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Original article

Psychological distress and fair/poor health among adults with arthritis: state-specific prevalence and correlates of general health status, United States, 2007

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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the **official position** of the Centers for Disease Control and Prevention.

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Abstract

Objectives: To: 1) estimate U.S. state-specific prevalence of serious psychological distress (SPD) and fair/poor health status (FPH), and 2) identify correlates of FPH among adults with arthritis (ARTH+).

Methods: Data were from the 2007 Behavioral Risk Factor Surveillance System (n = 414,719). State-specific weighted prevalence estimates of SPD (≥13 on the Kessler 6 scale) and FPH status were calculated, and multivariate logistic regression was used to identify correlates of FPH in four domains (physical health, mental health, sociodemographics, behaviors).

Results: Prevalence of SPD and FPH were 2 and 3 times higher, respectively, among ARTH+ compared to those without. Among ARTH+, the state-specific prevalence of SPD ranged from 2.7 % to 12.2 % and FPH from 22.1 % to 43.5 %. Health behaviors (physical activity, smoking, heavy drinking) and physical health indicators (e.g. activity limitation, physically unhealthy days, co-morbidity) were the strongest correlates of FPH status. After adjustment, physically active ARTH+ were 50–66 % less likely to report FPH compared to inactive ARTH+.

Conclusions: Psychological distress and poor health status are common in arthritis; increasing physical activity may be an intervention point to improve health status.

Keywords: Arthritis – Health status – Mental health – Health behavior – Co-morbidity.

Introduction

Arthritis is one of the most common chronic conditions affecting 46 million adults in the United States (US), limiting activity for 19 million and is the most frequent cause of disability.[1,2] With the aging of the population, an expected 67 million US adults will have arthritis by the year 2030.[3] Persons with arthritis have poor physical function resulting in disability[1,4–5] and report worse health-related quality of life than do adults without arthritis[6].

Psychologic co-morbidity is also common among persons with arthritis. Serious psychological distress (SPD) and frequent anxiety and depression prevalence among US adults with arthritis are higher than in adults without arthritis, although little is known about variation in these measures at the state level in the US[7], information which may be useful for local level planning. Arthritis not only co-occurs with psychological conditions such as depression, it is a major contributor according to Dunlop et al,[8] who report as much as 18 % of major depression has been attributed to arthritis. Previous depressive symptoms have also been shown to be an independent risk factor for the development of incident arthritis.[9] In addition, depression and anxiety can interfere with compliance and response to medical treatments, as well as contribute to excess mortality and morbidity in arthritis patients.[10–12]

Going beyond psychological measures of health, and capturing the burden of poor general health status among adults with arthritis is also important information for community-based efforts aimed at reducing the impact of arthritis. Gen-

eral health status, a self-rated scale using 5 levels (poor, fair, good, very good, excellent), takes into account both mental health and physical health and is considered a global measure of health-related quality of life. Single item measures of general health status have been shown to be reliable, and to predict mortality, healthcare utilization and clinical health outcomes in the general population and among people with chronic disease.[13–16] Identifying sociodemographic, physical, mental, and behavioral correlates of general health status can be useful in determining the characteristics of adults with arthritis with the highest need for interventions.

The purpose of this study was: 1) to estimate the state-specific prevalence of serious psychological distress (SPD) and fair/poor health status (FPH) among US adults with arthritis, and 2) to identify a predictive model for FPH among adults with arthritis using mental health, behavioral, sociodemographic, and physical health correlates of general health status.

Methods

Data source

The Behavioral Risk Factor Surveillance System (BRFSS) is an annual, random-digit-dialed, telephone health survey conducted in all 50 states, the District of Columbia and U.S. territories (Guam, Puerto Rico and the Virgin Islands). A probability sample of households with telephones are sampled monthly to collect health and risk factor data representative of the civilian, non-institutionalized population aged 18 years and older.

This study used data from the 2007 BRFSS which was sectioned into a core survey, and an optional module. Questions on arthritis status, FPH, and potential health correlates (i.e. mental health, behavioral, sociodemographic, and physical health variables) were asked on the core survey given in all 50 states, the District of Columbia and territories (Guam, Puerto Rico, U.S. Virgin Islands). A detailed description of the BRFSS survey design, execution and full-text questionnaires are available at http://www.cdc.gov/brfss/technical_infodata/surveydata/2007/overview_07.rtf. Six questions developed by Kessler et al.,[23] were asked as part of an optional module in 35 states, the District of Columbia and Puerto Rico. These 6 questions are used to assess SPD as defined below.

