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A psychometric examination of multimorbidity and mental health in older adults

Salene M. W. Jones, Ph.D.¹, Dagmar Amtmann, Ph.D.², and Nancy M. Gell, Ph.D., MPH³

Salene M. W. Jones: wu.582@osu.edu

¹Group Health Research Institute, 1730 Minor Ave, Seattle, WA 98101 USA, Phone: 206-287-2108

²Department of Rehabilitation Medicine, University of Washington, Box 354237, Seattle, WA 98195-4237 USA

³Department of Rehabilitation and Movement Science, University of Vermont, Burlington, VT, USA

Abstract

Objectives—Multimorbidity, the presence of multiple chronic medical conditions, is particularly prevalent in older adults. We examined the relationship of multimorbidity with mental health, social network and activity limitations in the National Health and Aging Trends Study (NHATS), a nationally representative, age-stratified sample of older adults.

Methods—After excluding participants who used a proxy to complete the survey and those who did not answer any of the depressive symptoms, anxiety symptoms, and positive and negative affect items, the final sample was 7,026. A disease count of 10 conditions (heart disease, hypertension, arthritis, osteoporosis, diabetes, lung disease, stroke, dementia, cancer, fracture) was used.

Results—Factor analysis indicated a one factor structure for disease count was tenable, although cancer did not appear to fit the model. Therefore, a count of the nine other diseases was used. Disease count was related to increased depressive symptoms, anxiety symptoms and negative affect and less positive affect. All individual diseases including cancer were related to worse mental health as was having two or more conditions. Disease count, having two or more conditions and several individual diseases (heart disease, hypertension, arthritis, cancer and fracture) were also related to increases in social network size while other individual diseases (osteoporosis, diabetes, lung disease, stroke and dementia) were related to decreases in social network size. All measures of multimorbidity and individual diseases were associated with increased odds of activity limitations.

Conclusions—Results support a broader focus for older adults with multimorbidity that includes mental health needs.

Correspondence to: Salene M. W. Jones, wu.582@osu.edu.

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Keywords

comorbidity; wellbeing; positive affect; negative affect; emotion

Background

Multimorbidity refers to the presence of two or more diagnosable medical conditions in the same person (Salive, 2013). Multimorbidity is more common in women and the rate of multimorbidity increases with age, with over two-thirds of older adults experiencing multimorbidity (Salive, 2013; van den Bussche et al., 2011). Numerous measures for multimorbidity exist but the most popular is disease count (Huntley, Johnson, Purdy, Valderas, & Salisbury, 2012). Disease count, as the name implies, simply counts the number of diseases that were measured or ascertained in the study. Other measures examine specific conditions and weight each condition by severity, such as the Charlson Comorbidity Index (Charlson, Szatrowski, Peterson, & Gold, 1994). Measures of multimorbidity are thought to reflect the burden of disease and are often used to predict mortality (Huntley et al., 2012).

Multimorbidity presents numerous challenges, especially within the context of the aging population. Co-occurring medical diagnoses are often a risk factor for greater healthcare utilization (Jakovljević & Ostojić, 2013) and increased risk of mortality (Salive, 2013). Worse quality of life is associated with multimorbidity (Chen, Baumgardner, & Rice, 2011; Fortin et al., 2005). A higher number of comorbid diseases is also associated with worse daily function (Loza, Jover, Rodriguez, Carmona, & Group, 2009) and an increased prevalence of clinically significant depression (Wikman, Wardle, & Steptoe, 2011).

Consensus statements on multimorbidity emphasize the need to include assessment of mental health and psychosocial factors when addressing this problem (Le Reste et al., 2013). This includes social support and resources as well as functional status and mental health. While multimorbidity has been shown to be related to depression in general adult samples (Gunn et al., 2012), this study investigated older adults and multiple facets of mental health including anxiety symptoms and positive affect. Positive affect has a protective effect against stroke (Ostir, Markides, Peek, & Goodwin, 2001), and has been linked to physiological outcomes such as lower cortisol and blood pressure (Dockray & Steptoe, 2010). Negative affect has been linked to somatic symptoms such as fatigue, dizziness and sleep disturbance (Leventhal, Hansell, Diefenbach, Leventhal, & Glass, 1996). The consensus statements and previous literature suggest a comprehensive examination of mental health and factors that might affect it when studying multimorbidity.

