

Research Article

## Mortality in Postmenopausal Women by Sexual Orientation and Veteran Status

Keren Lehavot, PhD,<sup>\*.1</sup> Eileen Rillamas-Sun, PhD, MPH,<sup>2</sup> Julie Weitlauf, PhD,<sup>3,4</sup> Rachel Kimerling, PhD,<sup>5</sup> Robert B. Wallace, MD, MSc,<sup>6</sup> Anne G. Sadler, PhD, RN,<sup>7</sup> Nancy Fugate Woods, PhD, RN, FAAN,<sup>8</sup> Jillian C. Shipherd, PhD,<sup>9,10</sup> Kristin Mattocks, PhD, MPH,<sup>11,12</sup> Dominic J. Cirillo, MD, PhD,<sup>13</sup> Marcia L. Stefanick, PhD, FAHA,<sup>14</sup> and Tracy L. Simpson, PhD<sup>15</sup>

<sup>1</sup>Health Services Research & Development, VA Puget Sound Health Care System and Department of Psychiatry and Behavioral Sciences, University of Washington, Seattle. <sup>2</sup>Division of Public Health Sciences, Fred Hutchinson Cancer Research Center and Health Services Research & Development, VA Puget Sound Health Care System, Seattle, Washington. <sup>3</sup>Sierra Pacific Mental Illness, Research, Education and Clinical Center and Center for Innovation to Implementation, VA Palo Alto Health Care System, California. <sup>4</sup>Department of Psychiatry & Behavioral Sciences and Stanford Cancer Institute, California. <sup>5</sup>VA Palo Alto Health Care System, Menlo Park, California. <sup>6</sup>University of Iowa College of Public Health, Iowa City. <sup>7</sup>Iowa City VA Medical Center. <sup>8</sup>University of Washington School of Nursing, Seattle. <sup>9</sup>VA Boston Healthcare System, National Center for PTSD Women's Health Sciences, Boston University School of Medicine, Massachusetts. <sup>10</sup>LGBT Program Patient Care Services, Washington DC. <sup>11</sup>VA Central Western Massachusetts, Leeds. <sup>12</sup>University of Massachusetts Medical School, Worcester. <sup>13</sup>Department of Public Health Sciences, University of Rochester School of Medicine and Dentistry, the University of Iowa Department of Epidemiology, New York. <sup>14</sup>Stanford Prevention Research Center, Stanford University School of Medicine, California. <sup>15</sup>Center of Excellence in Substance Abuse Treatment and Education, VA Puget Sound Health Care System and Department of Psychiatry and Behavioral Sciences, University of Washington, Seattle.

\*Address correspondence to Keren Lehavot, PhD, VA Puget Sound Health Care System, 1600 South Columbian Way, Seattle WA 98108. E-mail: [keren.lehavot@va.gov](mailto:keren.lehavot@va.gov)

Received April 21 2015; Accepted July 27 2015.

**Decision Editor:** Gayle E. Reiber, PhD, MPH

### Abstract

**Purpose of the Study:** To examine differences in all-cause and cause-specific mortality by sexual orientation and Veteran status among older women.

**Design and Methods:** Data were from the Women's Health Initiative, with demographic characteristics, psychosocial factors, and health behaviors assessed at baseline (1993–1998) and mortality status from all available data sources through 2014. Women with baseline information on lifetime sexual behavior and Veteran status were included in the analyses ( $N = 137,639$ ; 1.4% sexual minority, 2.5% Veteran). The four comparison groups included sexual minority Veterans, sexual minority non-Veterans, heterosexual Veterans, and heterosexual non-Veterans. Cox proportional hazard models were used to estimate mortality risk adjusted for demographic, psychosocial, and health variables.

**Results:** Sexual minority women had greater all-cause mortality risk than heterosexual women regardless of Veteran status (hazard ratio [HR] = 1.20, 95% confidence interval [CI]: 1.07–1.36) and women Veterans had greater all-cause mortality risk than non-Veterans regardless of sexual orientation (HR = 1.14, 95% CI: 1.06–1.22), but the interaction between sexual orientation and Veteran status was not significant. Sexual minority women were also at greater risk than heterosexual

women for cancer-specific mortality, with effects stronger among Veterans compared to non-Veterans (sexual minority  $\times$  Veteran HR = 1.70, 95% CI: 1.01–2.85).

**Implications:** Postmenopausal sexual minority women in the United States, regardless of Veteran status, may be at higher risk for earlier death compared to heterosexuals. Sexual minority women Veterans may have higher risk of cancer-specific mortality compared to their heterosexual counterparts. Examining social determinants of longevity may be an important step to understanding and reducing these disparities.

**Key Words:** All-cause mortality, Women Veterans, Sexual minority

Sexual minority women, including lesbians, bisexual women, and other groups of women who have sex with women, have been identified as an at-risk population for experiencing health disparities (Institute of Medicine, 2011). Health disparities refer to adverse health outcomes for communities of individuals who have, as a result of “social, economic, and environmental disadvantage, systematically experienced greater obstacles to health” (U.S. Department of Health and Human Services, 2010). For example, sexual minority women are at higher risk for poor mental health (Blosnich, Foynes, & Shipherd, 2013b; Cochran, 2001; Diamant & Wold, 2003; Dilley, Simmons, Boysun, Pizacani, & Stark, 2010; King et al., 2008), including psychological distress (Cochran, Sullivan, & Mays, 2003; Conron, Mimiaga, & Landers, 2010) and suicidal ideation (Conron et al., 2010; King et al., 2008) compared to heterosexuals. The experience of minority stress, or stress uniquely associated with being a sexual minority such as discrimination and internalized homophobia, is thought to be associated with sexual minority women’s poorer health (Meyer, 2003; Lehavot & Simoni, 2011).

The experiences of older sexual minority women have received less empirical attention, although some research suggests that they are at increased risk of engaging in various health risk behaviors and may be more vulnerable to a host of physical and mental health conditions than heterosexual women. In a study of postmenopausal women aged 50–79 from the Women’s Health Initiative (WHI), sexual minority women were found to use alcohol and cigarettes more often than heterosexual women (Valanis et al., 2000), and these findings were echoed in later comparisons of sexual minority and heterosexual women over 50 (Fredriksen-Goldsen, Hyun-Jun, Barkan, Muraco, & Hoy-Ellis, 2013). Additionally, older sexual minority women were found to report having less social support and poorer mental health (Valanis et al., 2000) as well as greater likelihood of having a disability and chronic health conditions than older heterosexual women (Fredriksen-Goldsen, Hyun-Jun, & Barkan, 2012; Wallace, Cochran, Durazo, & Ford, 2011).

Greater engagement in unhealthy behaviors and heightened risk of mental and physical health conditions among sexual minority women is cause for concern as these factors are associated with increased mortality risk (Baker et al., 2009; LaCroix et al., 1991; Pan et al., 2011; Schultz et al., 2000). Very limited research to date has examined

mortality risk among sexual minority populations, and those that have done so have produced variable results. For example, while two U.S. studies found no difference in all-cause mortality when comparing sexual minority and heterosexual women (Cochran & Mays, 2012, 2015), one of these studies found that sexual minority women were at increased risk for mortality from both breast cancer and suicide (Cochran & Mays, 2012) and the other study found elevated risk from suicide (Cochran & Mays, 2015). Because sexual orientation is not frequently included in mortality data sources, a few ecological studies have examined population level indicators, such as the density of the sexual minority population, and found associations that suggest increase risks for breast cancer mortality (Boehmer, Ozonoff, & Miamo, 2013), but not for lung or colorectal cancer mortality (Boehmer, Ozonoff, & Miamo, 2011, 2012).