Definitions

Adults were considered to have self-reported doctor-diagnosed arthritis if they responded affirmatively to the question "Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus or fibromyalgia?" This case finding question has been used for US surveillance of arthritis prevalence at the state and national level since 2002, and has been shown to have adequate validity for population level surveillance purposes.[17]

Serious psychological distress (SPD) is a nonspecific measure of psychological distress that has been shown to discriminate cases of diagnosed psychological disorders meeting DSM-IV criteria (e.g. major depressive disorder, generalized anxiety disorder, schizophrenia, etc.) from non-cases.[18]

SPD is calculated using the Kessler 6 scale (K6). The K6 consists of a set of 6 questions asking how often in the past 30 days the person felt: 1) so sad that nothing could cheer you up, 2) so nervous that nothing could calm you down, 3) restless or fidgety, 4) hopeless, 5) worthless, 6) everything was an effort. Each question is scored using a Likert-type scale from 0 (none of the time) to 4 (all of the time) and summed (range 0–24). As recommended by Kessler et al,[18] a total score of 13 or higher was used a dichotomous outcome for SPD.

The K6 has been used on large national and international health surveys and can be administered on the telephone, in-person, or in interviewer administered formats.[17] The K6 has demonstrated excellent internal consistency reliability (Cronbach's alpha 0.89–0.92) and criterion validity across many sociodemographic subpopulations.[18,19–20] The K6 has the best ability to detect the presence of any psychiatric disorder but has a lower ability to detect specific disorders or co-morbid psychiatric disorders.[21]

Fair/poor health status (FPH) was determined from the question "Would you say that in general your health is: Excellent, Very Good, Good, Fair, or Poor?" Responses were dichotomized as "Fair/Poor" versus "Excellent/Very Good/Good". This single-item question has been shown to be reliable and valid and predicts mortality, health care utilization, and clinical outcomes in primary care.[13–16]

Domains of Covariates

Potential correlates of FPH assessed in the BRFSS survey were assigned to one of four domains: sociodemographics, physical health indicators, mental health indicators, and health behaviors. Each domain included 3 to 6 individual variables.

The sociodemographic domain (Domain 1) included 6 variables: age in years (18–44, 45–64, and 65+), sex (male, female), race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, and Other), Education (<12 years/did not complete high school, ≥12 years/completed high school or equivalent), body mass index (BMI; normal = <25, overweight = 25.0–29.9, obese = 30.0+), and employment status (working, not working, unable to work). BMI (weight in kilograms/height in meters^2) was calculated using self-reported height and weight.

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Physical health indicators (Domain 2) included 5 variables: arthritis-attributable activity limitation (AAAL; yes response to "Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?"), current joint symptoms (yes response to "During the past 30 days, have you had any symptoms of pain, aching, or stiffness in or around a joint?"), physically unhealthy days (number of days in the past 30 when physical health was not good; range 0–30), activity limitation days (number of days in the past 30 when physical or mental health limited your usual activities; range 0–30), number of co-morbid chronic conditions (range 0–4). Co-morbid conditions included self-reported hypertension, diabetes, heart disease, and asthma.

Mental health indicators (Domain 3) included 4 variables: SPD (defined above), mentally unhealthy days (number of days in the past 30 when mental health was not good; range 0–30), life satisfaction (very satisfied or satisfied vs. very dissatisfied or dissatisfied with life in general), and emotional support (always or usually vs. sometimes, rarely or never receive the social or emotional support you need).

Health behaviors (Domain 4) included 3 variables: physical activity level (inactive, insufficient, and recommended; derived from 6 questions on usual participation in moderate and vigorous activity outside of work), current smoker (currently smokes cigarettes, cigars or pipe), and heavy drinker (men having more than two drinks per day and women having more than one drink per day).

