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Abstract
Purpose This paper examines the predictors of quality of life among older women (≥65 years of age) veterans in the United States focusing on the effect of comorbidity on health-related quality of life (HRQOL).
Methods Data from the National Survey of Women Veterans, a cross-sectional nationally representative population-based, stratified random sample of women veterans, were used with an analytic sample size of 1,379 older women veterans. The SF12 physical and mental composite scores (PCS and MCS) were used as outcome measures, and a weighted comorbidity index was used as a covariate.
Results Older women veterans who are married, employed, with higher income, and higher education have better physical health (PCS). For mental health, education is positively correlated, whereas depression and posttraumatic stress disorder are negatively correlated with MCS. After adjusting for socio-demographic, mental health, and chronic health indicators, the results showed that SF12 PCS varied by VA use status for each level of Seattle Index of Comorbidity. The same pattern was not found for MCS.
Conclusion For each level of comorbidity, VA users have worse HRQOL which might suggest that case mix adjustments comparing VA users and non-VA users must take into account more than comorbidity alone.

Keywords Health-related quality of life (HRQOL) · Older women veterans · Comorbidity · VA users · VA non-users

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Introduction

With life expectancy increasing, quality of life is a concept with extreme relevance to older adults. However, empirically based knowledge about quality of life in older (65 years of age and older) women veterans is limited. Women veterans have been shown to differ in important ways from their male veteran counterparts, as well as from women non-veterans [1–5]. Therefore, women veterans may have factors that are unique to their military experiences influencing their health-related quality of life (HRQOL), and predictors of HRQOL in older women veterans need to be examined.

Exposure to military-related trauma may be affecting HRQOL in women veterans. Women veterans compared with male veterans are more likely to experience military sexual trauma [1, 6, 7], and sexual trauma is associated with poor physical health in women [8–10]. Similarly, combat experience is also associated with poor physical health in women [2]. This study will therefore examine the effects of both military sexual trauma (MST) and combat exposure on HRQOL.

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Another factor that may be affecting HRQOL in women veterans is posttraumatic stress disorder (PTSD). There is a high prevalence of PTSD and depressive symptoms among U.S. women veterans [4, 5, 11–13], and mental health has been shown as associated with HRQOL among men and women non-veteran populations [14–17]. Barrett et al. [18] found that overall veterans with PTSD had lower HRQOL than veterans without PTSD. However, the specific effect of PTSD in women veterans has not been examined. This study will therefore also examine the effect of PTSD history on HRQOL in older women veterans.

Other factors that might be related to HRQOL in women veterans are use versus non-use of the Department of Veterans Affairs (VA) health care system and residence in rural versus urban settings. Forman-Hoffman et al. [19, p. 2304; also see 20] report that "patients seen in the VA medical system have lower SF-36 scores than patients who do not use the VA health care system," suggesting that when examining predictors of HRQOL among women veterans, it is important to control for this factor. Researchers have also found rural/urban differences in HRQOL among veterans [21, 22]. According to Weeks et al. [22], the rural veteran population experienced greater prevalence of most diseases (over 30 disease categories) and had lower HRQOL scores than their urban counterparts. This study will examine rural/urban differences as well as the effect of VA health care use versus non-VA health care use among women veterans.

In this study, we will also control for other factors known to influence HRQOL. Socio-demographic factors also influence HRQOL. Lower socioeconomic status is associated with poor health outcomes [23]. Marital status has been used as a proxy for social support which in turn can impact functional health status [24]. Health insurance can be used as a proxy for access to health care which can have a direct effect on health status.

The association between chronic health conditions and HRQOL has also been well established [25, 26]. However, many studies have examined the effect of single diseases on health-related quality of life (HRQOL). Since older people most often have multiple chronic conditions, there is an increasing interest in the measurement of the joint effects of multiple conditions [27, 28]. For example, Tooth et al. [27] recommend the use of a weighted score of multimorbidity as a covariate in predicting health-related quality of life in older non-veteran women over a single chronic disease indicator. To date, most studies examining the impact of having more than one chronic medical condition on HRQOL have been clinic-based rather than population-based samples [29, 30].

