
Cerebrovascular diseases	54.0	40.1	-26	24.5 <sup>d</sup>	28.7	+17	530.7	290.0	-45
							1,555.9	984.5	-39
							3,643.1	2,344.2	-38
Arteriosclerosis <sup>f</sup>	30.0	121.5	+305	27.8 (18.8)	27.2	NCT	68.8	30.9	-83
							340.9	161.9	-53
							1,453.3	653.3	-55
Other diseases of arteries, arterioles, and capillaries <sup>f</sup>	NA	NA	—	27.8 (18.8)	27.2	NCT	55.0	80.9	+47
							77.9	182.9	+135
							103.6	269.0	+160
Bronchitis, emphysema, and asthma	B E A	36.3 68.2 21.8	-23 +16 -48	B E A	6.2 39.4 13.8	NCH +13 +13	102.0 125.5 131.5	86.6 179.1 181.4	-15 +43 +38
							109.8	117.7	+7

Cirrhosis of liver <sup>d</sup>	4.6	2.7	-41	18.4	13.5	-27	57.4 45.1 40.0	63.7 47.6 29.7	+11 +6 -26
Nephritis and nephrosis <sup>b</sup>	44.8	36.3	-19	NA	5.0	—	53.2 31.1 70.2 174.0	57.0 19.5 53.1 94.8	+7 -37 -24 -46
							4,914.4	4,185.4	-15
All Causes:							10,178.4	9,385.3	-8
							21,186.3	17,258.9	-19
<b>WOMEN 65 +</b>									
Malignant neoplasms	NA	NA	—	4.4	7.7	+75	560.2 924.1 1,263.4	588.7 958.8 1,139.3	+5 +4 -10
Diabetes mellitus	91.3	83.9	-8	16.8	33.4	+99	709.3 108.4 178.5 188.7	758.8 64.5 150.4 217.5	+7 -40 -16 +15
Diseases of heart	198.3	280.6	+42	97.0	95.7	NCT	133.6 1,261.3 3,582.7 9,016.8	106.7 823.1 2,655.6 6,673.5	-20 -35 -26 -26
Hypertension	240.9	434.2	+80	51.1	47.2	NCT	24.1 75.4 215.9	6.6 22.7 57.6	-73 -70 -73
Cerebrovascular diseases	44.0	40.1	-9	16.6 <sup>d</sup>	18.4	+11	415.7 1,441.1 3,704.4	207.9 865.5 2,298.5	-50 -40 -38
Arteriosclerosis <sup>e</sup>	22.7	125.0	+451	22.7 (17.4)	27.0	NCT	46.5 281.4 1,404.1	19.2 133.1 631.6	-59 -53 -55





calculated from data in NCHS, *Vital and Health Statistics*, Series 10, No. 111, Table 4. For limitation rates, 1979: Calculated from unpublished tabulations for the 1979 NHIS, provided by NCHS. For mortality rates, 1960: NCHS, *Vital Statistics of the United States*, 1960. Vol. II — Mortality, Part A, table 1-M. Rates for three causes (other diseases of arteries/arterioles/capillaries, bronchitis/emphysema/asthma, nephritis/nephrosis) were calculated by the author from table 5-9. For mortality rates, 1978: Unpublished tabulations provided by NCHS.

— Cannot be computed.

NA Not available for this year.

NCT No clear trend (rates fluctuate widely over the years).

NCH No change (rates are essentially constant over the years).

<sup>a</sup> Prevalence rates for these titles are available for two points only. The initial rates are for the following years: 1968 (hernia), 1970 (bronchitis, emphysema, asthma), 1972 (diseases of heart, hypertension), 1973 (diabetes, nephritis/nephrosis). See Note g for cirrhosis.

<sup>b</sup> Limitation rates for most of the titles are available for six points (1959–1961, 1961–1963, 1963–1965, 1965–1967, 1969–1970, 1974). For 1959–1961, rates are for major limitations only; for other years, major and secondary limitations are included. We, therefore, compute trends from 1961–1963 onwards.

<sup>c</sup> The 1960 mortality rates use the seventh revision of the International Classification of Diseases; the 1978 rates use the eighth revision. All but three titles have close coding comparability between the revisions. The exceptions are hypertension (.794), other diseases of arteries, etc. (1.481), and hernia and intestinal obstruction (.734). Low comparability tends to depress hypertension and hernia rates for recent years, and to boost other artery diseases rates. (See NCHS, *Monthly Vital Statistics Report* 17(8, supplement, 25 October), 1968.

<sup>d</sup> The initial limitation rate is for 1969–1970. For earlier years: cerebrovascular diseases was in "Other circulatory system conditions," emphysema was in "Other respiratory system conditions," chronic bronchitis was combined with chronic sinusitis, and asthma was combined with hay fever (the allergy).

<sup>e</sup> The limitation rates are for "Other circulatory system conditions." (Before 1969–1970, this group included cerebrovascular diseases; 1969–1970 rates for the revised grouping are shown in parentheses.)

<sup>f</sup> The prevalence rates are for "Hernia of abdominal cavity" only.

<sup>g</sup> The prevalence rates are for "Liver condition"; the initial rates shown are for 1975 when the title was first used in tabulations. The limitation rates are for "Other digestive system conditions."

<sup>h</sup> The prevalence rates are for "Diseases of the urinary system." The limitation rates are for "Diseases of kidney and ureter"; the initial rates shown are for 1969–1970 when the title was first separated from "All genitourinary conditions."