Data Analysis

First, the overall prevalence of SPD and FPH were compared (Wald Chi Square) between adults with and without arthritis. Second, state-specific estimates of SPD and FPH were calculated using the proportion of adults with doctor-diagnosed arthritis as the denominator and the number of those adults reporting either SPD or FPH in the numerator. Estimates were weighted to represent the US adult population age 18 years and older using standardized statistical weights and SUDAAN software to account for the complex survey design. Estimates and 95 % confidence intervals (CIs) of SPD among adults with arthritis were available for 35 states, the District of Columbia and Puerto Rico. Estimates of FPH were available for all 50 states, the District of Columbia and all 3 US territories (Guam, Puerto Rico and the US Virgin Islands).

Univariate logistic regression was used to calculate crude odds ratios (OR) and 95 % CIs for the relationship between each correlate and FPH (excellent/very good/good = referent level). Variables that were significantly associated with FPH (Wald Chi Square $p < 0.05$) in univariate models were included in multivariate models. Model selection was conducted in 2 phases. Phase 1 began by assessing the relationship between each of the 4 domains of independent variables with the dependent variable FPH. Each domain model was further reduced by removing all variables in a stepwise fashion that were not statistically significant (Wald Chi Square $p > 0.05$). Model fit was assessed after each iteration, as described below. Phase 2 began with the domain model with the 'best fit' (defined below) and sequentially added individual variables from the remaining domains until the model fit parameters were maximized.

Because the BRFSS has such a large sample size, most variables are significantly associated with the dependent variable in univariate models and many remain statistically significant in multivariate models. Therefore, to assess whether different domains of variables contribute more or less to the model in Phase 2, Hosmer-Lemeshow Goodness-of-Fit (H-L) statistics and pseudo-R^2 values were calculated to assess the fit of models with different combinations of domains and individual variables.[22] Goodness-of-fit refers to how effective the combination of variables in a model is in relation to characterizing the outcome variable.[23–24] Pseudo-R^2 values are used as a measure of assessing the improvement of a full model (with 1 or more covariates) over a null model (intercept only) and should not be interpreted as the amount of variance explained by the independent variables in the model as in linear regression.[25] However, they are valid and useful in evaluating iterative models predicting the same outcome on the same dataset.[22,24]

Specifically, the H-L test with adjusted Satterthwaite F-test to account for the complex survey design was used to assess model fit.[26] A p-value of ≥ 0.05 indicated model fit. More than a dozen formulas exist for calculating pseudo-R^2 in logistic regression, but no single one has been accepted as the 'best' measure.[22] For this analysis we used the Cox & Snell pseudo-R^2 value which is one of the most commonly reported pseudo-R^2s and takes into account the sample size.[23] The 'best model' was defined as one that had an H-L test p-value ≥ 0.05 and maximized the pseudo-R^2 value.

Results

In 2007, the total sample size with complete data on arthritis for the BRFSS survey (50 states, the District of Columbia and 3 territories) was 414,719, with 27.1 % reporting arthritis. Among the subset of 35 states, the District of Columbia and Puerto Rico that asked the K6 module in 2007 (sample size = 212,016 with complete data), 26.5 % reported arthritis. The prevalence of arthritis was not statistically different between the full data set and the subset. The Council of American Survey Organizations (CASRO) response rates among

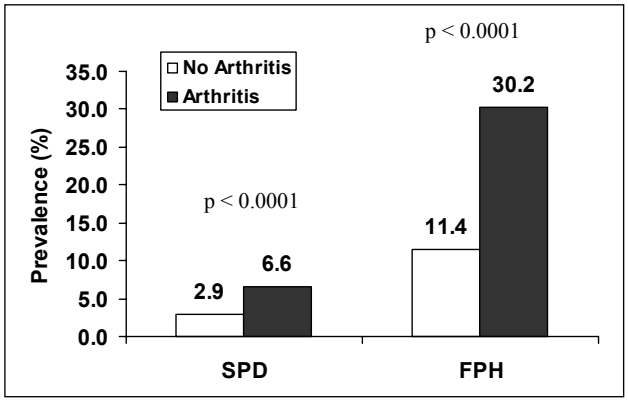

Figure 1. Overall prevalence (%)[a] of serious psychological distress (SPD) and fair/poor health status (FPH) among adults with and without arthritis.

[a] Prevalence estimates of serious psychological distress used data from 35 states and the District of Columbia; prevalence estimates of fair/poor health status used data from 50 states and the District of Columbia.

the 50 states, DC, and the three territories for 2007 ranged from 26.9% (New Jersey) to 65.4% (Nebraska) (median: 50.6%), and cooperation rates ranged from 49.6% (New Jersey) to 84.6% (Minnesota) (median: 72.1%). The complete 2007 BRFSS Data Quality Report, including definitions and methods for calculating cooperation and response rates, is available at http://www.cdc.gov/brfss/technical_infodata/pdf/2007summarydataqualityreport.pdf.