This study bridges this gap and examines the predictors of quality of life among a nationally representative sample of older (65 and older) women veterans in the United States, focusing on the effect of a weighted comorbidity summary index on HRQOL.

Methods

Data from the National Survey of Women Veterans (NSWV), a cross-sectional nationally representative population-based, stratified random sample of women veterans, were used for this analysis. For the purpose of creating a representative sample of all U.S. women veterans, the sampling frame for NSWV was created by merging Veterans Health Administration (VHA), Veterans Benefits Administration (VBA), and Department of Defense (DOD) administrative databases—yielding 925.946 unique records that represented over 50 % of the U.S. women veteran population [31]. A stratified sampling method was used where stratification was based on VA ambulatory care use (VA use/non-use) and military service era [31]. The NSWV data were collected by telephone from September 2008 until May 2009. Prior to the study, an information packet was mailed and potential study participants were screened for eligibility. Inclusion criteria included being a woman veteran of the regular armed forces or a member of the National Guard or Reserves who had been called to duty, excluding current active duty military personnel, and those employed by the VA or who were hospitalized or nursing home residents. All eligible study participants provided verbal consent and participated in a computer-assisted telephone interview. Detailed description and discussion of the creation of the sampling frame and the stratification process are available elsewhere [31]. This study was approved by the VA Greater Los Angeles Institutional Review Board, and the survey was also approved by the U.S. Office of Management and Budget.

Among 4,535 eligible women veterans identified in this process, 636 declined enrollment, 3,899 consented, 288 were over the recruitment quota, and a total of 3,611 women veterans participated in the study. In the study sample, there were 1,506 women veterans 65 years of age and older where 1,445 had non-missing data on SF12. For this paper, the analytic sample was 1,379 women veterans who were 65 years of age or older at the time of survey with non-missing data for any of the study variables included in the analysis.

Dependent variables

We measured current health status by two dependent variables—SF12 physical component summary (PCS) and mental component summary (MCS) ratings. The SF-12 is comprised of 12 items from the SF-36 (36 multiple-choice items originally derived from a large series of health-status

instruments employed in the Medical Outcomes study) [32, 33]. The first SF-12 item asks participants to rate their current overall health with response choices of excellent, very good, good, fair, and poor. The remaining 11 forced choice items ask participants to rate various aspects of their health [34, 35]. Two composite scores—PCS and MCS scores—are constructed from all 12 items using a standard scoring algorithm [36]. Higher scores on the SF12 PCS and MCS indicate better health status. In the U.S. population, the PCS and MCS component summary scores each have mean scores of 50 and standard deviations of 10 [37]. For older women adults (65 years of age and older) in the U.S. general population, which includes both veterans and non-veterans, the average SF12 PCS and MCS scores are 42.1 (SD = 9.2) and 51.7 (SD = 8.8), respectively [38]. These scores are very similar to the SF12 PCS and MCS mean scores for the NSWV sample of older women veterans (65 years of age and older), 41.8 (SD = 10.2) and 49.7 (SD = 8.9), respectively.

Independent variables

For socio-demographic variables, study participants were asked to indicate their age, race and ethnicity, marital status, education, employment status, health insurance, annual household income, and period of military service. Several questionnaire items assessed whether the participant uses VA health care, non-VA healthcare, or both. Study participants were also asked to indicate whether they had ever served in a combat or war zone. Sexual assault in military service was assessed with two items and considered positive if the participant answered yes to either item: forced to have sexual relations against one's will while in the military or had sexual contact with a superior while in the military to avoid negative consequences. Study participants were also asked whether they were ever told by a doctor or a nurse that they had PTSD or depression—both lifetime mental health diagnoses. Using the 1995 rural–urban continuum code, rural categories were identified and a dichotomous variable was created—rural versus urban.