The aim of the current study was to evaluate the psychometric properties of disease count as a measure of multimorbidity as few studies have examined this and also examined the relationship of multimorbidity to several measures of mental health, social network and activity limitations in the National Health and Aging Trends Study (NHATS) 2011 baseline sample. We examined factor structure and reliability of disease count as well as the relationship of disease count to depressive symptoms, anxiety symptoms, both positive and negative affect, social network and activity limitations. As the psychometric properties of the positive and negative affect items of NHATS have not been evaluated, we also examined

the factor structure, reliability and validity of the positive and negative affect items. We examined positive and negative affect in older adults in addition to more traditional mental health measures (depressive symptoms, anxiety symptoms), as positive and negative affect have been reported to be predictive of health outcomes in older adults.

Methods

Participants and Procedures

Data was from the first wave of NHATS, collected in 2011. NHATS is a nationally representative survey of Medicare beneficiaries across the United States (adults 65 and older). A sample of 8,245 older adults were enrolled in the study through an age-stratified, three-stage sampling procedure to be representative of the population, with oversampling of the oldest old and Black non-Hispanic persons (Montaquila, Freedman, Edwards, & Kasper, 2012). Analytic weights to adjust for non-response, oversampling, missing data and to allow generalization to the older adult population were used in all analyses (Montaquila, Freedman, Spillman, & Kasper, 2012). See Figure 1 for details of participant inclusion and exclusion in the analyses. Six hundred and thirty-six participants were ineligible for any of the analyses due to lack of interview data. The final sample for the multimorbidity analyses was 7,537 after excluding those with missing data on the 10 medical conditions. Participants who used a proxy to complete the survey (n=583) were excluded from the examination of mental health, social network and activity limitations because these variables may be affected by whether data is self-reported vs. proxy-reported. A total of 7,026 participants completed any of the mental health variables (depressive symptoms, anxiety symptoms, positive affect, negative affect). Our final sample was 6,942 for psychometric analyses on the positive and negative affect variables after also excluding participants with missing data on those specific items.

Measures

Medical Conditions—Participants were presented with a list of 10 conditions that were part of the standard NHATS survey and respondents were asked to self-report any medical conditions that a doctor said they had. These included any heart condition (heart attack or heart disease), hypertension, arthritis, osteoporosis, diabetes, lung disease, stroke, dementia or Alzheimer's disease, cancer and fracture and are some of the most common diseases experienced by older adults in the United States.

Positive and Negative Affect—The positive and negative affect items for NHATS were drawn from the Mid-life in the United States (MIDUS) survey (Mroczek, 2004) and the Health and Retirement Survey. Items from the MIDUS survey were drawn from the Positive and Negative Affect Scale (Watson, Clark, & Tellegen, 1988). The two positive items asked participants how often they felt cheerful and full of life in the past month. The two negative items asked participants how often they felt bored and upset in the past month. Items were rated on a five point scale (every day, most days, some days, rarely, never).

Patient Health Questionnaire 2 (PHQ2)—The PHQ2 is a screening measure for depressive symptoms and contains two items from the PHQ9 (Li, Friedman, Conwell, &

Fiscella, 2007). The two items are “feeling down or depressed” and “having little interest in things,” the hallmark symptoms of depression. Items are rated on a 0-3 scale (not at all to every day) and summed with higher scores indicating worse depressive symptoms.

Generalized Anxiety Disorder 2 (GAD2)—The GAD2 is a screening measure for problematic anxiety and contains two items from the GAD7 (Kroenke, Spitzer, Williams, & Lowe, 2009). The items (uncontrollable worry and nervous/anxious) assess symptoms of GAD but do not assess other anxiety disorders. Similar to the PHQ2, items are rated on the same 0-3 scale and summed with higher scores indicating more symptoms of Generalized Anxiety Disorder.

Social network—Participants were asked to name people that they talked to over the past year about important things. Participants could name up to five people in whom they confided. The number of people named (0 to 5) was used in this study.

Activity Limitations—Participants were asked to name a favorite activity and then asked whether their health limited their participation in this activity. Responses to this question were dichotomous, yes or no.