The overall prevalence of SPD was twice as high and the prevalence of FPH was almost three times higher among adults with arthritis compared with those without arthritis ($p < 0.0001$). (Figure 1) Almost 1 in 3 adults with arthritis reported FPH. Results were similar after age-adjustment [SPD: arthritis = 8.2% (95% CI 7.4–9.0), no arthritis = 2.8 (2.6–3.1); FPH: arthritis = 28.2 (27.4–28.9), no arthritis = 12.2 (11.9–12.5)]. (Data not shown)

Of the 37 states/territories that asked the K6 module questions, the prevalence of SPD among adults with arthritis ranged from 2.7% in Alaska to 12.2% in Kentucky (state median 5.8%). (Table 1) Texas had the largest number of persons affected (325,626) while Alaska had the fewest (3,019). Among 50 states and the District of Columbia the prevalence of FPH among adults with arthritis ranged from 22.1% in Vermont to 43.5% in Kentucky (state median 27.7%). In 4 states (California, Florida, New York and Texas) over 1 million adults with arthritis reported FPH. Puerto Rico had the highest prevalence of FPH (61%) among adults with arthritis of the 3 territories.

Table 1. State–specific weighted prevalence of self–reported serious psychological distress* and fair/poor health status among adults with arthritis, Behavioral Risk Factor Surveillance System, 2007.

State	Prevalence of Serious Psychological Distress (SPD)[a]			Prevalence of Fair/Poor Health (FPH)[a]		
	No. (in 1,000's)	% (95% CI[b])	CV[c]	No. (in 1,000's)	% (95% CI[b])	CV[c]
Alabama	–	–	–	466,550	39.0 (36.6–41.4)	3.1
Alaska	3,019	2.7 (1.4–4.0) [c]	25.0	31,989	27.0 (22.0–32.0)	9.4
Arizona	–	–	–	373,328	33.4 (29.4–37.4)	6.1
Arkansas	54,986	9.1 (7.6–10.7)	8.7	240,515	37.5 (35.1–39.8)	3.2
California	270,391	5.3 (3.7–7.0)	15.7	1,551,046	28.8 (25.7–31.9)	5.5
Colorado	26,857	3.5 (2.5–4.5)	15.0	187,363	23.0 (21.3–24.6)	3.6
Connecticut	24,858	3.9 (2.9–5.0)	13.6	153,984	22.8 (20.7–24.9)	4.7
Delaware	–	–	–	50,485	24.7 (21.8–27.6)	5.9
District of Columbia	5,166	5.4 (3.1–7.7) [c]	21.8	26,983	26.0 (22.9–29.2)	6.2
Florida	–	–	–	1,072,035	32.5 (30.6–34.3)	2.9
Georgia	139,097	8.3 (6.7–9.9)	9.9	602,542	32.6 (30.3–35.0)	3.7
Hawaii	9,037	4.0 (2.7–5.3)	16.9	62,077	26.4 (23.6–29.1)	5.4
Idaho	–	–	–	76,729	27.8 (25.2–30.4)	4.7
Illinois	132,103	5.3 (4.0–6.7)	13.0	753,690	29.5 (26.9–32.2)	4.5
Indiana	89,241	6.8 (5.4–8.2)	10.4	437,656	31.2 (28.6–33.7)	4.1
Iowa	23,034	4.1 (3.0–5.2)	13.8	147,643	24.2 (22.0–26.4)	4.7
Kansas	26,841	5.1 (3.7–6.4)	13.2	142,142	25.1 (23.2–26.9)	3.7
Kentucky	107,828	12.2 (10.4–14.1)	7.8	415,200	43.5 (40.8–46.2)	3.2
Louisiana	67,505	9.7 (7.8–11.5)	9.6	296,574	37.2 (34.6–39.8)	3.5
Maine	20,050	6.6 (4.9–8.3)	13.2	89,722	26.9 (24.5–29.2)	4.4
Maryland	–	–	–	300,194	26.3 (24.1–28.5)	4.3
Massachusetts	66,634	5.2 (3.5–7.0)	17.4	328,698	25.0 (23.6–26.4)	2.8