One commonly used comorbidity index, the Seattle Index of Comorbidity (SIC), was developed on a predominantly male (97 %) patient sample from general internal medicine clinics at the VA. The SIC was scored by giving points for the presence of each of seven chronic health items (1, 2, or 4 points depending on the specific chronic health condition) including prior myocardial infraction (1 pt), cancer (2 pts), lung disease (1 pt), chronic heart failure (2 pts), diabetes (2 pts), pneumonia (1 pt), stroke (2 pts), smoking status (current or past, 4 pts), plus age in 5-year intervals where 1 point was assigned for each 5-year interval above the age of 55 (i.e., age 50–54, 0 points; 55–59, 1 point; 60–64, 2 points, etc.) [39, 40]. Higher SIC scores indicate worse overall health. Tooth et al. [27] have used the SIC index to predict health-related quality of life among non-veteran women. This study used Fan et al.'s SIC to examine the effect of comorbidity on HRQOL among a nationally representative sample of women veterans in the United States while controlling for the effect of other relevant predictors and covariates of HRQOL, specifically examining the differences between VA and non-VA healthcare users.

Statistical analysis

All analyses were conducted with STATA/SE (version 12.1), using weights to account for disproportional allocation of the population by strata. The resulting estimates are therefore representative of the U.S. older (≥65 years of age) women veteran population [41]. Descriptive statistics were calculated for all study covariates, and weighted percents and unweighted frequencies are reported. Bivariate analyses were conducted comparing mean HRQOL SF12 physical and mental components (PCS and MCS) for all selected study variables. Single- and multiple-variable linear regression models were fitted separately—one for PCS and another for MCS. Multiple regression analyses controlled for demographic factors (age, race/ethnicity, marital status, employment status, rural/urban residence, health insurance), depression history, and PTSD history, chronic health conditions (SIC index), and VA use status. Interaction terms between VA use status and SIC were included to allow for heterogeneity in the relation between SIC and HRQOL for VA users and non-users. Regression coefficients and 95 % confidence intervals (CIs) were calculated for SIC, as well as the adjusted predicted probability of the two outcomes (PCS and MCS) as a function of each level of the SIC index stratified by VA use status. Using the margins and margins plot commands in STATA (version 12.1), differences in adjusted HRQOL SF12 PCS (contrasts) and 95 % CIs were also calculated for each SIC level.

To explore whether our results were sensitive to the choice of covariates used to control confounding, secondary analyses were conducted where multiple linear regression models were fitted which included as covariates additional demographic factors, indicators of general health, and other factors such as combat exposure and MST that have been associated with HRQOL in prior research. The results from these alternative specifications were not substantially different from those based on the models including age, race/ethnicity, marital status, employment status, depression history, PTSD history, rural/urban residence, and health insurance.

Results

Sample characteristics

Table 1 (column 4, weighted %) illustrates the characteristics of older (65 years of age or older) women veterans. The mean age for the analytic sample of 1,379 was 76.7 (SD = 8.0) with an age range of 65–97. Ninety percent of the sample was non-Hispanic whites, 31 % currently married, 52 % had a college or higher degree, 10 % working, 5 % lacked health insurance, and 8 % reported having a household income ≤100 % of the Federal Poverty Level. As for VA use, 13 % was currently using the VA, 18 % served in combat/war zone, 5 % reported military sexual trauma (MST), 57 % served during the Vietnam era to the present, whereas 43 % served prior to the Vietnam War. Approximately 4 % of the sample reported having PTSD and 23 % depression. The mean SIC index score was 8.4 (SD = 2.9).

HRQOL: SF12 PCS and MCS

Table 1 illustrates the HRQOL PCS and MCS mean scores by selected characteristics for older (≥65 years of age) women veterans ($n = 1{,}379$). Bivariate results indicate that married older women veterans had higher SF12 PCS mean scores compared to older women veterans who were not currently married (44.9 vs. 40.4, $p < 0.01$). Employed older women veterans had higher HRQOL mean scores compared to currently not employed women veterans (51.2 vs. 40.8, $p < 0.0001$). Similarly, older women veterans with higher incomes had better HRQOL scores compared

Table 1 HRQOL mean scores by selected characteristics for older (≥65 years of age) women veterans ($n = 1{,}379$)