Sexual minority women who served in the military comprise an important subgroup to consider when examining health disparities. A population-based study found that compared to sexual minority women non-Veterans, sexual minority women Veterans had three times the odds of poor physical health (Blosnich et al., 2013b). Additionally, a recent literature review indicated that sexual minority women Veterans were more likely to report experiences of victimization, physical and sexual assaults, depression, and poorer physical health than heterosexual women Veterans (Lehavot & Simpson, 2013). These findings, along with recent nationally representative data that indicated 25% of sexual minority women served in the military compared to 6% of heterosexual women (Blosnich, Bossarte, Silver, & Silenzio, 2013a), underscore the importance of examining the health needs of sexual minority Veterans. No research to date, however, has examined the health and well-being of older sexual minority women Veterans specifically. Among older women in general, a recent study found that Veterans had significantly elevated risk of all-cause mortality compared to non-Veterans (Weitlauf et al., unpublished). Because sexual minority women Veterans belong to at least two minority groups (minority sexual orientation and Veteran status), it is possible that they experience even worse health than sexual minority non-Veterans or heterosexual Veterans. Indeed, they may be especially vulnerable to earlier death given the multiple health risks conferred by minority sexual orientation and mortality risk conferred by Veteran status.

## Conceptual Framework

Our analysis is based on Minority Stress Theory (Meyer, 2003) and an adaptation of the Biopsychosocial Model of Health and Aging (Seeman & Crimmins, 2001). Minority Stress Theory hypothesizes that sexual minorities have poorer health than heterosexuals, likely due to increased exposures to a variety of stressors as a result of their minority status. The biopsychosocial model further suggests that women's long-term health may also be impacted by other characteristics, such as Veteran status. Given that sexual minority Veterans hold a unique, double-minority position, we hypothesize they may be at even greater risk than sexual minority non-Veterans and heterosexual Veterans for poorer outcomes, such as mortality.

The biopsychosocial model, which is illustrated and further expanded in Editorial 1 (Reiber & LaCroix, 2016), also stipulates that psychosocial stressors and health behavior practices, in addition to one's personal characteristics, contribute to long-term health. Given that literature in the general population has identified differences in sexual orientation in the areas of psychosocial factors (e.g., trauma exposures, social support, mental health) as well as health behaviors (e.g., alcohol use, smoking, obesity, chronic conditions), we account for these variables when examining differences in mortality across sexual orientation and Veteran groups (Institute of Medicine, 2011).

The current study examined the risk of all-cause and cause-specific mortality of sexual minority women Veterans compared to sexual minority non-Veterans, heterosexual Veterans, and heterosexual non-Veterans using data from the WHI. The WHI provided a unique opportunity to investigate differences in mortality risk across both sexual orientation and Veteran status, while accounting for demographic, psychosocial, and health risk factors. We examined all-cause mortality and mortality due to cancer, accidents/injuries, and suicide given prior research suggesting that sexual minorities may be at higher risk for these events. We also examined mortality due to cardiovascular disease (CVD) because it is the leading cause of death in women (CDC, 2010). Finally, we evaluated correlates of all-cause mortality, including demographic variables, psychosocial factors, and health behaviors, across these four groups of women.

## Design and Methods

### Study Design

The WHI consisted of an observational study (OS) and clinical trials (CT) of hormone therapy, dietary modification, and/or calcium and vitamin D supplementation. The study design and implementation for the WHI has been described in detail elsewhere (Anderson et al., 2003; Langer et al., 2003; Women's Health Initiative Study Group, 1998). Briefly, women were recruited from 1993 to 1998 by 40 clinical centers in the United States and were eligible to be a participant if they were 50–79 years old, postmenopausal, planned to remain in the area where they lived at recruitment, and had

an estimated survival of at least 3 years. A total of 161,808 women were enrolled. At the baseline assessment, participants completed standardized questionnaires about demographic, health behavior, and psychosocial characteristics. WHI follow-up occurred through clinic visits and/or mailings until study close-out in 2005. After 2005, follow-up occurred via the WHI Extension Studies. For this analysis, mortality outcomes were evaluated through 2014. Thus, these data comprise up to 21 years of follow-up. Institutional review boards at all participating clinical centers reviewed and approved study procedures. All participants provided written informed consent at baseline and at enrollment in the Extension Studies.

This analysis drew a sample of 145,521 women from either the OS or CTs who had baseline data about Veteran status. We further excluded 7,882 women whose sexual orientation could not be classified, resulting in a final study sample of 137,639 women.

### Measures

All data to characterize the exposure and covariate measures for this analysis were from the baseline assessment.

### Sexual Orientation

Sexual orientation was assessed with the question: "Regardless of whether you are currently sexually active, which response best describes who you have had sex with over your adult lifetime?" Women who responded that they have had sex with women or with both men and women were characterized as sexual minorities, while women who responded that they have only had sex with men were characterized as heterosexual. Women who reported never having had sex ( $n = 2,110$ ), who preferred not to answer ( $n = 4,333$ ), or whose data were missing ( $n = 1,439$ ) were excluded. This approach is consistent with how other studies have classified sexual orientation in the WHI (Valanis et al., 2000).

### Veteran Status

Veteran status was consistent with having responded affirmatively to the question, "Have you served in the U.S. armed forces on active duty for a period of 180 days or more?"

Using the sexual orientation and Veteran status items, women were classified into one of four groups: sexual minority Veteran, sexual minority non-Veteran, heterosexual Veteran, and heterosexual non-Veteran.

### Mortality

All deaths that occurred from baseline through 2010 were adjudicated by trained physicians using hospital or medical records, coronary or autopsy reports, death certificates, or National Death Index reports. After 2010, a subset of participants continued to have their deaths reported through adjudication; however, most participants' deaths were identified via direct notification from the decedent's family, friends, or personal physician. The National Death Index (plus) was checked periodically for all participants,

including those lost to follow-up or those who did not consent to participate in the Extention studies. The last National Death Index search for the WHI occurred in 2013, which captured deaths through 2011. All-cause mortality was defined as deaths due to any cause. Cause-specific mortality included deaths due to all cancers as well as breast, lung, and colorectal cancers; CVD (defined as definite or probable coronary heart disease, cerebrovascular, pulmonary embolism, and other/unknown cardiovascular), accidents and injuries, and suicides.

### Demographic Variables

Demographic variables at baseline included age, race/ethnicity, marital status, living alone, family income, highest educational level completed, and occupation. Age was calculated with date of birth and date of baseline visit information. All other demographic variables were self-reported.

### Psychosocial Factors

Social support was measured using the Medical Outcomes Study Social Support Survey, a 9-item scale that measures the functional components of social support, with higher scores indicating greater support (Hays, Sherbourne, & Mazel, 1993). Social strain (negative social support) was derived from four items that were part of a scale measuring negative aspects of social relations, with higher score indicating greater social strain (Antonucci, Kahn, & Akiyama, 1989; Vinokur & van Ryn, 1993).

Abuse items were adapted from previous epidemiological research (Matthews et al., 1997). The physical abuse question read: "Over the past year, were you physically abused by being hit, slapped, pushed, shoved, punched, or threatened with a weapon by a family member or close friend?" The verbal abuse question read: "Over the past year, were you verbally abused by being made fun of, severely criticized, told you were a stupid or worthless person, or threatened with harm to yourself, your possessions, or your pets, by a family member or close friend?" Finally, other trauma exposure was assessed by asking participants: "Over the past year, did you have any major accidents, disasters, mugging, unwanted sexual experiences, robberies, or similar events?" (Ruberman, Weinblatt, Goldberg, & Chaudhary, 1984). Participants were categorized dichotomously (yes/no) for each of these three items (i.e., physical abuse, verbal abuse, and other trauma exposure).

