Worsening Trends in Adult Health-Related Quality of Life and Self-Rated Health—United States, 1993–2001

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SYNOPSIS

Objectives. Health-related quality of life and self-rated health complement mortality and morbidity as measures used in tracking changes and disparities in population health. The objectives of this study were to determine whether and how health-related quality of life and self-rated health changed overall in U.S. adults and in specific sociodemographic and geographic groups from 1993 through 2001.

Methods. The authors analyzed data from annual cross-sectional Behavioral Risk Factor Surveillance System surveys of 1.2 million adults from randomly selected households with telephones in the 50 states and the District of Columbia.

Results. Mean physically and mentally unhealthy days and activity limitation days remained constant early in the study period but increased later on. Mean unhealthy days increased about 14% during the study period. The percentage with fair or poor self-rated health increased from 13.4% in 1993 to 15.5% in 2001. Health-related quality of life and self-rated health worsened in most demographic groups, especially adults 45–54 years old, high school graduates without further education, and those with annual household incomes less than $50,000. However, adults 65 years old or older and people identified as non-Hispanic Asian/Pacific Islander reported stable or improving health-related quality of life and self-rated health. In 18 of the states and the District of Columbia, mean unhealthy days increased, while only North Dakota reported a decrease.

Conclusion. Population tracking of adult health-related quality of life and self-rated health identified worsening trends overall and for many groups, suggesting that the nation's overall health goals as identified in the Healthy People planning process are not being met.

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Concerns about the aging of the population, the burden of chronic disease, environmental health threats, health behavior trends, and the performance and cost of health care services have led to renewed interest in population health tracking.[1–7] Since the 1979 publication of the Surgeon General's report on health promotion and disease prevention, *Healthy People,* national 10-year disease prevention strategies have emphasized the need to track population health, improvements, and disparities using broad measures other than morbidity and mortality.[8,9] The aging of the population,[10] the twin epidemics of obesity[11] and diabetes mellitus,[12] and the persistence of health disparities among subgroups of the U.S. population[9] all argue for expanding the public health focus on individual behaviors to include more emphasis on general societal trends and policies that affect population health and health-related quality of life (HRQOL).[13] Tracking perceived physical and mental health over time would provide such an emphasis and would help to address the need for broad measures of population health that go beyond morbidity and mortality.[13–16]

General subjective quality of life includes elements of life satisfaction and happiness. HRQOL, however, includes only those aspects of general subjective quality of life affecting a person's health or health perceptions. Measures of HRQOL have been shown to be valid and worthwhile outcomes in clinical and general populations.[17] Though patient-reported HRQOL outcomes are often included in assessing the symptom burden of treatment and control groups in clinical and pharmaceutical research, these outcomes are seldom used in tracking population health. Tracking HRQOL and self-rated health (SRH) through continual surveillance would provide the public's perspective to help guide health policy and monitor progress on reaching national health goals.

In the early 1990s, the Centers for Disease Control and Prevention (CDC) followed the advice of representatives from state and local health departments, other federal agencies, and experts in HRQOL, health status assessment, and population health in developing and validating a brief set of questions to track HRQOL and SRH in states and communities.[18] From 1993 through 2001, more than 1.2 million adults 18 years of age or older in the U.S. answered these questions on the population-based Behavioral Risk Factor Surveillance (BRFSS) surveys. Measures based on these questions have proved useful in quantifying the perceived burden of chronic health conditions[19–24] and disabilities[25,26] and have helped to identify the health-related needs of vulnerable populations.[27–30] For the present study, we used these data to estimate trends in HRQOL and SRH for adults in the U.S. and for sociodemographic and geographic groups. After presenting these findings, we discuss the health policy implications of these trends.

METHODS

Source of data

The BRFSS is an ongoing, random-digit-dialed telephone survey of U.S. adults 18 years of age or older. This survey is conducted monthly in each state and the District of Columbia to assess behavioral risk factors for disease and preventive behaviors to reduce disease.[31] The survey is a major data source used by public health departments in many states and large cities in developing their mission, objectives, and priorities.[32,33] The annual number of U.S. respondents to the survey increased from 102,263 in 1993 to 204,802 in 2001. Annual median state response rates as defined by the Council of American Survey Research Organizations (CASRO) decreased from 71.4% in 1993 to 51.1% in 2001.[34,35] Because the BRFSS is a surveillance system, the CDC's Institutional Review Board has determined that the BRFSS is exempt from its review.

From 1993 through 2001, state BRFSS participants answered the following four questions about SRH and HRQOL:

1. Would you say that in general your health is excellent, very good, good, fair, or poor? [*SRH*];
2. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good? [*physically unhealthy days*];
3. Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good? [*mentally unhealthy days*]
4. During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation? [*activity limitation days*].

Measures

We calculated percentages and their standard errors (SEs) for respondents reporting fair or poor health on the SRH question. We calculated annual means and SEs for the "days" measures. Finally, from the sum of a respondent's physically unhealthy days and mentally unhealthy days, we calculated a fifth measure (unhealthy days); the maximum allowed was 30 unhealthy days.

Statistical analyses

For each of the five study measures, we calculated annual values and their SEs separately for men and women in three age groups: 18–44 years, 45–64 years, ≥65 years. Because the BRFSS uses a complex sample design, we used Taylor series linearization that assumed "with-replacement" sampling to calculate SEs.[36]

After adjusting for respondent age, we also estimated average annual percentage changes and their 95% confidence intervals (CIs) for the five study measures for all respondents and for groups defined by sex, race/ethnicity, educational attainment, annual household income, employment status, marital status, and health care coverage. The annual percentage change is defined as the slope from a linear regression model of a study measure on interview year divided by the mean of that measure in the first year of this study, 1993. We considered average annual percentage changes with 95% CIs that excluded 0 as statistically significant. For each study measure, we also identified the sociodemographic subgroups with 95% CIs (for annual percentage changes) that did not overlap with the comparable 95% CI for all respondents.

For each state and U.S. Census Division, we calculated mean annual unhealthy days and their corresponding SEs

standardized for age to the U.S. population on April 1, 2000.[37] To calculate the average age-standardized annual percentage changes in unhealthy days over the study period, we regressed these means on interview year, with weights inversely proportional to the variances of these means (the squares of their SEs). Because we had no a priori hypotheses about the shape of the potential trends, we modeled only linear trends in these regressions. The annual percentage change is defined as the slope from these weighted regressions divided by a reference mean, the age-standardized unhealthy days mean for the first year of the study period, 1993. (For Wyoming, which did not participate in the 1993 BRFSS, we used the 1994 age-standardized unhealthy days mean.) For example, a state with data showing a slope from its weighted regression of 0.15 and an age-standardized unhealthy days mean in 1993 of 5.0 would have had a 3.0% (= [0.15 × 100] / 5.0) annual percentage change in unhealthy days over the study period; such an annual percentage change with this starting point would predict an age-standardized unhealthy days mean of 6.2 in 2001 (5.0 × [1 + (2001 − 1993) × 0.03] = 5.0 × 1.24 = 6.2).