Nephritis and nephrosis (45 to 64, men 65 and older)

Pattern 4: Declining Morbidity but Rising Mortality

Cirrhosis of liver (65 and older)

Pattern 1 is the typical one for killer diseases. From an epidemiological perspective, the pattern suggests increasing incidence and/or increasing duration (so cases are more severe) but, nevertheless, lower case fatality than before. Pattern 2 is more consistent, suggesting rising chances of having a disease and also of dying from it. Pattern 3 is also consistent, implying lower chances of having a disease and dying from it. Pattern 4 is perplexing but uncommon; it suggests lower risks of acquiring a disease but much greater severity of cases that do occur. Epidemiological interpretations of the patterns focus on risks of acquiring a degenerative disease (incidence) and of developing a severe condition (duration) which ultimately causes death. But there are other possible interpretations of the observed trends, which we shall discuss shortly.

### *Nonkiller Conditions*

We now examine morbidity trends for chronic conditions which seldom cause death; some are diseases, others are chronic symptoms not associated with diseases. Trends in prevalence and limitations for the most common nonkiller conditions are shown in table 4.

In the past 20 years, the following changes have occurred.

1. Varicose veins and hemorrhoids are bothersome circulatory problems. Prevalence and limitation rates for both have declined in the past two decades. This trend is opposite to those we found for life-threatening circulatory diseases.
2. Respiratory problems such as chronic sinusitis and hay fever without asthma have increased for middle-aged and older persons. This parallels the rises in bronchitis/emphysema/asthma which we noted.
3. Peptic ulcers are much less common for middle-aged men now; ulcer trends for the other age-sex groups are not clear. Most other digestive problems have decreased for all four groups, especially gallbladder conditions, frequent constipation, and chronic enteritis/ulcerative colitis.

TABLE 4  
Trends in Morbidity for the Most Common "Nonkiller" Chronic Conditions, for Middle-aged and Older Persons, United States (per 1,000)<sup>a</sup>

Chronic condition	Prevalence <sup>b</sup>			Limitations <sup>c</sup>			Prevalence <sup>b</sup>			Limitations <sup>c</sup>		
	1968-1973	1979	%	1961-1963	1979	%	1968-1973	1979	%	1961-1963	1979	%
	Men 45-64						Women 45-64					
Arteriosclerosis	33.0	23.3	-29	3.9	NA	—	110.4	77.0	-30	8.3	4.6	-45
Hemorrhoids	79.1	59.9	-24	2.7	NA	—	80.4	69.1	-14	3.8	NA	—
Chronic sinusitis	150.2	164.1	+9	NA	1.7	—	166.8	212.2	+27	NA	1.9	—
Chronic bronchitis	41.9	58.5	+40	NA	NA	—	61.1	79.2	+30	NA	NA	—
Diabetes	45.0	33.7	-25	9.2	6.6	-93	22.8	25.9	NCT	4.4	4.8	NCT
Peptic ulcer	25.5	36.2	+42	<sup>d</sup>			21.7	25.8	+19	<sup>d</sup>		
Upper gastrointestinal disorder	19.6	12.8	-35	<sup>d</sup>			49.0	39.6	-19	<sup>d</sup>		
Frequent constipation												
Skin:												
Eczema, dermatitis, and urticaria	20.1	31.9	+59	<sup>d</sup>			36.7	43.6	+19	<sup>d</sup>		
Corns and callosities	49.9	22.9	-54	<sup>d</sup>			114.1	56.6	-50	<sup>d</sup>		
Musculoskeletal:												
Arthritis	148.0	188.4	+27	28.3	31.5	+11	255.3	311.5	+22	42.5	51.5	+21
Gout	17.0	27.7	+63	<sup>d</sup>			7.5	11.2	+49	<sup>d</sup>		
Synovitis, bursitis, tenosynovitis or Other musculoskeletal disorders <sup>e</sup>	37.1	46.0	+24	11.2	19.8	+77	40.3	56.2	+39	7.7	18.1	+135

TABLE 4 (cont.)

TABLE 4 (Cont.)

Chronic condition	Prevalence <sup>d</sup>			Limitations <sup>d</sup>			Prevalence <sup>d</sup>			Limitations <sup>d</sup>		
	1968-1973	1979	%	1961-1963	1979	%	1968-1973	1979	%	1961-1963	1979	%
<b>Impairments:</b>												
Visual impairments	73.6	74.4	NCT	9.1	10.3	NCT	53.4	43.4	-19	6.5	8.7	NCT
Hearing impairments	140.2	147.8	NCT	3.7	4.6	+24	90.5	93.1	NCH	2.5	3.7	+48
Impairments of back or spine	68.2	71.8	NCH	20.0	18.9	NCH	68.2	77.1	+13	15.1	16.4	NCT
Impairments of lower extremities and hips	50.7	36.4	-28	12.9	17.6	+36	46.1	34.6	-25	10.9	10.0	NCH
Paralysis	12.0	8.2	-32	8.9	10.4	+17	9.5	5.2	-45	5.4	6.0	NCH
			Men 65+						Women 65+			
<b>Circulatory:</b>												
Varicose veins	52.2	36.9	-29	8.0	NA	-	123.8	126.3	NCH	13.4	5.5	-59
Hemorrhoids	65.4	52.3	-9	7.1	NA	-	80.3	75.8	-6	NA	NA	-
<b>Respiratory:</b>												
Chronic sinusitis	121.5	135.4	+11	NA	NA	-	147.1	171.1	+16	NA	NA	-
Hay fever without asthma	35.5	44.6	+26	NA	NA	-	38.4	54.8	+43	NA	NA	-
Digestive:												
Peptic ulcer	38.4	21.3	+55	12.1	9.3	-23	22.0	39.4	+79	5.3	6.1	NCT
Upper gastrointestinal disorder	32.4	33.9	NCH	<sup>d</sup>	<sup>d</sup>		11.7	30.6	-27	<sup>d</sup>	<sup>d</sup>	
Frequent constipation	62.5	41.5	-34	<sup>d</sup>	<sup>d</sup>		121.9	79.6	-35	<sup>d</sup>	<sup>d</sup>	
<b>Skin:</b>												
Eczema, dermatitis, and urticaria	20.8	30.4	+46	<sup>d</sup>	<sup>d</sup>		29.4	24.0	NCT	<sup>d</sup>	<sup>d</sup>	
Corns and callosities	65.5	29.7	-55	<sup>d</sup>	<sup>d</sup>		143.1	73.9	-48	<sup>d</sup>	<sup>d</sup>	