Psychometric Analyses of the NHATS positive and negative affect

As the NHATS positive and negative affect items have not been examined, we conducted the following psychometric analyses. We assessed both one and two factor models for fit to the four positive and negative affect items using structural equation modeling in Lisrel (Byrne, 1998). The one and two factor models were fit to a polychoric correlation matrix using diagonally weighted least squares estimation. The two factor confirmatory model utilized a positive affect factor (cheerful, full of life) and a negative affect factor (bored, upset) based on previous literature. All variables were recoded for the factor analysis such that higher levels indicated better well-being (more positive affect, less negative affect). The following fit indices and the published recommendations for acceptable fit were used: root mean square error of approximation (RMSEA) below .08 (Browne & Cudeck, 1993), comparative fit index (CFI) above .94, expected cross validation index (ECVI), root mean square residual (RMSR), and the Akaike information criterion (AIC). ECVI, RMSR and AIC are compared between models with lower values indicating better fit. For the positive and negative affect subscales, floor and ceiling effects were also examined by calculating the percent of the sample with the lowest and highest possible scores and 15% of the sample reporting the lowest or highest score was considered a floor or ceiling effect (Terwee et al., 2007).

To test reliability, Cronbach's alpha was used for both the positive and negative affect subscales, due to the results of the factor analysis (reported below). We also calculated item-total correlations. Acceptable Cronbach's alpha was .70 and acceptable item-total correlations were .40 or higher (Everitt, 2002). For construct validity of the positive and negative affect, the scores were correlated with continuous measures of depressive symptoms and anxiety symptoms. Positive and negative affect are theorized to have different relationships to depression and anxiety (Watson et al., 1995). With depression,

positive affect is reduced and negative affect increased. With anxiety, negative affect is increased but positive affect is mostly unaffected. However, literature on the relationship of positive affect to anxiety disorders has been mixed (Brown, Chorpita, & Barlow, 1998; Shankman & Klein, 2003).

Association of Multimorbidity with Mental Health, Social network and Limitations

For main analyses, we first examined whether a one factor model fit the disease count data well, which would support using disease count as a measure of multimorbidity. For this factor analysis, we used a tetrachoric correlation matrix and diagonally weighted least squares estimation. We also examined reliability of the disease count. To examine the relationship of disease count and mental health and social network, multiple linear regression was used with the mental health variables or social network (positive affect, negative affect, depressive symptoms, anxiety symptoms, and number in social network) as the dependent variable and disease count as the independent variable. Logistic regression was used for activity limitations (limited in favorite activity yes/no). As several previous studies have defined comorbidity as two or more chronic medical conditions (Salive, 2013), we also ran analyses again using this categorical measure of comorbidity. Covariates were age, gender, race/ethnicity, marital status and education. An interaction term between gender and disease count was included to determine whether the relationship of multimorbidity to the other variables differed by gender. As depressive symptoms and anxiety symptoms were positively skewed, the natural log of depressive symptoms and anxiety symptoms was used in the analyses.

Results

Descriptive statistics are reported in Table 1.

Positive and Negative Affect

Results of the confirmatory factor analyses supported a two-factor structure rather than a single overall, well-being factor. Fit indices indicated that the two-factor model (Table 2) fit better than the one-factor model, as would be expected for a model with more parameters specified. However, the RMSEA was acceptable for the two-factor model (.08) but not the one-factor model (.11) and the AIC also decreased for the two-factor model compared to the one-factor model (60.88 vs. 185.86). Also, factor loadings increased slightly for all items from the one-factor to two-factor model, although all loadings were over .50 in both models. Factor loadings for the one factor model were as follows: cheerful .83, full of life .77, bored .56, upset .54. Factor loadings for the two factor model were as follows: positive affect factor- cheerful .84, full of life .79; negative affect factor- bored .66, upset .61. The positive affect subscale did not show a floor effect (0.3% reporting the lowest score) but did show a ceiling effect (21.9% reporting the highest score). The negative affect subscale did not show substantial a floor effect (12.9% reporting the lowest score) or a ceiling effect (0.6% reporting the highest score).

The reliability was sufficient for the positive affect score but was low for the negative affect score. For the positive affect score, Cronbach's alpha was .738 and the items correlated at .