RESULTS

From 1993 through 2001, 96.8% (n=1,226,846) of the BRFSS survey respondents answered all four core questions related to HRQOL and SRH. Trends varied by sex, age group, and HRQOL or SRH measure (Table 1). Overall, the means for the four "days" measures remained relatively constant during the first five years of the study period (1993 through 1997) but increased later on (data not shown). Unhealthy days ranged from 5.23 in 1993 to 5.38 days in 1996, fell to 5.25 days in 1997, but increased thereafter to 6.03 in 2001 (data not shown). Activity limitation days ranged from 1.62 in 1993 to 1.73 in 1996, but increased to 2.01 in 2001 (data not shown). Physically unhealthy days ranged from 2.96 in 1994 to 3.14 in 1998, but increased to 3.46 in 2001 (data not shown). Mentally unhealthy days ranged from 2.87 in 1993 to 3.03 in 1999 but increased to 3.37 in 2001 (data not shown). The percentage of respondents with fair or poor SRH gradually increased from 13.4% in 1993 to 15.5% in 2001 (data not shown).

Women reported worse health—i.e., they more frequently reported poor health—on all measures of HRQOL and SRH than men within the same age groups, except for activity limitation days in women 45 years old or older in 1994 and the percentage with fair or poor SRH in women 45–64 years old in 1996 (Table 1). Older respondents also reported worse levels of HRQOL and SRH than younger respondents, except for mentally unhealthy days in all age groups and unhealthy days in women from 1999 through 2001. With some exceptions, most of the groups classified by sex and age followed the overall trend of worsening HRQOL and SRH over time, particularly in more recent years. These exceptions included mean mentally unhealthy days and activity limitation days for women 45–64 years old, which increased throughout the study period; mean mentally unhealthy days and percent fair or poor SRH for men 65 years old or older, which remained relatively constant; and percent fair or poor SRH for women 65 years old or older, which also remained relatively constant.

Sociodemographic groups

For all respondents, mean physically unhealthy days increased about 1.5% per year (95% CI 1.2%, 1.9%), or about 12% during the study period (Table 2). These increases occurred among both sexes; most age groups; people identified as non-Hispanic white, non-Hispanic African American, or non-Hispanic American Indian/Alaskan Native; all educational levels; all income groups; all employment groups; all marital groups; and people with health care coverage. Of the groups reporting increases, increases greater than that for all respondents occurred among people 45–54 years old, people identified as non-Hispanic American Indian/Alaska Native, high school graduates without further education, those with some college or technical school education, and those with incomes below $50,000. However, people 25–34 years old and 75 years old or older; people identified as Hispanic, non-Hispanic Asian/Pacific Islander, or members of "other non-Hispanic" minority groups; and those without health care coverage showed little change in mean physically unhealthy days.

For all respondents, mean mentally unhealthy days increased about 2.1% per year (95% CI 1.7%, 2.4%), or about 17% during the study period. In addition to the groups that reported increases in mean physically unhealthy days, these increases occurred among younger respondents (25–34 years old), members of "other non-Hispanic" minority groups, and those without health care coverage. Of the groups reporting increases, increases greater than that for all respondents occurred among people who were 45–54 years old, high school graduates without further education, and those with incomes less than $50,000. Mean mentally unhealthy days remained about the same during the period for people ages 65 years old or older and people identified as Hispanic or non-Hispanic Asian/Pacific Islander.

For all respondents, mean unhealthy days increased about 1.7% per year (95% CI 1.4%, 1.9%), or about 14% during the study period. Trends for this measure across sociodemographic groups resembled those for mentally unhealthy days. The only exceptions were in people 65 years old or older, who reported significant increases in unhealthy days but not in mentally unhealthy days, and in members of "other non-Hispanic" minority groups, who reported significant increases in mentally unhealthy days but not in unhealthy days. Of the groups reporting increases, increases greater than that for all respondents occurred among people 45–54 years old, high school graduates without further education, and those with annual household incomes less than $50,000. Mean unhealthy days remained about the same during the period for people identified as Hispanic, non-Hispanic Asian/Pacific Islander, or members of "other non-Hispanic" minority groups.

For all respondents, mean activity limitation days increased about 2.3% per year (95% CI 1.9%, 2.8%), or about 18% during the study period. Trends for this measure across the sociodemographic groups most closely resembled those for mentally unhealthy days. The only exceptions occurred among people ages 18–24 years and among "other non-Hispanic" minority group members, who reported more mentally unhealthy days over time but unchanged activity limitation days. Of groups reporting increases, increases greater than that for all respondents occurred among people

Table 1. Health-related quality of life and self-rated health by sex and age group, Behavioral Risk Factor Surveillance System, United States, 1993–2001

