Preventive Medicine 71 (2015) 61–66

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Social engagement and chronic disease risk behaviors: The Multi-Ethnic Study of Atherosclerosis

Laura J. Samuel [a,*], Cheryl R. Dennison Himmelfarb [a], Moyses Szklo [b], Teresa E. Seeman [c,d], Sandra E. Echeverria [e], Ana V. Diez Roux [f,1]

[a] Johns Hopkins University, School of Nursing, 525 N Wolfe St., Baltimore, MD 21205, USA
[b] Johns Hopkins University, Bloomberg School of Public Health, 615 North Wolfe Street, Room W6009, Baltimore, MD 21205, USA
[c] University of California, Los Angeles, David Geffen School of Medicine at UCLA, Department of Medicine, Division of Geriatrics, 10945 Le Conte Avenue, Suite 2339, Los Angeles, CA 90095, USA
[d] University of California, Los Angeles, School of Public Health, 10945 Le Conte Avenue, Suite 2339, Los Angeles, CA 90095, USA
[e] Rutgers School of Public Health, RWJMS Research and School of Public Health Bldg., 683 Hoes Lane West, Room 205, Piscataway, NJ 08854, USA
[f] University of Michigan, School of Public Health, 1415 Washington Heights, Ann Arbor, MI 48104, USA

ARTICLE INFO

Available online 15 December 2014

Keywords:
Social engagement
Social support
Neighborhood social cohesion
Physical activity
Smoking

ABSTRACT

Objective. Although engagement in social networks is important to health, multiple different dimensions exist. This study identifies which dimensions are associated with chronic disease risk behaviors.

Methods. Cross-sectional data on social support, loneliness, and neighborhood social cohesion from 5381 participants, aged 45–84 from the Multi-Ethnic Study of Atherosclerosis was used.

Results. After adjusting for individual characteristics and all social engagement variables, social support was associated with lower smoking prevalence (PR = 0.88, 95% CI: 0.82, 0.94), higher probability of having quit (PR = 1.03, 95% CI: 1.01, 1.06) and a slightly higher probability of achieving physical activity recommendations (PR = 1.03, 95% CI: 1.01, 1.06). Neighborhood social cohesion was associated with very slightly higher probability of achieving recommended (PR = 1.03, 95% CI: 1.01, 1.05) or any regular (PR = 1.0, 95% CI: 1.01, 1.04) physical activity, and a higher probability of consuming at least five daily fruit and vegetable servings (PR = 1.05, 95% CI: 1.01, 1.09).

Conclusions. Both social support and neighborhood social cohesion, a less commonly considered aspect of social engagement, appear to be important for chronic disease prevention interventions and likely act via separate pathways.

Introduction[2]

Risk behaviors, including smoking, lack of physical activity and poor diet, contribute to chronic disease, including cardiovascular disease, burden (Mokdad et al., 2004). Social engagement, meaning the degree of an individual's involvement in social networks, may reduce risk behaviors by enhancing self-efficacy, reducing distress and facilitating access to health-related information (Berkman and Krishna, 2014). Social engagement can be conceptualized along multiple dimensions, each capturing a resource gained from social networks (Cohen and Wills, 1985). For example, emotional social support is the love, care and trust in social networks (House, 1981). Another dimension gaining attention is loneliness, representing perceived social and emotional isolation (Hawkley et al., 2005). Finally, neighborhood social cohesion captures solidarity with community networks (Kawachi and Berkman, 2000).

Emotional social support (Delva et al., 2006; Holahan et al., 2011; Poortinga, 2006a; Vaananen et al., 2008) and neighborhood social cohesion (Carpiano, 2007; Kandula et al., 2009; Li et al., 2012) are generally associated with lower, and loneliness with higher (Lauder et al., 2006; Shankar et al., 2011), smoking rates. However, social support (Yun et al., 2010) and social cohesion (Chuang and Chuang, 2008; Li et al., 2012) may be associated with higher smoking rates in groups with high rates of smoking. Emotional social support (Weyers et al., 2010) and neighborhood social cohesion (Cleland et al., 2010; Cradock et al., 2009; Echeverria et al., 2008; Pabayo et al., 2010; Shelton et al., 2011; Utter et al., 2011) are often associated with greater, and loneliness with less (Hawkley et al., 2009; Shankar et al., 2011), physical activity, although associations are inconsistent for social support (Debnam et al., 2012; Poortinga, 2006b) loneliness (Lauder et al., 2006) and social cohesion (Ball

