The Effects of Widowhood on Physical and Mental Health, Health Behaviors, and Health Outcomes: The Women's Health Initiative

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This study examined whether widowhood was associated with physical and mental health, health behaviors, and health outcomes using a cross-sectional ($N = 72,247$) and prospective ($N = 55,724$) design in women aged 50–79 years participating in the Women's Health Initiative observational study (85.4% White). At baseline, married women reported better physical and mental health and generally better health behaviors than widowed women. Whereas women who remained married over the 3-year period showed stability in mental health, recent widows experienced marked impairments and longer term widows showed stability or slight improvements. Both groups of widows reported more unintentional weight loss over the 3-year period. Changes in physical health and health behaviors were inconsistent, with generally small effect sizes. Findings underscore the resilience of older women and their capacity to reestablish connections, but point to the need for services that strengthen social support among women who have difficulty during this transition.

Key words: widowhood, life events, women's health, aging, health behaviors, mental health

The death of a spouse is rated as among the most stressful life event that humans experience (Amster & Krauss, 1974; Holmes & Rahe, 1967), and yet, it is a common occurrence in the lives of midlife and older women. Almost one half of women over the age of 65 years are widowed (Fields & Casper, 2001). Although the psychosocial correlates of widowhood have been studied, less research has prospectively examined the impact of this life transition on mental health, and even fewer studies have focused on physical health, health behaviors, and health outcomes.

The importance of social support and intimate attachments for mental and physical health has been well described (House, Lan-

dis, & Umberson, 1988; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). From a conceptual perspective, a number of mechanisms have been described to explain how widowhood might lead to impairments in mental health, physical health, and health behaviors. Umberson (1987, 1992) has theorized that the loss of a spouse may result in the loss of a person who assists in monitoring and supporting attempts to change one's health behaviors. Major life events such as widowhood are also associated with a disturbance in one's normal routine (including participation in health behaviors) and an increase in stress (Holmes & Rahe, 1967). A recent meta-analysis found that total life events as well as the death of

significant others were associated with higher levels of depressive symptoms in older adults (Kraaij, Arensman, & Spinhoven, 2002). Depression, in turn, has been shown to interfere with health behaviors and compliance with medical treatment (DiMatteo, Lepper, & Croghan, 2000). Specifically related to widowhood, Chen and colleagues (1999) found that widows experiencing traumatic grief following the death of a spouse were at subsequent increased risk for physical health events such as cancer or a heart attack.

Several cross-sectional studies have suggested that marriage is protective and that widowhood, divorce, and separation are detrimental to health behaviors (Rosenbloom & Whittington, 1993; Schone & Weinick, 1998; Venters et al., 1986) and cardiovascular disease risk factors (Kushnir & Kristal-Boneh, 1995; Venters et al., 1986). Wolinsky and Johnson (1992), however, found no cross-sectional relationship between widowhood and health status, regardless of how recently the death of the spouse occurred. Goldman, Korenman, and Weinstein (1995) found that women who were widowed at baseline (women were widowed, on average, 14 years) had higher rates of disability 6 years later but were not at increased risk for mortality.

Few studies have examined the impact of transitioning to widowhood among women. Transitioning to being unmarried (widowed and divorced not distinguished) has been associated with weight loss (Umberson, 1992) and increased alcohol consumption in women (Temple et al., 1991). Becoming a widow has been associated with an increase in psychological distress (Avis, Brambilla, Vass, & McKinlay, 1991; Harlow, Goldberg, & Comstock, 1991; Schulz et al., 2001), weight loss (Schulz et al., 2001), higher rates of health care use (Avis et al., 1991), and nursing home placement (Wolinsky & Johnson, 1992) in some studies, whereas this transition was not associated with health care use (Wolinsky & Johnson, 1992), health status (Avis et al., 1991; Wolinsky & Johnson, 1992), or health risk behaviors (Avis et al., 1991; Schulz et al., 2001) in other studies.

The evidence relating widowhood to poor health status and negative health behaviors is inconsistent. There are several limitations in this body of literature to note. First, widowed status is often combined with divorced and separated status, making it difficult to determine the independent effects of widowhood. Second, most studies have been cross-sectional rather than prospective, making causal inferences difficult. Third, among studies that have examined the transition to widowhood, the number of participants who become widowed has been small. Thus, the goals of this study were to examine whether baseline marital status was associated with physical health, mental health, and health behaviors and whether the transition to widowhood was associated with poorer physical health, mental health, and health behaviors in a large sample of women aged 50–79 years at baseline. Consistent with the literature, we hypothesized that at baseline widowed women would report poorer physical and mental health and would report more negative health behaviors than married women. On the basis of a smaller and somewhat inconsistent body of evidence and on the basis of theories by Umberson (1987, 1992), we also hypothesized that becoming a widow over the 3-year follow-up period would be associated with negative changes in physical health, mental health, and health behaviors and poorer health outcomes relative to remaining married. We further hypothesized that these effects, particularly for mental health and health behaviors, would be greater for women who had more recently become widows. This last hypothesis was based on the idea that an acute event would lead to a greater disruption in one's life due to increased stress and disruption in routines, but that women would adjust to this transition over time.

Method

Procedures

The Women's Health Initiative (WHI) began in 1992 to investigate the leading causes of morbidity and mortality in postmenopausal women. Women were recruited into the WHI study at 40 clinical centers in the United States between September 1993 and December 1998, mostly through mass mailings to driver's license, voter registration, and Health Care Financing Administration (HCFA), or other insurance lists. This article reports on women in the observational study ($N = 93,725$). Women were either specifically recruited for the observational study or entered it because they were ineligible or unwilling to be randomized into the WHI clinical trial. Recruitment of minorities and older women was emphasized, and details of the WHI design are reported elsewhere (Women's Health Initiative Study Group, 1998).