Depression was measured with the short Center for Epidemiological Studies–Depression Scale, a 9-item scale widely used to screen for depression (Burnam, Wells, Leake, & Landsverk, 1988). Normative values and clinical cutoffs are available in the literature. An algorithm score greater than 0.06 was used as an indicator of depression (Burnam et al., 1988).

### Health Behaviors

Alcohol use was based on responses to questions about drinking behavior history and current weekly intake of

alcoholic beverages. Non- and past drinkers were defined as women who reported not consuming more than 12 drinks in their lifetime or not currently drinking. Smoking status was determined based on self-reported never, past, or current use of cigarettes. Height and weight were measured by study staff at the baseline health examination visit using a calibrated stadiometer and standard scale and without outdoor clothing. Body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters. Obesity was characterized as a BMI greater than or equal to 30.0 kg/m<sup>2</sup>, as defined in the *Surgeon General's Report on Nutrition and Health* (U.S. Department of Health and Human Services, 1988).

Activity of daily living (ADL) disability was recoded to indicate whether the participant required help with eating, dressing, transferring, and/or bathing (Lawton & Brody, 1969). History of asthma, arthritis, CVD, and cancer was determined based on a participant's self-report that a physician ever told her that she had the disease.

### Statistical Analysis

The distributions of the demographic, psychosocial factors, health behaviors, total deaths, and cause-specific deaths were compared across the four groups of women. The distribution of deaths from all causes was calculated as a proportion of the total sample within each of the four groups. However, for cause-specific deaths, the denominators were the total number of deaths in each group and thus percents represented the proportion of deaths from each cause among all possible deaths. Frequencies were calculated for categorical variables and post hoc pairwise comparisons were evaluated using the Chi-square test with Bonferroni adjustment. Means and standard deviations (*SD*) were reported for continuous variables and post hoc pairwise comparisons were completed using the Tukey–Kramer test.

To estimate the mortality risks associated with sexual orientation and Veteran status, we used Cox-Proportional Hazards models for three outcomes: deaths from all-cause, deaths from any cancer, and deaths due to CVD. Cancer- and CVD-specific mortality risks were examined because they were the most prevalent causes of death. In the models, sexual orientation and Veteran status were binary variables in which sexual minority orientation and being a Veteran were compared to heterosexual and non-Veteran status, respectively. Thus, the models generated hazard ratios (HR) and 95% confidence intervals (CIs) that described the risk of death associated with being a sexual minority or being a Veteran. Models also included an interaction term to evaluate whether the risk of death associated with sexual orientation varied by Veteran status. Four successive models were executed: crude, age adjusted, partially adjusted, and fully adjusted. The partially adjusted included study assignment (i.e., participation in the OS or randomization to hormone therapy



and/or dietary modification in the CTs), baseline age, and demographic characteristics. The fully adjusted model included all covariates in the partially adjusted model and variables about psychosocial factors, health behaviors, and health status. Both partially and fully adjusted models were conducted in order to examine changes to HRs once psychosocial and health factors known to be associated with mortality were included. Model assumptions were evaluated using graphical approaches, including Kaplan Meier curves for all-cause mortality and cumulative incidence curves for cancer- and CVD-specific mortality, with no observable violations in the assumptions. Event times were characterized from time of enrollment to death, with censoring at the time of last follow-up or the time of a non cancer-related/CVD-related death.

Lastly, we examined the association of baseline demographic, psychosocial, and health characteristics on all-cause mortality for each of the four groups of women. Four separate Cox-Proportional Hazards models were generated to calculate the HR and 95% CIs. The results of these four models enabled us to observe whether specific factors impacted mortality differently across the four groups. All analyses were completed using SAS v9.3 software (SAS Institute, Cary, NC). Statistical significance was based on a  $p < .05$ .

## Results

### Group Characteristics

The proportion of Veterans who were classified as sexual minority was 3.9% and the proportion of non-Veterans who were classified as sexual minority was 1.3%. The proportion of Veterans among sexual minority women and heterosexual women was 7.1% and 2.4%, respectively. [Table 1](#) displays the distributions of the demographic characteristics, psychosocial factors, health behaviors, and mortality by sexual orientation and Veteran status.

Demographic differences were observed between the groups. With a mean (*SD*) age of 60 (7) years, sexual minority non-Veterans represented the youngest group, while heterosexual Veterans were the oldest group (mean [*SD*] age = 67 [8] years). Only 24% of sexual minority Veterans were married or living as married compared to the other groups (41–64%). Heterosexual non-Veterans were the least likely to report living alone (24% vs. 33–37%). Sexual minority non-Veterans were most likely to have higher family incomes and to have a college education or higher. Regardless of Veteran status, sexual minority women were more likely to have had an occupation in a professional/managerial role compared to the heterosexual women (61% vs. 41%).

There were no significant differences on psychosocial variables between sexual minority Veterans and the other groups, likely due to low power. Sexual minority non-Veterans reported higher social strain compared to

heterosexual Veterans and non-Veterans. Overall, few women in the WHI reported experiencing physical abuse at baseline; however, sexual minority non-Veterans reported a higher percent (2%) relative to heterosexual Veterans and non-Veterans (both 1%). Similarly, verbal abuse and depression was reported more frequently among sexual minority non-Veterans than among heterosexual Veterans and non-Veterans. Heterosexual Veterans reported lower mean social support scores than heterosexual non-Veterans (34.8 vs. 36.1), but they also reported slightly lower levels of social strain (6.4 vs. 6.5) and lower rates of depression (9% vs. 11%).

With respect to health behaviors, both sexual minority Veterans and non-Veterans were more likely than the heterosexual groups to have a history of smoking (75% and 68% vs. 55% and 49%, respectively), and sexual minority Veterans were more likely than sexual minority non-Veterans to have had arthritis (59% vs. 45%). Sexual minority non-Veterans were more likely than heterosexual Veterans and non-Veterans to report currently drinking at least 7 drinks per week (17% vs. 13% and 12%), be obese (33% vs. 28% and 30%), and have asthma (11% vs. 8% and 8%). Compared to heterosexual non-Veterans, heterosexual Veterans were more likely to have had arthritis (54% vs. 47%), CVD (22% vs. 18%), and cancer (13% vs. 10%).

As shown in [Table 1](#), over 30% of the sexual minority and heterosexual Veterans died over study follow-up compared to approximately 19% deaths among sexual minority and heterosexual non-Veterans. Among Veterans, 48% of the deaths in sexual minority women were due to cancer compared to 26% of the deaths in heterosexuals. Similarly, among non-Veterans, cancer deaths represented a higher proportion of total deaths in sexual minority women compared to heterosexual women (38% vs. 33%). The higher frequency of cancer deaths observed in sexual minority Veterans was largely driven by deaths from breast cancer, which represented 10% of all cancer deaths in these women and was significantly greater than the percentage for heterosexual Veterans (3%). The proportion of deaths due to CVD was statistically significant across the four groups of women, with the highest frequency observed in heterosexual Veterans (32%). No statistically significant differences were observed in deaths due to accidents/injuries or suicide across the four groups, although there was a marginally significant difference for accidents/injuries with heterosexual Veterans having a higher frequency relative to non-Veteran women (4% vs. 3%;  $p = .06$  for pairwise comparison).

