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Among Older Americans, 1997–2010: An  
Examination by Gender and Race*

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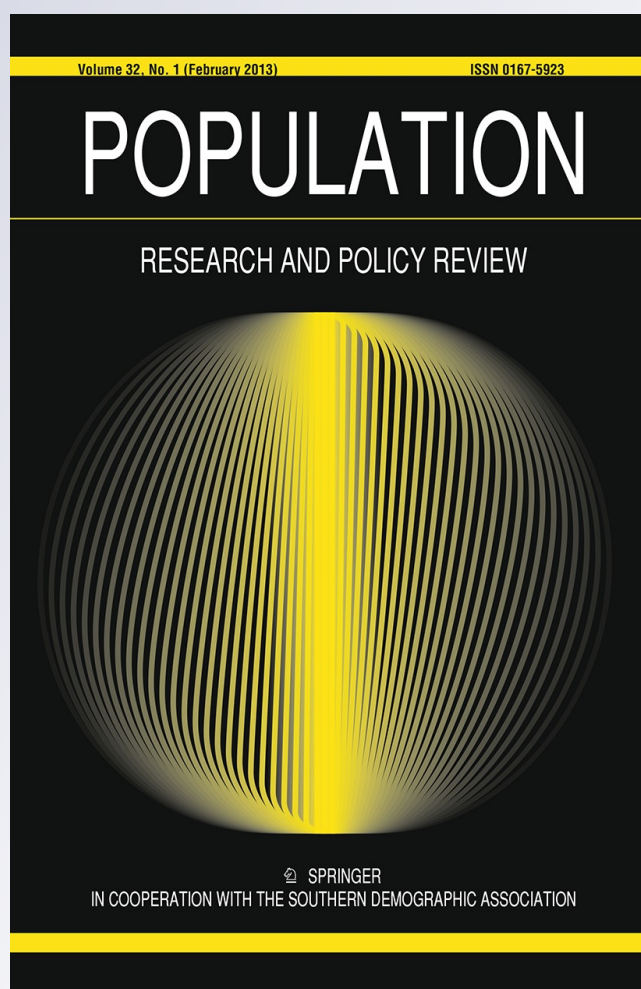
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## Disability Trends by Marital Status Among Older Americans, 1997–2010: An Examination by Gender and Race

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**Abstract** This study examined disability trends by marital status among older adults aged 60 and above from 1997 to 2010 in the U.S. We addressed two questions: (1) Has the relationship between marital status and disability changed over the study period? (2) Can the trends be explained by changes in socioeconomic status? We paid special attention to potential gender and racial variations in these patterns. Data were drawn from the National Health Interview Surveys (NHIS) 1997–2010 ( $N = 170,446$ ). Consistent with previous literature, our results from logistic regression models suggested that the married had lower odds of reporting either ADL or IADL disability than the unmarried groups over the entire study period across all gender and racial subgroups examined. More importantly, we found that the ADL disability gaps of widowed white men, widowed white women, and divorced white women in comparison to their married white counterparts decreased from 1997 to 2010; the IADL disability gaps of widowed white men and widowed black women in comparison to their married counterparts also decreased, while the IADL disability gap between never married white men and married white men increased over time. Socioeconomic status could explain little of these trends. These results, coupled with the growth of unmarried elderly population, suggest that the national long-term care system needs to get prepared for the potentially significant increase in demand for their services among the vulnerable unmarried elderly (especially blacks) and provide affordable and adequate services to those in need.

**Keywords** Disability · Marital status · Trends · Gender · Race

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In 2000, two out of five elderly Americans had daily activity limitations (Shirey and Summer 2000), and this proportion was higher for blacks and women than for whites and men (Martin et al. 2007). Based on recent estimates, the total number of elderly Americans with disabilities will rise to 21 million in 2030, more than double the figure for 2000. With the continued increase in life expectancy and millions of elderly projected to need care in daily activities (Jamshidi et al. 1992; Shirey and Summer 2000), a better understanding of disability trends has important public policy implications as it can provide guidance for arrangements of elderly care and social security policy in the future. Marital status, as a defining feature of social environment, is long argued to affect individuals' risks of disabilities (Hughes and Waite 2009). Being married is often associated with longer life expectancy and a lower risk of disability (Pienta et al. 2000). Over the past few decades, significant changes have taken place in American families with increasing rates of never marrying, cohabitation, and divorce and declining rates of first marriages and remarriages (Teachman et al. 2000). However, little is known whether disability gaps by marital status have changed over time in the context of such rapid family changes.

The main objective of the present study was to examine whether disability differences by marital status changed from 1997 to 2010 in the U.S. for the elderly aged 60 and older. Given the significant gender and racial differences in marriage and health patterns (Bird and Rieker 1999; Raley and Bumpass 2003; Zhang and Hayward 2006), we paid special attention to potential gender and racial variations in the trends. We further investigated whether these trends could be explained by changes in socioeconomic status across marital status groups. Examining trends in the association between marital status and disability among the elderly across gender and racial groups can enhance our understanding of the potentially dynamic development of health inequalities across different social groups and provide policy guidance for future elderly care arrangements.

## Background

This study is grounded in the broader theoretic framework linking social relationships and health outcomes (Umberson and Montez 2010). The marital relationship is one of the most often documented social relationships affecting health (Williams and Umberson 2004). A substantial literature has established an empirical relationship between marital status and a wide-range of health measures (Hughes and Waite 2009). In comparison to unmarried individuals, married people have lower levels of depression (Williams 2003), better self-rated health (Liu and Umberson 2008), fewer chronic diseases (Hughes and Waite 2009), and a lower risk of having functional problems and disabilities (Pienta et al. 2000; Schoeni et al. 2009), and a lower mortality rate (Liu 2009). Recent research suggested that the effect of marital relationship on health was more salient among older adults (Durden 2005; Umberson et al. 2006; Williams and Umberson 2004). For example, the detrimental effects of both divorce (Williams and Umberson 2004; for contrary evidence, see Liu 2012) and widowhood (Durden 2005; Liu 2012) on self-rated

health tended to be larger among older adults according to recent longitudinal studies. Another recent longitudinal study found that marital quality was also more important for self-rated health among older groups than younger groups (Umberson et al. 2006).

During the past half century, the U.S. has witnessed remarkable changes in marriage and family across all age groups. Average age at first marriage increased; the proportion of never married (especially for blacks) increased; and cohabitation and marital dissolution rose dramatically (Casper and Bianchi 2001). According to a recent study, one out of three baby boomers (born 1946-1964) was unmarried and this rate was much higher than that of their parents' generation (Lin and Brown 2012). The increase of the unmarried elderly population over recent decades was mainly concentrated among divorced and never married groups (Lin and Brown 2012). The percentage of divorced boomers increased nearly 30 % from 1980 to 2009 and the percentage of never married boomers increased about 60 % from 1990 to 2009 in the U.S. (Lin and Brown 2012).