Musculoskeletal:	287.0	354.6	+24	79.0	77.4	NCH	450.1	504.4	+12	118.4	126.8	+7
Arthritis	19.5	33.9	+74	<sup>d</sup>			7.6	22.5	+196	<sup>d</sup>		
Gout												
bursitis,												
tenosynovitis or												
Other musculo-	25.0	18.7	-25	5.7	15.2	+167	29.6	43.2	+46	5.7	14.6	+156
skeletal disorders <sup>e</sup>												
Impairments:												
Neural impairments	183.0	119.7	-35	43.6	42.9	NCH	220.4	117.6	-47	48.7	46.1	NCT
Hearing impairments	338.9	327.3	NCH	16.9	12.6	-25	262.2	249.5	NCH	11.6	9.0	-22
Impairments of back or spine	54.6	76.6	+40	21.0	15.6	-26	76.3	109.0	+43	16.8	14.4	NCT
Impairments of lower extremities and hips	65.4	48.1	-26	24.0	24.7	NCH	90.4	61.6	-32	30.0	29.6	NCH
Analgesia	27.5	20.1	-27	21.8	20.6	NCT	19.8	18.3	NCH	15.7	13.7	NCT

Notes: Same as sources in table 3 for prevalence rates and limitations rates.

<sup>a</sup> Cannot be computed.

<sup>b</sup> Not available for this year (rates are available for this title for other years.)

<sup>c</sup> No clear trend (rates fluctuate widely over the years).

<sup>d</sup> No change (rates are essentially constant over the years).

<sup>e</sup> Most of the nonkiller conditions in table 1 are shown here. Exceptions are mental and nervous disorders (titles are Mental and nervous conditions, Migraine), two residual groups (Other respiratory system conditions, Other digestive system conditions), and sex-specific problems (Diseases of prostate). Although not in table 1, Gout is included here because it often involves arthritic symptoms.

<sup>f</sup> Prevalence rates for these titles are available for two or three time points (two for Varicose veins through Hay fever; three for the others). The initial rates are for these years: 1968 (Digestive titles), 1969 (Skin, Musculoskeletal), 1970 (Respiratory), 1971 (Impairments), 1972 (Circulatory).

<sup>g</sup> Limitation rates for most of the titles shown are available for six points (1959-1961, 1961-1963, 1963-1965, 1965-1967, 1969-1970, 1974). For 1959-1961, rates are for major-activity limitations only; for other years, rates are for major- or secondary-activity limitations. We, therefore, compute trends from 1961-1963 onwards.

<sup>h</sup> Limitation rates for this title or a comparable title are not available.

<sup>i</sup> The prevalence rates are for Synovitis/bursitis/tenosynovitis; the limitation rates are for Other musculoskeletal disorders.

4. Some skin problems have increased (eczema/dermatitis/urticaria, psoriasis, other inflammatory conditions) and some have decreased (corns/callosities, other hypertrophic/atrophic conditions, diseases of nail). Troubles due to corns/callosities have declined especially sharply over the period. Bunions (classified as a musculoskeletal disorder) have also diminished.
5. Musculoskeletal problems show striking rises in prevalence and limitations. Arthritis, synovitis/bursitis/tenosynovitis, displaced disc, and other musculoskeletal disorders show sharp rises for men and women in both age groups. Gout (classified as a metabolic disease but typically manifested in joint discomfort) also shows marked increases.
6. Trends for impairments are not consistent across age-sex groups. For people 65 and over, rates have declined for most titles (visual, hearing, lower extremities/hips, multiple orthopedic impairments). And although prevalence of back/spine impairments has increased, limitations from them have diminished or remained constant. No general statement can be made for middle-aged people; some impairments show small rises, others small declines, and others no clear trend.

The list below summarizes morbidity trends for nonkiller conditions. The trend indicated applies to all four age-sex groups unless otherwise noted.

**Pattern 1: Rising Morbidity**

Respiratory conditions (for example, chronic sinusitis, hay fever without asthma)

Some skin conditions (for example, eczema/dermatitis/urticaria, psoriasis, other inflammatory conditions)

Musculoskeletal conditions (for example, arthritis, synovitis/bursitis/tenosynovitis, displaced disc; also gout)

**Pattern 2: Declining Morbidity**

Circulatory conditions (for example, varicose veins, hemorrhoids)

Digestive conditions (for example, peptic ulcer for men aged 5 to 64, gallbladder conditions, frequent constipation, enteritis/colitis)

Some skin conditions (for example, corns/callosities, other

hypertrophic/atrophic conditions, diseases of nail; also bunions)

Most impairments for people 65 and older

In sum, the most common nonkiller diseases (now and also 25 years ago) are arthritis, other musculoskeletal disorders, and chronic sinusitis. It is these problems that show consistent, large increases in rates over the past few decades. The coincidence of rising morbidity with the most common nonkillers propels statistics on chronic morbidity upward. By contrast, declines in rates are attached to less prevalent diseases and to impairments.

