# Social Networks of Lesbian, Gay, Bisexual, and Transgender Older Adults

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## Abstract

Purpose: This study examines global social networks—including friendship, support, and acquaintance networks—of lesbian, gay, bisexual, and transgender (LGBT) older adults. Design and Methods: Utilizing data from a large community-based study, we employ multiple regression analyses to examine correlates of social network size and diversity. Results: Controlling for background characteristics, network size was positively associated with being female, transgender identity, employment, higher income, having a partner or a child, identity disclosure to a neighbor, engagement in religious activities, and service use. Controlling in addition for network size, network diversity was positively associated with younger age, being female, transgender identity, identity disclosure to a friend, religious activity, and service use. Implications: According to social capital theory, social networks provide a vehicle for social resources that can be beneficial for successful aging and well-being. This study is a first step at understanding the correlates of social network size and diversity among LGBT older adults.

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## Introduction

Understanding social networks is essential for gerontological research. It has been repeatedly demonstrated that, among older adults, those embedded in resource-rich social networks experience better well-being (Litwin & Shiovitz-Ezra, 2011), better mental health (Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006; Fiori, Antonucci, & Cortina, 2006), and other health benefits (Cornwell & Waite, 2009) compared to those in resource-poor networks. The lack of social relationships, on the other hand, is associated with increases in risky health behaviors (Shankar, McMunn, Banks, & Steptoe, 2011) and poor physical health (Cacioppo & Hawkley, 2003).

In contrast to a large number of studies that have examined older adults' social networks in the general population, network studies specific to lesbian, gay, bisexual, and transgender (LGBT) older adults are limited. Among LGB older adults, increased social network size has been found to be inversely related to poor general health, disability, and depression (Fredriksen-Goldsen et al., 2013). Furthermore, social network size appears to attenuate the relationship between internalized stigma and poor general health in these populations (Fredriksen-Goldsen et al., 2013).

Social networks, in a broad sense, are relationships with family, friends, coworkers, neighbors, members of a community, acquaintances, and even members in online networking sites. Depending on the type of relationships, social networks have been conceptualized in different ways. It is important to distinguish between *peripheral* or *acquaintance* networks and *personal* or *support networks* (see Wrzus, Hanel, Wagner, & Neyer, 2013 for further information). Most of the aging literature focuses on support networks and their association with health outcomes among older adults (van Tilburg, 1998). However, it has been suggested that acquaintance ties are also important, especially for diffusion of influence and information within communities (Granovetter, 1973). Neighborhood contacts were shown to have important positive influences on social support as well as on changes in social support over time for British older adults (Gray, 2009). A recent meta-analysis of changes in social networks across the life span showed that peripheral relationships such as those at community organizations, church, or in the neighborhood might be most important at older ages when one is going through specific life events such as retirement (Wrzus et al., 2013).

Social network research distinguishes between sociocentric network data—data that contain all relationships between the people within a well-defined group such as a village—and egocentric (personal) network data. For a particular person (ego), egocentric social network data can be viewed as information on a subset of the people (alters) that the ego knows (O'Malley, Arbesman, Steiger, Fowler, & Christakis, 2012). In terms of egocentric network data, collecting information is typically done by asking a respondent (ego) about limited number of people (alters), such as close friends or individuals providing social support (Cornwell, 2009; Grossman, D'Augelli, & Hershberger, 2000). Collecting network data on acquaintances, however, precludes obtaining detailed information on alters due to the higher number and nature of these ties. In this article, we examine *general egocentric social networks that include support, friendship and acquaintance networks* of LGBT older adults from Caring and Aging with Pride: The National Health, Aging, and Sexuality Study (Fredriksen-Goldsen et al., 2011).