In the context of such rapid changes in family life, the association between marital status and health may have changed over time (Liu and Umberson 2008). A recent cross-sectional study among adults between the ages of 25 and 80 found that the self-rated health gap was narrowing between the married and never married, while it was widening between the married and previously married including the divorced, separated and widowed from 1972 to 2003 (Liu and Umberson 2008). Another cross-sectional study among the elderly aged 70 and older suggested that the proportion of the elderly reporting poor or fair health declined more rapidly for the married than the unmarried from 1982 to 2003 (Martin et al. 2007). In addition, recent studies on mortality in both Europe (e.g., van Poppel and Joung 2001) and the U.S. (Liu 2009) suggested widening mortality gaps between the married and unmarried groups.

Although informative, these studies do not inform us about *disability* trends by marital status over time. Because the unmarried are more likely to experience disability than the married (Pienta et al. 2000), the remarkable growth of the unmarried population over recent decades—especially at middle and older ages (Lin and Brown 2012)—may signal a great increase in the total number of disabled older adults. Schoeni et al. (2009) conducted one of the few studies to examine disability trends by marital status for the elderly population and suggested a widening gap in the risk of having disabilities between the married and unmarried from 1982 to 2002 based on data from the National Health and Interview Surveys. Schoeni et al. (2009) grouped all the unmarried statuses into one category without distinguishing among the never married, divorced, and widowed. Yet, family scholars emphasize the need to consider the heterogeneity of unmarried individuals to fully understand the relationship between marital status and health (Liu and Umberson 2008). Moreover, despite the long-standing observation of gender and racial variations in marriage and health processes, few studies have explored potential gender and racial variations in the disability trends by marital status. We address these important research gaps in the present study using more recent data.

## Why Marital Status is Related to Disability for the Elderly: Prediction of Trends

Recent research showed that the proportion of the elderly with disabilities declined over recent decades (Freedman et al. 2002; Martin et al. 2007). However, this decline may not be uniform for the elderly in different marital status groups—suggesting a changing relationship between marital status and disability over time. Two theoretic models are often adopted to explain the association between marital status and disability among the elderly, which provide a foundation for predicting the direction of change in the relationship between marital status and disability over time.

### The Marital Resource Model

According to the marital resource model, marriage provides social, psychologic, and economic resources, which in turn promote health and reduce the risk of disability (Waite and Gallagher 2000). In terms of economic resources, marriage may promote economic resources through specialization, economies of scale, and the pooling of wealth (Becker 1991). Consistent with this view, extant literature confirms that married people have higher levels of socioeconomic status (often measured by income, wealth, and education) than their unmarried counterparts. This is especially true for married women whose socioeconomic status is usually improved via marrying a typically higher earning male spouse. Higher levels of socioeconomic status are related to reduced risks of illness and disability through greater access to high quality medical care, better nutrition or other resources to prevent chronic diseases (Waite and Gallagher 2000). In terms of social and psychologic resources, having a spouse is a key mechanism to promote social integration and social control of health behaviors as well as to provide support, care, and assistance in case of illness—all resources which may reduce the risk of having chronic diseases and disabilities as well as promote better recoveries (Waite and Gallagher 2000).<sup>1</sup> The increased protective resources through marriage may be more important for the health of older adults as social networks and contact with friends tend to decrease at older ages (Turner and Marino 1994). As a result, having a spouse as a confidant and care giver may be more salient for the life of the elderly. In line with this literature, researchers have argued that advantages or disadvantages associated with certain marital statuses may have cumulative effects on health over the life course (Liu 2012).

With the rapid changes in gender roles and women's increasing labor force participation over the past few decades (Lynn, Schneider, and Zhang forthcoming), the resources associated with marriage may have changed. For example, Becker (1991) contended that, as the division of household labor decreased with increases in women's education and employment, specialization between the husband and

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<sup>1</sup> It is noteworthy that while marriage is a central source of financial, emotional, and social support for most people, poor marital quality is associated with higher levels of stress and more risky health behaviors which increase the risks of chronic diseases and disabilities in comparison to getting divorced or never marrying (Williams 2003). Recent research further highlights the heterogeneity of the unmarried groups by suggesting different levels of marital resources associated with different unmarried groups including the divorced, widowed, and never married (Liu and Umberson 2008).

wife declined and economic gains from marriage diminished. In turn, marriage became less valued as a source of economic stability (Teachman et al. 2000). If this is the case, we expect that the protective effects of marriage on health and disability may decrease over time. On the other hand, it is also likely that marriage may have become more important in the context of increasing geographic mobility and decreasing number of social ties and network connections for average Americans (McPherson et al. 2006; but also see Fischer 2009). Having a spouse, especially at older ages, may become even more important now than before as a source of social support, and thus significantly lower the chances of having chronic diseases, depression, and disability. In this sense, we expect that the disability gap between the married and unmarried including the divorced, widowed, and never married would have increased among the elderly over the past few decades.

### The Selection Model

Some scholars argue that individuals in higher socioeconomic status and better health are also more likely to get and remain married at older ages, whereas disabled individuals are more likely than their healthy peers to become divorced and are less likely to marry or remarry (Joung et al. 1998; Sweeney 2002). This suggests a potential selection process of marriage on disability among the elderly. Recent studies suggest that SES becomes more important when entering into marriage (Sweeney 2002), and disability disparities across SES groups are growing over recent decades (Schoeni et al. 2005). This suggests that the selection process of marriage on disability through SES may become more relevant now than in the past—indicating potential widening disability trends between the married and unmarried groups.

Another relevant selection process of marriage on disability among the elderly is through mortality. Because mortality rates are different across marital status groups, those groups with higher risks of mortality, such as the divorced, widowed, and never married, may be left with a more robust population at older ages, while the married who have lower risks of mortality may include a higher percentage of frail population at older ages. This mortality selection process then leads to a smaller disability gap between the married and unmarried at older ages. Recent research showed that for adults aged 40 and above, the mortality rate of the widowed, especially for white women, has increased over the past two decades in comparison to that of the married (Liu 2009). This suggests that the mortality selection process may leave a more robust widowed population now than before. In this sense, we may expect a closing disability gap between the married and unmarried groups, especially the widowed over time. Taken together, previous literature suggests that marital status differences in disability would have changed over time, but it did not imply a clear picture of the specific direction of change.

