Social integration and healthy aging among U.S. women

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ABSTRACT

Background: Social integration has been related to risk of chronic diseases and mental health conditions.
Purpose: We investigated the association between social integration in midlife with subsequent health and well-being in aging.
Methods: We included women from the Nurses' Health Study in the United States, who had no major chronic diseases in 1996 when we assessed social integration, using the Berkman-Syme Social Network Index. We defined healthy aging after 16 years of follow-up, when women ranged from 66 to 91 years, on the basis of survival along with 4 health criteria, assessed in 2012: no history of major chronic disease diagnosis, no self-reported impairment in memory, and no major impairments in physical function or mental health.
Results: Of the 41,013 surviving participants in 2012 with information on social integration and health criteria, 6206 (15.1%) were healthy agers (i.e., met all four criteria) and the remaining 34,807 (84.9%) were usual agers. After multivariable adjustment, women who were socially integrated at midlife had modestly better odds (odds ratio = 1.38, 95% confidence interval: 1.23, 1.55) of healthy aging compared to women who were socially isolated.
Conclusions: In this study, we found that women who were more socially integrated were more likely to be healthy agers. The results provide evidence for a longitudinal association between social integration and healthy aging.

1. Introduction

As the proportion of the U.S. population 65 years and older continues to grow (Centers for Disease Control and Prevention, 2013), identifying factors that contribute to healthy aging are of increasing importance. Midlife factors likely contribute to many chronic health conditions that manifest during older age. Social integration is one such factor that may have a significant impact on both physical and mental health in later life (Berkman et al., 2000). Prior studies have suggested that increased social integration associated with better physiological function (Yang et al., 2016), reduced risk of chronic diseases (Crittenden et al., 2014; Yang et al., 2016), dementia (Kuiper et al., 2015), and mortality (Barger, 2013). Social integration includes marital status, contact with relatives and friends, religious service attendance, as well as community activities (Berkman and Syme, 1979). These individual components could each be related to healthy aging; for example, prior evidence has indicated that religious service attendance is associated with better physical and psychological health (Powell et al., 2003; Hackney and Sanders, 2001). Additionally, a recent study found

that frequent attendance at religious services was associated with lower risk of all-cause, cardiovascular, and cancer mortality (Li et al., 2016). Thus, we investigated the associations between social integration in midlife with subsequent healthy aging, a composite outcome including survival as well as self-reported measures of chronic disease, impairments in memory, physical function, and mental health, among women in the Nurses' Health Study.

2. Methods

2.1. Study population

The Nurses' Health Study began in 1976 when 121,700 U.S. married women aged 30 to 55 years completed a mailed questionnaire. Follow-up questionnaires were sent every 2 years and follow-up remains completed for > 90%. In 1992 and every four years thereafter, the Medical Outcomes Study Short-Form-36, a 36 item-questionnaire which evaluates eight health concepts (including mental health and physical functioning) was administered (Ware, 1993). In 2012, questions were

added that addressed subjective memory concerns. This study was approved by the Institutional Review Board of Brigham and Women's Hospital (Boston, MA).

2.2. Ascertainment of social integration

Social integration was measured by the Berkman-Syme Social Network Index (Berkman and Syme, 1979), a composite measure of four types of social connection: marital status (married versus not); sociability (number and frequency of contact with children, close relatives, and close friends); church group membership (yes versus no); and membership in other community organizations (yes versus no). Responses to the Social Network Index were categorized into four levels of social connection: socially isolated (individuals with low intimate contacts- not married, fewer than six friends or relatives, and no membership in either church or community groups), moderately isolated, moderately integrated, and socially integrated (Kawachi et al., 1996). We defined baseline in this analysis as social integration as assessed in the 1996 questionnaire (the Berkman-Syme Social Network Index = 1 for socially isolated, 2–5 for moderately isolated, 6–7 for moderately integrated, 8–12 for socially integrated). See the Online Supplement for further details of the calculation.

2.3. Ascertainment of healthy aging

We separated "healthy" from "usual" aging on the basis of survival as well as 4 health domains measured in 2012. We considered persons free of 11 chronic diseases, with no reported memory impairment, no physical disabilities, and intact mental health as healthy agers; remaining women were usual agers.