## Theoretical Background

Social networks can be incorporated in a variety of theoretical frameworks, including social capital theory. The concept of social capital involves a notion of social relations (i.e., the social network) as an available resource (e.g., social support). Social capital can be defined as a function of social structure—a system of social relations—producing advantage for individuals who are within that structure (Coleman, 1988). Social ties—with kin, partners, adult children, friends, neighbors, or with fellow members of organizations—constitute social capital of older adults that can give them access to social, emotional, and practical support (Gray, 2009).

This article examines two characteristics of social networks: social network size and diversity. Based on social capital theory, social network size is the most basic characteristic of egocentric social network providing a vehicle for social resources—most notably, social support—that can be beneficial for people's health and well-being (Gray, 2009; Wrzus et al., 2013). Another form of social capital is network diversity, as it relates to social network bridging also known as network betweenness or centrality (Freeman, 1979), brokerage (Burt, 2005), and boundary spanning (Aldrich & Herker, 1977). Social network bridging is present when a person's position in the network provides connections to individuals who are otherwise not connected with each other. Social network researchers describe bridging as one of the network positions that tend to be associated with power, importance, and independence (Kolaczyk, 2009). The importance of network bridging for health

outcomes has been emphasized in the health literature (Cornwell, 2009; Eriksson, 2011; Valente & Fujimoto, 2010). Working within health and life-course frameworks, Cornwell (2009) identified the need to study network bridging potential in older adults as providing a different perspective on social networks than the traditional focus on social support. Cornwell (2009, p. 130) argued that benefits from social bridging include (a) having access to a variety of resources from different social domains and (b) being more independent from the control of others. In the absence of direct measures of bridging, social network diversity can be considered as an indicator of network bridging potential according to social capital theory (Putnam, 2000).

## Determinants of Social Network Among LGBT Older Adults

### Background Characteristics

Numerous studies demonstrate that individual characteristics are associated with social network size (Cornwell, Laumann, & Schumm, 2008; Wrzus et al., 2013). Social network size diminishes with aging in the general population (Cornwell et al., 2008) as well as among LGBT older adults (Fredriksen-Goldsen, Kim et al., 2015). African American and Hispanic older adults were found to have smaller networks compared to Whites (Cornwell et al., 2008). Social network size is also found to decrease with having chronic illness (McLaughlin, Vagenas, Pachana, Begum, & Dobson, 2010).

Previous studies consistently find that, among older adults, women have larger social networks than men (Cicirelli, 2010; Cornwell et al., 2008; McLaughlin et al., 2010); the same pattern is observed among LGB older adults (Fredriksen-Goldsen et al., 2013; Grossman et al., 2000). Older adults with higher levels of education tend to have larger social networks (Ajrouch, Blandon, & Antonucci, 2005), and those with higher incomes have been found to have larger (Belle, 1982) and more diverse (Fiori et al., 2006) networks. Being engaged in a work space allows one to expand his or her social network to coworkers, and retirement represents a significant transition for older adults' social networks (Wrzus et al., 2013). However, one recent population-based study found that those who are retired tend to have larger social networks among older adults (Cornwell et al., 2008).

Studies of determinants of older adults' network diversity and bridging potential are scarce (Cornwell, 2009). Erickson (2003) found higher income levels correlate with network diversity. Examining older adults' networks of people with whom they are likely to discuss important things, Cornwell (2009) found

that retirees and people in poor health are less likely to have bridging potential, while age was found to be not significantly associated with bridging.

Few studies have examined network characteristics of LGBT older adults. One study found that network sizes did not differ between gay/lesbian and bisexual older adults (Grossman et al., 2000). Another study documented that transgender older adults have larger social networks compared to non-transgender LGB older adults (Fredriksen-Goldsen, Cook-Daniels et al., 2014). Little is known regarding diversity of social networks in LGBT older adults.