### Gender, Race, Marital Status, and Disability

Both marriage patterns and the prevalence of disability are quite different across gender and racial subgroups, suggesting potential gender and racial differences in

disability trends by marital status. In comparison to men, women are more likely to report disabilities at older ages (Martin et al. 2007; Schoeni et al. 2005), but this gender difference seems to decrease over time due to a declining prevalence of disability for old women together with a stable disability trend for old men (Crimmins and Saito 2000). Sociologists have long argued that marital status is more important for the health of men than that of women, and health disparities by marital status are greater for men than for women (Liu and Umberson 2008; Williams and Umberson 2004). However, recent studies suggest that gender differences in health benefits of marriage tend to decrease over time with the shifts of gender roles in work, family, and society (Liu and Umberson 2008; Liu 2009). For example, the self-rated health gap between the married and never married diminished for men, but not for women over the past three decades, while the self-rated health gap between the married and previously married including the widowed, divorced, and separated increased more rapidly for women than for men (Liu and Umberson 2008). The mortality gap between the married and widowed increased for women aged 40 and above but it remained stable for men (Liu 2009). Given the evidence on trends in mortality and self-rated health by marital status, we hypothesize that marital status differences in disability are more likely to increase for elderly women, but more likely to decrease for elderly men.

Racial inequality may further complicate these dynamics. Older blacks, especially women, are more likely to have disabilities than their white counterparts, and the racial difference in disabilities among older adults remains quite stable over time (Martin et al. 2007). Research shows that in terms of the SES (Cohen 1999; Edin and Kefalas 2005) and health (Liu and Reczek 2012), blacks benefit less from marriage than do whites. This is especially true for black women because the earning premium of married men relative to unmarried men is smaller for blacks than for whites (Cohen 1999), and black women do not receive a financial boost from marriage to the same degree as their white female counterparts (Edin and Kefalas 2005). Research further suggests that married blacks report higher levels of relationship strain than married whites (Bulanda and Brown 2007)—which is shown to reduce the benefit of marriage for health (Umberson and Montez 2010). This line of literature then suggests that marriage may provide fewer social, psychologic, and economic resources for blacks (especially black women) than for whites (Liu and Reczek 2012). In addition, in comparison to whites, blacks in general have a higher risk of marital dissolution (Raley and Bumpass 2003) and a lower rate of marriage (Oppenheimer 1997), and these patterns have become stronger over time (Raley and Bumpass 2003). The more common occurrence of divorce, separation, and never married status among blacks than whites suggests that these unmarried statuses may be less stigmatized and have less detrimental consequences on health among blacks than whites (Liu and Umberson 2008). Thus, we hypothesize that disability trends by marital status are more likely to persist or converge and less likely to diverge among blacks than whites over time.

## The Present Study

In sum, we hypothesize that marital status differences in disability are changing in recent years in the U.S. although the prediction of the direction of change is mixed.



The argument about a potential decrease in economic benefit from marriage along with the increasing mortality selection of some unmarried groups (i.e., widowed) suggests narrowing disability gaps between the married and unmarried groups over time. In contrast, the potentially more important role of marriage in providing social support in the context of increasing geographic mobility along with the selection process of marriage on disability through SES over time suggests widening disability gaps between the married and unmarried groups. Moreover, we expect that these trends would vary by gender and racial groups with whites and women more likely to experience widening trends than blacks and men. Although previous studies are valuable to our understanding of trends in the overall relationship between marital status and health, the majority of them do not focus on disability by marital status among the elderly. Moreover, recent studies have highlighted the importance of examining how gender and race combine to influence the health of older people (Warner and Brown 2011). In this paper, we for the first time, investigate the joint influence of gender and race in determining the disability trends by marital status and explore the trends among white men, white women, black men, and black women.

## Data and Methods

### Data and Sample

We used pooled data from the 1997–2010 Integrated National Health Interview Surveys (NHIS) (Minnesota Population Center and State Health Access Data Assistance Center 2011). The NHIS is a multistage probability survey conducted annually by the U.S. Department of Health and Human Services and National Center for Health Statistics, and is a representative of the civilian noninstitutionalized population of the U.S. We applied weights from the different years of the NHIS in the analysis to allow our estimates to reflect the non-institutionalized population of the country across these years. All significance tests were based on robust standard errors, which were further adjusted for the primary sampling unit employed in the sampling design. The NHIS provides unique opportunities for the current analysis as it covers a long enough time period to examine disability trends and it provides high quality SES measures and socio-demographic information which are important for studying trends in the relationship between marital status and disability.

In this study, we included only non-Hispanic white (hereafter “white”) and non-Hispanic black (hereafter “black”) individuals aged 60 and above when the surveys were conducted. Other racial/ethnic groups (about 16 %) were excluded from the analysis because of their tremendous heterogeneity and fewer observations of disability for those groups. Missing cases on disability and marital status were further excluded (less than 1 %). In total, 170,446 observations were included in the final analysis.

## Measures

### *Disability*

We used two measures of disability which were consistently measured in the NHIS since 1997: the need for help with activities of daily living (ADL disability) and the need for help with instrumental activities of daily living (IADL disability). The NHIS measures for disability before 1997 are not comparable to those since 1997 because of major survey design changes initialized in 1997. The ADL disability is measured based on the interview question: “Because of a physical, mental, or emotional problem, does the person need the help of other persons with personal care needs, such as eating, bathing, dressing, or getting around inside the house?” The IADL disability indicates whether the person currently need the help of other persons in handling routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes, because of a physical, mental, or emotional problem. For both ADL and IADL disabilities, we used the code of 1 indicating needing help and 0 indicating others. Both ADL and IADL disabilities are widely used disability measures in previous studies (e.g., Parker and Thorslund 2007; Schoeni et al. 2005) although it is important to point out that the specific wording and the number/type of activities of daily living or instrumental activities of daily living may vary in different surveys (Freedman et al. 2004).

### *Marital Status*

Four categories of marital status were created including married, widowed, divorced (including the separated), and never married with the married as the reference group.

### *Year*

We used the survey year to record trends from 1997 (coded 0) to 2010 (coded 13). We also included year squared in the analysis to take account of potential nonlinear trends.

### *SES*

We included two measures of SES: education and poverty status. *Education* was measured as a categorical variable: no high school diploma (the reference), high school or GED, some college, college graduate, and missing reports (3 %). *Poverty status* was determined based on comparing the total family income with the U.S. Census Bureau’s poverty thresholds for the specific year, which took account of family income, family size, and the ages and number of children. If the total family income was lower than the poverty threshold for families of that size and age composition, the respondent was determined to be “in poverty.” Otherwise, the respondent was determined to be “not in poverty.” 31 % of the total sample had

missing information on poverty status. We included those missing cases as a separate category, and used those “not in poverty” as the reference.