* Corresponding author at: Johns Hopkins University, Bloomberg School of Public Health, 2024 E. Monument Street, Suite 2-700, Baltimore, MD 21205-2223, USA.
E-mail addresses: lsamuel@jhmi.edu (L.J. Samuel), cdennis4@jhu.edu (C.R. Dennison Himmelfarb), mszklo@jhsph.edu (M. Szklo), tseeman@mednet.ucla.edu (T.E. Seeman), sandra.echeverria@rutgers.edu (S.E. Echeverria), avd37@drexel.edu (A.V. Diez Roux).
[1] Present Address: Drexel University School of Public Health, Nesbit Hall, 3215 Market St., Philadelphia, PA 19104, USA.
[2] Abbreviations: MESA: Multi-Ethnic Study of Atherosclerosis; MET: Metabolic equivalent.

http://dx.doi.org/10.1016/j.ypmed.2014.12.008
0091-7435/

et al., 2010; Veitch et al., 2012) in similar large, diverse samples. Emotional social support is also associated with greater fruit and vegetable intake (Debnam et al., 2012; Poortinga, 2006a).

Many studies are limited to one dimension of social engagement, precluding their comparison. Also, these variables should, theoretically, have synergistic interactions, so prior results may underestimate the total potential effect of social engagement on behaviors (Uchino, 2004). There is some evidence of synergistic interactions between social support and loneliness as they relate to health (O'Donovan and Hughes, 2007; Pressman et al., 2005). The presence of countervailing or interacting influences of different types of social engagement may also account for prior conflicting findings. The purpose of this paper was to examine and contrast associations of several related, but distinct, measures of social engagement with behaviors and test for hypothesized synergistic interactions between them.

Methods

Sample

The Multi-Ethnic Study of Atherosclerosis (MESA) is a multi-ethnic cohort study investigating the prevalence and progression of subclinical cardiovascular disease, described elsewhere (Bild et al., 2002). Briefly, 6814 participants aged 45 to 84 without clinical cardiovascular disease were recruited from six U.S. geographical areas: Baltimore City and Baltimore County, Maryland; Chicago, Illinois; Forsyth County, North Carolina; Los Angeles County, California; New York City, New York; and St. Paul, Minnesota. Each site employed slightly different sampling procedures. However, all sites used random sampling strategies to recruit from available community lists and attempted to recruit equal numbers of men and women from at least two *a priori* categorized racial/ethnic groups (White, Black, Hispanic, and Chinese) to facilitate racial/ethnic comparison of risk factors.

Data collection

Data for these analyses were obtained during the baseline in-clinic examination, which occurred between July 2000 and July 2002, except for loneliness, which was measured in the fourth in-clinic examination, carried out between July 2005 and July 2007. Loneliness is included in the current analyses as there is evidence that loneliness is relatively stable during adulthood (Boomsma et al., 2005). Participants with complete data for analyses of physical activity ($n = 5378$), fruit and vegetable intake ($n = 4966$) current smoking status ($n = 3408$) and smoking cessation among all who ever smoked ($n = 2627$) were included.