Table 1. Continue

State	Prevalence of Serious Psychological Distress (SPD)[a]			Prevalence of Fair/Poor Health (FPH)[a]		
	No. (in 1,000's)	% (95% CI[b])	CV[c]	No. (in 1,000's)	% (95% CI[b])	CV[c]
Michigan	134,282	5.8 (4.3–7.3)	13.2	620,346	26.4 (24.5–28.3)	3.7
Minnesota	39,186	4.4 (3.0–5.7)	15.8	209,518	23.2 (20.7–25.7)	5.5
Mississippi	55,138	9.0 (7.8–10.3)	7.1	285,433	43.3 (41.1–45.6)	2.6
Missouri	101,548	7.6 (5.8–9.4)	12.0	453,806	32.2 (29.3–35.2)	4.6
Montana	10,977	5.4 (3.9–7.0)	14.3	54,684	26.0 (23.6–28.3)	4.6
Nebraska	15,314	4.2 (2.8–5.7)	17.8	85,818	23.2 (20.9–25.5)	5.0
Nevada	31,301	7.1 (4.6–9.6)	17.9	128,938	28.0 (24.4–31.6)	6.6
New Hampshire	13,613	5.0 (3.9–6.1)	11.4	69,304	24.1 (21.9–26.3)	4.7
New Jersey	–	–	–	508,078	30.1 (27.5–32.6)	4.3
New Mexico	24,396	6.6 (5.1–8.2)	12.0	122,914	31.6 (29.0–34.1)	4.2
New York	–	–	–	1,201,283	30.0 (27.5–32.2)	4.0
North Carolina	–	–	–	660,301	34.5 (32.8–36.1)	2.5
North Dakota	–	–	–	34,290	25.8 (23.3–28.4)	5.0
Ohio	185,097	7.1 (5.6–8.6)	10.8	773,886	28.1 (26.4–29.9)	3.1
Oklahoma	69,453	9.4 (7.8–10.9)	8.7	284,558	35.4 (33.3–37.6)	3.1
Oregon	44,027	6.0 (3.9–8.2)	18.0	181,887	24.6 (22.3–26.9)	4.7
Pennsylvania	–	–	–	880,466	29.0 (26.8–31.2)	3.9
Rhode Island	14,704	6.9 (5.4–8.3)	10.8	64,365	27.0 (24.5–29.5)	4.8
South Carolina	70,836	7.9 (7.0–9.1)	7.8	306,297	32.1 (30.2–34.1)	3.1
South Dakota	–	–	–	40,313	25.8 (23.7–27.9)	4.2
Tennessee	–	–	–	620,572	40.3 (37.2–43.5)	4.0
Texas	325,626	9.2 (7.4–11.1)	10.2	1,393,588	36.0 (34.0–37.9)	2.8
Utah	–	–	–	92,512	24.2 (21.6–26.8)	5.5
Vermont	7,722	5.8 (3.7–7.9)	18.4	30,785	22.1 (20.2–24.0)	4.4
Virginia	89,016	6.2 (4.7–7.6)	11.9	421,412	27.7 (25.0–30.5)	5.1
Washington	56,721	4.5 (3.6–5.3)	9.6	316,098	24.0 (22.9–25.1)	2.4
West Virginia	–	–	–	192,222	37.9 (35.3–40.6)	3.5
Wisconsin	46,992	4.3 (2.9–5.8)	16.9	279,273	24.2 (21.8–26.6)	5.0
Wyoming	5,674	5.5 (4.2–6.8)	12.1	27,624	25.3 (23.2–27.5)	4.3
State Median (range)		5.8 (2.7–12.2)			27.7 (22.1–43.5)	
Guam	–	–	–	6,418	45.8 (34.8–56.9)	12.3
Puerto Rico	64,688	10.7 (8.8–12.7)	9.1	382,258	61.0 (57.7–64.3)	2.8
Virgin Islands	–	–	–	3,897	31.8 (26.9–36.7)	7.9

[a] Estimates of serious psychological distress prevalence are available for 35 states, the District of Columbia, and Puerto Rico; estimates of fair/poor health status are available for all 50 states, the District of Columbia and the 3 territories.
[b] CI = confidence interval.
[c] CV = coefficient of variation; estimates with a coefficient of variation between 20% and 30% may be unreliable.