### *Self or Proxy Report*

The NHIS is a household survey and it collected health information of all family members. Within each family, there is one primary respondent who reports the information of all family members. Owing to the concerns about potentially systematic differences in health reports by self and other persons (Magaziner et al. 1997), we controlled for a variable indicating whether the observation came from the primary respondent who self reported his/her own health information or from a family member whose health status was reported by the primary respondent. The missing cases (about 8 %) on primary respondents were included as a separate category.

*Other socio-demographic covariates* included age (in years, calculated by subtracting birth year from survey year) and geographic region (Northeast, Midwest, South, and West, with the South as the reference). Age is related to the prevalence of both marital status and disability. Previous research suggests that people living in the South have health disadvantages than people living in other regions (Martin et al. 2007). The prevalence of marital status also varies across regions with divorce and never marrying less prevalent in less economically developed regions (e.g., the South) than in more economically developed regions (e.g., the Northeast).

### Statistical Methods

Because the meanings and processes of marriage and marital dissolution are fundamentally different across gender and racial groups (Thornton et al. 2007), we conducted analyses separately for white men, white women, black men, and black women. Our additional analysis by means of the Chow tests to compare the overall models between white men and the other three gender and racial subgroups revealed statistical significance for all analyzed models ( $p < .001$ ) separately by gender and race—which provided statistical justification for stratifying the analysis by gender and race (see Demaris 2004). Within each gender and racial subgroup, we estimated two models. We first estimated a model only controlling for basic demographic covariates to understand the general disability trends by marital status. In Model 2, we controlled for SES measures as additional covariates to see whether SES could explain the differences in disability trends by marital status. A change in the sizes and/or significance levels of the interaction effects of marital status by year between Models 1 and 2 would suggest that SES contributed to changes in marital status differences in disability over time. The logistic models we estimated are specified in the following way:

$$\log \frac{p}{1-p} = \tau + \alpha T + \sum \beta_j M_j + \sum \gamma_j M_j T + \sum \pi_i X_i$$

where  $p$  represents the probability of reporting ADL or IADL disability;  $\tau$  represents the intercept;  $T$  is the survey year and  $\alpha$  is the coefficient;  $M_j$  represents the set of

marital status dummy variables and  $\beta_j$  represents the corresponding coefficients (“married” is the reference group);  $\gamma_j$  represents the corresponding coefficients for the set of interaction terms between marital status and year; and  $X_i$  stands for the other covariates included in the model and  $\pi_i$  for the corresponding coefficients.

## Results

### Descriptive Results

We first report descriptive results on general patterns of disability by marital status across the four gender and racial groups. Table 1 shows the weighted percentages of ADL and IADL disabilities by marital status for white men, white women, black men, and black women. From Table 1, we can see that, in general, the married had lower prevalence of ADL and IADL disabilities than the divorced, widowed, and never married for each gender and racial subgroup examined with only a few exceptions: the prevalence of ADL disability was not significantly different for divorced white men, divorced black men, divorced black women, and never married black women in comparison to their married counterparts. Within each marital status group, white men were the most advantaged and *generally* had lower prevalence of ADL and IADL disabilities than that of the other three groups.

Table 2 shows the weighted descriptive statistics of all other analyzed variables by gender and racial groups. From Table 2, we can see that the proportion of being married was significantly lower among white women, black men, and black women in comparison to white men. Both black men and black women were more likely to live in the South than white men. White women and black women as well as black men were more likely to be family primary respondents to self-report their health status than white men. White men were the most likely to be college graduates and least likely to have no high school diploma across the four gender and racial subgroups. White men were also less likely to live in poverty than other gender and racial subgroups. Black men tended to be younger than white men, while both white women and black women tended to be older than white men.

### Logistic Regression Results

Tables 3 and 4 show the estimated odds ratios of reporting ADL and IADL disabilities for white men, white women, black men, and black women. The main effects of marital status in Tables 3 and 4 indicate the marital status differences in odds of reporting ADL or IADL disability at the baseline survey year (i.e., 1997) with all other covariates controlled in the model. The main effects of year and year squared in Tables 3 and 4 indicate ADL or IADL disability trends for the married. The interaction terms of year with other marital statuses are of greatest interests to this study because they represent the differences in ADL and IADL disability trends between the married and each specific marital status group. For example, the odds ratio of 0.965 for “Year X widowed” in Model 1 of Table 3 for white men indicates that the odds of reporting ADL disability decreased 3.5 % (i.e.,  $(1 - 0.965) \times 100$ )

**Table 1** Weighted percentages of ADL and IADL disabilities by marital status, gender and race

	White men	White women	Black men	Black women	Total
<b>Married</b>					
% ADL	3.34	3.33	5.16*	6.64*	3.49
% IADL	4.95	6.26*	7.38*	10.56*	5.75
Total N	50,967	41,615	5,547	4,027	102,156
<b>Widowed</b>					
% ADL	6.66 <sup>+</sup>	9.09* <sup>+</sup>	7.79 <sup>+</sup>	14.26* <sup>+</sup>	9.16
% IADL	15.34 <sup>+</sup>	20.95* <sup>+</sup>	16.93 <sup>+</sup>	25.6* <sup>+</sup>	20.37
Total N	6,759	28,803	1,411	6,024	42,997
<b>Divorced</b>					
% ADL	3.43	4.64* <sup>+</sup>	5.84*	6.99*	4.57
% IADL	8.13 <sup>+</sup>	11.91* <sup>+</sup>	13.34* <sup>+</sup>	16.18* <sup>+</sup>	11.21
Total N	5,675	8,340	1,759	2,777	18,551
<b>Never married</b>					
% ADL	5.14 <sup>+</sup>	6.33 <sup>+</sup>	7.32* <sup>+</sup>	7.89*	6.12
% IADL	11.61 <sup>+</sup>	15.49* <sup>+</sup>	17.09* <sup>+</sup>	17.29* <sup>+</sup>	14.30
Total N	2,398	2,592	645	1,107	6,742
<b>Total</b>					
% ADL	3.76	5.58	5.82	10.06	5.25
% IADL	6.54	12.30	10.56	18.65	10.53
Total N	65,799	81,350	9,362	13,935	170,446

\* Difference between white men and the specific gender and racial subgroup within the marital status group is significant at  $p < .05$  based on two-way Z-tests for comparing proportions

<sup>+</sup> Difference between the married and unmarried groups within the gender and racial subgroup is significant at  $p < .05$  based on two-way Z tests for comparing proportions

more for widowed white men than married white men each year with all other covariates controlled. Because our preliminary analyses (not reported but available upon request) suggested that the interaction effects of marital status by year squared were not statistically significant, we did not include year squared interactions in the final models reported in Tables 3 and 4. Other odds ratios can be interpreted in the same way that odds ratios in conventional logistic regression models are interpreted.