### Summary of Health and Mortality Trends

Most of the NHIS indicators show rising morbidity for middle-aged and older people since 1957. First, although acute-condition incidence rates have dropped a little, restricted activity and bed disability for them have increased. Thus, people cut down their usual activities and stay in bed more days per acute condition now than before. Second, total restricted activity (for acute and chronic conditions combined) shows especially sharp rises over time. The rise is mostly for nonbed days (cutting down activities but not staying in bed), and the data suggest that such care has increased especially for chronic problems. Third, the percentages of people who are limited in their major activity (job or housework) or their secondary activities have increased steadily since the late 1950s for middle-aged people and in the 1970s for older people. Fourth, chronic diseases which often cause death ("killers") have risen in both prevalence and limitations; this is especially true for cancer, heart disease, hypertension, and diabetes. Chronic diseases which are common but seldom cause death ("nonkillers") have also risen in prevalence and limitations; this is especially true for arthritis, other musculoskeletal disorders, and chronic sinusitis, which are the leading nonfatal diseases for middle-aged and older adults.

Examining fewer health indicators and a shorter time period (1966–1976), Colvez and Blanchet (1981) noted similar trends. Six conditions showed increased limitation rates for middle-aged people (malignant neoplasms for women, diabetes, heart conditions for men, hypertension, other circulatory system conditions, other musculoskeletal disorders). Two conditions increased in limitations for older people (diabetes and

other circulatory system conditions). Our analysis shows increases for these same conditions and for many others over the past two decades.<sup>1</sup>

Declining morbidity appears for relatively few indicators (incidence of acute conditions, especially respiratory diseases; prevalence and limitations for some digestive and urinary chronic conditions, varicose veins and hemorrhoids, some skin conditions, and impairments for persons aged 65 and older). Few indicators show no trend over the 20 to 25 year period. In sum, signs of increasing morbidity far exceed signs of decreasing morbidity or no change.

In the same time interval, mortality has declined for middle-aged and older people. Table 3 records mortality rates in 1960 and 1978 for all causes and for chronic diseases which are leading causes of death. (The 1960 to 1978 period is chosen to be similar to the 1957–1981 span of NHIS indicators. Most of the mortality decline occurred after 1967.) For all causes, rates have dropped 15 to 30 percent for all age groups (45–54, 55–64, 65–74, 75–84, 85+). Declines for cardiovascular diseases (diseases of the heart, hypertension, cerebrovascular diseases, and arteriosclerosis) are especially large. Diabetes, hernia, and nephritis/nephrosis also registered declines. A few leading causes do show increased rates (cancer, mainly for men; cirrhosis, mainly for people aged 45 to 64; bronchitis/emphysema/asthma, mainly for people 65 and older). (The rise of “other diseases of arteries/arterioles/capillaries” is spurious, owing to changes in disease classification between the seventh and eighth ICD revisions.) These increases are irregular, being limited to just some age-sex groups, while the other groups show declines. In sum, the main picture is one of declining mortality from killer diseases for middle-aged and older men and women. (For further

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<sup>1</sup> We find similar percentage changes as Colvez and Blanchet for malignant neoplasms, diabetes, heart conditions, hypertension, and other musculoskeletal disorders. For “other circulatory system conditions,” we find smaller percentage increases from 1961–1963 to 1978 (see “other diseases of arteries/arterioles/capillaries” in table 3). The 1966 rates used by Colvez and Blanchet for the title were unusually low, and this accounts for the large percentage change they report. Colvez and Blanchet assess trends between two time points and perform statistical significance tests on the differences between two rates. Here, we examine the full data series (more than two time points) and identify trends visually rather than by regression equations. Methods for computing standard errors of regression coefficients for complex surveys like NHIS are being developed (see Landis et al. 1982; Verba 1982), but they are not yet standardized or easy to apply.



discussions of recent mortality trends, see Crimmins 1981, 1983; Fingerhut 1982; Klebba, Maurer, and Glass 1973, 1974; Rosenberg and McMillen 1983; Verbrugge 1980, 1983b.)

## What Explains Longer Life but Worsening Health?

First let us consider possible reasons for the increasing prevalence of chronic diseases and limitations from them in the population, and then possible reasons for declining mortality from chronic diseases.

### *Worsening Health*

Increasing prevalence and limitations from chronic diseases can be due to six factors:

1. Higher incidence of chronic diseases. If environmental quality or personal health habits deteriorated notably since 1957, chances of developing chronic diseases (killers and nonkillers) would rise.
2. Earlier diagnosis of chronic diseases. If people now learn that they have a disease earlier in its development than they did in the 1950s, this awareness causes more (better) disease reporting in health interviews and thereby higher prevalence rates.
3. Earlier accommodations in activities for disease. If people now change their jobs and other activities at earlier stages of a disease or they cut down their usual activities more for flareups, this boosts disability indicators such as limitation and restricted-activity rates.
4. Improved survival. As mortality rates drop, some people are "rescued" from death and remain among the living. Most of these "new survivors" are ill with chronic diseases, though not so ill as those who died. By staying alive longer, they have more years for their illnesses to advance in severity and more time to develop other chronic conditions, both killers and non-killers. The survivors may actually be more susceptible to new illnesses than their healthier age peers are; this is an intriguing question. Lower mortality, therefore, makes population health worsen in three ways: by immediate increases in prevalence rates,

- by more gradual increases in limitation rates and other severity measures, and by further gradual increases in prevalence rates due to new illnesses among the rescued.
5. Less institutionalization. Illness and impairment are principal reasons for entry into nursing and personal care homes. If ill people are more able to receive home and community care, this can reduce rates of institutional residence. Prevalence and limitation rates in the noninstitutional population should rise accordingly.
  6. Questionnaire changes. Changes in procedures for eliciting chronic disease reports can influence morbidity rates.