	Women						*Men*					
	18–44 years		*45–64 years*		*≥65 years*		*18–44 years*		*45–64 years*		*≥65 years*	
	Mean	*SE*	*Mean*	*SE*	*Mean*	*SE*	*Mean*	*SE*	*Mean*	*SE*	*Mean*	*SE*
Physically unhealthy days												
1993	2.5	<0.05	3.7	0.1	5.5	0.1	1.8	0.1	3.1	0.1	4.9	0.2
1994	2.4	0.1	3.9	0.1	5.3	0.1	1.7	<0.05	3.3	0.1	4.6	0.2
1995	2.6	0.1	3.9	0.1	5.7	0.1	1.8	0.1	3.1	0.1	4.5	0.2
1996	2.5	0.1	3.8	0.1	5.2	0.1	1.7	<0.05	3.3	0.1	4.7	0.2
1997	2.5	<0.05	3.8	0.1	5.5	0.1	1.8	<0.05	3.3	0.1	4.4	0.1
1998	2.5	<0.05	4.2	0.1	5.5	0.1	1.8	<0.05	3.3	0.1	4.7	0.1
1999	2.6	<0.05	4.1	0.1	5.6	0.1	2.0	0.1	3.4	0.1	4.8	0.2
2000	2.6	<0.05	4.4	0.1	5.8	0.1	2.0	0.1	3.6	0.1	5.0	0.2
2001	2.8	0.1	4.5	0.1	5.9	0.1	2.1	<0.05	3.7	0.1	5.1	0.1
Mentally unhealthy days												
1993	3.8	0.1	3.2	0.1	2.0	0.1	2.6	0.1	2.2	0.1	1.7	0.1
1994	3.9	0.1	3.3	0.1	2.2	0.1	2.7	0.1	2.2	0.1	1.6	0.1
1995	4.0	0.1	3.2	0.1	2.3	0.1	2.6	0.1	2.2	0.1	1.7	0.1
1996	4.0	0.1	3.4	0.1	2.1	0.1	2.6	0.1	2.3	0.1	1.6	0.1
1997	4.0	0.1	3.5	0.1	2.1	0.1	2.7	0.1	2.3	0.1	1.6	0.1
1998	4.1	0.1	3.6	0.1	2.4	0.1	2.7	0.1	2.3	0.1	1.5	0.1
1999	3.9	0.1	3.6	0.1	2.1	0.1	2.9	0.1	2.4	0.1	1.5	0.1
2000	4.4	0.1	3.9	0.1	2.4	0.1	2.9	0.1	2.4	0.1	1.5	0.1
2001	4.4	0.1	4.1	0.1	2.4	0.1	3.1	0.1	2.8	0.1	1.6	0.1
Unhealthy days												
1993	5.9	0.1	6.0	0.1	6.5	0.1	4.1	0.1	4.5	0.1	5.5	0.2
1994	5.8	0.1	6.3	0.1	6.4	0.1	4.1	0.1	4.7	0.1	5.4	0.2
1995	6.1	0.1	6.2	0.1	7.0	0.1	4.1	0.1	4.6	0.1	5.3	0.2
1996	5.9	0.1	6.2	0.1	6.3	0.1	4.0	0.1	4.7	0.1	5.4	0.2
1997	5.9	0.1	6.1	0.1	6.5	0.1	4.2	0.1	4.8	0.1	5.1	0.2
1998	6.1	0.1	6.6	0.1	6.8	0.1	4.2	0.1	4.7	0.1	5.4	0.2
1999	5.9	0.1	6.6	0.1	6.6	0.1	4.5	0.1	4.9	0.1	5.5	0.2
2000	6.4	0.1	7.0	0.1	7.0	0.1	4.5	0.1	5.2	0.1	5.6	0.2
2001	6.5	0.1	7.4	0.1	7.2	0.1	4.7	0.1	5.4	0.1	5.9	0.1

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Table 1 (continued). Health-related quality of life and self-rated health by sex and age group, Behavioral Risk Factor Surveillance System, United States, 1993–2001

	Women						*Men*					
	18–44 years		*45–64 years*		*≥65 years*		*18–44 years*		*45–64 years*		*≥65 years*	
	Mean	*SE*	*Mean*	*SE*	*Mean*	*SE*	*Mean*	*SE*	*Mean*	*SE*	*Mean*	*SE*
Activity limitation days												
1993	1.4	<0.05	1.9	0.1	2.6	0.1	1.1	<0.05	1.8	0.1	2.4	0.1
1994	1.4	<0.05	2.0	0.1	2.4	0.1	1.1	<0.05	2.0	0.1	2.4	0.1
1995	1.5	<0.05	2.1	0.1	2.9	0.1	1.1	<0.05	1.8	0.1	2.6	0.1
1996	1.6	<0.05	2.0	0.1	2.5	0.1	1.1	<0.05	1.9	0.1	2.4	0.1
1997	1.4	<0.05	2.1	0.1	2.6	0.1	1.2	<0.05	2.0	0.1	2.4	0.1
1998	1.6	<0.05	2.3	0.1	2.8	0.1	1.1	<0.05	2.1	0.1	2.5	0.1
1999	1.6	<0.05	2.3	0.1	2.8	0.1	1.3	<0.05	2.0	0.1	2.5	0.1
2000	1.6	<0.05	2.5	0.1	2.6	0.1	1.2	<0.05	2.2	0.1	2.6	0.1
2001	1.7	<0.05	2.6	0.1	2.7	0.1	1.3	<0.05	2.3	0.1	2.5	0.1
Fair or poor self-rated health												
1993	8.1	0.2	16.6	0.4	30.6	0.6	6.2	0.2	15.6	0.5	29.9	0.8
1994	8.0	0.2	17.3	0.5	30.0	0.6	7.3	0.3	16.4	0.5	28.0	0.9
1995	8.6	0.3	17.4	0.5	30.4	0.6	7.0	0.3	15.4	0.5	28.2	0.8
1996	8.8	0.2	17.2	0.4	28.4	0.5	7.5	0.3	17.4	0.5	27.8	0.7
1997	8.8	0.2	16.6	0.4	28.7	0.5	8.0	0.3	16.4	0.5	27.1	0.7
1998	8.8	0.2	18.3	0.4	29.7	0.5	8.1	0.3	16.4	0.4	27.4	0.7
1999	9.3	0.2	18.0	0.4	28.1	0.5	8.4	0.3	16.5	0.4	27.5	0.7
2000	9.7	0.2	18.9	0.4	29.0	0.5	8.9	0.3	16.8	0.4	28.2	0.7
2001	10.1	0.2	19.4	0.4	29.5	0.5	8.5	0.3	17.9	0.4	26.8	0.6

NOTE: All SEs shown as <0.05 are positive values, i.e., >0.

SE = standard error

Table 2. Annual percentage changes in measures of health-related quality of life and in self-rated health among adults, by demographic characteristics, Behavioral Risk Factor Surveillance System, United States, 1993–2001