### Results for ADL Disability Trends

The significant main effects of marital status in Model 1 of Table 3 suggest that for each gender and racial subgroup, the odds of reporting ADL disability were significantly higher for each of the unmarried groups—with the only exception for never married black women—in comparison to their married counterparts at the beginning of the study period (i.e., in 1997) net of the effects of basic demographic covariates. The odds of reporting ADL disability were not significantly different between never married and married black women. Results from Model 1 of Table 3 also show that the odds of reporting ADL disability remained quite stable for the

**Table 2** Weighted descriptive statistics of covariates by gender and race

	White men ( <i>n</i> = 65,799)	White women ( <i>n</i> = 81,350)	Black men ( <i>n</i> = 9,362)	Black women ( <i>n</i> = 13,935)
Marital status (%)				
Married	77.28	51.26*	59.74*	29.14*
Widowed	10.24	35.12*	14.68*	42.71*
Divorced	8.82	10.42*	18.86*	20.22*
Never married	3.66	3.2*	6.71*	7.94*
Region (%)				
Northeast	20.81	21.27*	16.15*	17.86*
Midwest	26.27	26.63	18.6*	19.03*
South	34.56	34.56	56.89*	56.02*
West	18.36	17.54*	8.35*	7.1*
Self report (%)				
No	41.13	27.19*	39.06*	23.19*
Yes	50.46	64.69*	51.97*	67.87*
Unknown	8.41	8.12*	8.97	8.94*
Education (%)				
No high school diploma	19.24	20.25*	39.78*	39.7*
High school graduate	30.01	38.09*	26.88*	28.04*
Some college	20.87	22.61*	16.6*	17.08*
College graduate	26.97	15.99*	11.84*	10.51*
Unknown	2.92	3.05	4.89*	4.66*
Poverty status (%)				
Not in poverty	66.67	60.95*	58.24	49.16*
In poverty	3.65	6.15*	13.2*	19.47*
Unknown	29.68	32.9*	28.56*	31.37*
Mean age	70.52388	71.82055*	69.43395*	70.72116*
Mean year	2003.859	2003.772*	2003.953*	2003.982*

\* Difference between white men and the specific gender and racial subgroup is significant at  $p < .05$  based on two-way  $T$  tests for comparing means or two-way  $Z$  tests for comparing proportions

married over time across all gender and racial groups—indicated by the non-significant main effects of year and year squared. More interestingly, results from Model 1 of Table 3 show some significant differences in ADL disability trends for the divorced and widowed in comparison to the married among white men and white women; but, those trends were not significantly different among black men and black women. Specifically, results from Model 1 of Table 3 suggest that the odds of reporting ADL disability decreased 3.5, 2.5, and 3.8 % more each year for widowed white men, widowed white women, and divorced white women, respectively, in comparison to their married white counterparts—leading to closing gaps in ADL disability between those unmarried groups and their married counterparts. For each gender and racial subgroup, the ADL disability gap between

**Table 3** Estimated odds ratios of ADL disability trends from logistic regression models, 1997–2010

	White men		White women		Black men		Black women	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	Marital status (0 = married)							
Widowed	2.348***	2.154***	2.918***	2.586***	1.766*	1.692*	2.283***	2.120***
Divorced	2.427***	2.271***	3.263***	2.920***	2.384**	2.255**	2.010**	1.842*
Never married	1.748*	1.555*	2.221***	2.071***	2.686**	2.571**	1.856	1.691
Year	0.983	0.985	1.004	1.012	0.960	0.968	0.996	1.009
Year squared	1.001	1.002	1.001	1.001	1.004	1.004	1.002	1.002
Year × widowed	0.965*	0.966*	0.975**	0.977*	0.988	0.987	0.969	0.964
Year × divorced	0.979	0.977	0.962*	0.963*	0.979	0.978	0.961	0.960
Year × never married	1.060	1.059	1.013	1.014	0.983	0.974	0.979	0.973
Basic socio-demographic covariates								
Age	1.102***	1.099***	1.102***	1.098***	1.075***†	1.071***†	1.087***†	1.083***†
Region (0 = south)								
Northeast	0.718***	0.725***	0.927†	0.939†	0.704	0.756	0.766**	0.819*
Midwest	0.744***	0.741***	0.865***†	0.871***†	0.840	0.893	1.113†	1.156†
West	0.865*	0.921	1.027†	1.119**†	1.315†	1.401**†	1.171†	1.292†
Self report (0 = no)								
Yes	0.339***	0.350***	0.268***†	0.266***†	0.318***	0.309***	0.333***	0.312***
Unknown	0.624***	0.642***	0.451***†	0.451***†	0.523*	0.515*	0.493***	0.477***
SES								
Education (0 = no diploma)								
High school graduate		0.806***		0.715***		0.730*		0.756**
Some college		0.747***		0.663***		0.986		0.830

**Table 3** continued

	White men		White women		Black men		Black women	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
College graduate		0.669***		0.656***		0.822		0.516***
Unknown		1.467***		1.436***		1.011		1.098
Poverty status (0 = not in poverty)								
In poverty		2.187***		2.038***		1.556*** <sup>†</sup>		1.680*** <sup>†</sup>
Unknown		1.084		1.083*		0.981		1.048
P value for overall Chow-test	-	-	0.000	0.000	0.000	0.000	0.000	0.000
N	65,799	65,799	81,350	81,350	9,362	9,362	13,935	13,935

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

<sup>†</sup>  $p < 0.05$  for the Chow-test comparing individual coefficients between white men and the specific gender and racial subgroup. The overall Chow-tests are to compare overall models between white men and the specific gender and racial subgroup