In phase 1 of the model building process only Domain 4 (Health Behaviors) exhibited 'good fit' per the H-L test. (Table 2) Removing variables within each domain that were not statistically significant did not improve model fit, therefore phase 2 began with all 3 variables in Domain 4. Domain 2 (Physical Health Indicators) was chosen as the next set of variables to add to the Domain 4 model because the pseudo-R^2 was considerably higher than any other domain, even though the H-L test indicated poor model fit. Domain 2 variables were added one at a time based on the magnitude of the Wald F value from the phase 1 model. The model that included all Domain 4 variables and 3 of the Domain 2 variables (physical unhealthy days, co-morbidity category, and arthritis-attributable activity limitation) maximized the pseudo-R^2 value (0.2912) and exhibited good model fit (H-L test p-value = 0.0561). Adding the final Domain 2 variable, activity limitation days, reversed the model fit to poor and thus was excluded. Other combinations of variables from Domains 1 and 3 with Domain 4 also produced models with poor fit. [Data not shown]

Despite the fact that all variables in each of the domains were significantly associated ($p < 0.05$) with FPH in univariate logistic regression models, only 6 variables remained after the 2-phase model building process. (Table 3) Reporting 14 or more physically unhealthy days in the past 30 days had the

Table 2. Among adults with arthritis – Model fit statistics for selected logistic regression models containing different combinations of independent variables, 2007 Behavioral Risk Factor Surveillance System combined 35 states and the District of Columbia.

Domain [a] Model	H-L Test p-value[b]	Cox & Snell Pseudo-R^2 Values[c]
Phase 1 Models		
Domain 1 (Sociodemographics)	<0.0001	0.1665
Age and sex removed	0.0116	0.1645
Domain 2 (Physical Health Indicators)	<0.0001	0.2792
Current joint symptoms removed	<0.0001	0.2789
Domain 3 (Mental Health Indicators)	<0.0001	0.0954
Serious psychological distress removed	<0.0001	0.0905
Domain 4 (Health Behaviors)	0.1328	0.0828
Heavy drinker removed	0.0733	0.0820
Phase 2 Models		
Domain 4+ PUD[d]	0.1214	0.2398
Domain 4+ PUD+MORB	0.0470	0.2749
Domain 4+ PUD+MORB+AAAL	**0.0561**	**0.2912**
Domain 4+ PUD+MORB+AAAL+LIMDAYS	<0.0001	0.2943

[a] Domain definitions: Domain 1 = Sociodemographics (includes age, sex, race/ethnicity, education, body mass index, and employment status); Domain 2 = Physical Health Indicators (includes arthritis-attributable activity limitation, current joint symptoms, hypertension, diabetes, heart disease, and asthma); Domain 3 = Psychological Health Indicators (includes serious psychological distress, emotional support, life satisfaction), and Domain 4 = Health Behaviors (includes, physical activity level, smoking status, and heavy drinking).
[b] Hosmer-Lemeshow (H-L) Goodness-of-Fit Test using a Satterthwaite Adjusted F-test. High p-values (≥0.05) indicate the model has a good fit. [34]
[c] The pseudo R^2 (Cox & Snell) value is interpreted as the improvement from a null model (intercept only) to a fitted model (with covariates). Pseudo R^2 values can range from 0 to 1, with higher values representing better model fit. The Cox & Snell R^2 has a maximum value less than 1. [34]
[d] Abbreviations: All variables from Domain 2. PUD = physically unhealthy days, MORB = co-morbidity categories; AAAL = arthritis-attributable activity limitation, LIMDAYS = activity limitation days.

strongest association with FPH (OR = 7.64, 95 % CI 6.94–8.41) followed by having 3 or 4 co-morbid conditions (OR = 6.91, 95 % CI 5.78–8.27). Two variables were inversely associated with FPH, physical activity level and heavy drinking.

Discussion

Adults with arthritis have a higher prevalence of SPD and FPH than their peers without arthritis and this has been shown at both the national[7] and now the state level. However, there is a wide variation in prevalence of SPD among adults with arthritis from state-to-state, from a low of 2.7 % in Alaska to a high of 12.2 % in Kentucky. The range in prevalence of FPH is similarly wide (22.1 % in Vermont to 43.5 % in Kentucky). These findings suggest that state and local level data are critically important for identifying areas with the highest need for interventions aimed at improving mental, physical, and general health status.