	Physically unhealthy days		*Mentally unhealthy days*		*Unhealthy days*		*Activity limitation days*		*Percent with fair or poor self-rated health*	
Variable	*Percent change*	*95% CI*	*Percent change*	*95% CI*	*Percent change*	*95% CI*	*Percent change*	*95% CI*	*Percent change*	*95% CI*
Overall	1.5	1.2, 1.9[a]	2.1	1.7, 2.4[a]	1.7	1.4, 1.9[a]	2.3	1.9, 2.8[a]	1.2	0.9, 1.6[a]
Sex										
Men	1.8	1.3, 2.3[a]	1.9	1.4, 2.5[a]	1.8	1.4, 2.2[a]	2.0	1.3, 2.7[a]	1.4	0.9, 2.0[a]
Women	1.4	1.0, 1.8[a]	2.2	1.8, 2.6[a]	1.6	1.3, 1.9[a]	2.6	2.1, 3.1[a]	1.1	0.7, 1.5[a]
Age group (years)										
18–24	1.0	0, 2.0[a]	2.2	1.4, 3.0[a]	1.6	1.0, 2.3[a]	0.9	–0.4, 2.3	2.8	1.2, 4.3[a]
25–34	0.6	–0.1, 1.3	1.7	1.1, 2.3[a]	1.2	0.7, 1.7[a]	1.2	0.3, 2.1[a]	3.3	2.2, 4.4[a]
35–44	2.4	1.6, 3.1[a]	1.6	1.0, 2.2[a]	1.7	1.3, 2.2[a]	3.1	2.1, 4.1[a]	3.9	3.0, 4.9[a]
45–54	2.8	2.0, 3.6[a]	3.4	2.7, 4.2[a]	2.8	2.2, 3.3[a]	5.3	4.2, 6.4[a]	3.0	2.2, 3.8[a]
55–64	2.0	1.2, 2.8[a]	2.2	1.3, 3.2[a]	2.0	1.3, 2.6[a]	2.9	1.9, 4.0[a]	0.7	0, 1.4[a]
65–74	0.9	0.2, 1.6[a]	0.8	–0.4, 1.9	0.9	0.3, 1.5[a]	0.4	–0.7, 1.4	–0.8	–1.4, –0.3[a]
≥75	0.6	–0.2, 1.3	0.1	–1.3, 1.4	0.9	0.2, 1.6[a]	0.6	–0.5, 1.8	–0.8	–1.3, –0.2[a]
Race/ethnicity										
Non-Hispanic white	1.4	1.0, 1.7[a]	1.9	1.6, 2.2[a]	1.6	1.4, 1.9[a]	2.1	1.6, 2.5[a]	0	–0.2, 0.3
Non-Hispanic African American	1.7	0.7, 2.7[a]	2.5	1.5, 3.5[a]	1.9	1.2, 2.6[a]	1.7	0.2, 3.3[a]	–2.0	–3.2, –0.8[a]
Hispanic	0.5	–0.6, 1.6	0.2	–1.0, 1.3	0.6	–0.3, 1.4	0.9	–0.5, 2.3	3.9	2.9, 4.9[a]
Asian/Pacific Islander	0.7	–1.8, 3.3	–1.2	–3.5, 1.0	–0.6	–2.4, 1.2	1.5	–1.9, 4.9	0.2	–2.7, 3.0
Non-Hispanic American Indian/Alaskan Native	4.6	2.2, 7.0[a]	2.8	0.3, 5.4[a]	3.0	1.2, 4.7[a]	6.6	3.2, 10.1[a]	3.3	0.8, 5.7[a]
Other non-Hispanic	0.3	–2.7, 3.2	4.0	0.4, 7.6[a]	2.0	–0.5, 4.5	1.1	–3.1, 5.2	1.4	–1.7, 4.5
Educational attainment										
Less than high school	1.8	1.1, 2.4[a]	2.3	1.6, 3.1[a]	1.9	1.3, 2.4[a]	2.0	1.2, 2.9[a]	2.8	2.3, 3.3[a]
High school	2.6	2.0, 3.1[a]	3.2	2.6, 3.7[a]	2.6	2.2, 3.0[a]	3.8	3.0, 4.6[a]	2.0	1.5, 2.6[a]
Some college/technical school	2.6	2.0, 3.3[a]	2.2	1.6, 2.7[a]	2.2	1.8, 2.6[a]	3.6	2.7, 4.4[a]	2.1	1.4, 2.8[a]
College	1.1	0.4, 1.7[a]	1.3	0.7, 1.9[a]	1.1	0.7, 1.6[a]	2.0	1.0, 2.9[a]	1.0	0.1, 2.0[a]

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Table 2 (continued). Annual percentage changes in measures of health-related quality of life and in self-rated health among adults, by demographic characteristics, Behavioral Risk Factor Surveillance System, United States, 1993–2001

	Physically unhealthy days		*Mentally unhealthy days*		*Unhealthy days*		*Activity limitation days*		*Percent with fair or poor self-rated health*	
Variable	*Percent change*	*95% CI*	*Percent change*	*95% CI*	*Percent change*	*95% CI*	*Percent change*	*95% CI*	*Percent change*	*95% CI*
Annual household income										
<$15,000	4.8	4.2, 5.5[a]	4.9	4.2, 5.7[a]	4.1	3.6, 4.6[a]	7.3	6.4, 8.1[a]	4.6	4.1, 5.2[a]
$15,000–$24,999	5.9	5.0, 6.7[a]	4.4	3.7, 5.2[a]	4.6	4.0, 5.2[a]	7.5	6.4, 8.6[a]	6.6	5.8, 7.4[a]
$25,000–$49,999	3.4	2.8, 4.0[a]	3.5	3.0, 4.1[a]	3.2	2.8, 3.7[a]	4.5	3.6, 5.4[a]	5.8	4.9, 6.6[a]
≥$50,000	1.9	1.2, 2.7[a]	2.2	1.5, 2.8[a]	1.9	1.4, 2.4[a]	2.6	1.6, 3.6[a]	3.2	1.9, 4.4[a]
Unknown or refused to answer	2.5	1.7, 3.3[a]	3.2	2.2, 4.1[a]	2.6	2.0, 3.3[a]	3.7	2.5, 5.0[a]	2.0	1.3, 2.8[a]
Employment status										
Employed/self-employed	2.0	1.6, 2.5[a]	2.2	1.8, 2.6[a]	2.0	1.7, 2.3[a]	2.5	1.9, 3.2[a]	3.4	2.7, 4.0[a]
Unemployed/unable to work	1.6	0.9, 2.2[a]	2.5	1.7, 3.2[a]	1.9	1.3, 2.4[a]	2.3	1.6, 3.1[a]	1.2	0.6, 1.8[a]
Student/homemaker	0.8	0.3, 1.3[a]	0.9	0.4, 1.5[a]	0.9	0.5, 1.3[a]	1.4	0.7, 2.1[a]	–0.1	–0.6, 0.3
Marital status										
Single	1.8	1.0, 2.6[a]	2.1	1.4, 2.8[a]	1.9	1.3, 2.4[a]	2.5	1.4, 3.6[a]	1.9	0.8, 2.9[a]
Currently married	1.0	0.6, 1.5[a]	1.7	1.2, 2.1[a]	1.3	0.9, 1.6[a]	1.6	1.0, 2.2[a]	0.9	0.5, 1.4[a]
Other	2.0	1.4, 2.5[a]	1.9	1.4, 2.5[a]	1.8	1.4, 2.2[a]	2.7	2.0, 3.3[a]	1.0	0.5, 1.5[a]
Health care coverage										
Yes	1.7	1.3, 2.0[a]	2.2	1.9, 2.6[a]	1.8	1.5, 2.1[a]	2.4	1.9, 2.9[a]	0.7	0.4, 1.1[a]
No	0.4	–0.4, 1.2	1.1	0.4, 1.8[a]	0.7	0.2, 1.3[a]	1.2	0.2, 2.2[a]	3.3	2.4, 4.1[a]
Health care coverage (18–64 years old)										
Yes	1.8	1.4, 2.1[a]	2.6	2.2, 3.0[a]	2.0	1.7, 2.3[a]	2.8	2.3, 3.3[a]	1.5	1.1, 1.9[a]
No	0.5	–0.3, 1.3	1.1	0.4, 1.8[a]	0.8	0.2, 1.3[a]	1.3	0.3, 2.4[a]	3.3	2.4, 4.1[a]