**Table 4** Estimated odds ratios of IADL disability trends from logistic regression models, 1997–2010

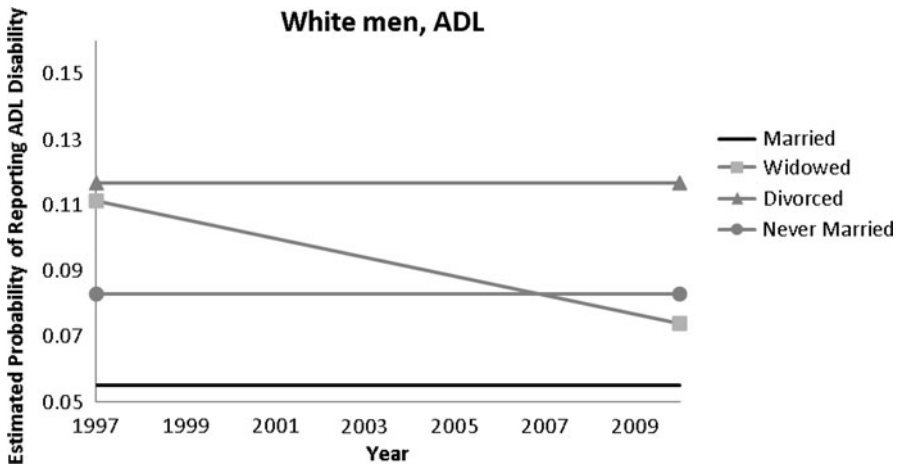
	White men		White women		Black men		Black women	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	Marital status (0 = married)							
Widowed	3.355***	3.054***	2.613***†	2.335***†	2.209***†	2.037**	2.502***	2.304***
Divorced	3.095***	2.854***	2.636***	2.358***	3.615***	3.297***	2.424***	2.187***
Never married	2.523***	2.238***	2.313***	2.225***	3.685***	3.357***	2.118**	1.870*
Year	0.969	0.974	0.951***	0.962**	0.911*	0.921	0.990	1.006
Year squared	1.003	1.003	1.004**	1.003**	1.008*	1.008*	1.002	1.001
Year × widowed	0.968**	0.968**	0.999†	1.001†	0.996	0.995	0.970	0.964*
Year × divorced	0.992	0.990	1.005	1.006	0.965	0.963	0.968	0.966
Year × never married	1.055**	1.054**	1.023	1.023	1.000	0.989	0.994	0.990
Basic socio-demographic covariates								
Age	1.096***	1.092***	1.090***	1.095***	1.082***†	1.077***†	1.081***†	1.076***†
Region (0 = south)								
Northeast	0.698***	0.712***	0.840***†	0.860***†	0.777	0.864	0.747***	0.811**
Midwest	0.842**	0.836**	0.959†	0.970†	1.156†	1.269**†	1.215**†	1.285***†
West	0.827***	0.901	1.006†	1.103**†	1.144†	1.313†	1.124†	1.257**†
Self report (0 = no)								
Yes	0.531***	0.556***	0.564***	0.558***	0.561***	0.545***	0.648***†	0.602***
Unknown	0.564***	0.588***	0.615***	0.615***	0.471**	0.466**	0.613***	0.590***
SES								
Education (0 = no diploma)								
High school graduate		0.704***		0.681***		0.663**		0.738***
Some college		0.649***		0.679***		0.802		0.781**
College graduate		0.538***		0.552***		0.645*		0.521***

**Table 4** continued

	White men		White women		Black men		Black women	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Unknown		1.119		1.052		0.916		0.980
Poverty status (0 = not in poverty)								
In poverty		2.232***		2.067***		1.854***		1.812***†
Unknown		1.123**		1.035		0.980		1.016
P value for overall Chow-test	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	65,799	65,799	81,350	81,350	9,362	9,362	13,935	13,935

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

†  $p < 0.05$  for the Chow-test comparing individual coefficients between white men and the specific gender and racial subgroup. The overall Chow-tests are to compare overall models between white men and the specific gender and racial subgroup



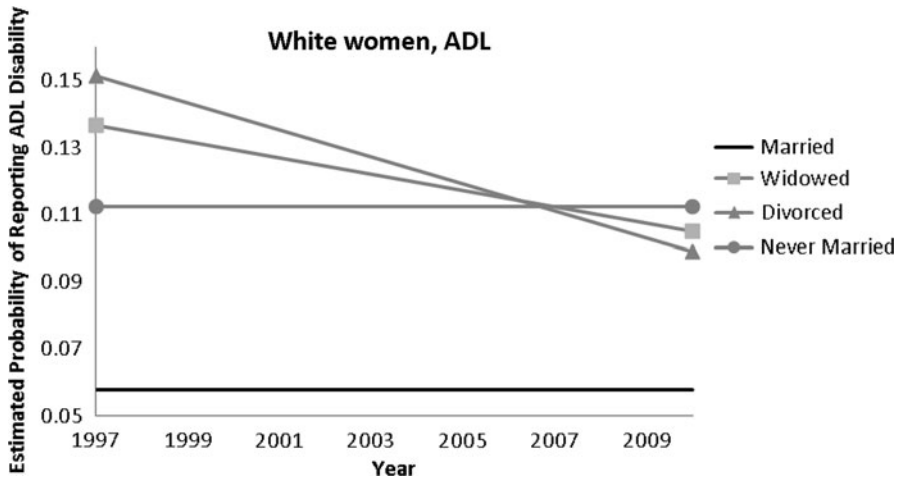
**Fig. 1** Estimated trends in reporting ADL disability by marital status for white men, aged 60 and above, 1997–2010

the never married and married remained unchanged. Our additional analyses (i.e., changing the reference marital status group, not shown, but available upon request) suggested that the ADL disability trends of the never married were significantly different from those of the widowed and divorced for white men, but not for other gender and racial subgroups; the ADL disability trends of the widowed and divorced were not significantly different from each other for all gender and racial subgroups.

To assess how SES contributed to marital status differences in ADL disability trends, we added education and poverty status in Model 2 as additional covariates. Results from Model 2 of Table 3 suggest that higher levels of education were associated with significantly lower odds of reporting ADL disability, and living in poverty was related to significantly higher odds of reporting ADL disability. A comparison of results from Models 1 and 2 in Table 3 suggests that controlling for SES in Model 2 resulted in little change in the estimates of the interaction effects of marital status by year although the magnitudes of the main effects of marital status decreased to some extent. This suggests that changes in socioeconomic conditions across marital status groups cannot explain the identified ADL disability trends by marital status although socioeconomic status differences may explain some baseline differences in ADL disability across marital status groups.

To better illustrate these trends, we computed the predicted probabilities of reporting ADL disability across marital status groups based on results from Model 2 of Table 3 and graphically presented these results in Figs. 1 and 2.<sup>2</sup> We only showed the results for white men in Fig. 1 and for white women in Fig. 2 because we did not find any statistically significant marital status differences in the estimated

<sup>2</sup> We calculated the predicted probabilities based on the formula,  $p = \exp(X'b)/(1 + \exp(X'b))$ . Age was set at the mean and all other covariates were set to the reference group. Only significant coefficients in Model 2 of Tables 3 and 4 were used to calculate the predicted probabilities of reporting ADL or IADL disability since insignificant coefficients were not statistically different from zero.



**Fig. 2** Estimated trends in reporting ADL disability by marital status for white women, aged 60 and above, 1997–2010

ADL disability *trends* for black men or black women. From Fig. 1, we can see that the probability of reporting ADL disability remained quite stable for married white men from 1997 to 2010. It also remained unchanged for divorced and never married white men over time. Therefore, we see persistent gaps in the probability of reporting ADL disability for divorced and never married white men in comparison to married white men. In contrast, the probability of reporting ADL disability decreased among widowed white men—leading to a convergent trend between widowed and married white men.