Variable	Categories	*N*	Weighted %	SF12 PCS Mean (SD)	SF12 MCS *p* Value	SF12 MCS Mean (SD)	*p* value
Age categories	65–74	565	49.1	43.2 (9.3)		50.4 (8.2)	
	≥75	814	50.9	40.4 (10.9)	0.0808	49.1 (9.4)	0.3951
Race/ethnicity	Non-Hispanic whites	1,170	89.7	41.5 (9.9)		49.6 (8.7)	
	All others	209	10.3	44.0 (12.4)	0.3453	51.1 (9.8)	0.3564
Married	Yes	443	30.7	44.9 (9.1)		50.0 (9.9)	
	No	936	69.3	40.4 (10.4)	0.0032	49.6 (8.4)	0.8130
Education	Less than college	451	22.7	39.0 (11.0)		49.7 (12.2)	
	Some college	480	25.4	40.1 (11.7)		46.7 (10.8)	
	College graduate or +	446	51.9	43.9 (8.2)	0.0140	51.0 (6.1)	0.0428
Employed	Yes	135	9.5	51.2 (7.2)		48.4 (10.4)	
	No	1,244	90.5	40.8 (10.0)	<0.0001	49.9 (8.7)	0.6362
Health insurance	None	173	5.2	38.5 (14.8)		50.4 (12.4)	
	Medicare/other	1,206	94.8	42.0 (9.8)	0.1072	49.7 (8.6)	0.6966
HH income ≤100 %	Yes	134	7.7	38.5 (9.8)		45.4 (13.5)	
Poverty level	No	1,034	92.3	42.2 (9.9)	0.0297	50.7 (7.9)	0.0595
Military service	WWII to pre-Vietnam	1,143	42.8	38.5 (15.1)		47.9 (13.1)	
	Vietnam to OEF/OIF	236	57.2	44.2 (4.9)	0.0002	51.1 (4.5)	0.0211
Combat exposure	Yes	104	17.6	41.0 (7.1)		53.2 (4.9)	
	No	1,198	82.4	41.7 (10.2)	0.7705	48.9 (9.7)	0.0086
MST	Yes	88	5.2	33.9 (15.7)		45.3 (8.9)	
	No	1,218	92.8	42.0 (9.3)	0.0325	49.9 (9.4)	0.0096
Rural	Yes	39	1.7	43.5 (10.4)		47.5 (5.0)	
	No	1,340	98.3	41.7 (10.2)	0.4722	49.8 (8.9)	0.0991
Current VA use	Yes	818	13.0	40.3 (22.7)		48.4 (20.1)	
	No	561	87.0	42.0 (7.0)	0.1052	49.9 (6.0)	0.1141
Depression (ever told had)	Yes	282	22.8	39.9 (9.7)		42.8 (10.0)	
	No	1,097	77.2	42.3 (10.3)	0.1947	51.7 (7.3)	<0.0001
PTSD (ever told had)	Yes	56	4.2	43.2 (10.2)		44.4 (8.9)	
	No	1,323	95.8	41.7 (10.2)	0.6919	49.9 (7.4)	0.0061

Mean age, 76.7 (SD = 8.0); age range, 65–97

Table 2 Correlates of HRQOL using multiple regression analysis for older (≥65 years of age) women veterans ($n = 1{,}379$)

	SF12 PCS Regression coeff. (95 % CI)	SF12 MCS Regression coeff. (95 % CI)
Age (in years)	0.18 (−0.07, 0.37)	0.11 (−0.04, 0.26)
Race/ethnicity (white)	−0.74 (−3.78, 2.31)	−1.44 (−3.79, 0.92)
Not married	−1.39 (−4.21, 1.43)	0.89 (−1.89, 3.66)
Not employed	−8.81 (−11.75, −5.86)***	1.40 (−2.99, 5.79)
Ever diagnosed w/PTSD	1.97 (−4.72, 8.66)	−0.20 (−5.15, 4.75)
Ever diagnosed w/depression	−2.04 (−5.44, 1.36)	−8.32 (−12.71, −3.94)***
Rural	1.96 (−1.97, 5.89)	−3.97 (−7.71, −0.23)*
No health insurance	−2.79 (−6.06, 0.48)	0.76 (−3.29, 4.81)
VA use	−7.59 (−12.79, −2.38)**	−3.14 (−8.28, 2.00)
SIC	−1.60 (−2.10, −1.11)***	−0.81 (−1.27, −0.36)**
SIC * VA use	0.67 (0.09, 1.24)*	0.22 (−0.31, 0.76)
Intercept	51.73 (39.16, 64.30)***	49.43 (39.45, 59.41)***

SIC Seattle Index of Comorbidity (higher scores indicated greater comorbidity)

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

to older women veterans with annual household income ≤100 % poverty level (42.2 vs. 38.5, $p < 0.05$).