585. Cronbach's alpha was .515 for the negative affect scale, below the recommended .70, and items correlated at .347. As predicted, negative affect was positively related to depressive symptoms ($r=.414$, $p<.001$) and anxiety symptoms ($r=.426$, $p<.001$). Positive affect was negatively related to both depressive symptoms ($r=-.468$, $p<.001$) and anxiety symptoms ($r=-.407$, $p<.001$).

Psychometric Analysis of Multimorbidity

Results of the factor analysis of multimorbidity are reported in Tables 2 (fit indices) and 3. (factor loadings). While a one-factor solution fit the data well (RMSEA=.044, CFI=.95), cancer had a particularly low factor loading compared to the other diseases. This suggests that cancer perhaps represents a different or unique burden of disease compared to the other diseases. The reliability of disease count further supported this. With all 10 diseases, reliability was .428. However, without cancer, the reliability of the other 9 diseases increased to .441. To ascertain whether a one factor model on the 9 diseases, excluding cancer, was tenable, we ran analyses again without cancer. These are also reported in Tables 2 and 3. Fit indices and factor loadings did not substantially change when cancer was excluded and due to these results, a disease count of the 9 other diseases was used. This suggested that the other 9 diseases comprised a single factor when cancer was not included in the model.

Multimorbidity and Mental Health

Multimorbidity was significantly related to all measures of mental health (see Table 4). More comorbid diseases were related to more negative affect, more depressive symptoms and more anxiety symptoms as well as less positive affect ($p's<.001$). For every additional comorbid disease, negative affect increased by .191 standard deviations, depressive symptoms increased by .276 standard deviations and anxiety symptoms increased by .257 standard deviations. Positive affect decreased by .212 standard deviations for every additional comorbid disease. Although the interaction between gender and disease count was significant for all four outcomes (all $p's<.001$), this was likely due to the sample size and the interaction predicted less than 1% of the variance in all outcomes.

Because cancer was excluded from the disease count due to factor analysis results as described above and to be consistent with previous studies, we conducted multiple regressions to test whether each individual disease was related to these outcomes (see Table 4). Covariates were entered on the first step and all 10 diseases were entered on the second step. Results were similar to those for disease count as reporting any of the 10 medical diagnoses (heart condition, hypertension, arthritis, osteoporosis, diabetes, lung disease, stroke, dementia or Alzheimer's disease, cancer and fracture) was related to worse mental health (all $p's<.001$). In general, reporting any of the medical conditions was related to increased depressive symptoms, anxiety symptoms and negative affect and decreased positive affect. Arthritis had the largest coefficient for depressive symptoms ($\beta=.089$), negative affect ($\beta=.072$) and for positive affect ($\beta=-.097$). Dementia had the largest coefficient for anxiety symptoms ($\beta=.097$). Cancer had the lowest coefficient for depressive symptoms ($\beta=.017$) and negative affect ($\beta=.018$). Diabetes had the lowest coefficient for

anxiety symptoms ($\beta=.021$) and hypertension had the lowest coefficient for positive affect ($\beta=-.029$).

Previous studies have defined comorbidity as having two or more chronic medical conditions therefore, we also conducted analyses using this measure of comorbidity. Although having two or more medical conditions was related to more depressive symptoms, negative affect and anxiety symptoms (all $p's<.001$) and less positive affect ($p<.001$), the amount of variance explained by using a definition of two or more chronic medical conditions was less than that explained by disease count and the diseases individually (R^2 for two or more diseases: .019 to .029; disease count: .034 to .071; individual diseases: .038 to .085). Overall, all measures of multimorbidity were related to more depressive symptoms, anxiety symptoms and negative affect and to less positive affect.

Multimorbidity, Social network and Activity Limitations

Multimorbidity was related to both increases and decreases in social network and to increases in activity limitations (Table 4). Disease count and the interaction of disease count with gender were significantly, negatively related to the number of people in participants' social network (both $p's<.001$) however both effects accounted for less than 0.1% of the variance. While each individual disease was related to social network (all $p's<.001$), heart disease, hypertension, arthritis, cancer and fracture were related to increases in social network size and osteoporosis, diabetes, lung disease, stroke and dementia were related to decreases in social network size. Also, the individual diagnoses only accounted for 0.5% of the variance in social network size. Having two or more medical diagnoses was significantly related to social network size ($p=.001$) but accounted for less than 0.1% of the variance. Disease count, individual diagnoses and having two or more diagnoses were all positively related to activity limitations (all $p's<.001$) such that more multimorbidity was associated with higher odds of activity limitations.