Among adults with arthritis in this population-based study, health behaviors and physical health indicators seem to play a larger role in FPH than mental health indicators or sociodemographic characteristics. Physical health indicators, particularly multi-morbidity, have been shown to be related to FPH in some studies[16,37–40]. However, in contrast to others[27–28], we did not find that the presence of current joint symptoms (e.g. pain, stiffness, aching) to be associated with FPH status among US adults with arthritis. This may be because our symptom measure was merely the presence of symptoms (yes/no), while others[27–28] have found that moderate or severe pain was highly associated with FPH status among adults with arthritis and other chronic diseases using a measure of symptom severity assessed by Likert-type ordinal response options.

Physical inactivity was clearly related to FPH. Adults with arthritis who engaged in at least some physical activity were 50–66 % less likely to report FPH compared with those reporting no physical activity even after adjusting for activity limitations and the presence of other chronic conditions. Due to the cross sectional nature of the BRFSS survey, we are unable to determine the temporal sequencing of physical activity level and FPH. However, these findings are supported by data from prospective randomized controlled trials that report physical activity improves pain and physical function and delays the onset of disability among adults with arthritis.[29] Since physical health indicators such as activity limitation seem to play an important role in FPH among adults with arthritis, it may be possible to improve general health status at the population level through the delivery of physical activity and

Table 3. Among adults with arthritis – Association between sociodemographic factors, physical health indicators, mental health indicators, health behaviors, and fair/poor health status, combined 2007 Behavioral Risk Factor Surveillance System 35 states[a] and the District of Columbia.

Domain/Variable	Distribution (Weighted %)	Fair/poor Health (FPH) Status			
		Crude OR[b]	95% CI[b]	Adjusted[c] OR**	95% CI[b]
Sociodemographics (Domain 1)					
Age					
18-44	20.9	1.00	Referent	--	--
45-64	44.7	1.32	1.19–1.47		
65+	34.3	1.60	1.44–1.78		
Sex					
Male	41.2	1.00	Referent	--	--
Female	58.8	1.09	1.02–1.17		
Race/Ethnicity					
Non-Hispanic White	77.4	1.00	Referent		
Non-Hispanic Black	8.8	2.19	1.90–2.45	--	--
Hispanic	5.8	1.55	1.33–1.81		
Non-Hispanic Other	8.0	2.51	2.12–2.98		
Education					
< HS	12.5	3.67	3.32–4.06	--	--
≥ HS	87.5	1.00	Referent		
Body Mass Index					
< 25.0	27.9	1.00	Referent	--	--
25.0–29.9	36.8	0.98	0.91–1.07		
30.0+	35.3	1.77	1.63–1.92		
Employment status					
Working	43.6	1.00	Referent	--	--
Not working	45.1	2.34	2.16–2.54		
Unable to work	11.4	15.00	13.32–16.90		
Physical Health Indicators (Domain 2)					
Arthritis-attributable activity limitation (Yes)	38.8	4.44	4.14–4.75	2.32	2.12–2.54
Current joint symptoms (Yes)	75.7	2.01	1.84–2.19	--	--
Physical unhealthy days					
0–13	77.4	1.00	Referent	1.00	Referent
14+	22.6	12.54	11.55–13.61	7.64	6.94–8.41
Activity limited days					
0–13	86.1	1.00	Referent	--	--
14+	13.9	10.75	9.81–11.78		
Co-morbid conditions					
0	38.0	1.00	Referent	1.00	Referent
1–2	54.9	2.86	2.63–3.11	2.44	2.19–2.71
3–4	7.1	12.03	10.56–13.71	6.91	5.78–8.27
Mental Health Indicators (Domain 3)					
Serious psychological distress (SPD) (Yes)	6.6	6.65	5.80–7.64	--	--
Mentally unhealthy days					
0–13	84.9	1.00	Referent	--	--
14+	15.1	4.27	3.91–4.66		
Life Satisfaction					
Very satisfied/satisfied	91.9	1.00	Referent	--	--
Very dissatisfied/dissatisfied	8.1	5.00	4.47–5.60		
Emotional support					
Always/usually	75.4	1.00	Referent	--	--
Sometimes/rarely/never	24.6	2.65	2.47–2.86		
Health Behaviors (Domain 4)					
PA level[b]					
Inactive	17.9	1.00	Referent	1.00	Referent
Insufficient	38.9	0.31	0.28–0.33	0.50	0.45–0.56
Recommended	43.2	0.19	0.17–0.21	0.34	0.30–0.39
Current Smoker (Yes)	19.7	1.62	1.50–1.75	1.48	1.33–1.65
Heavy Drinker (Yes)	4.8	0.61	0.50–0.74	0.69	0.55–0.86