## Family Relations and Community Involvement

There has been a number of studies that examined relationships between family and community involvement and social networks in the general population. Marital status, family relations, religious activities, and membership in organizations are important determinants of social networks among older adults (Fiori, Smith, & Antonucci, 2007; Gray, 2009; Litwin & Shiovitz-Ezra, 2011). For example, among older adults in the general population, married individuals tend to have larger networks (Cicirelli, 2010; Hurlbert & Acock, 1990; McLaughlin et al., 2010), and those with children (Conway, Magai, Jones, Fiori, & Gillespie, 2013). Research on the general population also suggests that older persons' social networks rely heavily on access to community sources of integration such as senior centers and neighbors (Gs & Balfour, 2003).

In contrast, there are no systematic studies examining family and community involvement as correlates of network size and diversity for LGBT older adults. Family structures are different for LGBT adults compared to those of non-LGBT adults (Dewaele, Cox, Van den Berghe, & Vincke, 2011). LGBT older adults are less likely to be married or partnered than non-LGBT older adults, perhaps in part due to the prohibition of same-sex marriage (Butler, 2006; Fredriksen-Goldsen et al., 2011). Moreover, while the majority of gay male and lesbian individuals among baby boomers have acceptance from their biological families, this is not the case for bisexual and especially for transgender people (Metlife Mature Market Institute & American Society on Aging, 2010).

## Identity Disclosure

A unique feature in the lives of LGBT adults is identity disclosure to others in their everyday life. Current cohorts of LGBT older adults have experienced social marginalization through their life due to discriminatory social contexts

(Fredriksen-Goldsen, 2007). According to Meyer (2003), disclosing sexual identity may help LGB individuals build relationships with other sexual minority individuals although concealment of their sexual or gender identity seems to play a protective function in terms of reducing the number of discrimination and victimization events over their lifetime. The expression of sexual or gender identity is not only verbal but also behavioral; thus, the fear of being disclosed may lead to limiting social relationship, manifesting in smaller and less diverse acquaintance contacts.

The goal of this article is to examine correlates of network size and network diversity using egocentric group-specific network data on social acquaintances from CAP Study, 2010–2011 (Fredriksen-Goldsen et al., 2011). Based on social capital theory, we will test the following hypotheses:

> **Hypothesis 1:** Background characteristics (being gay or lesbian, female, younger age, non-Hispanic White, having higher income and education, being employed and having fewer chronic conditions), family relations (having a partner or spouse and child), identity disclosure (to best friends and neighbors), participation in religious activities, and service utilization will be positively associated with greater social network size.

> **Hypothesis 2:** Background characteristics (being gay or lesbian, female, younger age, non-Hispanic White, having higher income and education, being employed and having fewer chronic conditions), family relations (having a partner or spouse and child), identity disclosure (to best friends and neighbors), participation in religious activities, and service utilization will be positively associated with greater social network diversity.

## Design and Methods

### Data Collection

The study was conducted through a collaboration with 11 community agencies from different regions of the United States, including some agencies that were LGBT specific and some that were serving older adults in general. Over a 6-month period from June to November 2010, the agencies utilized their contact lists of older adults, aged 50 and above, to distribute invitation letters and paper questionnaires. The lists included people who have been in contact with the agencies and for whom contact information was available. For

How many different lesbian, gay, bisexual, transgender or straight people (such as your friends, family members, colleagues, neighbors, etc.) have you interacted with (including talked to, visited with, exchanged phone calls or emails with, etc.) in a typical month?

|  | Age 50 and older | Under the age of 50 |
|---|---|---|
| a. Gay men: | _____ | _____ |
| b. Gay women/lesbians: | _____ | _____ |
| c. Bisexual men and women: | _____ | _____ |
| d. Transgender men and women: | _____ | _____ |
| e. Heterosexual or straight men and women: | _____ | _____ |

**Figure 1.** Social network questions in the CAP questionnaire.

agencies with electronic mailing lists, a similar Internet-based survey was used. In addition, all follow-up reminders included an Internet-based survey option. Overall, 2,201 paper and 359 Internet-based questionnaires were submitted and satisfied eligibility criteria (LGBT adults 50 years of age and older). The questionnaire collected information on demographic characteristics, quality of life, physical and mental health, issues of receiving and providing care, and other risk and protective factors and life events. Detailed information regarding the data collection procedures is described elsewhere (Fredriksen-Goldsen et al., 2011, 2013).