### All-Cause and Cause-Specific Mortality Models

#### All-Cause Mortality

As shown in [Table 2](#), the age adjusted all-cause mortality risk among sexual minority women was elevated relative to heterosexual women (HR = 1.37, 95% CI: 1.22–1.52),

**Table 1. Descriptive Characteristics by Sexual Orientation and Veteran Status (N = 137,639)**

Characteristic	Sexual minority Veterans	Sexual minority non-Veterans	Heterosexual Veterans	Heterosexual non-Veterans	p value
N (%) of women	133 (0.1)	1,751 (1.3)	3,300 (2.4)	132,455 (96.2)	
<b>Demographics</b>					
Age, mean (SD), years <sup>a,f</sup>	64.3 (8.0)	59.7 (6.9)	67.1 (7.9)	63.2 (7.1)	<.001
Age group, n (%) <sup>b,f</sup>					<.001
<50–59 years	40 (30.1)	966 (55.2)	689 (20.9)	43,529 (32.9)	
60–69 years	48 (36.1)	586 (33.5)	953 (28.9)	60,650 (45.8)	
70–79+ years	45 (33.8)	199 (11.4)	1,658 (50.2)	28,276 (21.4)	
<b>Race/ethnicity, n (%)<sup>d,f</sup></b>					
Non-Hispanic White	115 (89.2)	1,470 (85.1)	2,896 (89.2)	110,338 (84.4)	<.001
African American	10 (7.8)	156 (9.0)	225 (6.9)	11,649 (8.9)	
Hispanic/Latina	2 (1.6)	72 (4.2)	74 (2.3)	4,752 (3.6)	
Asian/Pacific Islander	0 (0.0)	24 (1.4)	35 (1.1)	3,386 (2.6)	
American Indian/Alaskan Native	2 (1.6)	6 (0.4)	18 (0.6)	541 (0.4)	
<b>Marital status, n (%)<sup>b,f</sup></b>					
Married or living as married	32 (24.1)	712 (40.9)	1,723 (52.4)	84,852 (64.3)	<.001
Divorced/separated	39 (29.3)	529 (30.4)	616 (18.7)	21,340 (16.2)	
Widowed	10 (7.5)	155 (8.9)	788 (23.9)	22,818 (17.3)	
Never married	52 (39.1)	344 (19.8)	164 (5.0)	3,030 (2.3)	
Living alone, n (%) <sup>c,f</sup>	49 (37.4)	579 (33.4)	1,135 (34.7)	32,174 (24.4)	<.001
<b>Family income, n (%)<sup>d,f</sup></b>					
<\$20,000	22 (16.5)	257 (15.3)	544 (17.4)	19,339 (15.6)	<.001
\$20,000–\$49,999	61 (45.9)	683 (40.5)	1,539 (49.2)	55,115 (44.4)	
≥\$50,000	50 (37.6)	745 (44.2)	1,047 (33.5)	49,810 (40.1)	
<b>Highest education level, n (%)<sup>b–f</sup></b>					
High school/GED or less	5 (3.8)	194 (11.1)	392 (11.9)	28,984 (22.0)	<.001
Some college	47 (35.3)	414 (23.8)	1,390 (42.3)	50,561 (38.4)	
College graduate or higher	81 (60.9)	1,133 (65.1)	1,505 (45.8)	52,072 (39.6)	
<b>Main occupation, n (%)<sup>b–f</sup></b>					
Professional/managerial	85 (63.9)	1,059 (60.5)	1,597 (48.4)	54,465 (41.1)	<.001
Technical/sales/administrative	20 (15.0)	311 (17.8)	864 (26.2)	39,376 (29.7)	
Service/labor	17 (12.8)	287 (16.4)	481 (14.6)	22,722 (17.2)	
Homemaker only	5 (3.8)	68 (3.9)	292 (8.9)	13,363 (10.1)	
Unknown	6 (4.5)	26 (1.5)	66 (2.0)	2,529 (1.9)	
<b>Psychosocial factors</b>					
Social support score, M (SD) <sup>d,f</sup>	35.4 (8.5)	36.1 (7.7)	34.8 (8.2)	36.1 (7.7)	<.001
Social strain score, M (SD) <sup>d–f</sup>	6.64 (2.69)	6.81 (2.54)	6.41 (2.52)	6.53 (2.52)	<.001
Experienced physical abuse, n (%) <sup>d,e</sup>	1 (0.8)	37 (2.1)	35 (1.1)	1,568 (1.2)	.004

Table 1. Continued

Characteristic	Sexual minority Veterans	Sexual minority non-Veterans	Heterosexual Veterans	Heterosexual non-Veterans	p value
Experienced verbal abuse, <i>n</i> (%) <sup>d,e</sup>	13 (9.9)	257 (14.8)	322 (9.8)	14,674 (11.1)	<.001
Had other trauma exposure, <i>n</i> (%) <sup>e</sup>	9 (6.8)	171 (9.8)	264 (8.0)	9,094 (6.9)	<.001
Has depression, <i>n</i> (%) <sup>d,f</sup>	19 (14.3)	272 (15.5)	305 (9.2)	14,172 (10.7)	<.001
Health behaviors/status					
Alcohol intake, <i>n</i> (%) <sup>d,e</sup>					<.001
None or past drinker	36 (27.1)	446 (25.5)	881 (26.9)	37,977 (28.8)	
<1 drink/week	41 (30.8)	489 (28.0)	1,093 (33.3)	43,500 (33.0)	
1-7 drinks per week	36 (27.1)	513 (29.4)	885 (27.0)	34,369 (26.1)	
≥7 drinks per week	20 (15.0)	298 (17.1)	419 (12.8)	15,821 (12.0)	
Smoking status, <i>n</i> (%) <sup>b,f</sup>					<.001
Never	33 (25.4)	558 (32.2)	1,454 (45.0)	66,315 (50.7)	
Past smoker	78 (60.0)	959 (55.3)	1,498 (46.3)	55,683 (42.5)	
Current	19 (14.6)	218 (12.6)	281 (8.7)	8,926 (6.8)	
Body mass index, M (SD), kg/m <sup>b,d,e</sup>	28.8 (6.5)	28.6 (6.6)	27.8 (5.9)	27.9 (5.9)	<.001
Obese, <i>n</i> (%) <sup>d,e</sup>	43 (32.8)	566 (32.7)	929 (28.4)	38,898 (29.6)	.012
Activity of daily living disability, <i>n</i> (%)	1 (0.8)	9 (0.5)	25 (0.8)	715 (0.5)	.39
Ever had asthma, <i>n</i> (%) <sup>d,e</sup>	14 (10.6)	182 (10.6)	271 (8.3)	10,300 (7.9)	<.001
Ever had arthritis, <i>n</i> (%) <sup>a,d,f</sup>	78 (58.7)	784 (45.1)	1,757 (53.7)	62,290 (47.3)	<.001
Ever had cardiovascular disease, <i>n</i> (%) <sup>d,f</sup>	21 (15.9)	307 (17.7)	721 (22.2)	23,195 (17.7)	<.001
Ever had cancer, <i>n</i> (%) <sup>d,f</sup>	18 (13.5)	176 (10.1)	420 (12.8)	12,617 (9.6)	<.001
Deaths					
Deaths (from all causes), <i>n</i> (%) <sup>a,c,d,f</sup>	42 (31.6)	326 (18.6)	1,067 (32.3)	26,129 (19.7)	<.001
Cause-specific deaths, <i>n</i> (%) (denominator = all deaths)					
Cancer (all) <sup>b,d,f</sup>	20 (47.6)	125 (38.3)	274 (25.7)	8,512 (32.6)	<.001
Breast cancer <sup>b</sup>	4 (9.5)	10 (3.1)	28 (2.6)	1,015 (3.9)	.04
Lung cancer	5 (11.9)	28 (8.6)	72 (6.8)	1,957 (7.5)	.46
Colorectal cancer	1 (2.4)	6 (1.8)	21 (2.0)	685 (2.6)	.48
Cardiovascular disease	7 (16.7)	86 (26.4)	340 (31.9)	7,614 (29.1)	.04
Accidents/injuries	1 (2.4)	10 (3.1)	41 (3.8)	669 (2.6)	0.08
Suicide	0 (0.0)	2 (0.6)	2 (0.2)	59 (0.2)	.51

Notes: Post hoc pairwise comparisons completed using Tukey-Kramer test for continuous variables and Chi-square test with Bonferroni adjustment for categorical variables. GED = General Educational Development. *p* < 0.05 was regarded as statistically significant.