Inclusion criteria for the WHI observational study were (a) postmenopausal woman, (b) aged 50–79 years at first screening contact, (c) likely to be residing in the study area for at least 3 years after enrollment, and (d) provided written informed consent. Exclusion criteria were (a) medical

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condition associated with predicted survival of less than 3 years; (b) active alcoholism or other drug dependency; (c) mental illness, including severe depression; (d) dementia; and (e) active participant in any other intervention trial (intervention or control group). Participants completed a self-administered questionnaire (either at their home or during their clinic visit) and completed a clinic visit at baseline and 3 years later.

Of the original 93,725 participants in the baseline cohort, 403 were excluded because they reported marital status data that were inconsistent (e.g., reported that they were currently divorced and lost a spouse within the past year) and 716 were excluded because marital status was missing. Because the focus of the article is on widowhood, we excluded women who were never married ($n = 4,366$), divorced or separated ($n = 14,499$), and in a marriagelike relationship ($n = 1,494$). Thus, the baseline sample for our analyses consisted of 72,247 women. For the prospective analyses, we included women who transitioned from married to widowed ($n = 2,254$) over the 3-year period, women remained married ($n = 41,834$), women who remained widowed ($n = 11,366$), and women who transitioned from widowed to married ($n = 270$), for a total sample of 55,724 women. We further divided those participants who reported at the 3-year visit that they had been widowed for 1 year or less ($n = 1,325$), labeled *recent widows,* versus women who had been widowed for more 1 year ($n = 929$), labeled *longer term widows.*

Measures

Demographic variables. At baseline, participants reported the highest grade in school they completed (by categories), income (by categories), date of birth, and race or ethnicity. They also reported income at the 3-year visit. Because income and education were highly associated at baseline, $\chi^2(25, N = 86,559) = 16,348.1, p < .01$, and because substantially more participants did not report income ($n = 6,638$) than education ($n = 528$), we chose to use education rather than income in all baseline analyses as an indicator of socioeconomic status. For prospective analyses, however, we included change in income as a covariate because becoming a widow could impact income level, which could in turn impact changes in our dependent variables of interest. For change in income, we created five distinct groups: women who reported the same income category at both assessments (no change), women whose income increased by one category (small increase), women whose income decreased by one category (small decrease), women whose income increased by two or more categories (large increase), and women whose income decreased by two or more categories (large decrease). Participants reported their current marital status at baseline and at the 3-year visit. They also completed a brief life events checklist at both times, similar to the Social Readjustment Rating Scale (Holmes & Rahe, 1967); one item asked whether they had lost a spouse in the last year. On the basis of self-reported marital status at baseline and 3 years later and the 3-year life events checklist, women were classified into one of five groups for the prospective analyses: remained married, remained widowed, recent widow (became widowed in the past year), longer term widow (became widowed longer than 1 year ago), and remarried.

Physical health variables. Blood pressure was assessed by the average of two readings (30 s between readings) during the clinic visit, after 5 min of quiet rest. Hypertension was defined as a resting systolic blood pressure greater than 140 mm Hg, resting diastolic blood pressure greater than 90 mm Hg, or self-report of taking antihypertensive medication(s). Height and weight, without shoes and in very light clothing, were measured during the clinic visit to the nearest 10th of a centimeter (height) and kilogram (weight), and body mass index (BMI) was calculated (kg/m^2). A woman with a BMI of 30 kg/m^2 or greater was considered obese (Expert Panel on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults, 1998). Participants were also asked at the 3-year visit whether they had unintentionally lost 5 or more pounds (2.27 kg) at any time in the past 2 years (*yes/no*). To assess physical function and health status, we used the Physical Functioning, General Health, and Pain scales of the Short-Form Health Survey (SF-36; McHorney, Ware, & Raczek, 1993; Ware, Snow, &

Kosinski, 1993–2000). Scores can range from 0 to 100, with higher values indicating higher physical functioning, better health, and less pain.

Mental health variables. Depressive symptomatology was assessed with a 6-item version of the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). Participants rated the frequency of depressive thoughts in the past week, and scores could range from 0 to 18. The participant's self-report of antidepressant medication was also coded. Social functioning was assessed with the Social Functioning scale of the SF-36 (McHorney et al., 1993; Ware et al., 1993–2000), and scores could range from 0 to 100. Overall mental health was assessed with the mental component summary score of the SF-36. This composite is derived using norm-based methods, and has a mean of 50 and a standard deviation of 10 in the general U.S. population (Ware, Kosinski, & Keller, 1994). Higher values indicate better social functioning and mental health.

Health behaviors. We used a modified version of the National Cancer Institute-Health Habits and History Questionnaire (Block, Woods, Potosky, & Clifford, 1990), described in detail elsewhere (Patterson et al., 1996, 1999), to assess dietary behaviors. Total energy from fat, daily servings of fruits and vegetables, and alcoholic beverages consumed per week were computed. Participants were asked whether they smoked tobacco and how much they smoked (cigarettes per day). To assess physical activity, participants were asked how often each week they usually walked (including duration and speed) outside the home for more than 10 min without stopping. They were also asked how often they engaged in strenuous or very hard exercise and moderate exercise, with examples provided. Duration of physical activities was also collected. *Sedentary* was defined as reporting no walking or other types of exercise in the baseline analyses. An estimate of kilocalories expended per week was used in the prospective analyses. To assess health care use, participants were asked at their 3-year visit whether they had visited their doctor within in the last year (*yes/no*).