Discussion

This study found a positive relationship between multimorbidity and poor mental health, including positive and negative affect, social network and activity limitations in a nationally representative sample of older adults. The positive and negative affect items appeared to measure two unique but related constructs and should continue to be used separately in future analyses. Based on factor analyses and reliability results, a disease count of 9 diseases (heart disease, hypertension, arthritis, osteoporosis, diabetes, lung disease, stroke, dementia and fracture) was used. Cancer appeared to confer a unique burden and was not included in the disease count. Disease count was related to worse mental health outcomes including increased depressive symptoms, anxiety symptoms and negative affect and decreased positive affect. Gender did not appear to substantially moderate the relationship of multimorbidity and mental health. Cancer and the other individual illnesses were also related to worse mental health outcomes. Having two or more diseases was related to worse mental health but some information appeared to be lost when this method of classifying multimorbidity was used compared to disease count or individual diseases. While all measures of multimorbidity were related to social network size, multimorbidity was

associated with a very small amount of the variance in social network size. Understandably, more multimorbidity was associated with higher odds of reporting activity limitations.

The results on the structure of disease count have two implications. First, although a one factor model (i.e., disease count as a measure of multimorbidity) did fit these data, this could have been due to the small number of diseases measured. Another study that used both diseases and symptoms, instead of disease count alone, and over 30 variables (cardiovascular disease, dizziness, anxiety, etc.) found three factors (Schäfer et al., 2010). Given that cancer did not seem to fit as well as the other diseases, this also supports the possibility of more factors in future studies. Second, that cancer did not fit as well with the other diseases could be due to the diseases measured. All the other diseases concerned either one or two specific bodily systems (nervous system, cardiovascular system) whereas cancer refers to a heterogeneous group of diseases that share a similar mechanism of disease but can affect nearly every system of the body. Cancer also follows a different trajectory than other chronic illnesses, where the majority of treatment is experienced closer to diagnosis whereas other illnesses on the list tend to need more long term treatment. Essentially, there was a logical reason for excluding cancer from the disease count and examining its effects separately in addition to the statistical reasons.

Our results showing multimorbidity is related to worse mental health are consistent with previous studies on quality of life (QOL) and multimorbidity. A greater burden of disease is related to worse outcomes for both negative outcomes such as depressive symptoms and negative affect but also to less positive outcomes such as QOL and positive affect. As older adults with multimorbidity conceptualize mental health as having both positive and negative facets (Grundberg, Ebbeskog, Dahlgren, & Religa, 2012), this means that multimorbidity may have wide-ranging and detrimental effects on many aspects of mental health. These results also support more expansive definitions of multimorbidity that include not just psychiatric diagnoses but other psychological and social risk factors (Le Reste et al., 2013). Although our results did not support a strong association between multimorbidity and social network, social network may still affect or moderate the management of multimorbidity and particularly of mental health in multimorbidity. Our results showed that some diseases were associated with increases in social network (cancer, heart disease) while others were associated with decreases in social network (osteoporosis, stroke). This could have been due to an increase in instrumental support (Mendes de Leon, Gold, Glass, Kaplan, & George, 2001) for diseases associated with an increase in social network as people with these diseases may have required and sought more instrumental support.

Although our data was cross-sectional and cannot speak directly to causality, it is likely that multimorbidity and mental health have a bidirectional relationship. Depression is a risk factor for several illnesses such as heart disease (Patten et al., 2008). In our sample, the medical conditions comprising multimorbidity likely developed years prior to the survey and the mental health measures were for the past two weeks, suggesting that medical conditions could lead to poor mental health. Previous studies have also suggested that medical illness can worsen mental health (Mitchell et al., 2011).