Outcome variables

Three behaviors, each capturing slightly different aspects of chronic disease risk, were dichotomized, using clinically relevant cut points. Smoking status was derived by asking "Have you smoked cigarettes during the last 30 days?" and "Have you smoked at least 100 cigarettes in your lifetime?". To evaluate the progression from never smoking, to smoking, to cessation, current smokers were compared to never smokers, and former smokers were compared to current smokers. Participants who achieved CDC-recommended levels of physical activity (≥500 Metabolic equivalent (MET) minutes of moderate to vigorous physical activity weekly) (U.S. Department of Health and Human Services, 2008) were compared to those who reported less. Separately, participants who reported any regular moderate to vigorous physical activity were compared to those who reported none. MET minutes of leisure-time moderate and vigorous physical activity per week were calculated by multiplying the minutes spent in each activity by the MET level for the activity, defined by prior research (Ainsworth et al., 2000), using data from the MESA Typical Week Physical Activity Survey, which was adapted from a previously validated survey (Whitt et al., 2003). The survey asks participants if they performed various activities in a "typical week in the past month", and records the level of effort and amount of time for each activity. Fruit and vegetable intake was calculated as the average daily servings of previously itemized fruit, fruit juice, and vegetable foods (Nettleton et al., 2006) using responses to the MESA 120-item food frequency questionnaire, which is adapted from a previously validated questionnaire (Block et al., 1990) and assesses typical diet over the past year. In analyses, five daily servings of fruits and vegetables was used as a cut point, which is roughly equivalent to the minimal suggested intake (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010), but since most participants did not meet this recommendation, a separate model also compared those who consumed at least two daily servings to those who consumed less than two, comparable to prior work (Poortinga, 2006a).

Main independent variables

Social support was measured using the six-item emotional social support index (Mitchell et al., 2003), which asks about having someone available to listen, or provide advice, or show affection (Cronbach's α in this sample = 0.88). Loneliness was measured with an instrument derived from the revised University of California at Los Angeles Loneliness Scale (Russell et al., 1980) ($\alpha = 0.79$), asking participants how often they lack companionship, feel left out, or isolated from others. Neighborhood social cohesion was assessed with the instrument from the Project on Human Development in Chicago Neighborhoods (Sampson et al., 1997), asking participants if the neighborhood is close-knit and whether neighbors help each other, get along, can be trusted, and share the same values ($\alpha = 0.70$). Because hypotheses focused on how individual-level perceptions of social engagement influence health behaviors, perceived neighborhood social cohesion was examined as an individual-level variable. Scores from each instrument were standardized (i.e. z scores) prior to analyses.

Covariates

Demographic characteristics, socioeconomic factors and self-reported health were considered potential confounders and adjusted for in analyses. This included age, sex, marital status (married, widowed, divorced/separated, never married), race/ethnicity (White, Black, Hispanic, Chinese), family annual income (<$16,000, $16,000–$29,999, $30,000–$49,999, $50,000–$74,999, >$75,000),level of education achieved (<high school, high school/GED, some college/technical school/Associate's degree, Bachelor's degree, Graduate degree) and study site (categorized as above). Self-reported health (poor/fair, good, very good, excellent) was also included since health declines may lead to both social isolation and behavior changes.

Statistical analysis

Prevalence ratios (PR) of behaviors associated with standardized social engagement variables (i.e. z scores) were modeled with Poisson regression, using robust standard errors (Wacholder, 1986; Zou, 2004) in Stata 10 (StataCorp, 2007). Models were built in a step-wise fashion, testing unadjusted associations, then adjusting for covariates prior to adding all social engagement variables. Interaction terms between each pair of social engagement variables were then tested and retained in the model if they were both statistically significant ($p < 0.05$) and improved model fit, based on Akaike Information Criterion (Akaike, 1974). Stratified analyses were used to further examine statistically significant ($p < 0.05$) interactions. Correlations between social engagement variables were also examined.

Results

Table 1 describes characteristics of the sample, comparing individuals with low and high levels of each social engagement variable, split at the median value. Overall, socially engaged participants tended to be slightly older, male, White, married, and have higher incomes and better health. There was also no evidence of collinearity in adjusted analyses (i.e. variance inflation factor ≥ 10, tolerance ≤ 0.1). Also, loneliness, which was measured at the fourth examination, was correlated with social support, measured at both the first and the fourth examination (Spearman $\rho = -0.3879$ and -0.5106, respectively). Linear associations between the logarithmic prevalence ratio and standardized social integration variables were confirmed using lowess plots, which is a nonparametric method used to visualize the relationship between variables (Cleveland and Mcgill, 1985).

Unadjusted and adjusted prevalence ratios of risk behaviors in relation to a standard deviation increase of social engagement variables are shown in Table 2. In unadjusted models (Model 1), each standard