How plausible are these changes over the past 25 years?

1. Risks of developing chronic diseases have probably fallen due to safer work and home settings and to better lifestyle behaviors (less smoking by adults, reduced fats and alcohol, increased aerobic activity). Health habits affect disease risks in a slow and cumulative way; so the consequences of lifestyle changes by the population emerge gradually over decades rather than by immediate effects on disease incidence and severity.
2. People are now more aware of their chronic diseases than before due to marked improvements in diagnostic techniques and to more frequent visits to physicians (the percentage with a visit in the past six months has risen steadily over 20 years).
3. It is quite likely that people are more willing and able to adopt the sick role now than in the 1950s. People now know more about how their own behaviors affect disease onset and prognosis; in particular, the belief that disability slows the progress of chronic diseases and speeds recovery from acute ones may be stronger now. Furthermore, there are now ampler social supports for disability. Employer policies about work absence are more flexible, and public assistance programs, pension plans, and health insurance make it easier and more remunerative to be ill or disabled on a long-term basis. Finally, public attitudes about disability—both about short-term reductions and about permanent disability—seem more empathic and flexible.
4. Mortality declines have principally occurred in the 1970s. Increases in chronic morbidity are most pronounced in that decade as well. This sensitivity of morbidity trends to mortality trends is

not surprising especially for older ages, since every added year of life entails high risks of having diseases worsen or developing new ones.

5. Institutionalization rates have risen sharply in the past 20 years. Residence rates in nursing and personal care homes have increased for middle-aged and older persons, especially for those aged 75 to 84 and 85 and older (National Center for Health Statistics 1981).
6. Changes in data collection procedures can cause sudden jumps in rates, but they are unlikely to cause secular trends. The NHIS questionnaire has changed in several important ways, but there is no evidence this underlies the observed morbidity trends.<sup>2</sup>

Overall, the most plausible reasons for increased morbidity are people's greater awareness of their diseases due to earlier diagnosis, lower population mortality rates, and, possibly, earlier accommodations for disease. Trends in disease incidence and institutionalization have probably acted to decrease morbidity, and procedural changes in NHIS cannot account for the long trends. Colvez and Blanchet (1981) offer a similar list of factors to explain increased morbidity. They make no final choices among the reasons but do express concern that easier access to health services can encourage disability of ill people. Wilson (1981, 1983) offers especially comprehensive and thoughtful discussions of factors that can cause morbidity trends in health interview data.

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<sup>2</sup> Before 1967 people were asked first to name their recent acute health problems, then to indicate disability taken for them. In 1967 the procedure was reversed; people are now asked about any short-term disability first and then the conditions (acute or chronic) causing it. The heightened emphasis on disability did not, however, boost rates of restricted activity and bed disability (National Center for Health Statistics 1975). From 1968 to 1977, chronic condition presence was queried by asking all households about one body system each year. Since 1978 all body systems are covered each year but each household is asked about just one or two of them. This change should have no effect on the population rates (but standard errors for rates do increase).

One constant feature of NHIS procedures may be a problem for trend analysis. Tabulations use the broad age groupings of 45–64 and 65 and over. The average age of people in the groups has risen since 1957, and this “category aging” can push morbidity rates upward even if risk factors remain constant. To avoid such effects, we need data series with narrower age groupings.

### *Longer Life*

Decreasing mortality from chronic diseases can be due to four factors:

1. Lower incidence of chronic diseases. If environmental quality or personal health habits have improved over time, risks of developing chronic diseases would fall. This would ultimately (but not rapidly) be reflected in lower mortality rates.
2. Earlier or better treatment of chronic diseases. If medical intervention is now applied at earlier stages of a disease because of earlier or better diagnosis, diseases advance more slowly and case fatality is lower. Similarly, if medical treatments are more efficacious now, this too slows the course of disease and lowers case fatality.
3. Earlier or better self-care for disease. When diagnosed with a chronic disease, people can change their health habits in hopes of slowing its development. If people are now more likely to change their risk factors such as smoking, alcohol consumption, and stress level than before, this will delay death from their disease.
4. More heroic medical care near death. When disease has advanced and death is near, intensive drug therapy and technical procedures may stave off death. If heroic measures are applied more now than before, death can be delayed for days, months, and occasionally years.

How plausible are these changes for the past 25 years?

As noted above, incidence rates for many chronic diseases have probably fallen. Few data are available to document trends in incidence; for cancer, incidence rates have fallen for women but have increased for men (Devesa and Silverman 1978).

Early diagnosis and improved medical therapy for cardiovascular diseases are thought to be key reasons for declining mortality rates from them. Better drugs and surgical procedures for diabetes, early-stage respiratory diseases, and hernia have probably improved the prognosis for those conditions. By contrast, although some cancers are now detected earlier than in the 1950s, there have been few significant improvements in cancer therapy.

Lifestyle changes by the population have probably influenced the progression of chronic diseases. When diagnosed with a killer disease,

adults are now strongly encouraged to alter their habits and many do so in hopes of prolonging life. Earlier diagnosis has improved individuals' chances to make adaptations that do, in fact, influence the disease process.