NOTE: The annual percentage change of a health-related quality of life measure equals the slope from a linear regression model of that measure on year, adjusted for age (except where stratified by age) and divided by the mean of that measure in the reference year, 1993.

[a]Two-sided $p<0.05$

CI = confidence interval

45–54 years old, people identified as non-Hispanic American Indian/Alaskan Native, high school graduates without further education, and those with incomes less than $50,000.

For all respondents, the percentage reporting fair or poor SRH increased about 1.2% per year (95% CI 0.9%, 1.6%), or about 10% during the study period. Although both men and women reported increases, younger respondents (25–54 years old) reported greater increases than the increase for all respondents, while older respondents (≥65 years old) reported decreases over time. People identified as non-Hispanic white, non-Hispanic Asian/Pacific Islander, or members of "other non-Hispanic" minority groups reported no change, but those identified as African American reported decreases, and those identified as Hispanic or as non-Hispanic American Indian/Alaskan Native reported increases in the percentage with fair or poor SRH. Respondents without health care coverage reported an increase in the percentage with fair or poor SRH greater than those for people with health care coverage and all respondents. Of groups reporting increases, increases greater than that for all respondents occurred among people identified as Hispanic, people who did not graduate from high school, all income groups except those who did not know or refused to provide their annual household income, and the employed and the self-employed.

For the HRQOL ("days") measures, annual percentage changes were consistently greater in the 45–54 year age group than in the younger or older age groups; in individuals with less than $50,000 in annual household income than in higher-income people; in employed and unemployed individuals than in students, homemakers, or retired people; and in those with health care coverage than in those without such coverage. For SRH, percentage changes within groups resembled those for the HRQOL measures except for health care coverage; people without coverage had a larger percentage increase than people with coverage.

Geographic areas

Although mean age-standardized unhealthy days for six of the nine U.S. Census Divisions generally increased yearly from 1993 through 2001, means for the West North Central Division, the Mountain Division, and the Pacific Division remained about the same (Table 3). The East South Central Division had the largest annual increase in mean age-standardized unhealthy days of any Census Division (3.9%, 95% CI 2.5%, 5.2%).

Trends in mean unhealthy days for many but not all of the states within a Census Division paralleled that Division's trend. No change in mean unhealthy days was found for three Census Divisions. Within these divisions, no change in mean unhealthy days was found for all but two of the seven states in the West North Central Division, all but two of the eight states in the Mountain Division, and two of the five states in the Pacific Division. Three of the four states in the East South Central Division had statistically significant yearly percentage increases in unhealthy days. The District of Columbia had the largest yearly percentage increase in unhealthy days, 11.8% (95% CI 5.0%, 18.6%), though six of the eight other states in the same South Atlantic Division showed no overall change in unhealthy days. Over the study period, 18 states and the District of Columbia showed statistically significant worsening linear trends in unhealthy days, 31 states showed no change in these trends, and only one state (North Dakota) showed a statistically significant improving linear trend. The similar patterns of change in contiguous states (see the Figure) may indicate common characteristics affecting unhealthy days. For each year, the states' mean unhealthy days were uncorrelated with CASRO response rates (data not shown).

DISCUSSION

This is the first study of both national and state estimates of trends in HRQOL and SRH. HRQOL and SRH worsened overall among U.S. adults from 1993 through 2001. Compared to the level of mean unhealthy days in the 1993 adult population, an excess of 15 million years of unhealthy life occurred among adults in 1994–2001.

In addition to being the first of its kind, this study has several other strengths. First, the large sample size allowed for the study of trends in distinct sociodemographic and geographic groups; some sociodemographic groups reported greater declines in HRQOL and SRH than the overall group, and others reported little change. Most states in the West North Central, Mountain, and Pacific Census Divisions showed less of an increase in unhealthy days than other areas.

Second, this study has the strength of reporting trends not only in health status but also in HRQOL measures with specific time references (the "days" measures) sensitive to changes like seasonality.[38] We also analyzed trends in perceived mental as well as physical health, across demographic subgroups, and across geographic areas. Third, our measures of HRQOL and SRH have been validated against other instruments of functional status[25,39] (for example, the Medical Outcomes Study Short-Form 36[40]) and among individuals with known chronic conditions.[24] These HRQOL and SRH measures have also been shown to predict short-term (up to one year) hospitalization, health care utilization, and mortality in an older, low-income population.[41]

The result that states showed varying trends in the summary measure of unhealthy days suggests possible differences in health and social policy. To compare and evaluate such differences, organizations including the UnitedHealth Group, the National Women's Law Center, and the Kaiser Family Foundation have adopted one or more measures based on BRFSS surveillance data for their annual state "report cards."[42–44] Moreover, Alaska, New Jersey, and North Carolina have developed their own multi-year health promotion and disease prevention plans that incorporate BRFSS HRQOL measures to complement Healthy People 2010 and to guide their own progress.[45–47]

The present study also has limitations. First, though population-based, the BRFSS excludes people in institutions, those too functionally impaired to complete a telephone interview, and those without residential telephones. Annual poststratification adjustments were applied to the respondent sampling weights so that final respondent weights conform to the state age- and sex-specific population distributions and thus address recent declines in response rates to the BRFSS surveys. Moreover, the yearly state-specific response rates were unrelated to the state-specific levels of the HRQOL measures.