Health outcomes. Locally adjudicated instances of cardiovascular events (including stroke; transient ischemic attack; coronary heart disease events, including coronary artery bypass grafting, percutaneous transluminal coronary angioplasty, cardiac catheterization, etc.) and cancer occurrences were assessed annually. Participants also reported whether they had any overnight hospitalizations during this 3-year period.

Statistical Analyses

Baseline analyses. Using multiple logistic regression analyses, we examined the associations between marital status and each of the physical health, mental health, and health behavior variables of interest, controlling for age, education, and race or ethnicity. For the dependent variables of interest, we dichotomized the variable to indicate whether the participant had an "impaired" or at-risk score (i.e., obese; hypertensive, current smoker, sedentary, ate fewer than five servings of fruits and vegetables per day; drank seven or more alcoholic beverages per week, ate a diet with 30% or more of energy from fat; physical functioning, general health, pain, social functioning, and mental health composite in the bottom 10% of the sample; and current depressed mood as evidenced by a 6-item CES-D score greater than 4, or taking antidepressant medication).

Although we considered using continuous dependent variables, where possible we chose to dichotomize these variables for three reasons. First, our sample size was large and the power to detect differences between groups was not of concern (a major argument against dichotomizing variables is the loss of power that typically results). Second, variables were dichotomized using clinically relevant cut points (e.g., obese, hypertensive, not meeting various recommendations for health behaviors). Thus, we were able to report marital status differences in clinically meaningful variables (i.e., the odds ratio indicates the likelihood, e.g., of being hypertensive for a widowed woman relative to a married woman), as opposed to reporting just small but statistically significant differences in variables. Finally, dichotomizing variables was a way to simplify the data, which we believed was important given the number of variables in the baseline analyses.

Prospective analyses.   We first examined whether completion of the follow-up visit was associated with baseline sociodemographic, physical health, mental health, and health behavior variables. Next, we conducted three multivariate linear regression models for continuous dependent variables: mental health, health behaviors, and physical health variables. In each model, we examined whether experiencing a marital status transition was associated with changes in the variables of interest over the 3-year period, after adjusting for age, education, change in income, and race or ethnicity, relative to remaining married.

For the physical health model, body weight (kilograms), systolic blood pressure (mm Hg), physical functioning, general health, and pain were the dependent variables. For the mental health model, social functioning, depressive symptoms, and the mental health composite were the dependent variables. For the health behaviors model, tobacco use (cigarettes per day), physical activity (kcals per day), fruit and vegetable consumption (servings per day), percentage of energy consumed from fat, and alcohol consumption (drinks per week) were the dependent variables. An alpha-corrected *p* value of .05 divided by the number of dependent variables for each multivariate model was used ($p = .017$ for mental health variables, $p = .01$ for health behaviors, and $p = .01$ for physical health variables) as the threshold for statistical significance. We also computed effect sizes for each group to examine the magnitude of the change (3-year value minus baseline value divided by baseline standard deviation). Married or widowed standard deviation at baseline was used, depending on baseline marital status. We used standard criteria (Cohen, 1988) for judging whether an effect size was small ($d = 0.2$), medium ($d = 0.5$), or large ($d = 0.8$).

Finally, we conducted five multiple logistic regression analyses to examine the association between marital transitions and several outcomes assessed at the 3-year visit: adverse health outcomes (cardiovascular event, cancer, overnight hospitalization), self-reported unintentional weight loss of 5 pounds (2.27 kg) or greater in the past 2 years, and having had a physician visit in the past year. All analyses were controlled for age, education, race or ethnicity, and change in income. A *p* value of .01 (.05/5 analyses) was used as the threshold for statistical significance.

Results

Sample Characteristics

Of the total sample ($N = 72,247$), 85.4% were White, 6.4% were Black or African American, 3.4% were Hispanic, 0.4% were American Indian, 3.0% were Asian/Pacific Islander, and 1.3% were of unknown race or ethnicity. The 2000 Census (U.S. Census Bureau, 2001) indicated that the U.S. population comprises 75.1% Whites, 12.3% Black or African Americans, 0.9% American Indian/Alaskan Natives, 3.6% Asian, 0.1% Native Hawaiian and other Pacific Islander, 5.5% of some other race, and 2.4% reporting two or more races. Thus, WHI tends to be biased toward the inclusion of Whites. In terms of education, 1.7% of WHI participants had 0–8 years of education, 3.6% had some high school, 17.6% had a high school diploma or equivalent, 36.8% had some education after high school, and 39.7% had a college degree or higher (0.6% were missing). The 2000 Census (U.S. Census Bureau, 2001) indicated that 6.9% of those aged 25 and older had 0–8 years of education, 11.5% had some high school, 29.5% had a high school diploma or equivalent, 27.0% had some college, and 25.1% had a college degree or higher. Thus, WHI participants had higher education levels than the general population. Finally, the average age of participants was 64.09 ± 7.32 years.