## Measures

*Egocentric group-specific social network data.* The study asked about social acquaintances inside and outside the LGBT communities, including relationships with friends, colleagues, family members, and neighbors as reported by the respondent. We conceptualized social relations as interactions that included ''talking to, visiting with, or exchanging phone calls or e-mails with someone.'' To assess diversity of social networks by sexual identity and age, we asked respondents to report the number of their acquaintances separately for five categories, gay men, gay/lesbian women, bisexual individuals (men and women), transgender (men and women), and heterosexual individuals (men and women), and we asked the previously mentioned counts be reported separately for persons aged 50 and older and for persons under the age of 50 (Figure 1).

The social network measurement component of the questionnaire was limited in scope due to the potential for overall respondent burden. This prevented us from considering name-generating questions that are typically used

in social network studies (Burt, 1984) and also from collecting information on social relations among other people in the respondent's network. However, not using name-generating questions allowed us to elicit a larger fraction of respondent's social contacts (Marsden, 2005). Note that we decided not to ask separate questions for every possible combination of sexual and gender identity because of substantial additional cognitive complexity that the expanded data collection instrument would have created. In addition, the survey asked about interactions in a typical month; this time reference has been shown to provide better predictive validity than asking about ''the past month'' (Chang & Krosnick, 2003).

*Social network size.* We develop a modified summation index to estimate the network size of LGBT individuals. The modified summation index is analogous to the approach for measuring social network size known as the summation method (McCarty, Killworth, Bernard, Johnsen, & Shelley, 2001), which relies on reported numbers of contacts with alters in various relationships, such as members of the immediate family, neighbors, and coworkers. The modified summation index uses groups defined by sexual identity, gender identity, and age because these groups reflect the basic composition of the population of interest better than typical relational categories. It has been shown that the summation method yields a valid and reliable proxy for the actual network size (McCarty et al., 2001).

*Network diversity as an indicator of network bridging potential.* In the context of this article, for the purposes of concise exposition, we will refer to transgender adults as T, and to nontransgender lesbian, nontransgender gay men, and nontransgender bisexual groups as simply L, G, and B, respectively. We measure network diversity by counting the number of sexual identity and gender identity groups L, G, B, or T for which respondents reported nonzero networks (from 0 to 5). Our conceptualization of this diversity index is similar to Barefoot, Grønbaek, Jensen, Schnohr, and Prescott (2005) in that it counts social contacts to people of different characteristics, except, in our case, we consider characteristics specific to sexual identity and gender identity.

*Background characteristic.* Sexual identity was measured by asking participants to self-identify as gay, lesbian, bisexual, heterosexual or straight, and other. Female participants who identified themselves as gay were recoded as lesbian. Gender identity was measured by asking participants ''Are you transgender?'' Based on the inclusion criteria (LGBT 50 years and older), those who identified as ''other'' for sexual identity were excluded from the study as well as those heterosexual individuals who did not identify as transgender.

Other background characteristics included in the analyses are age, gender (*Male* = 0; *Female* = 1), income (at or below 200% of the federal poverty level [FPL] = 1; above 200% FPL = 0), education (high school or less = 0; some college or more = 1), race/ethnicity (non-Hispanic *White* = 1; *Other* = 0), and employment status (*Employed* = 1; *Not employed* = 0). For inclusion in the models, we used age categories of 50–64, 65–79, and 80+ years that corresponded approximately to the birth years 1946—1960, 1930–1945, and 1929 and older. Regarding their health conditions, participants were asked whether they had ever been told by a doctor that they had the following: high blood pressure, high cholesterol, heart attack, angina, stroke, cancer, arthritis, diabetes, asthma, or HIV/AIDS. We use the number of chronic conditions reported (from 0 to 10) as an indicator of chronic health problems.