[a] Analyses used data from 35 states and the District of Columbia.
[b] OR = odds ratio; CI = confidence interval; PA = physical activity.
[c] Adjusted ORs were calculated using a 2 phase model building process. All ORs are statistically significant (Wald Chi Square $p \leq 0.05$) and adjusted for all other variables in the final model.
--Variables were not statistically significant in the final model.

exercise interventions in community settings that have been shown to improve these indicators.

These data suggest that heavy consumption of alcohol may confer some benefit in terms of general health status among adults with arthritis (a similar relationship was seen among adults without arthritis [data not shown]). Other studies from around the world have found moderate alcohol consumption to be positively related to general health status[30–35] and heavy drinking or 'intoxication' negatively related[30–32,35]. Our definition of heavy drinking (2+ drinks per day for men, 1+ drink per day for women) would be considered low to moderate alcohol intake in other studies[32–35] which is likely related to the cultural perceptions regarding alcohol in different countries. The relationship between alcohol intake and general health may also vary by gender[31,34–35] and the type of alcohol ingested (e.g. wine, beer, hard liquor)[32–33,35]. We found no differences by gender [data not shown], however, we cannot assess the independent effect of different types of alcohol due to the question format used in the BRFSS. Moderate intake of alcohol, if not contraindicated for medical reasons (diagnosis of gout, medication interactions, etc.), may help persons with arthritis with stress management, relaxation, and sleep quality, which subsequently may improve their perceived general health status.

Public health approaches to arthritis include self-management education and physical activity promotion, particularly participation in community-based physical activity programs. Community-based programs are available and effective at improving arthritis symptoms, physical function, and mental health, yet are underused.[36,37] Identifying persons and/or communities where there is significant need for these programs is helpful for targeting program implementation. These data suggest that select states, such as Kentucky, Louisiana, Texas and California, have high numbers and rates of SPD and FPH among their adults with arthritis and could benefit the most by widespread dissemination of effective programs. Since having multiple chronic conditions was one of the strongest correlates of FPH in this analysis, non-disease specific programs such as the Chronic Disease Self-Management Program and EnhanceFitness (http://www.cdc.gov/arthritis/intervention/index.htm) may be the most appropriate for communities to disseminate.

Despite the large sample size, ability to calculate state-level estimates, and the variety of sociodemographic, physical, mental and health behavior variables available, this study has several limitations. As with all cross sectional surveys we are unable to determine the temporal sequencing of the key variables in this study, however, as noted, some of these relationships have been confirmed in prospective studies. All data were self-reported and not confirmed by a health care provider or other objective measures and therefore there may be subject misclassification bias. However, it is likely any bias would be non-differential and thus the associations reported would be biased towards the null. The BRFSS is the largest telephone health survey in the world, but has had diminishing response rates which may limit the generalizability of these findings, particularly to those persons who do not have a residential telephone line, are cognitively impaired, or reside in institutions. Estimates generated from the BRFSS over time are relatively stable and mirror other national health surveys using different methodologies, suggesting the survey is still useful for determining public health burden of chronic conditions and health behaviors.[38] Last, the BRFSS lacks information on several variables that may be linked to general health status, such as demographic (e.g. family structure), environmental (neighborhood characteristics, population density, etc.) and psychosocial constructs (self esteem, stress, illness perceptions, self-efficacy, social support, etc.).[39–40] This may partially explain the moderately low pseudo-R^2 value of 0.29 we report in Table 2.

Adults with arthritis have more psychological distress and worse general health status than their peers without arthritis. In this population, physical health indicators, including the presence of multiple co-morbid chronic conditions, are the largest contributor to poor health. Widespread dissemination of effective, community-based self-management education and physical activity programs may be able to improve the general health status of this large population of persons with arthritis.

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers of Disease Control and Prevention.

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