The Relationship Between Marital Status and Physical Health, Mental Health, and Health Behavior Variables at Baseline

Baseline associations between marital status and each of the physical health, mental health, and health behavior variables are shown in Table 1. Separate logistic regression models were conducted for each physical health, mental health, and health behavior

Table 1
Relationship Between Marital Status and Study Variables at Baseline

		Marital status					
		Recent widow[b]			Longer term widow[c]		
Variable	Married[a] (%)	%	OR	CI	%	OR	CI
Physical health							
Obese (body mass index $\geq$ 30 kg/m^2)	23.0	28.3	1.13*	1.03, 1.24	28.0	1.28*	1.22, 1.34
Hypertensive	41.2	55.1	1.11*	1.02, 1.20	52.8	1.08*	1.03, 1.12
Physical functioning in bottom 10%	8.9	19.2	1.45*	1.30, 1.62	15.1	1.22*	1.14, 1.29
General health in bottom 10%	12.0	18.4	1.21*	1.09, 1.35	13.8	1.00	0.95, 1.07
Pain in bottom 10%	12.0	17.9	1.20*	1.08, 1.34	14.8	1.06	1.00, 1.12
Mental health							
Social functioning in bottom 10%	11.5	21.4	1.80*	1.62, 1.99	13.5	1.14*	1.07, 1.21
Depressed mood	21.2	41.2	2.60*	2.39, 2.83	22.2	1.10*	1.05, 1.16
Mental health composite in bottom 10%	8.5	19.7	2.69*	2.42, 3.00	9.0	1.18*	1.10, 1.27
Health behaviors							
Current smoker	4.7	7.8	1.89*	1.62, 2.20	7.0	1.88*	1.72, 2.04
Sedentary	12.9	15.1	0.97	0.87, 1.09	14.6	1.08*	1.01, 1.14
< 5 servings fruit & vegetables per day	64.1	68.5	1.14*	1.04, 1.25	66.1	1.15*	1.10, 1.20
> 30% energy from fat	53.0	57.7	1.04	0.96, 1.13	55.5	1.01	0.97, 1.06
$\geq$ 7 alcoholic drinks per week	13.6	10.2	0.88	0.78, 1.01	10.8	0.80*	0.75, 0.85

Note.   Married is the reference group. OR = odds ratio, adjusted for age, education, and ethnicity; CI = confidence interval.
[a] $n = 56,171$.   [b] $n = 2,657$.   [c] $n = 13,419$.
* $p < .05$.

variable, controlling for age, race or ethnicity, and education. All models were significant at $p < .01$.

Married versus widowed women. For all of the physical health variables (obesity, hypertension, poor physical functioning, poor general health, and high pain), women who were widowed were significantly more impaired than married women. There were only two exceptions: Longer term widows did not differ from married women for general health or pain; a virtually identical pattern was present for mental health variables. Women who were widowed were significantly more impaired than married women on measures of social functioning, depressed mood, and overall mental health. For health behaviors, the pattern was less consistent. Widowed women were more likely than married women to be current smokers and were less likely to eat five or more servings of fruits and vegetables per day. Longer term widows were also more likely to be sedentary than married women. Finally, longer term widows were less likely than married women to consume seven or more alcoholic drinks per week. The pattern was similar for recent widows but did not reach statistical significance.

Recent versus longer term widows. In separate logistic regression models, recent widows (≤ 1 year) were compared with longer term widows (> 1 year) for each variable presented in Table 1. After adjustment for age, race or ethnicity, and education, longer term widows were more likely to be obese, whereas recent widows were more likely to report poor physical functioning, negative general health, low social functioning, current depressed mood, and poor overall mental health. No other health-related variables were significantly different between these two groups.

Summary of baseline findings. Women who were married at baseline had more favorable physical and mental health than women who were widowed at baseline. This relationship was present for some of the health behavior variables, especially fruit and vegetable consumption and smoking and, to a lesser extent, physical activity participation. Married women, however, consumed more alcohol than widowed women. Finally, recent widows reported poorer mental health across all variables and poorer physical health for selected variables than longer term widows.

Prospective Analyses

Before assessing the impact of becoming a widow on changes in physical and mental health, health behaviors, and health outcomes, we examined whether women who completed the 3-year follow-up visit differed from women who did not complete this visit. In our analyses of sociodemographic factors, women who were widowed, older, or less educated and who belonged to an ethnic minority group were less likely to complete the 3-year visit than their counterparts. In our analyses of physical health, those who reported poorer physical functioning, general health, and lower pain and those who were obese and hypertensive were less likely to complete this visit. In our analyses of mental health, those with greater depressive symptoms or who took antidepressant medication and those with poorer overall mental health and social functioning were less likely to complete the 3-year visit. Finally, in our analyses of health behaviors, women who were smokers, those who consumed less alcohol, and those who were sedentary were less likely to complete this visit.

Baseline and 3-year means and standard deviations for all dependent variables of interest are shown in Table 2, by marital transition group. This table can be referred to in interpreting the prospective regression analyses shown in Tables 3, 4, and 5.

The three multivariate linear regression models, which tested whether the set of independent variables (covariates of age, education, race or ethnicity, and change in income, plus marital status transition groups) predicted the set of continuous dependent variables, were statistically significant for physical health, $F(20, 127558) = 2.27$, $p < .01$; mental health, $F(12, 115122) = 63.81$, $p < .01$; and health behaviors, $F(20, 151451) = 4.10$, $p < .01$. Thus, we proceeded to report the associations between marital status transition and the dependent variables for each multivariate model. These analyses examined whether becoming a widow (either in the past year or in the past 1–3 years) was associated with differential changes in the physical health, mental health, and health behavior variables (relative to women who remained married). These analyses did not test differences in the absolute levels of functioning on these variables. Effects for marital status transition groups were only reported if the overall group effect was significant at the alpha-corrected p values ($p = .02$ for mental health, $p = .01$ for health behaviors, and $p = .01$ for physical health).

Five additional multiple logistic regression analyses examined the impact of marital transitions on dichotomous dependent variables, including one physical health variable (unintentional weight loss), one health behavior variable (having had a physician visit in the past year), and three health outcomes (cardiovascular event, cancer, overnight hospitalization), controlling for age, education, race or ethnicity, and change in income. A p value of .01 (.05/5 analyses) was used as the threshold for statistical significance.