Although heroic medical care is more common now than before, it is applied to relatively few people and probably has a negligible effect on mortality rates.

Overall, the most plausible reasons for decreased mortality are earlier and better medical care of diagnosed cases, earlier and better self-care after diagnosis, and possibly lower incidence of some chronic diseases. Heroic measures have minimal effect.

### *The Compatibility of Longer Life and Worsening Health*

The conjunction of increased morbidity and decreased mortality for American adults is not contradictory, but is instead a logical result of medical and social changes in the past 25 years. During this period, secondary prevention—the early detection of disease and subsequent intervention to slow its progress—was emphasized in medical care and personal health care (see Knowles 1977). Numerous drugs to control diseases were developed and widely disseminated through medical practice. Increasingly, individuals were encouraged to take more responsibility for their long-term health—to have persistent symptoms diagnosed, to follow drug regimens for diagnosed conditions, and to view short-term restrictions and long-term disability as means to improve health and longevity. Social programs made it easier for people to be disabled for a short time or permanently. These changes led naturally to increased chronic prevalence rates and increased acute and chronic disability rates in the population. At the same time, these medical and social changes slowed the progress of diagnosed chronic conditions, leading to decreased mortality rates. The mortality declines further spurred morbidity rates upward as the “new survivors” had their conditions worsen and as they developed new illnesses during their extra years of life.

Trends for specific chronic conditions are also consistent with these medical and social changes. Recall that morbidity increased while mortality decreased for most killer diseases (diabetes, diseases of heart, hypertension, cerebrovascular diseases, arteriosclerosis, bronchitis/em-

physema/asthma at ages 45 to 64, and hernia). This is a logical outcome of earlier diagnosis, better medical care, and better self-care. Several killers show rising morbidity and mortality (malignant neoplasms, bronchitis/emphysema/asthma at ages 65 and older, cirrhosis at ages 45 to 64). (The mortality rise for "other diseases of arteries, etc." is spurious.) Medical advances have been slow for these diseases especially at later stages. Also, although awareness and accommodations may have increased, lifestyle changes do not deter their progress much. And as cohorts with heavy smoking and drinking histories entered middle and older ages, incidence may have actually risen for these diseases. (Cancer incidence rates have risen for men.) Several killer diseases show declining morbidity and mortality in some age-sex groups (hernia, nephritis/nephrosis). These conditions are more amenable to medical treatment than those just mentioned. Lower morbidity rates also suggest lower incidence for them now.

The principal nonkiller diseases have risen in prevalence and limitations. This would be a logical outcome of more awareness, more accommodations, and longer lives. For impairment trends, we must look for different causes than for disease trends. Impairments (especially orthopedic ones) are often initiated by accidents, and physical aids are often used in their treatment. The decline in impairment rates for older people may reflect improvements in prosthetic devices and rehabilitation. (Injury rates have not fallen for people aged 65 and older, so we cannot argue that risks of acquiring impairments are lower now.)

The morbidity and mortality trends are contradictory only if we adopt a limited epidemiological approach and see them as straightforward outcomes of disease incidence and duration (severity). But once we invoke medical and social changes that affect health status and health behavior in contemporary America, the contradiction evaporates and the trends are consistent and even expected.

## Models That Link Morbidity and Mortality

In premodern society, the links between morbidity and mortality are simple, since acute conditions are the main causes of illness and death and interventions are uncommon (or at least not very effective). But in modern society, chronic conditions predominate and interventions

are common. Many chronic conditions are not fatal but do bother people and induce them to change activities and seek medical care. Others are fatal and will ultimately cause death, though personal and medical interventions can delay that outcome and provide symptom relief. Health habits and medical care are aimed at slowing the progress of chronic diseases, more than toward preventing them in the first place or curing them entirely. This can change as research identifies causal factors of chronic disease or finds ways to arrest it. Overall, the causal links between morbidity and mortality become more complex, and we must look to medicine and social behavior as well as epidemiology for explanations of aggregate change (trends in morbidity and mortality rates).

Ultimately, health scientists would like to develop a model that states how changes in chronic disease incidence and prevalence affect mortality rates. The model would also allow us to specify how changes in mortality will affect the population's health profile. The model would include risk factors, showing how changes in medical practice, physical environment, and individual behavior propel changes in disease incidence, prevalence, and mortality. The model could be elaborated to include assumptions about biological limits to mortality and disease reduction or about changes in virus structure and potency. And it could be extended to study the implications of morbidity and mortality changes on health expenditures and services. To craft a model linking morbidity and mortality is difficult but not impossible. Manton (1982) discusses some features of a model and asserts there is a "dynamic equilibrium" between population morbidity and mortality which can ultimately be quantified.

With a model, scientists could interpret recent trends and make future forecasts about morbidity and mortality with more confidence and rigor than is now possible. Contemporary analyses are necessarily more speculative, and they can easily differ from each other by using different assumptions about medical and social changes. Some examples of forecasts: Gruenberg (1977) posits that population morbidity will increase in the future. He notes that modern medical care has reduced the case fatality of some diseases, mainly by eliminating their complications (often terminal infections). He finds no evidence of changes in incidence or early progression of the diseases. Manton (1982) notes that population morbidity can also rise if techniques to reduce disease

severity or slow disease progression improve. In general, scenarios of worsening health rely on advances in secondary prevention of disease. By contrast, Fries (1983) and Fries and Crapo (1981) posit an improving health profile for older individuals in the future, due mainly to primary prevention. They assert that most people will soon be free of chronic diseases until the very end of life and that death will come from a simultaneous breakdown of body systems. Distinct chronic diseases may or may not appear at that point. This forecast assumes widespread and rapid success in disease prevention, and the authors express confidence that individual health practices are changing speedily to accomplish this. Note that the forecast refers to a morbidity profile for individuals, not to population morbidity rates. Some forecasts make no assumptions about morbidity trends. For example, Rice and Feldman (1983) consider how the increasing percentage of older persons in the United States population will affect future health services use and expenditures. They note that if increasing morbidity at older ages were also assumed and included, the estimates would be even higher.