<sup>a</sup>Sexual minority Veterans versus sexual minority non-Veterans; <sup>b</sup>sexual minority Veterans versus heterosexual Veterans; <sup>c</sup>sexual minority Veterans versus heterosexual non-Veterans; <sup>d</sup>sexual minority non-Veterans versus heterosexual Veterans; <sup>e</sup>sexual minority non-Veterans versus heterosexual Veterans; <sup>f</sup>heterosexual Veterans versus heterosexual non-Veterans.

and this association remained significant even after adjusting for demographic, psychosocial and health factors (HR = 1.20, 95% CI: 1.07–1.36). The age adjusted risk of all-cause mortality was also higher among Veterans relative to non-Veterans (HR = 1.14, 95% CI: 1.07–1.22), and this association persisted after adjusting for demographic, psychosocial and health factors (HR = 1.14, 95% CI: 1.06–1.22). The interaction between sexual orientation and Veteran status revealed no statistically significant findings.

**Cancer-Specific Mortality**

A higher age adjusted cancer-specific mortality risk was observed in sexual minority women relative to heterosexual women (HR = 1.37, 95% CI: 1.15–1.64), with the HR attenuating but remaining significant in the fully adjusted model, which accounted for demographic, psychosocial, and health factors (HR = 1.25, 95% CI: 1.03–1.51). No statistically significant differences in the risk for cancer-specific mortality were seen between Veteran and non-Veteran women. The interaction term for sexual orientation by Veteran status was significant in the fully adjusted model (HR = 1.70, 95% CI: 1.01–2.85), suggesting that the risk of death from cancer varied by Veteran status and sexual orientation. Further exploration from stratified models showed that higher risks were influenced largely by sexual orientation (Table 3). Specifically, among Veterans, sexual minority women had a 2.09 (95% CI: 1.26–3.47)

risk of cancer death relative to heterosexual women, while for non-Veterans, the risk for sexual minority compared to heterosexual women was 1.25 (95% CI: 1.03–1.51). Comparisons between Veterans and non-Veterans among only sexual minority women and only heterosexual women indicated no statistically significant differences in the risk of cancer deaths.

**CVD-Specific Mortality**

Sexual minority women had a higher risk of death from CVD compared to heterosexual women in the age adjusted

**Table 3.** Results from Stratified Models: Sexual Orientation by Veteran Status and Veteran Status by Sexual Orientation on Cancer Mortality

Group comparison	HR <sup>a</sup>	(95% CI)
Sexual minority relative to heterosexual among Veterans	2.09	1.26–3.47
Sexual minority relative to heterosexual among non-Veterans	1.25	1.03–1.51
Veterans relative to non-Veterans among heterosexuals	1.01	0.89–1.16
Veterans relative to non-Veterans among sexual minorities	1.61	0.96–2.73

<sup>a</sup>Fully adjusted model.

**Table 2.** Hazard Ratios for All-Cause, Cancer-Specific, and Cardiovascular-Specific Mortality by Sexual Orientation and Veteran Status

	All-cause mortality		Cancer-specific mortality		Cardiovascular-specific mortality	
	HR	95% CI	HR	95% CI	HR	95% CI
<b>Crude</b>						
Sexual minority	0.91	0.82–1.02	1.09	0.91–1.30	0.84	0.68–1.03
Veteran	1.77	1.66–1.88	1.37	1.22–1.55	1.92	1.72–2.14
Sexual minority × Veteran	1.06	0.77–1.48	1.66	1.02–2.70	0.61	0.28–1.33
<b>Age-only adjusted</b>						
Sexual minority	1.37	1.22–1.52	1.37	1.15–1.64	1.38	1.11–1.70
Veteran	1.14	1.07–1.22	1.07	0.95–1.21	1.11	1.00–1.24
Sexual minority × Veteran	0.99	0.71–1.37	1.59	0.98–2.59	0.55	0.25–1.19
<b>Partially adjusted<sup>a</sup></b>						
Sexual minority	1.32	1.18–1.48	1.34	1.12–1.62	1.30	1.04–1.63
Veteran	1.16	1.09–1.24	1.06	0.93–1.20	1.16	1.03–1.30
Sexual minority × Veteran	0.94	0.66–1.32	1.59	0.96–2.63	0.57	0.26–1.24
<b>Fully adjusted<sup>b</sup></b>						
Sexual minority	1.20	1.07–1.36	1.25	1.03–1.51	1.17	0.92–1.50
Veteran	1.14	1.06–1.22	1.01	0.89–1.16	1.16	1.03–1.31
Sexual minority × Veteran	1.03	0.73–1.47	1.70	1.01–2.85	0.65	0.30–1.43

<sup>a</sup>Adjusted for study arm, race/ethnicity, and baseline age, marital status, living alone, family income, education, and employment level.

<sup>b</sup>Adjusted for all variables in partial model, plus social support, social strain, trauma history (experienced major accident or physical or verbal abuse), depression, smoking status, alcohol intake, and prevalence of asthma, arthritis, cardiovascular disease, cancer, and obesity. The cancer-specific/CVD-specific model does not adjust for history of cancer/CVD and treats non-cancer/non-CVD deaths as censored.



model (HR = 1.38, 95% CI: 1.11–1.70), but this risk was attenuated in the partially and fully adjusted models (final HR = 1.17, 95% CI: 0.92–1.50). Veterans had a statistically significant higher risk of CVD-specific deaths relative to non-Veterans in the age adjusted model as well as after adjusting for demographic, psychosocial, and health factors (final HR = 1.16, 95% CI: 1.03–1.31). CVD-specific mortality risks did not vary by sexual orientation and Veteran status.

### Baseline Characteristics Associated with All-Cause Mortality

Hazard ratios aimed at evaluating the associations of baseline characteristics with all-cause mortality across each of the four groups are shown in Table 4. In all groups, older age was associated with an increased risk of mortality. Sexual minority Veterans with a history of trauma exposure had a 4.3-fold (95% CI: 1.38–13.47) risk of death compared to sexual minority Veterans without a history trauma exposure. For sexual minority non-Veterans, health behaviors and morbidity, such as smoking, being obese, and history of arthritis and CVD, were associated with an increased risk of mortality, with HRs ranging from 1.39 to 1.45. For heterosexual

Veterans, similar health behaviors increased risk of mortality, including smoking history, being a non-drinker, and history of CVD and cancer (HRs ranging from 1.22 to 1.58). For heterosexual non-Veterans, the group with the largest sample size and thus the most statistical power, nearly all demographic, psychosocial, and health characteristics were statistically significantly associated with all-cause mortality with the exception of race/ethnicity, occupation, and verbal abuse.