Physical health. As shown in Table 3, marital status transitions were significantly associated with changes in systolic blood pressure but were not associated with changes in physical functioning, general health, or pain. Women who remarried had greater increases in systolic blood pressure than women who remained married (small effect sizes). Although the overall effect of marital transition approached significance for changes in body weight, the estimates were not significant at our alpha-corrected p value of .01 for any group.

Marital status transitions were significantly associated with self-reported unintentional weight loss of 5 pounds (2.27 kg) or greater in the last 2 years. Women who became widowed (regardless of timing) were significantly more likely than women who remained married to report unintentional weight loss of 5 pounds (2.27 kg) or greater, and this effect was significantly larger among recent than among longer term widows (50.9% of recent widows, 40.3% of longer term widows, and 21.7% of women who remained married, $p < .01$; data not shown).

Mental health. As shown in Table 4, transitions in marital status were significantly associated with changes in social functioning, depressive symptoms, and the mental health composite. Recent widows experienced substantial declines (medium to large effect sizes) in social functioning and mental health as well as increases in depressive symptoms relative to women who remained married. Longer term widows, however, experienced larger improvements in social functioning and mental health (small effect sizes), but no change in depressive symptoms, relative to women who remained married. Women who remarried had larger improvements in social functioning and mental health and reduc-

Table 2

Baseline and 3-Year Follow-Up Means (With Standard Deviations) for Physical Health, Mental Health, and Health Behavior Variables, by Marital Transition Groups

Variable	Married–married[a]	Widowed–widowed[b]	Widowed–married[c]	Married–widowed[d] (≤1 year)	Married–widowed[e] (>1 year)
Demographics (baseline)					
Age (years)	62.6 (7.0)	68.6 (6.3)	65.0 (6.7)	67.0 (6.9)	67.2 (6.5)
Education (%)					
< High school	3.5	7.2	5.2	6.0	5.1
High school or general equivalency diploma	16.5	19.8	17.8	20.3	19.8
Some school after high school	35.7	39.2	40.4	40.5	36.6
College degree	43.7	33.4	36.7	32.4	37.9
Missing	0.5	0.6	0.0	0.8	0.6
Race or ethnicity (%)					
White	88.8	84.0	92.6	84.9	91.0
Black	4.0	8.9	3.3	6.0	4.5
Hispanic	2.7	2.5	1.9	2.6	1.0
American Indian	0.3	0.4	0.7	0.8	0.4
Asian/Pacific Islander	3.1	2.5	1.1	3.8	1.4
Unknown	1.2	1.6	0.4	2.0	1.7
Physical health					
Body weight (kg)					
Baseline	70.4 (15.8)	70.8 (16.5)	67.2 (11.5)	71.7 (17.2)	70.5 (15.3)
3-year follow-up	70.9 (15.9)	70.8 (15.8)	69.5 (13.5)	71.2 (17.5)	69.9 (15.2)
Systolic blood pressure (mm Hg)					
Baseline	125.7 (17.6)	130.4 (18.2)	126.9 (17.9)	128.9 (17.2)	129.6 (18.9)
3-year follow-up	125.4 (17.2)	130.1 (18.2)	130.0 (18.2)	127.7 (17.7)	128.3 (17.1)
Physical functioning					
Baseline	83.9 (18.1)	77.7 (21.5)	85.4 (16.4)	78.3 (21.4)	79.4 (19.9)
3-year follow-up	80.2 (21.2)	72.4 (24.6)	80.4 (21.1)	73.6 (24.9)	75.2 (23.2)
General health					
Baseline	75.3 (17.4)	73.4 (17.8)	78.4 (17.4)	73.7 (18.2)	74.4 (17.2)
3-year follow-up	73.5 (18.2)	70.4 (18.8)	75.7 (19.6)	70.8 (19.0)	72.3 (18.0)
Pain					
Baseline	75.6 (22.3)	74.0 (24.1)	77.1 (23.4)	73.3 (23.8)	74.5 (22.6)
3-year follow-up	73.3 (23.7)	70.5 (25.6)	72.8 (25.9)	69.7 (26.3)	73.0 (24.6)
Mental health					
Social functioning					
Baseline	91.2 (16.5)	89.4 (18.1)	91.3 (16.4)	89.3 (18.1)	88.4 (19.6)
3-year follow-up	89.1 (19.2)	86.8 (20.9)	90.7 (18.9)	79.1 (25.1)	88.0 (20.1)
Depressive symptoms					
Baseline	2.1 (2.3)	2.5 (2.6)	2.3 (2.5)	2.4 (2.5)	2.6 (2.6)
3-year follow-up	2.2 (2.4)	2.4 (2.5)	1.9 (2.4)	4.5 (3.8)	2.8 (2.9)
Mental health composite					
Baseline	53.9 (7.7)	53.3 (8.4)	53.4 (8.1)	52.7 (8.7)	52.1 (9.2)
3-year follow-up	54.1 (8.3)	54.3 (8.5)	55.8 (7.6)	48.0 (11.6)	53.4 (9.1)
Health behaviors					
Tobacco use (cigarettes per day)					
Baseline	0.6 (3.6)	1.0 (4.6)	0.7 (3.9)	0.7 (3.9)	0.7 (3.6)
3-year follow-up	0.4 (3.0)	0.8 (3.8)	0.5 (3.2)	0.6 (3.3)	0.6 (3.2)
Physical activity METs (kcal per kg per week)					
Baseline	14.5 (14.3)	13.1 (13.8)	17.1 (17.5)	12.9 (14.7)	11.9 (13.1)
3-year follow-up	14.2 (14.6)	12.6 (14.2)	15.0 (14.7)	11.8 (14.0)	12.5 (13.1)
Fruits & vegetables (servings per day)					
Baseline	4.5 (2.1)	4.3 (2.2)	4.3 (2.1)	4.4 (2.2)	4.4 (2.1)
3-year follow-up	4.5 (2.2)	4.3 (2.3)	4.4 (2.3)	4.2 (2.4)	4.4 (2.2)
% energy from fat					
Baseline	30.7 (8.5)	31.2 (8.7)	31.3 (8.5)	32.1 (8.6)	31.7 (8.5)
3-year follow-up	32.6 (8.4)	32.7 (8.5)	33.6 (8.6)	33.3 (8.3)	32.2 (8.3)
Alcohol consumption (drinks per week)					
Baseline	2.8 (5.3)	2.2 (4.9)	2.2 (3.7)	2.3 (4.8)	2.4 (4.9)
3-year follow-up	2.6 (5.2)	2.0 (4.6)	2.6 (4.2)	2.1 (5.0)	2.2 (4.2)