## The Health of Future Cohorts

In predicting how healthy or ill future cohorts of middle-aged and older persons will be, we must, therefore, keep myriad factors in mind. The chances of acquiring and dying from chronic diseases are influenced by individuals' lifestyle habits and health care practices, the safety of work and residence environments, and medical drugs and procedures. The chances of being limited by a chronic disease or impairment are further influenced by public attitudes about illness, definitions of disability used by public assistance programs, employer policies about work absence, health insurance coverage, and pension supports. Moreover, the health and mortality profile of an age group reflects not just their contemporary risks but the cumulation of lifetime risks. Cohorts who will be middle-aged and older several decades from now will have had very different inputs to their health and longevity than current cohorts of those ages. Here, we offer some thoughts about those inputs and their consequences for health and mortality.

Future cohorts of middle-aged and older people will probably have more years of healthful lifestyles than current cohorts. Work environments will probably pose fewer hazards for chronic disease development; whether community environments will improve is less certain. Medical



diagnosis and treatment will be more efficacious, so that diseases are slowed and sometimes even arrested or reversed. Public attitudes and financial supports may make it easier for people to adopt the sick role temporarily or permanently. But more than today, ill people may wish to remain socially active, and employer policies may help them remain employed. Whether seriously ill people are more likely to remain in the community than enter institutions is uncertain, and it will depend greatly on public financing of care in both places. Summarizing this array of medical and social changes, we can anticipate (1) lower incidence of chronic diseases, (2) earlier diagnosis of chronic diseases, though the gains may be smaller than in the past 25 years, (3) earlier accommodations in activities for disease (the net results of some factors which encourage disability and some which discourage it), (4) earlier and better medical treatment of chronic diseases, and (5) earlier and better self-care for diseases.

The consequences for health and mortality statistics would be as follows. Mortality rates will continue to fall as fast or faster than in the 1970s. Prevalence rates for killer diseases could rise in the next few decades, mainly due to earlier diagnosis and to mortality reductions. In fact, further mortality declines will have a pernicious effect on population morbidity since future "new survivors" will be even more ill and susceptible than those in the 1970s. Gradually, as primary prevention succeeds and incidence rates fall, the upward trend in prevalence rates may be slowed or stopped. Prevalence rates for nonkiller diseases will probably increase further, because longer life gives people more opportunity to develop them and because advances in primary prevention are unlikely. Little is known now about the causes of nonfatal chronic conditions, and medical research will continue to focus on killer diseases in coming decades. Short-term disability rates may continue to rise, a reflection of earlier diagnoses, mortality reductions, and personal motivations to care for illness. So many factors affect long-term disability, it is difficult to make any forecasts. One possibility is that complete disability rates fall while partial disability rates rise; this can occur if medical treatments improve and if ill people choose to make minor accommodations but not relinquish social roles entirely.<sup>3</sup> Overall, morbidity for middle-aged and older people

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<sup>3</sup>The distinction of complete vs. partial disability is not the same as the NHIS distinction of major-activity vs. secondary-activity limitation. The

will probably shift toward nonkiller conditions, less severe symptoms, and partial accommodations.

Underlying the statistics will be individuals experiencing diseases, symptoms, and disability. What will their daily lives and later years be like compared to current individuals? At a given age, they will probably have fewer chronic diseases (both killers and nonkillers). Symptoms from the diseases they do have will tend to be less severe than at present, partly because diseases are less advanced and partly because the diseases will more often be nonkillers. People will probably have fewer serious limitations in their social activities, physical functioning, and mobility. And individuals who do have severe conditions may still be more independent than now because of better special aids and public accommodations (DeJong and Lifchez 1983). Thus, middle-aged and older people may be more comfortable and active even when chronic diseases are present. Individuals can expect to live longer. An unfortunate consequence is that they may ultimately develop more chronic conditions in their lifetime than now, especially the nonkiller conditions. And symptoms due to natural aging processes (such as graying of hair and loss of skin elasticity) will also accumulate. The death process might be swifter than now and involve the breakdown of several body systems at once (Fries 1983; Fries and Crapo 1981); this endpoint scenario will be more common as primary prevention of disease succeeds.

In conclusion, for the rest of this century some health statistics will continue to show increasing morbidity in the United States population. This is especially likely for statistics on prevalence and limitations for nonkiller conditions. Increasingly, individuals will choose behaviors early in life with the hope of preventing killer diseases and debilitating nonkillers such as arthritis and hearing loss. Medical research and care will continue to focus on diagnosis and control of killer diseases. But as medical advances for them slow and as nonkillers assume prominence in patients' lives, medicine will gradually shift emphasis toward musculoskeletal diseases and symptoms, sensory impairments, allergies, and skin problems of middle-aged and older persons.

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former refers to degree of disability, the latter to type of activity affected. (NHIS does ask about degree of major-activity limitation, but age-sex-specific rates are not available for recent years so trends for 1957 to 1981 cannot be examined.)