Table 3. Annual age-standardized[a] mean unhealthy days and average annual age-standardized[a] percent change, by Census Division and state, Behavioral Risk Factor Surveillance System, United States, 1993–2001

Place of residence	1993		1994		1995		1996		1997		1998		1999		2000		2001		Percent change
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
United States	5.3	<0.05	5.3	<0.05	5.4	<0.05	5.3	<0.05	5.4	<0.05	5.5	<0.05	5.6	<0.05	5.8	<0.05	6.0	<0.05	1.7[b]
New England	5.1	0.1	5.0	0.1	5.4	0.1	5.5	0.1	5.5	0.1	5.1	0.1	5.4	0.1	5.8	0.1	6.0	0.1	1.9[b]
Connecticut	4.1	0.2	3.6	0.2	5.1	0.2	5.0	0.2	5.1	0.3	5.2	0.2	5.6	0.3	5.6	0.2	5.7	0.1	5.3[b]
Maine	4.4	0.3	4.2	0.2	4.4	0.3	5.1	0.3	5.6	0.3	5.3	0.3	5.4	0.2	5.9	0.2	6.0	0.2	5.3[b]
Massachusetts	5.6	0.3	6.1	0.3	5.8	0.2	5.9	0.2	5.7	0.3	4.9	0.2	5.2	0.2	6.0	0.1	6.1	0.1	0.5
New Hampshire	5.0	0.2	4.8	0.2	4.7	0.3	5.3	0.3	5.9	0.3	5.4	0.3	5.8	0.3	5.0	0.2	5.4	0.2	1.2
Rhode Island	6.0	0.3	—	—	6.0	0.2	6.0	0.2	5.1	0.2	5.6	0.2	5.0	0.2	6.2	0.2	6.5	0.2	0.5
Vermont	5.0	0.2	5.1	0.2	5.7	0.2	5.4	0.2	4.9	0.2	5.3	0.2	5.2	0.2	5.4	0.2	5.8	0.2	1.2
Middle Atlantic	5.3	0.1	5.2	0.1	5.5	0.1	5.4	0.1	5.4	0.1	5.4	0.1	5.5	0.1	5.9	0.1	6.2	0.1	1.9[b]
New Jersey	4.5	0.2	4.1	0.2	5.3	0.3	5.5	0.2	5.3	0.2	4.9	0.2	5.4	0.2	5.6	0.2	5.7	0.2	3.5[b]
New York	5.7	0.2	5.3	0.2	5.5	0.2	5.4	0.2	5.4	0.2	5.5	0.2	5.6	0.2	6.1	0.2	6.3	0.2	1.9[b]
Pennsylvania	5.3	0.2	5.6	0.2	5.5	0.2	5.2	0.2	5.4	0.2	5.5	0.2	5.2	0.2	5.7	0.2	6.2	0.2	1.1
East North Central	5.1	0.1	5.1	0.1	5.2	0.1	5.2	0.1	5.3	0.1	5.6	0.1	5.5	0.1	5.9	0.1	6.0	0.1	2.2[b]
Illinois	4.5	0.2	3.9	0.2	4.4	0.2	5.7	0.2	5.7	0.2	5.2	0.2	5.4	0.2	5.2	0.2	5.4	0.2	2.9
Indiana	6.0	0.2	6.1	0.2	6.3	0.2	6.2	0.2	6.2	0.2	5.9	0.2	5.5	0.3	6.2	0.2	6.4	0.2	0.2
Michigan	5.6	0.2	6.2	0.2	5.8	0.2	5.5	0.2	5.8	0.2	6.5	0.2	6.0	0.2	6.3	0.2	6.5	0.2	1.6[b]
Ohio	5.1	0.3	5.0	0.3	4.7	0.3	4.0	0.2	4.4	0.2	5.2	0.2	4.8	0.2	5.9	0.2	5.9	0.2	3.1
Wisconsin	5.2	0.3	5.4	0.3	5.7	0.2	5.5	0.2	4.8	0.2	5.4	0.2	6.2	0.2	6.5	0.2	5.9	0.2	2.2
West North Central	5.0	0.1	4.8	0.1	5.4	0.1	5.2	0.1	5.1	0.1	5.4	0.1	5.2	0.1	5.1	0.1	5.5	0.1	1.0
Iowa	3.9	0.2	3.7	0.2	5.8	0.2	5.2	0.2	5.2	0.2	5.3	0.2	5.5	0.2	4.8	0.2	5.0	0.2	2.6
Kansas	4.2	0.2	4.0	0.3	5.3	0.2	3.5	0.2	3.4	0.2	4.9	0.2	4.4	0.2	5.1	0.2	5.1	0.1	3.4
Minnesota	5.5	0.2	5.3	0.2	5.3	0.2	5.4	0.2	5.2	0.1	5.7	0.2	4.9	0.1	4.8	0.2	5.6	0.2	−0.4
Missouri	5.6	0.3	5.4	0.3	5.5	0.3	5.8	0.3	6.0	0.3	5.8	0.2	5.7	0.2	5.7	0.2	6.3	0.2	1.1
Nebraska	4.8	0.2	4.4	0.2	4.9	0.2	5.4	0.4	4.7	0.2	5.4	0.2	5.1	0.2	4.5	0.2	4.8	0.2	0.3
North Dakota	5.6	0.2	5.8	0.2	5.1	0.2	5.6	0.2	5.2	0.2	4.7	0.2	4.9	0.3	4.7	0.2	4.8	0.2	−2.2[b]
South Dakota	4.0	0.2	3.8	0.2	4.6	0.2	3.6	0.2	4.9	0.2	4.6	0.2	5.1	0.2	4.8	0.1	4.9	0.1	3.4[b]
South Atlantic	5.2	0.1	5.1	0.1	5.1	0.1	4.9	0.1	5.0	0.1	5.4	0.1	5.4	0.1	5.7	0.1	5.9	0.1	2.0[b]
Delaware	5.9	0.2	5.5	0.3	5.2	0.2	4.5	0.2	6.1	0.2	5.5	0.3	6.0	0.3	5.5	0.3	5.9	0.2	0.9
District of Columbia	3.0	0.2	3.0	0.2	—	—	4.9	0.3	3.4	0.3	3.8	0.2	4.9	0.2	5.9	0.3	5.5	0.3	11.8[b]
Florida	5.6	0.2	5.9	0.2	6.0	0.2	5.8	0.2	5.9	0.2	5.4	0.2	5.3	0.1	5.7	0.2	5.7	0.2	−0.7
Georgia	4.8	0.2	5.7	0.2	5.0	0.2	4.3	0.2	4.7	0.2	5.6	0.2	5.1	0.2	5.7	0.2	6.0	0.2	2.5
Maryland	4.9	0.2	4.5	0.2	4.4	0.1	4.4	0.2	3.9	0.2	5.7	0.2	6.1	0.2	5.7	0.2	5.6	0.2	3.5
North Carolina	5.0	0.2	3.9	0.2	4.1	0.2	4.2	0.2	4.8	0.2	5.8	0.3	5.7	0.3	5.8	0.2	5.6	0.2	4.3[b]
South Carolina	5.3	0.2	5.2	0.2	4.6	0.2	4.8	0.3	4.2	0.2	5.2	0.2	5.1	0.2	5.7	0.2	6.2	0.2	2.1
Virginia	4.9	0.2	4.9	0.2	5.4	0.3	5.0	0.2	4.9	0.2	5.2	0.2	5.4	0.2	5.4	0.2	6.1	0.2	2.5[b]
West Virginia	6.1	0.2	5.8	0.2	5.4	0.2	4.9	0.2	4.8	0.2	4.9	0.2	5.7	0.3	7.6	0.3	8.1	0.2	4.0