Figure 2 shows the predicted probabilities of reporting ADL disability across marital status groups for white women. From Fig. 2, we can see that the probability of reporting ADL disability remained stable for both married and never married white women from 1997 to 2010—leading to a persistent disparity in ADL disability between these two groups over time. In contrast, the probability of reporting ADL disability decreased among widowed and divorced white women—leading to a closing gap for widowed/divorced white women in comparison to their married counterparts. Nevertheless, for both white men and white women, the married were less likely to report ADL disability than any other unmarried groups throughout the study period.

#### *Results for IADL Disability Trends*

The significant main effects of marital status in Model 1 of Table 4 suggest that for each gender and racial subgroup, the odds of reporting IADL disability were significantly higher for each of the unmarried groups in comparison to their married counterparts at the beginning of the study period (i.e., in 1997) net of the effects of basic demographic covariates. Results from Model 1 of Table 4 also suggest that for

married white men and married black women, the odds of reporting IADL disability remained stable over time; while for married white women and married black men, the odds of reporting IADL disability decreased steadily until 2003 and then they started to increase over time.<sup>3</sup> Moreover, the significant marital status interaction effects by year in Model 1 of Table 4 suggest that in comparison to their married white counterparts, the odds of reporting IADL disability decreased 3.2 % *more* each year for widowed white men, while they *increased 5.5 % more* each year for never married white men. The IADL trends of the unmarried groups were not significantly different from those of the married for white women, black men, and black women. Similar as the results for ADL disability trends, our additional analyses by changing the reference marital status groups (not shown, but available upon request) suggested that the IADL disability trends of the never married were significantly different from those of the widowed and divorced for white men, but not for other gender and racial subgroups; the IADL disability trends of the widowed and divorced were not significantly different from each other for all gender and racial subgroups.

A comparison of results from Models 1 and 2 in Table 4 suggests that adding SES in Model 2 as additional covariates, to some extent, reduced the magnitudes of the main effects of marital status for all gender and racial subgroups—suggesting that socioeconomic status differences partly explained the baseline IADL differences across marital status groups. After the SES were controlled, the interaction effect of widowhood by year for black women also became significant (OR = 0.964,  $p < 0.05$ ). Specifically, after SES were controlled, the odds of reporting IADL disability decreased 3.6 % *more* each year for widowed black women in comparison to married black women. Controlling for SES resulted in little change in the estimates of marital status differences in IADL trends for white men, white women or black men in Table 4.

Figures 3 and 4 graphically present these significant IADL trends by marital status for white men and black women (based on Model 2 of Table 4). From Fig. 3, we can see that the probability of reporting IADL disability remained stable for both married and divorced white men from 1997 to 2010—leading to a persistent gap in IADL disability between these two groups over time. The probability of reporting IADL disability decreased among widowed white men, which led to a narrowing gap between widowed and married white men. In contrast, the probability of reporting IADL disability increased among never married white men, and thus we see a widening gap in IADL disability between never married and married white men. Figure 4 shows the IADL disability trends for black women and suggests that the probability of reporting IADL disability remained quite stable for married as well as divorced and never married black women from 1997 to 2010, but it decreased among widowed black women. Therefore, we see a narrowing gap in IADL disability between widowed and married black women over time.

<sup>3</sup> If  $\log(p/1 - p) = b_0 + b_1 \cdot X + b_2 \cdot X^2$ , the formula for the minimum expected value is:  $-b_1/2 \cdot b_2$ . For white women:  $Optimum X = -\log(0.951)/(2 \cdot \log(1.004)) = 6.3$ . Since  $X = year - 1997$ , we added 1997, which yielded an optimum year of 2003.3. For black men:  $Optimum X = -\log(0.911)/(2 \cdot \log(1.008)) = 5.8$ . Since  $X = year - 1997$ , we added 1997, which yielded an optimum year of 2002.8.

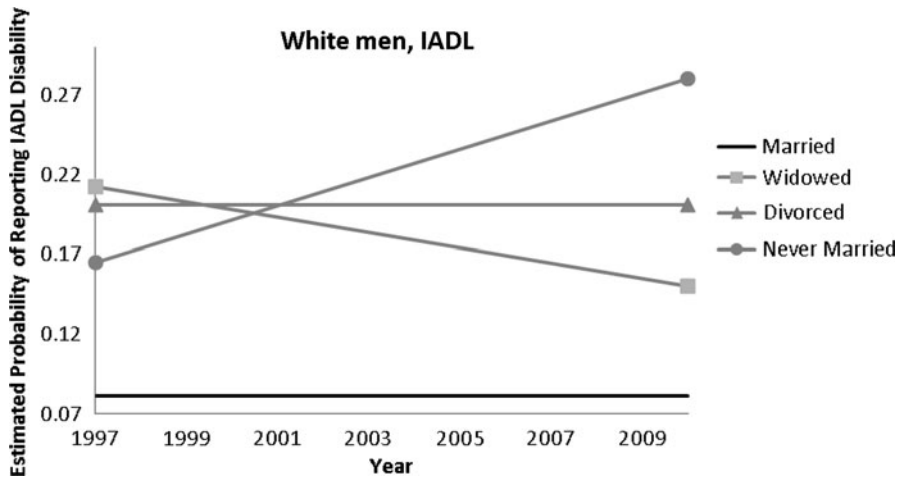


Fig. 3 Estimated trends in reporting IADL disability by marital status for white men, aged 60 and older, 1997–2010

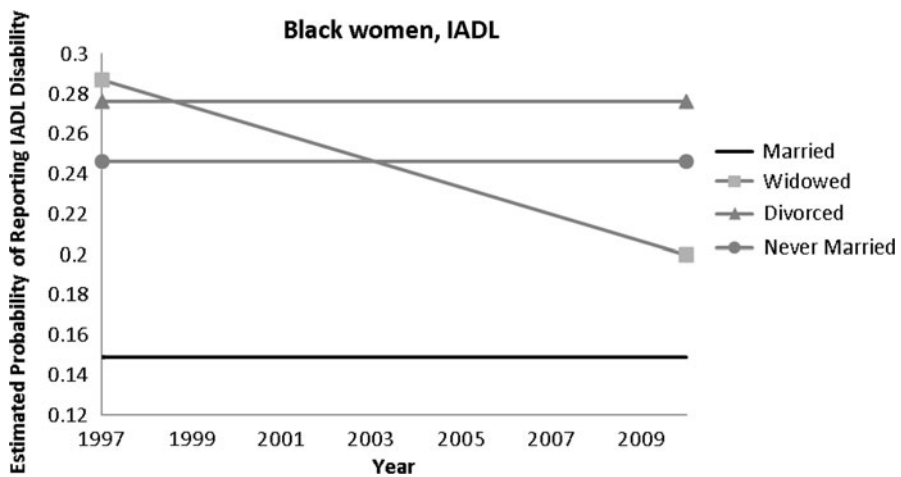


Fig. 4 Estimated trends in reporting IADL disability by marital status for black women, aged 60 and older, 1997–2010