## References

- Balamuth, E. 1965. Health Interview Responses Compared with Medical Records. *Vital and Health Statistics*, Series 2, no. 7. Washington: National Center for Health Statistics.
- Colvez, A., and M. Blanchet. 1981. Disability Trends in the United States Population 1966–76: Analysis of Reported Causes. *American Journal of Public Health* 71:464–71.
- Crimmins, E.M. 1981. The Changing Pattern of American Mortality Decline, 1940–1977, and Its Implications for the Future. *Population and Development Review* 7:229–54.
- . 1983. Recent and Prospective Trends in Old Age Mortality. Paper presented at the American Association for the Advancement of Science meetings, Detroit.
- DeJong, G., and R. Lifchez. 1983. Physical Disability and Public Policy. *Scientific American* 248(6):40–49.
- Devesa, S.S., and D.T. Silverman. 1978. Cancer Incidence and Mortality Trends in the United States: 1935–1974. *Journal of the National Cancer Institute* 60:545–71.
- Fingerhut, L.A. 1982. Changes in Mortality among the Elderly: United States, 1940–78. *Vital and Health Statistics*, series 3, no. 22. Hyattsville, Md.: National Center for Health Statistics.
- Fries, J.F. 1983. The Compression of Morbidity. *Milbank Memorial Fund Quarterly/Health and Society* 61:397–419.
- Fries, J.F., and L.M. Crapo. 1981. *Vitality and Aging*. San Francisco: W.H. Freeman.
- Gruenberg, E.M. 1977. The Failures of Success. *Milbank Memorial Fund Quarterly/Health and Society* 55:3–24.
- Klebba, A.J., J.D. Maurer, and E.J. Glass. 1973. Mortality Trends: Age, Color, and Sex, United States, 1950–69. *Vital and Health Statistics*, series 20, no. 15. Rockville, Md.: National Center for Health Statistics.
- . 1974. Mortality Trends for Leading Causes of Death, United States, 1950–69. *Vital and Health Statistics*, series 20, no. 16. Rockville, Md.: National Center for Health Statistics.
- Knowles, J.H., ed. 1977. *Doing Better and Feeling Worse: Health in the United States*. New York: Norton.
- Landis, J.R., J.M. Lepkowski, S.A. Eklund, and S.A. Stenouwer. 1982. A Statistical Methodology for Analyzing Data from a Complex Survey: The First National Health and Nutrition Examination Survey. *Vital and Health Statistics*, Series 2, no. 92. Hyattsville, Md.: National Center for Health Statistics.
- Madow, W.G. 1967. Interview Data on Chronic Conditions Compared

- with Information Derived from Medical Records. *Vital and Health Statistics*, series 2, no. 23. Washington: National Center for Health Statistics.
- . 1973. Net Differences in Interview Data on Chronic Conditions and Information Derived from Medical Records. *Vital and Health Statistics*, series 2, no. 57. Washington: National Center for Health Statistics.
- Manton, K.G. 1982. Changing Concepts of Morbidity and Mortality in the Elderly Population. *Milbank Memorial Fund Quarterly/Health and Society* 60:183–244.
- National Center for Health Statistics. 1975. Health Interview Survey Procedure, 1957–1974. *Vital and Health Statistics*, Series 1, no. 11. Rockville, Md.: National Center for Health Statistics.
- . 1980. *Health: United States, 1979*. DHHS pub. no. PHS 80-1232. Hyattsville, Md.
- . 1981. *Health: United States, 1981*. DHHS pub. no. PHS 82-1232. Hyattsville, Md.
- Rice, D.P., and J.J. Feldman. 1983. Living Longer in the United States: Demographic Changes and Health Needs of the Elderly. *Milbank Memorial Fund Quarterly/Health and Society* 61:362–96.
- Rosenberg, H.M., and M.M. McMillen. 1983. Trends in U.S. Mortality. *Proceedings of the American Statistical Association*. Washington: American Statistical Association.
- Verba, V. 1982. The Estimation and Presentation of Sampling Errors. *World Fertility Survey Technical Bulletin*, no. 11. Voorburg, Netherlands: International Statistical Institute.
- Verbrugge, L.M. 1980. Recent Trends in Sex Mortality Differentials in the United States. *Women and Health* 5:17–37.
- . 1982. Sex Differentials in Health. *Public Health Reports* 97:417–37.
- . 1983a. Women and Men: Mortality and Health of Older People. In *Aging in Society: Selected Reviews of Recent Research*. ed. M.W. Riley, B.B. Hess, and K. Bond, 139–64. Hillsdale, N.J.: Lawrence Erlbaum Associates.
- . 1983b. The Social Roles of the Sexes and Their Relative Health and Mortality. In *Sex Differentials in Mortality: Trends, Determinants, and Consequences*, A. Lopez and L. Ruzicka, 221–45. Canberra: Australian National University.
- . 1984. A Health Profile of Older Women, With Comparisons to Older Men. *Research on Aging*, in press.
- Wilson, R.W. 1981. Do health indicators indicate health? *American Journal of Public Health* 71:461–63.

———. 1983. Trends in illness and disability. *Proceedings of the American Statistical Association* (Social Statistics Section). Washington.

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*Acknowledgments:* An earlier version of this paper was presented at the Population Association of America meetings, Pittsburgh, April 1983, and the American Sociological Association meetings, Detroit, August 1983. A Research Career Development Award from the National Institute of Child Health and Human Development facilitated the research and writing of the paper. The author appreciates comments from Jacob Brody, James Fries, Ernest Gruenberg, Ronald Wilson, and an anonymous reviewer of earlier versions.

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