continued on p. 502

Table 3 (continued). Annual age-standardized[a] mean unhealthy days and average annual age-standardized[a] percent change, by Census Division and state, Behavioral Risk Factor Surveillance System, United States, 1993–2001

Place of residence	1993		1994		1995		1996		1997		1998		1999		2000		2001		Percent change
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	
East South Central	5.0	0.1	5.1	0.1	5.7	0.1	5.6	0.1	6.1	0.1	6.2	0.1	6.3	0.1	6.1	0.1	6.5	0.1	3.9[b]
Alabama	4.0	0.2	4.9	0.3	5.8	0.3	5.9	0.2	6.1	0.3	6.9	0.2	6.6	0.2	6.3	0.2	7.3	0.2	8.9[b]
Kentucky	5.7	0.2	6.3	0.2	6.9	0.3	6.8	0.2	7.3	0.2	6.5	0.2	7.2	0.2	6.9	0.2	7.2	0.2	2.5[b]
Mississippi	5.6	0.3	4.9	0.3	5.2	0.3	4.6	0.2	4.8	0.2	5.8	0.2	6.0	0.2	6.3	0.3	6.5	0.2	3.4[b]
Tennessee	5.0	0.2	4.5	0.2	5.0	0.2	5.0	0.2	5.9	0.2	5.8	0.2	5.6	0.2	5.3	0.2	5.4	0.2	2.2
West South Central	5.2	0.1	5.5	0.2	5.5	0.2	5.4	0.2	5.3	0.2	5.7	0.1	5.8	0.1	6.0	0.1	5.9	0.1	1.8[b]
Arkansas	5.4	0.2	5.7	0.3	5.7	0.3	4.9	0.3	5.4	0.3	6.3	0.2	6.3	0.2	6.5	0.2	7.1	0.2	3.7[b]
Louisiana	4.9	0.2	5.2	0.3	5.7	0.3	5.4	0.3	6.0	0.3	5.3	0.3	5.6	0.3	5.3	0.2	5.3	0.2	0.2
Oklahoma	5.2	0.3	3.9	0.2	3.9	0.2	3.9	0.2	3.5	0.2	4.1	0.2	4.8	0.2	4.7	0.2	6.1	0.2	3.5
Texas	5.2	0.2	5.8	0.3	5.7	0.3	5.7	0.3	5.6	0.2	6.0	0.2	6.0	0.2	6.3	0.2	5.8	0.1	1.5[b]
Mountain	5.5	0.1	5.5	0.1	5.7	0.1	5.2	0.1	4.7	0.1	4.6	0.1	4.8	0.1	5.8	0.1	6.2	0.1	0.4
Arizona	5.1	0.3	5.3	0.3	5.7	0.3	3.8	0.3	2.2	0.2	1.9	0.2	1.5	0.2	5.3	0.4	6.5	0.3	−4.0
Colorado	5.8	0.2	5.7	0.2	5.8	0.3	5.7	0.3	5.7	0.2	5.3	0.2	6.1	0.2	5.8	0.2	6.2	0.2	0.5
Idaho	5.9	0.3	5.4	0.3	5.3	0.2	5.2	0.2	5.8	0.2	5.4	0.2	5.6	0.2	5.9	0.2	6.0	0.2	1.2
Montana	6.1	0.3	5.1	0.3	4.9	0.3	4.5	0.2	4.7	0.2	4.9	0.2	5.1	0.2	4.6	0.2	5.1	0.2	−0.9
Nevada	6.8	0.3	6.9	0.3	6.1	0.3	5.6	0.3	6.3	0.4	6.0	0.3	6.8	0.3	6.5	0.3	6.6	0.3	−0.1
New Mexico	4.6	0.3	4.6	0.3	5.8	0.3	6.3	0.4	5.8	0.2	6.1	0.2	6.5	0.2	6.2	0.2	6.2	0.2	4.3[b]
Utah	5.3	0.2	5.4	0.2	5.9	0.2	6.1	0.2	6.4	0.2	6.4	0.2	6.0	0.2	6.2	0.2	6.2	0.2	1.9[b]
Wyoming	—	—	5.6	0.3	4.7	0.2	5.2	0.2	4.9	0.2	5.5	0.2	5.2	0.2	5.8	0.2	5.7	0.2	2.2
Pacific	5.7	0.1	5.9	0.1	5.7	0.2	5.6	0.1	5.8	0.1	5.5	0.1	5.9	0.1	6.0	0.2	6.2	0.1	0.7
Alaska	4.6	0.4	5.1	0.4	5.1	0.3	4.8	0.4	5.3	0.3	4.8	0.3	5.4	0.3	5.3	0.3	5.8	0.3	2.4[b]
California	5.9	0.2	6.1	0.2	5.8	0.2	5.6	0.2	5.9	0.2	5.5	0.2	5.9	0.2	6.1	0.2	6.3	0.2	0.4
Hawaii	3.9	0.2	4.3	0.2	3.8	0.2	4.8	0.2	5.0	0.2	3.9	0.2	4.2	0.2	4.4	0.1	3.3	0.1	−1.4
Oregon	5.5	0.2	5.5	0.2	5.7	0.2	5.7	0.2	5.8	0.2	6.0	0.3	6.5	0.2	6.5	0.2	6.3	0.2	2.3[b]
Washington	5.2	0.2	5.6	0.2	5.7	0.2	5.8	0.2	5.5	0.2	5.7	0.2	6.0	0.2	5.8	0.2	6.1	0.2	1.5[b]