When women veterans served in the military was significantly associated with HRQOL. Women veterans who served in Vietnam to Operations Enduring and Iraqi Freedom (OEF/OIF) military service eras had higher physical HRQOL scores compared to women veterans who served in WWII to pre-Vietnam eras (44.2 vs. 38.5, $p < 0.001$). Similarly, the bivariate results for SF12 MCS indicate higher mean scores for Vietnam to OEF/OIF era women veterans compared to WWII to pre-Vietnam era women veterans (51.1 vs. 47.9, $p < 0.05$).

MST and combat exposure were significantly associated with HRQOL, but in opposite directions. Older women veterans who reported MST had lower PCS mean scores compared to older women veterans who did not report experiencing MST (33.9 vs. 42.0, $p < 0.05$). Similarly, respondents who reported MST had lower MCS scores compared to those who did not report MST (45.3 vs. 49.9, $p < 0.01$). However, older women veterans who served in combat zones had higher mean MCS scores compared to those who did not serve in combat zone (53.2 vs. 48.9, $p < 0.01$). No significant difference was seen by combat exposure with respect to mean PCS scores. MCS scores were lower for older women veterans who reported having depression (42.8 vs. 51.7, $p < 0.0001$) and for those who reported having PTSD (44.4 vs. 49.9, $p < 0.01$). However, no significant associations were observed between these factors and PCS score.

Table 2 presents the correlates of HRQOL using multiple regression analysis for SF12 PCS and SF12 MCS outcome measures. For SF12 PCS, the regression results indicate those unemployed had lower HRQOL (regression coefficient = −8.81, 95 % CI −11.75, −5.86), those using the VA health care system had lower HRQOL (regression coefficient = −7.59, 95 % CI −12.79, −2.38), and the SIC index was negatively associated with HRQOL (regression coefficient = −1.60, 95 % CI −2.10, −1.11). For SF12 MCS, the results indicate that those ever diagnosed with depression had lower HRQOL (regression coefficient = −8.32, 95 % CI −12.71, −3.94), those living in rural areas had lower SF12 MCS compared to those living in urban areas (regression coefficient = −3.97, 95 % CI −7.71, −0.23), and similar to SF12 PCS, SIC was negatively associated with HRQOL (regression coefficient = −0.81, 95 % CI −1.27, −0.36).

Table 3 presents adjusted (predicted) mean PCS and MCS values by VA use for each SIC index score level (3–12). These analyses adjusted for age, race/ethnicity, marital status, employment status, ever told had depression, ever told had PTSD, rural/urban residence, and health insurance. The findings from these multiple regression analyses indicate that SF12 PCS scores varied by VA use status. VA users had lower physical component scores (PCS) for most SIC levels compared to non-VA users (e.g., for SIC = 3, PCS = 45.2 for VA users, 50.8 for VA non-users); however, the difference between VA and non-VA users was significant at SIC index scores 3 to 8 (p's < 0.01), but not for scores 9 to and higher (p's > 0.05) (see Table 3). For the mental component (MCS), even though VA users had lower SF12 MCS scores compared to non-VA users, the differences were not statistically significant at any SIC level (see Table 3).

Figure 1 further illustrates the differences in predicted (or adjusted) SF12 PCS values (contrasts) and 95 % CI by VA health care use status for SIC index scores (3–12). The figure illustrates that for SIC index scores 3–8, the adjusted SF12 PCS mean differences between VA users and non-VA users are significant (also see Table 3). For SIC index scores higher than 9, however, there were no significant differences in adjusted SF12 PCS mean scores between VA users and non-users (also see Table 3).