Incidence of 11 chronic diseases was reported on the biennial questionnaires (Colditz et al., 1995; Barr et al., 2002; Alonso et al., 2008; Sun et al., 2007). This list combined primary causes of death in the United States (cancer other than non-melanoma skin cancer, myocardial infarction, coronary artery bypass surgery, percutaneous transluminal coronary angioplasty, congestive heart failure, and stroke) and diseases commonly found in the literature on healthy aging (type 2 diabetes, kidney failure, chronic obstructive pulmonary disease, Parkinson disease, multiple sclerosis, and amyotrophic lateral sclerosis). To avoid redundancy, we did not include diseases that were reflected by other components of our healthy aging outcome (for example, dementia was not one of the chronic diseases considered because subjective memory concerns were a separate domain).

Subjective memory complaints were assessed through a set of 7 yes/no questions from the 2012 biennial questionnaire. These questions were based on a prior study that used these same questions to detect individuals with possible cognitive impairment (Go et al., 1997). No impairment in memory was defined as at most one memory complaint.

We identified impairment of physical function as any of the following: limited at least "a little" on moderate activities as assessed by the Medical Outcomes Study Short-Form-36 (such as moving a table, bowling, or pushing a vacuum cleaner, climbing one flight of stairs, walking > 1 mile or walking several blocks; bathing or dressing) or limited "a lot" on more difficult items (such as running, lifting heavy objects, lifting or carrying groceries, climbing several flights of stairs, bending, kneeling, or stooping).

Lastly, on the basis of answers to the Geriatric Depression Scale-15(Lyness et al., 1997) (range: 0–15, lower scores indicating better mental health), we defined good mental health as a score less than or equal to 1 (the median value in the cohort).

2.4. Ascertainment of covariates

Sociodemographic, lifestyle and health-related covariates (age; smoking; body mass index; physical activity; alcohol consumption; diet quality; husband's education; hypertension, hypercholesterolemia,

physical exam in the past two years; post-menopausal hormone use) were obtained from the 1996 biennial questionnaire. Median annual household income and home value were estimated from the census tract of participant's residence, geocoded to the 1994 U.S. Census.

2.5. Population for analysis

Among 100,952 women who returned their 1996 questionnaire, 14,224 were excluded because of missing information on social integration. An additional 21,876 women were excluded because they had reported a history of any of the 11 chronic diseases as of 1996. We excluded 23,839 women missing the healthy aging outcome due to an incomplete Medical Outcomes Study Short-Form-36, skipping any items on the Geriatric Depression Scale-15, skipping > 5 items on the physical function scale, or the missing responses to the questions on subjective memory complaints on the 2012 questionnaire. Thus, we had 41,013 participants available for analyses.

2.6. Statistical analysis

To evaluate the association between social integration in midlife and healthy aging, we used age-adjusted and multivariable-adjusted logistic regression models. Sociodemographic, lifestyle, and health-related covariates were obtained from the 1996 questionnaire. We also secondarily conducted analyses in which we examined the individual components of the social integration score (marital status, religious service attendance, membership in other community organizations, and sociability level). When considering the individual components, all components were included in models simultaneously and multivariable models were adjusted for the same confounders as in the main analysis. In sensitivity analyses, we considered social integration in 2000, 2004, and 2008 in relation to healthy aging in 2012; these were not primary analyses since we were concerned that as the women aged, their level of social integration may become increasingly linked with their underlying health, possibly leading to reverse causation bias. We used sensitivity analysis for unmeasured confounding to assess the robustness of our results to uncontrolled and residual confounding (Ding and VanderWeele, 2016).

3. Results

Compared to women who were socially isolated at midlife, women who were socially integrated (Table 1) tended to drink less, were more physical active, were less likely to be current smokers, were more likely to be not employed outside the home or retired, were more likely to have a physical exam in the past two years, and their husbands tended to have a higher education level. The groups were similar in terms of body mass index, diet quality, median family income, and prevalence of hypertension and high cholesterol.

Of the 41,013 participants, 6206 (15.1%) were considered healthy agers and the remaining 34,807 (84.9%) were considered usual agers. In age-adjusted analyses of social integration at midlife and subsequent odds of healthy aging, women who were socially integrated had 48% higher odds (odds ratio (OR) = 1.48, 95% confidence interval (CI): 1.33, 1.65) of healthy aging compared to women who were socially isolated at midlife. After adjusting for potential confounders, results were attenuated but remained significant (multivariable-adjusted OR comparing socially integrated vs. socially isolated = 1.34, 95% CI: 1.18, 1.51, Table 2). In sensitivity analysis for unmeasured confounding, an unmeasured confounder that was associated with both social integration and healthy aging by a risk ratio of 2.01-fold each could explain away the estimate, but weaker confounding could not; to shift the confidence interval to include the null, an unmeasured confounder that was associated with social integration and healthy aging by a risk ratio of 1.64 each could do so, but weaker confounding could not.