Note. Higher scores for physical functioning, general health, pain, social functioning, and mental health composite indicate better health. Higher scores for depressive symptoms indicate greater depressive symptoms. METs = metabolic equivalents.
[a] *n* = 41,834.   [b] *n* = 11,366.   [c] *n* = 270.   [d] *n* = 1,325.   [e] *n* = 929.

Table 3

Relationship Between Marital Status Transition and Change in Physical Health Functioning (N = 38,483)

Variable	B	SE B	p	d
Body weight (kg)				
Longer term widow	−0.714	0.423	<.10	−0.03
Recent widow	−0.651	0.340	.08	−0.02
Remarried	1.562	0.753	.05	0.11
Remained widowed	−0.142	0.136	.33	0.01
Remained married	ref	—	—	0.02
Overall group effect		$F(4, 38464) = 2.55, p = .04$		
Systolic blood pressure (mm Hg)				
Longer term widow	−0.709	0.656	.28	−0.06
Recent widow	−0.359	0.571	.53	−0.04
Remarried	3.0326	1.251	<.01	0.16
Remained widowed	0.763	0.225	<.01	0.02
Remained married	ref	—	—	−0.02
Overall group effect		$F(4, 38464) = 5.20, p < .01$		
Physical functioning				
Longer term widow	0.733	0.599	.22	−0.14
Recent widow	0.216	0.521	.68	−0.17
Remarried	−0.508	1.146	.66	−0.18
Remained widowed	−0.135	0.205	.51	−0.16
Remained married	ref	—	—	−0.18
Overall group effect		$F(4, 38464) = 0.62, p = .65$		
General health				
Longer term widow	0.379	0.575	.51	−0.08
Recent widow	−0.672	0.500	.18	−0.14
Remarried	−1.339	1.097	.22	−0.17
Remained widowed	−0.508	0.197	.01	−0.12
Remained married	ref	—	—	−0.10
Overall group effect		$F(4, 38464) = 2.48, p = .04$		
Pain				
Longer term widow	0.417	0.888	.64	−0.06
Recent widow	−0.716	0.772	.35	−0.11
Remarried	−1.013	1.693	.55	−0.12
Remained widowed	−0.294	0.304	.33	−0.09
Remained married	ref	—	—	−0.08
Overall group effect		$F(4, 38464) = 0.57, p = .68$		

Note. Results presented are from a multivariate linear regression analysis (continuous dependent variables). Estimates shown are adjusted for age, education, race or ethnicity, and change in income. Effect sizes are equal to the Year 3 score minus the baseline score, divided by the standard deviation at baseline. Dashes indicate that *SE B* and *p* values are not provided for the reference group (ref).

tions in depressive symptoms relative to those who remained married (small effect sizes).

Health behaviors. As shown in Table 5, marital status transitions were significantly associated with changes in tobacco use, physical activity, fruit and vegetable consumption, and dietary fat consumption but were not associated with changes in alcohol consumption. Women who remained widowed decreased their tobacco use to a greater extent than women who remained married (small effect size). For physical activity, longer term widows increased their level of physical activity as compared with women who remained married (small effect size). In contrast, women who remarried decreased their level of physical activity to a greater degree than women who remained married (small effect size). Recent widows showed a decline in fruit and vegetable consumption relative to married women (small effect size). All groups increased fat consumption, but longer term widows had a smaller increase than women who remained married (small effect size).

With the dichotomous health behavior variable, marital status transitions were not associated with having seen one's physician in the past year (data not shown).

Health outcomes. Marital status transitions were not associated with cardiovascular disease or cancer events or overnight hospitalizations over this 3-year period (data not shown).

Post Hoc Analysis

Because it is possible that only widows who experience elevated levels of depression experience adverse physical health and health behavior outcomes (Chen et al., 1999), we examined whether participants who became widowed and had a higher level of depressive symptoms (score of 4 or higher on the 6-item CES-D) were more likely to show negative changes in physical health and health behavior variables than participants who became widowed but had a lower level of depressive symptoms or participants who remained married. The multivariate models described above were rerun with the same covariates, but with only three marital status transition groups (remained married, became widowed and had more depressive symptoms, and became widowed and had fewer depressive symptoms). In no instances did widowed women with more depressive symptoms show more negative changes than the other two groups.