*Family relations, identity disclosure, religious activity, and service utilization.* Family relation measures included whether the respondent has any children, and relationship status (*Married/partnered* = 1; *Other* = 0) with "other" including single, divorced, widowed, and separated. We included two measures of sexual and gender identity disclosure, which asked participants to what extent their best friend and their neighbors know or have known that they are LGBT (0 = *Definitely or probably do not know or probably know*; 1 = *Definitely know*). For religious activity, we used three categories: "none" included people who reported no religious activities; "less than once a week" included people who reported up to 4 religious activities in the past 30 days; and "more than once a week" included people who reported 5 or more religious or spiritual activities in the past 30 days. The service utilization indicator (0 or 1) measures whether the respondent was a current user of programs or services for LGBT older adults.

## Analysis

We begin with a descriptive analysis of the social networks size and diversity. We then apply a series of multiple regression analyses to examine correlates of log-network size and network diversity among LGBT older adults.

Although participants were asked to provide numeric responses to the social network questions, there were 647 cases with nonnumeric responses, such as "many" or a question mark. These 647 cases were excluded from all analyses reported in this article. In addition, 367 observations had missing values on covariates. Finally, 18 cases with zero social network sizes were removed from multiple regression analyses as the mechanisms related to the

absence of network ties might be qualitatively different from mechanisms related to changes in magnitude of the social network ties. This provided us with a sample size of 1,528 for the regression analyses.

Correlations among all variables were examined to avoid multicollinearity issues. While identify disclosure to neighbor was significantly correlated with identity disclosure to friend ($\chi^2$ test $p < .001$), 199 individuals reported being out to friend but not to neighbor, and 29 individuals reported being out to neighbor but not to friend. Thus, we used both of these measures in regression.

To satisfy the assumptions of homoscedasticity and normality of residuals (Weisberg, 2005), we employed the logarithm transformation of the social network size variable. For the diversity variable, which is a count from 0 to 5, we employed two approaches: the ordinal logistic regression model (Agresti, 2002) and the linear regression (e.g., Weisberg, 2005). The ordinal logistic regression is more appropriate for ordered discrete outcomes than the linear regression that assumes linearity. However, in both analyses, the identified significant predictors and the directions of associations were the same. Because our focus is on identifying significant associations, we present results from the linear multiple regression analyses mentioned subsequently.

## Results

Network information was available for 1,913 individuals, of whom there were 529 lesbian nontransgender women, 1128 gay nontransgender men, 94 bisexual nontransgender men and women, and 136 transgender men and women. The mean total network size was estimated to be 63.20 people ($SD =$ 94.59), and the median size was 36, with the reported minimum of 0 and maximum of 1,149. Some respondents explained that high numbers of individuals in their acquaintance networks were due to their occupations (e.g., being a doctor). Table 1 provides the descriptive statistics for the total network size by sexual and gender identity. Comparing network sizes, transgender participants reported the largest size ($M = 86.44$; $SD = 106.41$) and gay men reported the smallest size ($M = 56.73$; $SD = 87.12$); the network sizes for lesbian ($M = 70.84$; $SD = 105.82$) and bisexual ($M = 67.45$; $SD = 90.34$) older adults were similar to each other.

Figure 2 provides the corresponding histograms of social network size, where the reported numbers of ties that were larger than the 95th percentile (network size of 214 or larger) are not shown. The distributions of network size look fairly similar across groups. The mean network diversity was