Table 3 Predicted mean HRQOL (SF12 PCS and SF12 MCS)[a] by SIC index and VA use

SIC index[b]	VA users	Non-VA users	*z* test	*p* value**
SF12 PCS				
3	45.2	50.8	−3.03	0.002
4	44.3	49.2	−3.09	0.002
5	43.3	47.6	−3.13	0.002
6	42.4	46.0	−3.12	0.002
7	41.5	44.4	−2.98	0.003
8	40.5	42.8	−2.57	0.010
9	39.6	41.2	−1.83	0.067
10	38.6	39.6	−0.98	0.329
11	37.7	38.0	−0.24	0.810
12	36.8	36.4	0.30	0.761
SF12 MCS				
3	51.8	54.3	−1.32	0.187
4	51.2	53.5	−1.37	0.170
5	50.7	52.7	−1.43	0.153
6	50.1	51.9	−1.48	0.139
7	49.5	51.1	−1.50	0.135
8	48.9	50.2	−1.44	0.151
9	48.3	49.4	−1.25	0.212
10	47.7	48.6	−0.95	0.342
11	46.6	47.8	−0.63	0.526
12	46.6	47.0	−0.36	0.716

** *p* values are based on the comparison of adjusted SF12 PCS or SF12 MCS mean scores for SIC

[a] Adjusted for age, race/ethnicity, marital status, employment status, ever told had depression, ever told had PTSD, rural/urban, and health insurance

[b] SIC = age (in 5-year intervals) + prior MI + 2*(cancer) + lung disease + 2*(CHF) + 2*(diabetes) + pneumonia + 2*(stroke) + 2*(past smoker) + 4*(current smoker), where 1 point was assigned for each 5-year interval above the age of 55 (i.e., age 50–54, 0 points; 55–59, 1 point; 60–64, 2 points, etc.). Higher SIC index scores indicate worse health conditions

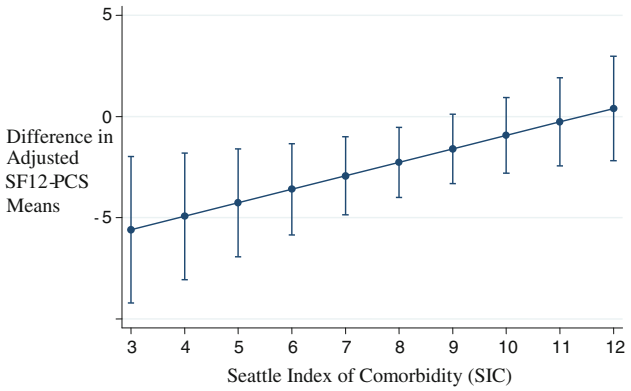

Fig. 1 Difference in the adjusted HRQOL means (SF12 PCS) and 95 % CIs, between VA and non-VA users for each SIC index score, among older women veterans

Conclusion/Discussion

Understanding the determinants of health-related quality of life especially for women veterans, a specific demographic where their numbers are increasing annually, is important. The associations with socio-demographic characteristics, with better PCS scores for those who are married, employed, and have higher incomes, and higher MCS scores for those with higher education, is consistent with prior literature in other populations, as well as in this demographic [23, 24]. The data also showed lower physical and mental health scores for older women veterans who reported having experienced sexual trauma during military service compared to those with no military sexual trauma, which support earlier findings [8–10]. We also found that combat exposure is associated with higher HRQOL on the mental health domain, but not on the physical health. We further found that although, not surprisingly, PTSD is associated with lower HRQOL on the mental health domain, it is not associated on the physical health domain.

In post hoc analysis, we further explored the findings of the bivariate associations between HRQOL and service era and combat exposure by performing multiple regression analysis controlling for service period and education. We hypothesized that the finding of lower HRQOL in women veterans who served prior to the Vietnam era might be an effect of age, as women who served prior to the Vietnam era are older and therefore are more likely to have poor physical health. In terms of combat exposure being positively associated with HRQOL, we hypothesized that combat exposure might be a proxy for being a Vietnam era nurse, which might also mean membership in a highly educated group. In multiple regression, the relationship between combat exposure and MCS was no longer significant ($p = 0.122$).