Discussion

In the largest sample reported to date, we examined whether marital transitions, namely becoming a widow, negatively im-

Table 4

Relationship Between Marital Status Transition and Change in Mental Health Functioning (N = 43,533)

Variable	B	SE B	p	d
Social functioning				
Longer term widow	2.747	0.753	<.01	0.04
Recent widow	−7.543	0.659	<.01	−0.57
Remarried	3.034	1.421	.03	0.06
Remained widowed	0.684	0.261	<.01	−0.07
Remained married	ref	—	—	−0.12
Overall group effect		$F(4, 43514) = 40.16, p < .01$		
Depressive symptoms				
Longer term widow	−0.050	0.094	.59	0.05
Recent widow	1.735	0.082	<.01	0.82
Remarried	−0.605	0.177	<.01	−0.17
Remained widowed	−0.321	0.033	<.01	−0.06
Remained married	ref	—	—	0.07
Overall group effect		$F(4, 43514) = 151.23, p < .01$		
Mental health composite				
Longer term widow	1.460	0.306	<.01	0.22
Recent widow	−4.438	0.268	<.01	−0.53
Remarried	2.713	0.577	<.01	0.35
Remained widowed	1.105	0.106	<.01	0.16
Remained married	ref	—	—	0.04
Overall group effect		$F(4, 43514) = 116.03, p < .01$		

Note. Results presented are from a multivariate linear regression analysis (continuous dependent variables). Estimates shown are adjusted for age, education, race or ethnicity, and change in income. Effect sizes are equal to the Year 3 score minus the baseline score, divided by the standard deviation at baseline. Dashes indicate that *SE B* and *p* values are not provided for the reference group (ref).

Table 5

Relationship Between Marital Status Transition and Change in Health Behaviors (N = 45,687)

Variable	B	SE B	p	d
Tobacco use (cigarettes per day)				
Longer term widow	0.084	0.093	.36	−0.01
Recent widow	0.022	0.080	.78	−0.02
Remarried	0.036	0.172	.83	−0.02
Remained widowed	−0.140	0.032	<.01	−0.05
Remained married	ref	—	—	−0.03
Overall group effect	$F(4, 45668) = 5.44, p < .01$			
Physical activity METs (kcals/kg per week)				
Longer term widow	0.941	0.442	.03	0.05
Recent widow	−0.402	0.382	.29	−0.04
Remarried	−2.220	0.817	<.01	−0.17
Remained widowed	0.264	0.151	.08	0.00
Remained married	ref	—	—	−0.02
Overall group effect	$F(4, 45668) = 4.13, p < .01$			
Servings of fruits & vegetables (per day)				
Longer term widow	0.102	0.070	.15	0.05
Recent widow	−0.188	0.061	<.01	−0.08
Remarried	0.130	0.130	.32	0.06
Remained widowed	−0.006	0.024	.81	0.00
Remained married	ref	—	—	0.01
Overall group effect	$F(4, 45668) = 3.28, p > .01$			
% energy from fat				
Longer term widow	−1.064	0.258	<.01	0.11
Recent widow	−0.434	0.222	.05	0.19
Remarried	0.577	0.475	.22	0.30
Remained widowed	−0.150	0.088	.09	0.22
Remained married	ref	0.240	—	—
Overall group effect	$F(4, 45668) = 5.83, p < .01$			
Alcohol consumption (drinks per week)				
Longer term widow	0.006	0.150	.97	−0.03
Recent widow	0.016	0.129	.90	−0.03
Remarried	0.574	0.277	.04	0.09
Remained widowed	0.019	0.051	.72	−0.03
Remained married	ref	—	—	−0.03
Overall group effect	$F(4, 45668) = 1.09, p = .36$			

Note. Results presented are from a multivariate linear regression analysis. Estimates shown are adjusted for age, education, race or ethnicity, and change in income. Effect sizes are equal to the Year 3 score minus the baseline score, divided by the standard deviation at baseline. Dashes indicate that *SE B* and *p* values are not provided for the reference group (ref). METs = metabolic equivalents.

pacted the physical and mental health, health behaviors, and health outcomes of older women. Cross-sectional analyses indicated that marriage was associated with a more favorable health profile than widowhood. Married women generally had more favorable physical and mental health than women who were widowed, and although findings were less consistent for health behaviors, this same pattern was generally present for fruit and vegetable consumption and smoking and, to a lesser extent, physical activity. Unlike other studies (see review by Temple et al., 1991), alcohol use was highest among married women. A difference between other studies and ours is that WHI participants were older and rates of alcohol consumption are lowest in older women relative to other age groups (Dawson, Grant, Chou, & Pickering, 1995). Older women's alcohol consumption, therefore, may be associated with or impacted by marital status differently than younger women's consumption. Further, Umberson (1992) found that although shift-

ing from married to unmarried was associated with increased tobacco use and alcohol consumption in men, it was not associated with these health behaviors in women.

It is important to note that even in cross-sectional analyses, the timing of widowhood was important. Women who were recent widows (widowed in the past year) reported substantially higher rates of depressed mood and poorer social functioning, overall mental health, physical functioning, and general health than longer term widows.

This study's major contribution was to report the effects of transitioning to widowhood on a diverse set of physical and mental health, health behavior, and health outcome variables in a large sample of older women. Indeed, 2,254 women became widowed over this 3-year period, and of these 1,325 became widowed within the year prior to the 3-year visit. To our knowledge, these numbers are the largest reported in the literature to date. Further, an additional 270 women transitioned from widowhood at baseline to becoming married at the 3-year assessment, which offered us a unique opportunity to examine this rarely studied transition.