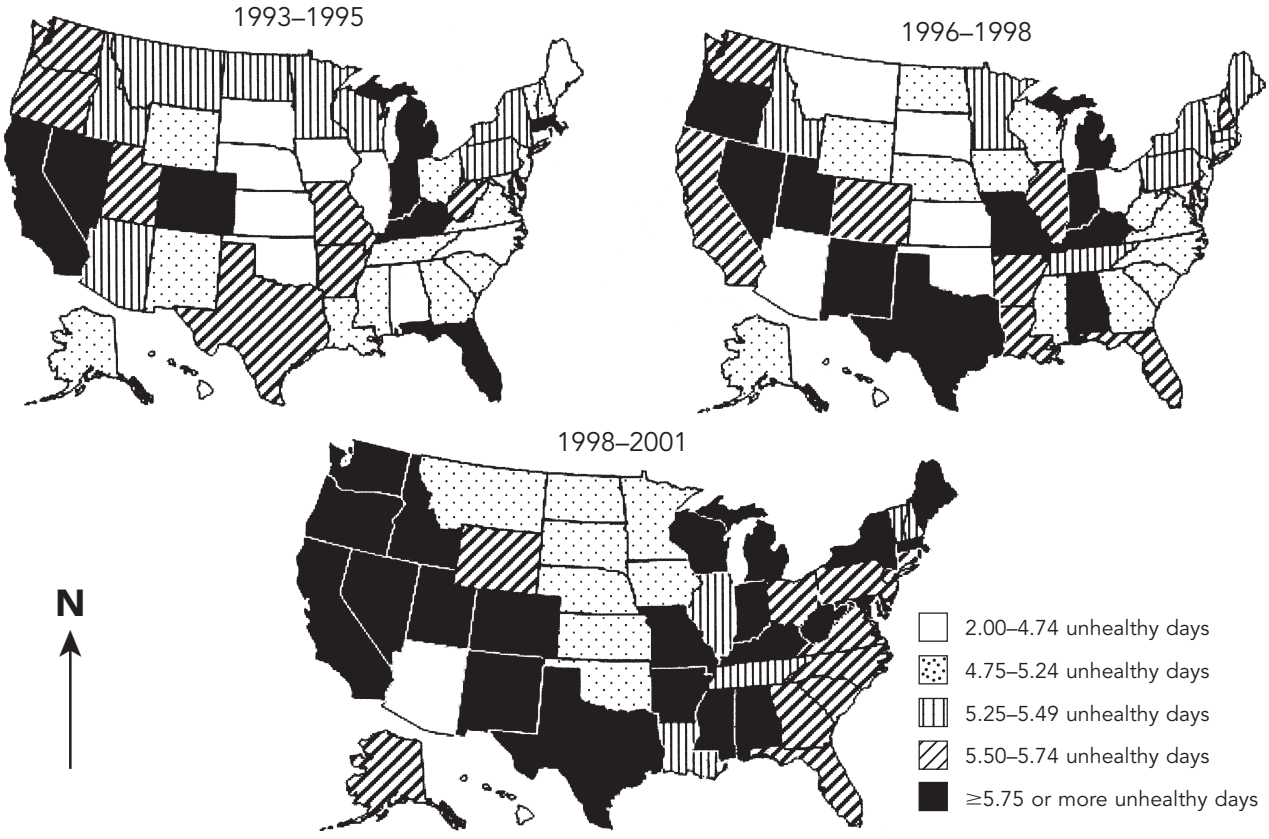
NOTE: All SEs shown as <0.05 are positive values, i.e., >0.

[a]Age-standardized to the U.S. population ≥18 years of age on April 1, 2000

[b]Two-sided $p<0.05$

SE = standard error of the mean

Figure. Age-standardized mean unhealthy days by state and time period—United States, 1993–1995, 1996–1998, and 1999–2001



We also accounted for the potential confounding effects of an aging population. Adjustment for other sociodemographic characteristics probably would not have changed our results because the trends in worsening HRQOL and SRH also occurred within most of the groups. Although obesity and diabetes mellitus are assessed in the BRFSS,[31] can affect HRQOL and SRH,[48] and increased in reported prevalence during the study period,[11,12] changes in state-specific obesity and diabetes prevalence during the study period were only weakly related to changes in mean unhealthy days (data not shown).

Some of our findings resemble those of other researchers. The improved SRH in adults 65 years old or older continues a similar trend found in the 1980s among older adults.[49] However, our finding of little change in activity limitation in adults >65 years of age differs from the reported decline in overall activity limitation from 1982 through 1999.[50,51] This apparent difference in a partially overlapping time period may result from differences in the sampling frame or the survey questions.

Two recent reviews of national health and well-being surveillance systems have recognized the value of HRQOL surveillance based on the BRFSS.[52,53] Future research should control more completely for confounding, assess the impact of selection bias, and disentangle possible causes of trends in HRQOL and SRH. Enhancing the BRFSS by adding questions about more chronic diseases and conditions and a longitudinal follow-up of a sample of previous responders may help accomplish these research goals. Inclusion of brief standard measures of HRQOL and SRH in several other health surveillance systems would also help clarify these trends and provide insight into their causes.[54,55]

The negative trends in HRQOL and SRH pose a significant but resolvable public health problem. First, many conditions associated with poor HRQOL such as depression and disabilities have effective interventions,[56,57] an essential criterion for designating a condition as a resolvable public health problem. HRQOL assessment can help assure the cost-effectiveness of these interventions.[58] Second, measuring HRQOL allows communities to monitor health status over time and identify population subgroups with particularly poor outcomes so they can be targeted for intervention. For example, monitoring HRQOL in children has allowed European practitioners to identify children at risk of poor health outcomes and to intervene effectively, and monitoring quality of life in rural settings has led to early intervention to reduce occupational risks of farmers.[59,60] Third, although public health activities have markedly reduced mortality rates

during the last century, and although advances in clinical technology have prolonged life, quality of life at the end of life has become a major societal concern and merits continued tracking.[61]

Because several risk factors affect HRQOL and SRH,[48] our findings of worsening trends in these two domains may also be important for medical care in the U.S. If such trends continue, they probably will increase demand for medical care. This study's findings have important policy implications because they suggest that the nation's overall health goals[9] are not being met. Identifying and addressing the causes of these worsening trends in HRQOL and SRH are essential. Continued population surveillance of HRQOL and SRH offers promise for contributing to our understanding of the broader determinants of the nation's health and for evaluating progress toward national health goals.

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