### Discussion

This is the first known study of mortality risk by sexual orientation and Veteran status. Findings suggest heightened risk of all-cause mortality among sexual minority women relative to heterosexual women and among Veterans relative to non-Veterans. However, contrary to our hypotheses, we observed no interactive effects of sexual orientation and Veteran status on all-cause mortality, suggesting that sexual minority Veterans were not at heightened risk compared to sexual minority non-Veterans. However, sexual minority women were at greater risk of death from any cancer compared to heterosexual women, and this relationship was stronger among Veterans than non-Veterans. There were no differences by sexual orientation in deaths from

**Table 4.** Hazard Ratios on the Association of Baseline Characteristics on All-Cause Mortality by Sexual Orientation and Veteran Status

Characteristic	Sexual minority Veterans <i>n</i> = 133	Sexual minority non-Veterans <i>n</i> = 1,751	Heterosexual Veterans <i>n</i> = 3,300	Heterosexual non-Veterans <i>n</i> = 132,455
<b>Demographics</b>				
Age, years	<b>1.12 (1.04–1.20)</b>	<b>1.11 (1.09–1.13)</b>	<b>1.12 (1.10–1.13)</b>	<b>1.11 (1.11–1.11)</b>
Non-white	2.40 (0.57–10.11)	1.12 (0.78–1.61)	0.82 (0.61–1.09)	0.98 (0.94–1.02)
Divorced/separated, widowed, never married	1.03 (0.34–3.10)	1.19 (0.86–1.64)	<b>1.24 (1.01–1.52)</b>	<b>1.20 (1.15–1.26)</b>
Living alone	0.64 (0.20–2.08)	1.04 (0.76–1.44)	<b>0.79 (0.65–0.97)</b>	<b>0.95 (0.91–0.99)</b>
Family income <\$50,000	1.24 (0.45–3.43)	1.11 (0.83–1.50)	<b>1.20 (1.01–1.42)</b>	<b>1.18 (1.14–1.22)</b>
Less than college graduate education	1.45 (0.47–4.49)	1.32 (0.99–1.77)	1.06 (0.91–1.24)	<b>1.10 (1.07–1.14)</b>
Occupation is not professional/managerial	0.39 (0.12–1.20)	<b>1.37 (1.03–1.83)</b>	1.01 (0.87–1.17)	0.99 (0.96–1.03)
<b>Psychosocial factors</b>				
Social support score	0.97 (0.91–1.05)	1.01 (0.99–1.02)	<b>0.99 (0.98–1.00)</b>	<b>0.99 (0.99–1.00)</b>
Social strain score	0.96 (0.80–1.16)	1.00 (0.94–1.05)	1.02 (0.99–1.05)	<b>1.01 (1.00–1.02)</b>
Experienced physical abuse	—	0.81 (0.31–2.11)	1.57 (0.72–3.40)	<b>1.17 (1.02–1.33)</b>
Experienced verbal abuse	0.47 (0.07–2.92)	1.14 (0.79–1.64)	1.05 (0.81–1.34)	0.99 (0.95–1.04)
Had other trauma exposure	<b>4.31 (1.38–13.47)</b>	1.26 (0.85–1.87)	0.98 (0.76–1.26)	<b>1.06 (1.00–1.12)</b>
Has depression	2.30 (0.71–7.53)	0.96 (0.66–1.38)	1.09 (0.85–1.39)	<b>1.12 (1.07–1.17)</b>
<b>Health behaviors/status</b>				
Ever smoker	1.14 (0.44–3.00)	<b>1.39 (1.06–1.84)</b>	<b>1.41 (1.23–1.61)</b>	<b>1.49 (1.45–1.53)</b>
Non-drinker	2.21 (0.91–5.33)	1.29 (0.98–1.70)	<b>1.22 (1.05–1.42)</b>	<b>1.25 (1.22–1.29)</b>
Obese	0.62 (0.24–1.64)	<b>1.45 (1.12–1.89)</b>	1.07 (0.92–1.25)	<b>1.21 (1.18–1.25)</b>
Ever had asthma	2.85 (0.75–10.75)	1.16 (0.79–1.71)	1.14 (0.90–1.44)	<b>1.19 (1.14–1.25)</b>
Ever had arthritis	1.32 (0.59–3.00)	<b>1.43 (1.10–1.85)</b>	0.97 (0.85–1.12)	<b>1.04 (1.01–1.07)</b>
Ever had cardiovascular disease	0.68 (0.22–2.16)	<b>1.44 (1.09–1.90)</b>	<b>1.58 (1.37–1.82)</b>	<b>1.45 (1.41–1.50)</b>
Ever had cancer	2.28 (0.80–6.44)	1.26 (0.89–1.80)	<b>1.44 (1.21–1.72)</b>	<b>1.40 (1.35–1.46)</b>

Notes: Model adjusted for study arm and all other variables listed. Values rounded to two decimals. All values in bold statistically significant at  $p < .05$ .

CVD, although Veteran women were more likely than non-Veterans to die from CVD.

Compared with heterosexual women, sexual minority women had relatively higher incomes, educational level, and professional occupation, factors that are typically protective for premature death, yet we found that sexual minority women were still at higher risk for all-cause mortality even in the fully adjusted model. This finding diverges from results of two other studies that used nationally representative data from the National Health Interview Survey (Cochran & Mays, 2012) and the General Social Surveys (Cochran & Mays, 2015), both of which detected no differences in all-cause mortality risk by sexual orientation. Neither of these studies, however, focused on middle-aged and older women and both had substantially smaller numbers of sexual minority women ( $N = 693$  and  $N = 853$ , respectively) than the present study. Given the breadth of data available in the WHI, the current study was also able to adjust for a wider range of behavioral and health variables in addition to demographic variables. The differences between the Cochran and Mays study samples and available data and the present WHI study may be responsible for the varied pattern of results, and future research will be necessary to determine the relative risk of earlier mortality for sexual minority women compared with heterosexual women.

We did not find sexual minority Veterans to be at greater risk for all-cause mortality than their sexual minority non-Veteran counterparts, but this finding should be interpreted cautiously in light of the relatively small number of sexual minority Veterans in our sample ( $n = 133$ ). Results showed, however, that sexual minority women's higher risk of all-cancer mortality compared to heterosexual women was stronger among Veterans compared to non-Veterans. In general, sexual minority women's heightened risk for cancer parallels previous studies that have documented their higher mortality rates for specific types of cancer, such as breast cancer (Boehmer, Ozonoff, & Miamo, 2013; Cochran & Mays, 2012), although to our knowledge this is the first study that specifically examined all-cancer specific mortality for sexual minorities. The finding that cancer disparities are greater for sexual minority women Veterans (compared to heterosexual Veterans) than for sexual minority non-Veterans (compared to heterosexual non-Veterans) indicates that this might be a unique, at-risk group. It also extends results of a previous study that found that sexual minority Veterans reported elevated odds of mental distress, sleep problems, smoking, and poor physical health when compared with both sexual minority non-Veterans and heterosexual Veterans (Blosnich et al., 2013b). The present results are especially concerning given that the fully adjusted model accounted for smoking status and other health risk behaviors and conditions examined in the Blosnich et al. (2013b) study. This suggests that there may be other factors, for example stigma, poorer access to or quality of care, or nulliparity, associated with the

interaction between sexual minority and Veterans statuses that elevate these women's risk for cancer-related death.

Though a complete examination of the mechanisms underlying disparities in mortality risk is beyond our scope, the data offer some important clues. For sexual minority Veterans, past-year trauma exposure reported at baseline (e.g., major accidents, disasters, mugging, unwanted sexual experiences, robberies) was the strongest and only contributor to all-cause mortality other than age in the simultaneous logistic regression model. This suggests that this is a psychosocial factor that may be especially important to attend to for this group, though the finding should be interpreted cautiously due to the low number of sexual minority Veterans who reported trauma exposure. With the exception of sexual minority Veterans, the strongest predictors of all-cause mortality across the groups were smoking history and CVD. These results highlight the need to focus on the management of chronic disease and health behaviors in these populations. They are especially striking given that sexual minority Veterans and non-Veterans reported the highest rates of smoking. Additionally, sexual minority non-Veterans reported worse psychosocial status and poorer health than the heterosexual groups, and heterosexual Veterans reported the highest rates of CVD. These are modifiable risk factors that contribute to mortality risk and could be targeted in prevention and intervention programs.