The conclusions of this study should be considered within the limitations. The NHATS data is, by design, limited to older adults and results cannot be extrapolated to younger samples. However, as most previous studies have examined general adult samples, this study provides important insight into older adults who are much more likely to experience multimorbidity. We also excluded people who used a proxy to complete the survey and who had missing data and this could limit generalizability to older adults who were able to complete the survey themselves. Our measure of social function only assesses social network size and not quality of social support. Furthermore, the results of the factor analysis for disease count only apply to this specific set of diseases and might not apply to disease counts formed from other lists of diseases. The respondents were only given a list of 10 diagnoses and it is likely that they had other diagnoses not captured by this list. A previous study of 30 diagnoses and symptoms reported a three factor structure (Schäfer et al., 2010). This highlights the need for more research on how to measure multimorbidity and to develop a consistent measure across studies (Meghani et al., 2013; Salive, 2013). This was a cross-sectional study and causality could not be determined. However, this study supports continued focus on the management and needs of older adults with multiple medical conditions and, given the implications that multimorbidity is associated with worse mental health, a comprehensive approach that considers the full constellation of medical conditions is recommended. Future research may also focus on how multimorbidity affects the treatment of mental health concerns in older adults.

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Figure 1. Flow Chart of participant inclusion and exclusion of analyses

Table 1

Descriptive statistics for sample with complete mental health data (total unweighted n=7,026). Weights adjust for oversampling of subgroups and non-response.

Variable	% Unweighted	% Weighted
Age		
65-69	19.5%	28.9%
70-74	21.7%	25.7%
75-79	20.3%	19.1%
80-84	19.7%	14.5%
85-89	11.6%	8.3%
90-94	7.2%	3.6%
Female	58.0%	56.5%
Race/ethnicity		
White, Caucasian	65.5%	81.4%
Black, African American	21.2%	7.9%
Other	9.3%	10.7%
Education, Some post-high school education (n=6955)	46.4%	51.5%
Married	51.1%	57.8%
Disease count (range 0-9; n=6964)		
0	9.2%	10.3%
1	19.6%	21.6%
2	25.7%	25.6%
3	22.5%	21.3%
4	13.1%	12.1%
5 or more diseases	9.8%	9.1%
Limited in favorite activity due to health (n=6692)	11.6%	11.4%
	<u>Unweighted mean (SD)</u>	<u>Weighted mean (SD)</u>
PHQ2 (range 0-6; n=6981)	.96 (1.38)	.91 (1.35)
GAD2 (range 0-6; n=7000)	.92 (1.39)	.89 (1.37)
Positive affect (range 2-10; n=6911)	7.96 (1.67)	8.01 (1.64)
Negative affect (range 2-10; n=6921)	4.18 (1.59)	4.16 (1.55)
Number in social network (range 0-5)	1.90 (1.29)	1.95 (1.31)
Disease count (range 0-9; n=6964)	2.44 (1.52)	2.35 (1.52)

Table 2

Fit indices for positive and negative affect and multimorbidity factor analyses.

	<u>Positive and Negative Affect</u>		<u>Multimorbidity</u>	
	One Factor	Two Factor	One Factor- all diseases	One Factor- all except cancer
Perfect Fit	$\chi^2=362.46$, $p<.001$	$\chi^2=90.46$, $p<.001$	$\chi^2=3201.19$, $p<.001$	$\chi^2=3092.81$, $p<.001$
Close fit	$p<.001$	$p=.009$	$p=1.00$	$p=.76$
RMSEA	.110 (.096, .120)	.078 (.059, .098)	.044 (.041, .047)	.048 (.045, .052)
CFI	.98	1.00	.95	.95
RMSR	.043	.016	.074	.080
ECVI	.027	.009	.078	.071
AIC	185.86	60.88	587.29	538.72

Table 3

Factor loadings for multimorbidity factor analysis.

	One Factor- all diseases	One Factor- all except cancer
Heart Disease	.47	.47
Hypertension	.41	.41
Arthritis	.50	.49
Osteoporosis	.41	.41
Diabetes	.32	.32
Lung Disease	.39	.39
Stroke	.48	.48
Dementia	.36	.36
Cancer	.14	N/A
Fracture	.37	.37

Table 4

Regressions on the relationship of mental health with multimorbidity. Analyses adjusted for age, gender, race/ethnicity, marital status and education.