## Discussion

Recent studies suggest that the relationships between marital status and different dimensions of health status such as happiness (Glenn and Weaver 1988), self-rated health (Liu and Umberson 2008), and mortality (Liu 2009) have changed over time in the context of rapid social changes. However, few previous studies have examined *disability* trends by marital status across gender and racial groups. The present study makes an important contribution to the field by documenting marital status differentials in ADL and IADL disability trends over time, paying close

attention to gender and racial variations. Using repeated cross-sectional data from the National Health Interview Surveys from 1997 to 2010, we have three major findings. First, we found some support for our hypothesis that the relative marital status differences in disability have changed in recent years in the U.S. Second, some of these trends varied across gender and racial groups. Third, although socioeconomic status explained some baseline differences in ADL and IADL disabilities across marital status groups, it explained little of the identified disability *trends* by marital status.

In terms of ADL disability trends, the most significant changes occurred among white men and white women. The gap in ADL disability for widowed white men, widowed white women and divorced white women in comparison to their married white counterparts narrowed from 1997 to 2010. These changes occurred largely through a decrease in the reported disability among these unmarried groups along with a relatively stable trend among their married white counterparts throughout the study period. However, for black men and black women, the ADL disability gaps between the married and each unmarried group persisted during the study period. The caveat here is that we have relatively small sample sizes for black men and black women in some marital status groups, and the results for black men and black women should be interpreted with caution.

As for IADL disability trends, we find that the most significant changes in marital status differences in disability occurred among white men and black women. For white men, the IADL gap between the married and widowed narrowed from 1997 to 2010 whereas the gap between the married and never married increased. This was largely due to a decrease in the reported IADL disability among widowed white men and an increase in the reported IADL disability among never married white men along with a stable trend among married white men. For black women, the gap between the married and widowed narrowed significantly due to a declining proportion of the widowed reporting IADL disability. For white women and black men, the IADL gap between the married and each unmarried group remained unchanged throughout the study period.

Although it is beyond the scope of this study (and also the current data) to empirically examine all the potential reasons behind changing disparities in disability by marital status, we did examine one potential factor: the changing socioeconomic conditions (measured by education and poverty status) among different marital status groups. However, they did not explain the changing relationship between marital status and disability over time. This finding is consistent with prior studies that showed changing economic resources did not explain the changing relationship between marital status and self-rated health (Liu and Umberson 2008).

What are other factors that may explain the trends? One of the potential explanations for the decreasing disability gap for the widowed (especially for white men, white women and black women) in comparison to their married counterparts is the tendency toward increasing mortality selection among the widowed. Recent research shows that the mortality gap between the married and widowed has widened over the past few decades (Liu 2009). It is possible that disabled widowed had an increasing rate of mortality in recent years and thus the surviving widowed

population was more robust compared to the married whose mortality rates have decreased (Liu 2009). Moreover, the observed narrowing ADL gap between married and divorced white women may reflect a decline in the disability selection effect on divorce and remarriage. It may be that men are less likely to divorce their disabled wives and/or more open to marrying them later in life now than before. Finally, the finding of an increasing IADL disability gap between never married and married white men is consistent with the hypothesis of increasing importance of marriage as a source of social support and care giving in the context of increasing geographic mobility (McPherson et al. 2006; also see Fischer 2009). To better explain these trends, future studies should examine other potentially important factors such as changing household wealth, health behaviors, access to quality health services, and number of children living nearby, which may contribute to the disability trends by marital status.

This study has several limitations. First, although ADL and IADL disabilities are strongly associated with mortality, it is not a pure measure of health. It reflects the gap between an individual's underlying health status and the environmental demands (Schoeni et al. 2005). Although we find that disability trends have changed between the married and some unmarried groups among white men, white women, and black women, we do not know how much of the change is due to changes in the underlying health between the married and unmarried groups and how much is due to the changes in environmental demands or accommodations made by people in different marital status groups. Second, previous research has shown that marital sequences, duration, and timing may affect health in later life (Barrett 2000; Hughes and Waite 2009). Due to data limitation, we could not assess such potential effects of marital history on disabilities and how these effects may have changed over time. Future research should explore these important questions using other datasets. Third, our sample is limited to noninstitutionalized population and excludes older adults who have limitations too severe to stay at home. Those people who stay at hospitals or nursing homes are more likely to be unmarried because research shows that the unmarried are more likely to suffer severe disabilities than the married (Hughes and Waite 2009). In this sense, our estimate of marital status differences in disability should be conservative. Finally, it is difficult to sort out causal links using cross-sectional data. We cannot rule out the possibility that some of the disability trends we documented are due to changing selection processes of marriage and marital dissolutions. Our results call for future research to investigate the causes and consequences of changing disability trends by marital status. It is also important to examine whether the disability trends by marital status among whites and blacks are also visible in other racial/ethnic groups (e.g., Hispanic and Asian Americans).

## Conclusion and Policy Implications

Despite the limitations, our study makes an important contribution to the field. We find that the decline in disability in recent decades is not experienced by all marital status groups. Generally speaking, the disability gaps between the married and each unmarried group remain significant for all gender and racial subgroups examined in



the study although for a few selected groups such as widowed white men, widowed white women, widowed black women, and divorced white women, the disability gaps have narrowed. In contrast, the probability of reporting IADL disability has increased for never married white men in comparison to married white men from 1997 to 2010. This is a disturbing trend.

Our results have important policy implications given the significant changes in the family structure of older adults over the past few decades. Recent research on baby boomers show that they are more likely than their parent generation (some are examined in our study) to be unmarried in later life (Lin and Brown 2012). The unmarried are at significant disadvantages compared to their married counterparts in socioeconomic resources, health, and social integration (Lin and Brown 2012). In addition, the significantly higher proportion of unmarried population among blacks along with our finding of *generally* persistent disability gaps between the married and unmarried blacks suggests that in the near future the U.S. may face an increasingly large population of unmarried elderly blacks with disability who need care. The national long-term care system (e.g., nursing homes, assisted living facilities, and home health care agency) needs to get prepared for the potentially significant increase in demand for their services among the vulnerable unmarried black elderly and tries to provide affordable and adequate services to those in need. We urge policymakers, health care providers, and researchers to think creatively about ways to reduce the disability disparities between the married and unmarried groups, especially among blacks, and promote healthy aging for all older adults. As most elderly people prefer home- and community-based care, it is also important to promote the development and expansion of these services and provide support for family caregivers.

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