Another factor that may contribute to mortality risk for sexual minority women includes stigma, which exists at the intrapersonal (e.g., internalized homophobia), interpersonal (e.g., hate crimes, discrimination), and structural (e.g., community norms, institutional policies) levels. A large body of literature has linked stigma to mental health and well-being among sexual minorities (Feinstein, Goldfried, & Davila, 2012; Hatzenbuehler, 2009; Lehavot & Simoni, 2011). Among older sexual minority adults, the influence of discrimination on quality of life was recently found to be particularly salient, especially for those aged 80 and older (Fredriksen-Goldsen, Hyun-Jun, Shiu, Goldsen, & Emler, 2015). Another recent study examined stigma in relation to mortality and demonstrated that sexual minorities living in communities with high levels of antigay prejudice experienced a higher hazard of mortality than those living in low-prejudice communities, adjusting for individual and community-level covariates (Hatzenbuehler et al., 2014). Analysis of specific causes of death revealed that suicide, homicide/violence, and CVDs were substantially elevated among sexual minorities in high-prejudice communities (Hatzenbuehler et al., 2014). In the present study, we had limited ability to evaluate contextual factors such as stigma. Future research that examines this factor, alongside other psychosocial factors and health behaviors, may provide a more complete picture of what drives disparities for specific groups.

Several limitations of our study methodology warrant acknowledgement and discussion. First, sexual orientation

and Veteran status were both determined by self-report at study baseline. Sexual orientation was defined based on sexual behavior in this study, and other ways of defining sexual orientation, such as sexual identity, may result in different findings. The prevalence of self-identified sexual minorities was low (1.4%) and 5.4% of the total sample were excluded due to missing data on sexual orientation (either due to not having had sex, preferring not to answer, or missing data). Reporting bias due to social acceptability and under-detection of the true prevalence of sexual minority women is likely. Small numbers of sexual minority women reduced statistical power, including the capacity to detect a sexual orientation by Veteran status interaction on mortality risk, and thus these findings should be interpreted with caution. Similarly, we found no significant differences in mortality due to accidents or suicide by sexual orientation, potentially due to low overall occurrence and sample size, which precluded us from conducting a more thorough analysis on these outcomes. It is also unknown to what extent findings from this older population of women can be generalized to the current cohort of Veterans. Moreover, though the WHI participant population is representative of the racial, ethnic and geographic diversity of the U.S. women's population, WHI utilized a volunteer sample and the representativeness of the sexual minority and/or Veteran sample is unknown. Finally, lack of contextual data on salient risk factors (e.g., experiences with stigma, discrimination, nature, and scope of military service) limits our ability to adjust for factors that likely vary by sexual orientation and Veteran status and that would be expected to impact mortality risk. Similarly, even though analyses adjusted for some abuse and trauma exposures, sexual assault was not assessed independently and may also differ by sexual orientation and Veteran status.

Despite these limitations, the current study builds on prior work by examining mortality risk for a unique and understudied group using individual-level data for sexual orientation, utilizing a long-term prospective evaluation, and taking into account a wide range of demographic, psychosocial, and health variables. Results showed that postmenopausal sexual minority women, regardless of Veteran status, were at higher risk for earlier death compared to heterosexual women. The sexual minority Veterans had higher risk of all-cancer specific mortality compared to their heterosexual Veteran counterparts. Modifiable risk factors such as smoking and CVD are essential factors to target to reduce mortality risk for these groups. In addition, examining social determinants of longevity may be an important step to understanding and reducing these disparities.

## Funding

The Women's Health Initiative (WHI) program is funded by the National Heart, Lung, and Blood Institute, National Institutes of Health, U.S. Department of Health and Human Services through

contracts HHSN268201100046C, HHSN268201100001C, HHSN268201100002C, HHSN268201100003C, HHSN268201100004C, and HHSN271201100004C.

The research reported here was also supported by Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development Service FOP14-439 and the VA Office of Women's Health.

## Acknowledgements

The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

## References

- Anderson, G. L., Mason, J., Wallace, R., Lund, B., Hall, D., Davis, S., Shumaker, S., Wang, C., Stein, E., & Prentice, R. L. (2003). Implementation of the Women's Health Initiative study design. *Annals of Epidemiology*, *13*, S5–S17.
- Antonucci, T., Kahn, R., & Akiyama, H. (1989). Psychosocial factors and the response to cancer symptoms. In R. Yancik and J. Yates (Eds.), *Cancer in the elderly: Approaches to early detection and treatment*. New York: Springer Press.
- Baker, M. W., LaCroix, A. Z., Wu, C., Cochrane, B. B., Wallace, R., & Woods, N. F. (2009). Mortality risk associated with physical and verbal abuse in women aged 50 to 79. *Journal of the American Geriatric Society*, *57*, 1799–1809. doi:10.1111/j.1532-5415.2009.02429.x
- Blosnich, J., Bossarte, R., Silver, E., & Silenzio, V. (2013a). Health care utilization and health indicators among a national sample of U.S. veterans in same-sex partnerships. *Military Medicine*, *178*, 207–212. doi:10.7205/MILMED-D-12-00325
- Blosnich, J., Foynes, M.M., & Shipherd, J.C. (2013b). Health disparities among sexual minority women Veterans. *Journal of Women's Health*, *22*, 631–636. doi:10.1089/jwh.2012.4214
- Boehmer, U., Ozonoff, A., & Miamo, X. (2011). An ecological analysis of colorectal cancer incidence and mortality: Differences by sexual orientation. *BMC Cancer*, *11*, 400–408. doi:10.1186/1471-2407-11-400
- Boehmer, U., Ozonoff, A., & Miamo, X. (2012). An ecological approach to examine lung cancer disparities due to sexual orientation. *Public Health*, *126*, 605–612. doi:10.1016/j.puhe.2012.04.004
- Boehmer, U., Ozonoff, A., & Miamo, X. (2013). Breast cancer mortality's association with sexual orientation. *Sexuality Research and Social Policy*, *10*, 279–284. doi:10.1007/s13178-013-0126-5
- Burnam, M. A., Wells, K. B., Leake, B., & Landsverk, J. (1988). Development of a brief screening instrument for detecting depressive disorders. *Medical Care*, *26*, 775–789. doi:10.1097/00005650-198808000-00004
- Centers for Disease Control (CDC) (2010). *Leading causes of death in females, United States, 2010*. Retrieved January 12, 2015, from <http://www.cdc.gov/women/lcod/2010/index.htm>.
- Cochran, S. D. (2001). Emerging issues in research on lesbians' and gay men's mental health: Does sexual orientation really matter? *American Psychologist*, *56*, 931–947. doi:10.1037/0003-066X.56.11.931