Variable	Std. β	T-test	P-value	R ²
Depressive symptoms				
Disease Count	.276	1664.220	<.001	.071
Gender*Disease Count	-.013	-81.409	<.001	<.001
Heart Disease	.078	464.944	<.001	.085
Hypertension	.043	261.110	<.001	
Arthritis	.089	534.571	<.001	
Osteoporosis	.039	222.498	<.001	
Diabetes	.073	439.372	<.001	
Lung Disease	.087	531.495	<.001	
Stroke	.083	505.232	<.001	
Dementia	.137	835.095	<.001	
Cancer	.017	103.850	<.001	
Fracture	.057	347.689	<.001	
2 or more conditions	.175	1039.114	<.001	.029
Anxiety symptoms				
Disease Count	.257	1538.691	<.001	.062
Gender*Disease Count	.008	48.806	<.001	<.001
Heart Disease	.082	485.165	<.001	.072
Hypertension	.048	288.196	<.001	
Arthritis	.079	464.361	<.001	
Osteoporosis	.076	430.559	<.001	
Diabetes	.021	127.730	<.001	
Lung Disease	.093	566.366	<.001	
Stroke	.063	378.753	<.001	
Dementia	.097	584.729	<.001	
Cancer	.031	188.175	<.001	
Fracture	.065	389.521	<.001	
2 or more conditions	.165	976.212	<.001	.026
Negative Affect				
Disease Count	.191	1080.197	<.001	.034
Gender*Disease Count	-.012	-69.194	<.001	<.001
Heart Disease	.045	252.484	<.001	.038
Hypertension	.035	199.707	<.001	
Arthritis	.072	403.997	<.001	
Osteoporosis	.046	245.319	<.001	
Diabetes	.053	298.569	<.001	

Variable	Std. β	T-test	P-value	R ²
Lung Disease	.061	347.850	<.001	
Stroke	.051	292.470	<.001	
Dementia	.067	387.327	<.001	
Cancer	.018	101.495	<.001	
Fracture	.029	163.540	<.001	
2 or more conditions	.142	804.143	<.001	.019
Positive Affect				
Disease Count	-.212	-1214.614	<.001	.043
Gender*Disease Count	-.009	-52.851	<.001	<.001
Heart Disease	-.070	-397.206	<.001	.047
Hypertension	-.029	-164.471	<.001	
Arthritis	-.097	-549.237	<.001	
Osteoporosis	-.049	-265.170	<.001	
Diabetes	-.056	-320.372	<.001	
Lung Disease	-.073	-423.305	<.001	
Stroke	-.053	-308.254	<.001	
Dementia	-.040	-237.008	<.001	
Cancer	-.067	-103.137	<.001	
Fracture	-.081	-116.741	<.001	
2 or more conditions	-.154	-878.196	<.001	.023
Social Network Size				
Disease Count	.007	42.42	<.001	<.001
Gender*Disease Count	-.022	-131.40	<.001	<.001
Heart Disease	.017	94.509	<.001	.005
Hypertension	.031	178.205	<.001	
Arthritis	.015	86.191	<.001	
Osteoporosis	-.012	-66.528	<.001	
Diabetes	-.043	-246.265	<.001	
Lung Disease	-.007	-41.748	<.001	
Stroke	-.007	-42.620	<.001	
Dementia	-.024	-139.771	<.001	
Cancer	.037	217.286	<.001	
Fracture	.012	70.839	<.001	
2 or more conditions	.021	120.45	<.001	<.001
Activity Limitations				
	OR	95% CI	P-value	
Disease Count	1.517	1.516, 1.518	<.001	
Gender*Disease Count	1.067	1.064, 1.069	<.001	

Variable	Std. β	T-test	P-value	R ²
Heart Disease	1.758	1.753, 1.762	<.001	
Hypertension	1.055	1.052, 1.058	<.001	
Arthritis	2.091	2.085, 2.096	<.001	
Osteoporosis	1.371	1.368, 1.375	<.001	
Diabetes	1.374	1.371, 1.378	<.001	
Lung Disease	1.644	1.640, 1.648	<.001	
Stroke	1.749	1.743, 1.755	<.001	
Dementia	1.706	1.696, 1.716	<.001	
Cancer	1.259	1.256, 1.262	<.001	
Fracture	1.237	1.234, 1.240	<.001	
2 or more conditions	3.064	3.055, 3.074	<.001	

OR=Odds ratio

CI=Confidence interval