The most interesting and unique finding in this study is the difference between VA users and non-VA users. After adjusting for age, race/ethnicity, marital status, employment status, depression history, PTSD history, rural/urban residence, and health insurance, the findings indicate that older women veterans with a *lower* number of chronic conditions (SIC scores below 9) who are VA users have lower physical health scores compared to non-VA users. For women veterans with *more* chronic conditions (SIC scores 9 and higher), however, there are no significant differences in physical health between VA users and non-VA users; regardless of VA use status, both groups have poor physical health (SF12 PCS < 41.2). Since decrements in SF12 PCS are related to lower socioeconomic status, worse healthcare access, and increased comorbidity—factors that are generally correlated with VA use—it is possible that VA use in this study is a proxy for aspects of

these constructs that were not reflected in our measures [41]. For the mental component (MCS), on the other hand, even though VA users have slightly lower SF12 MCS scores compared to non-VA users, the differences were not statistically significant overall or at any SIC level. The results from this study both support and expand Tooth et al.'s [27] findings by illustrating that the SIC-weighted comorbidity index was associated with HRQOL among older women veterans with the caveat that for this specific population of women veterans, the relationship is confounded by VA health care use.

There are strengths and limitations that deserve attention which help put the study in perspective. One of the study's unique strengths was the use of the NSWV data set, which is an inclusive large, nationally representative, and diverse sample of older women veterans. However, one of the limitations is that this specific focus on women veterans does not allow us to generalize the findings to other settings and/or populations, and the generalizability of these findings is limited to U.S. women veterans. Additionally, while most studies on veterans utilize VA data sets and thus only survey current VA users, one of the strengths of this study is that it includes both VA and non-VA users—allowing comparisons between these two groups and differentiating the association between chronic conditions and physical health by VA use status. The data used in the analyses were cross-sectional, limiting the extent to which causality could be assessed; however, reverse causality is not a major concern for the key question about the relationship between VA use status and health-related quality of life. Another limitation is the lack of data on HRQOL dimensions which can only be derived from the use of the complete SF36 questionnaire; however, when constructing telephone surveys, burden on the respondent is an important consideration, and use of all SF36 items would have prolonged survey time which might have negatively impacted the completion of the survey. It is also important to note that even though the use of a weighted comorbidity index has its advantages of summarizing the joint effect of chronic conditions, one needs to consider the possible significant effects of the individual components of the SIC index on HRQOL. Similarly, one needs to consider the possibility that the different combinations of chronic conditions might have different effects on HRQOL. In this study, one weighted summary score of chronic diseases was used and the examination of the effects of single medical conditions or the effect of the different combinations of chronic conditions can be explored in future studies.

In summary, among older women veterans in the United States, HRQOL is associated with both general socio-demographic characteristics and some factors unique to military exposure. Not surprisingly, we found poor HRQOL among those with high comorbidity. However, older women VA users differ from non-VA users in that, among those with few chronic conditions, VA users have lower physical health scores compared to non-VA users. This interaction between comorbidity and VA use in predicting HRQOL has not previously been examined. This finding is a new contribution to the literature. VA users have worse HRQOL than non-VA users at lower levels of comorbidity suggests that case mix adjustments comparing VA users and non-VA users must take into account more than comorbidity alone. With a rising proportion of VA users being from this demographic, further attention to their needs, and how they may differ from their male counterparts, is needed. The findings from this study have important policy implications for planning healthcare services for older women veterans. These findings also have implications for resource planning and allocation for this specific demographic. Healthcare reform in the United States is expected to be fully implemented by 2014. With expanded healthcare access, many current VA users may choose to obtain healthcare in non-VA settings; therefore, these settings may have an influx of women veterans with poorer HRQOL in the near future. Healthcare settings outside of the VA need to have an understanding of women veterans' healthcare needs and consider resource implications of caring for individuals with worse HRQOL. Future research should evaluate, develop, and disseminate best methods for meeting the needs of women veterans, whichever system of care they choose.

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