Our data clearly indicated that becoming a widow has a significant but acute negative impact on mental health. These results are consistent with those of Harlow et al. (1991), who also reported a 1-year period of elevated levels of depression following widowhood. The changes in depressed mood, general mental health, and social functioning were of medium to large magnitude (Cohen, 1988). Our results further point to the time course of these effects; women who became widowed more than 1 year before the 3-year visit showed comparable or more favorable changes in mental health variables than did married women. It is possible that a sizable number of these women had been caring for their spouse because of illness, frailty, or dementia at baseline (Ory, Hoffman, Yee, Tennstedt, & Schulz, 1999) or may have been anticipating the death of their spouse, and widowhood might have reduced the physical and mental strain associated with caregiving or anticipatory loss. This hypothesis is consistent with recent findings by Schultz and colleagues (2001). Another explanation for our findings could be that women who became widowed sought out support (e.g., professional or personal) and positive coping strategies as a result of widowhood. Taylor et al. (2000) recently reviewed interesting gender differences in response to stress that appears in both human and animal studies. They argued that women or females tend to show a "tend-and-befriend" response rather than a "fight-or-flight" response. Relevant to this study, *befriending* refers to women's or females' tendency to create and maintain social networks that provide support during stressful times. Also consistent with our findings, Utz, Carr, Nesse, and Wortman (2002) recently reported that informal social participation levels decreased among widowed persons prior to the death of a spouse, but then increased following the loss. These findings, they argued, indicate that social participation, especially with family and friends, is an adaptive coping mechanism among widowed persons.

It is also important to note that women who were widowed at baseline and remarried by the 3-year visit showed improvements in mental health and reductions in depression, although the magnitude of these changes were small. These findings are consistent with the importance of intimacy and close emotional social support for mental health (House et al., 1988; Uchino et al., 1996). Other transitions, such as becoming divorced or ending a marriagelike

relationship, have not been well studied in older women. Although it would have been interesting to focus on these and other groups in our prospective analyses, this focus would have been beyond the scope of the present study and too broad. Instead, we chose to focus on the experience of widowhood. Women who never marry and women in marriagelike relationships are similarly interesting, yet understudied, groups that merit further study.

One paradox in our study was the difference between baseline and prospective findings. Baseline associations indicated that widowhood was negatively associated with various physical health and health behavior variables. Yet, despite the breadth and number of variables studied, we found little evidence to support the hypothesis that becoming a widow had a negative impact on changes in physical health, health behaviors, or health outcomes. When significant effects were noted, the magnitude of these effects was small. Very few studies have examined the transition to widowhood, and of those conducted to date (Avis et al., 1991; Harlow et al., 1991; Schulz et al., 2001), the health status and health behavior results have not been consistent. One mechanism that could account for differences between our baseline and prospective findings is assortatitive mating. There is a body of evidence indicating that physical and mental health variables are associated between spouses (Galbaud du Fort, Kovess, & Boivin, 1994; Knuiman, Divitini, Bartholomew, & Welborn, 1996; Mathews & Reus, 2001). Thus, marital status could be associated with health status, but changes in marital status might not predict changes in health status. Unfortunately, this possibility cannot be addressed with our data, but it underscores the need to use caution in making causal inferences from cross-sectional data.

Although this study was large, comprehensive, and included a large number of outcome variables, there are several limitations that prevent us from strongly arguing that widowhood is not associated with changes in physical health and health behaviors. First, the follow-up time of 3 years may not be long enough to see an impact on health outcomes, especially outcomes such as cardiovascular disease and cancer events. Mounting evidence indicates that depression is a risk factor for noncompliance with medical treatment (DiMatteo et al., 2000) and is associated with poorer adherence to behavioral and lifestyle changes following a myocardial infarction (Ziegelstein et al., 2000). Perhaps a longer follow-up time would have borne out these relationships. Second, women with clinical levels of depressed mood were screened out of this study, which may have attenuated associations. Women with poorer physical and mental health and more negative health behaviors at baseline were significantly less likely than women with healthier profiles to complete the 3-year visit. In addition, recent widows at baseline were less likely than married women to return for this visit. Women who are widowed and experiencing higher levels of psychological distress appear to be at greatest risk for adverse health outcomes (Chen et al., 1999). Thus, these potentially at-risk women might have been selected out of the prospective analyses. In post hoc analyses, we found that women who became widowed and had elevated levels of depressive symptoms were no more likely than women who remained married or women who were widowed but had low levels of depressive symptoms to experience negative changes in physical health or health behavior variables. However, these analyses likely excluded those who were having the most difficulty with widowhood. Third, women could have experienced a marital transition that was not

captured by the two assessments. For example, a married woman potentially could have become a widow and remarried within the 3-year period. We expect that these numbers would have been small, with a negligible effect on our findings. Fourth, participants in the WHI are volunteers and thus a selective population. Results may not generalize to more representative populations. Even among WHI participants, completion rates for the 3-year visit were significantly lower for women who belonged to an ethnic minority group and women with less education. Also, our sample was fairly young (ages 50–79 years at baseline) relative to widows in the general population, and results may not generalize to older women who become widowed.

These limitations notwithstanding, our study provides clear support for the idea that becoming a widow leads to acute impairments in overall mental health, depressive symptoms, and social functioning. After a 3-year period of time passed, however, emotional and social functioning improved among most women. These findings speak to the resilience of older women and underscore the importance of studying how individuals successfully cope with major life stressors, for example, by creating and maintaining new social networks and close emotional relationships (Taylor et al., 2000; Utz et al., 2002). These findings do not, however, negate the need for services and interventions that strengthen social and emotional support networks among women experiencing the death of one's spouse, as this appears to be a time of increased risk for adverse mental health outcomes. Furthermore, women who have difficulty adjusting to this transition may be particularly at risk for longer term adverse mental and physical health outcomes.

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