- Cochran, S. D., & Mays, V. M. (2012). Risk of breast cancer mortality among women cohabiting with same sex partners: Findings from the National Health Interview Survey, 1997–2003. *Journal of Women's Health, 21*, 528–533. doi:10.1089/jwh.2011.3134
- Cochran, S.D., & Mays, V. M. (2015). Mortality risks among persons reporting same-sex sexual partners: Evidence from the 2008 General Social Survey-National Death Index Data Set. *American Journal of Public Health, 105*, 358–364. doi:10.2105/AJPH.2014.301974
- Cochran, S. D., Sullivan, J. G., & Mays, V. M. (2003). Prevalence of mental disorders, psychological distress, and mental health services use among lesbian, gay, and bisexual adults in the United States. *Journal of Consulting and Clinical Psychology, 71*, 53–61. doi:10.1037/0022-006X.71.1.53
- Conron, K. J., Mimiaga, M. J., & Landers, S. J. (2010). A population-based study of sexual orientation identity and gender differences in adult health. *American Journal of Public Health, 100*, 1953–1960. doi:10.2105/AJPH.2009.174169
- Diamant, A. L., & Wold, C. (2003). Sexual orientation and variation in physical and mental health status among women. *Journal of Women's Health, 12*, 41–49. doi:10.1089/154099903321154130
- Dilley, J. A., Simmons, K. W., Boysun, M. J., Pizacani, B. A., & Stark, M. J. (2010). Demonstrating the importance and feasibility of including sexual orientation in public health surveys in the Pacific Northwest. *American Journal of Public Health, 100*, 460–467. doi:10.2105/AJPH.2007.130336
- Feinstein, B. A., Goldfried, M. R., & Davila, J. (2012). The relationship between experiences of discrimination and mental health among lesbians and gay men: An examination of internalized homonegativity and rejection sensitivity as potential mechanisms. *Journal of Consulting and Clinical Psychology, 80*, 917–927. doi:10.1037/a0029425
- Fredriksen-Goldsen, K., Hyun-Jun, K., & Barkan, S. E. (2012). Disability among lesbian, gay, and bisexual adults: Disparities in prevalence and risk. *American Journal of Public Health, 102*, e16–e21. doi:10.2105/AJPH.2011.300379
- Fredriksen-Goldsen, K., Hyun-Jun, K., Barkan, S. E., Muraco, A., & Hoy-Ellis, C. P. (2013). Health disparities among lesbian, gay, and bisexual older adults: Results from a population-based study. *American Journal of Public Health, 103*, 1802–1809. doi:10.2105/AJPH.2012.301110
- Fredriksen-Goldsen, K., Hyun-Jun, K., Shiu, C., Goldsen, J., & Emler, C. A. (2015). Successful aging among LGBT older adults: Physical and mental health-related quality of life by age group. *The Gerontologist, 55*, 154–168. doi:10.1093/geront/gnu081
- Hatzenbuehler, M. L. (2009). How does sexual minority stigma “get under the skin”? A psychological mediation framework. *Psychological Bulletin, 135*, 707–730. doi:10.1037/a0016441
- Hatzenbuehler, M. L., Bellatorre, A., Lee, Y., Finch, B. K., Muennig, P., & Fiscella, K. (2014). Structural stigma and all-cause mortality in sexual minority populations. *Social Science and Medicine, 103*, 33–41. doi:10.1016/j.socscimed.2013.06.005
- Hays, R. D., Sherbourne, C. D., & Mazel, R. M. (1993). The RAND 36-Item Health Survey 1.0. *Health Economics, 2*, 217–227. doi:10.1002/hec.4730020305
- Institute of Medicine. (2011). *The health of lesbian, gay, bisexual, and transgender people: Building a foundation for better understanding*. Washington, DC: The National Academies Press.
- King, M., Semlyen, J., Tai, S. S., Killaspy, H., Osborn, D., Popelyuk, D., & Nazareth, I. (2008). A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC Psychiatry, 8*, 70–87. doi:10.1186/1471-244X-8-70
- LaCroix, A. Z., Lang, J., Scherr, P., Wallace, R. B., Cornoni-Huntley, J., Berman, L., Curb, D., Evans, D., & Hennekens, C. H. (1991). Smoking and mortality among older men and women in three communities. *New England Journal of Medicine, 324*, 1619–25. doi:10.1056/NEJM199106063242303
- Langer, R. D., White, E., Lewis, C. E., Kotchen, J. M., Hendrix, S. L., & Trevisan, M. (2003). The Women's Health Initiative observational study: Baseline characteristics of participants and reliability of baseline measures. *Annals of Epidemiology, 13*(Suppl. 1), S107–S121. doi:10.1016/S1047-2797(03)00047-4
- Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist, 9*, 179–186. doi:10.1093/geront/9.3\_Part\_1.179
- Lehavot, K., & Simoni, J. M. (2011). The impact of minority stress on mental health and substance use among sexual minority women. *Journal of Consulting and Clinical Psychology, 79*, 159–170. doi:10.1037/a0022839
- Lehavot, K., & Simpson, T. L. (2013). Incorporating lesbian and bisexual women in women veterans' health priorities. *Journal of General Internal Medicine, 28*, S609–614. doi:10.1007/s11606-012-2291-2
- Matthews, K. A., Shumaker, S., Bowen, D. J., Langer, R. D., Hunt, J. R., Kaplan, R. M., Klesges, R. C., & Ritenbaugh, C. (1997). Women's Health Initiative: Why now? What is it? What's new? *American Psychologist, 52*, 101–116. doi:10.1037/0003-066X.52.2.101
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin, 129*, 674–697. doi:10.1037/0033-2909.129.5.674
- Pan, A., Lucas, M., Sun, Q., van Dam, R. M., Franco, O. H., Willett W. C., ... Hu, F. B. (2011). Increased mortality risk in women with depression and diabetes mellitus. *JAMA Psychiatry, 68*, 42–50. doi:10.1001/archgenpsychiatry.2010.176
- Reiber, G. E. & LaCroix, A. (2016) Older Women Veterans and the Women's Health Initiative. Editorial 1 Special Supplement, February.
- Ruberman, W., Weinblatt, E., Goldberg, J. D., & Chaudhary, B. S. (1984). Psychosocial influences on mortality after myocardial infarction. *New England Journal of Medicine, 311*, 552–559. doi:10.1056/NEJM198408303110902
- Schultz, R., Beach, S. R., Ives, D. G., Martire, L. M., Ariyo, A. A., & Kop, W. J. (2000). Association between depression and mortality in older adults: The cardiovascular health study. *JAMA Internal Medicine, 160*, 1761–1768. doi:10.1001/archinte.160.12.1761
- Seeman, T. E. & Crimmins, E. (2001). Social environment effects on health and aging. *Annals of the New York Academy of Sciences, 954*, 88–117. doi:10.1111/j.1749-6632.2001.tb02749.x
- U.S. Department of Health and Human Services. (1988). *The Surgeon General Report on Nutrition and Health*. Retrieved January 12, 2015, from <http://profiles.nlm.nih.gov/ps/access/NNBCQG.pdf>
- U.S. Department of Health and Human Services. (2010). *Healthy People 2020: Disparities* Retrieved December 17, 2014, from <http://www.healthypeople.gov/2020/about/disparitiesAbout.aspx>

- Valanis, B. G., Bowen, D. J., Bassford, T., Whitlock, E., Charney, P., & Carter, R. A. (2000). Sexual orientation and health: Comparisons in the Women's Health Initiative sample. *Archives of Family Medicine, 9*, 843–853. doi:10.1001/archfami.9.9.843
- Vinokur, A., & van Ryn, A. (1993). Social Support and undermining in close relationships: their independent effect on the mental health of unemployed persons. *Journal of Personality and Social Psychology, 99*(3), 350–359. doi:10.1037/0022-3514.65.2.350
- Wallace, S. P., Cochran, S. D., Durazo, E. M., & Ford, C. L. (2011). The health of aging lesbian, gay and bisexual adults in California. *Policy Brief UCLA Center for Health, Policy and Research, 0*, 1–8.
- Weitlauf, J., Stefanick, M., Desai, M., Kubo, J., Goldstein, M., Katon, J. G., ..., Stefanick, M. L. *Physical health status, psychosocial functioning and health risk behaviors in postmenopausal women veterans*. Unpublished manuscript.
- Women's Health Initiative Study Group. (1998). Design of the Women's Health Initiative clinical trial and observational study. *Control Clinical Trials, 19*, 61–109.