**Table 1.** Descriptive Statistics for the Total Network Size by Sexual and Gender Identity Group.

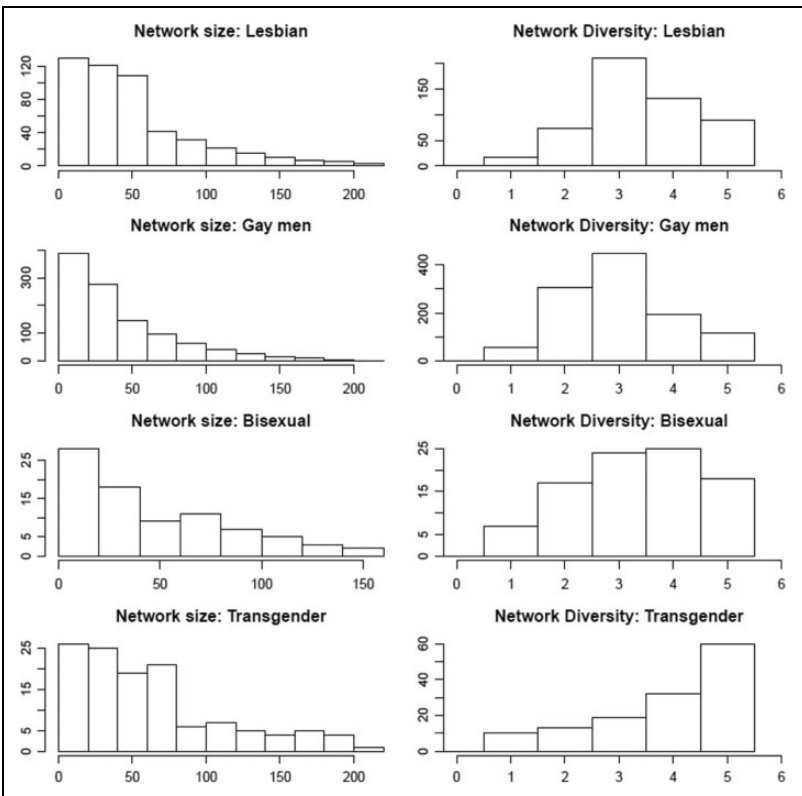| | N | Mean | Median | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Lesbian, nontransgender | 529 | 70.84 | 43 | 105.82 | 0 | 1,047 |
| Gay men, nontransgender | 1,128 | 56.73 | 31 | 87.12 | 0 | 1,149 |
| Bisexual, nontransgender | 94 | 67.45 | 35 | 90.34 | 0 | 578 |
| Transgender | 136 | 86.44 | 54.5 | 106.41 | 0 | 730 |



**Figure 2.** Histograms of network size (up to 95th percentile) and network diversity for lesbian ($n = 529$), gay male ($n = 1,128$), bisexual ($n = 94$), and transgender ($n = 136$) individuals. Individual who reported zero network size ($n = 18$) are excluded.

estimated to be 3.17($SD = 1.13$). Figure 2 also summarizes network diversity by sexual and gender identity categories of the respondent. There was significant difference in diversity by the sexual and gender identity group (Kruskal-Wallis test, p value < .001). For both gay male and lesbian older adults, the modal diversity was 3, indicating that more of these individuals reported social ties to three different sexual identity and gender identity groups (among L, G, B, or T) than to any other number of groups. Nonetheless, on average, lesbian respondents had more diversity in their network ties than gay men (independent 2-group Mann–Whitney U Test, *p* value < .001). Transgender and bisexual individuals had greater diversity than gay and lesbian individuals, and their modal network diversity values were 5 and 4, respectively. Considering gender, female individuals had larger network diversity than male, and transgender individuals had larger network diversity than nontransgender (Kruskal-Wallis test, *p* value < .001). Considering age, older people had less diverse networks (Kruskal-Wallis test, *p* value < .001).

Table 2 provides the number of respondents (egos) who reported social ties to individuals (alters) in the row categories (L, G, B, T, or heterosexual). For example, of 529 lesbian respondents, 422 reported that they have social ties to gay male individuals. The transgender participants showed the most even distribution of social ties across the four sexual and gender identity groups, while lesbian and gay male older adults showed the most affinity toward groups of similar sexual and gender identity. More than 90% of participants who had social interactions, regardless of sexual or gender identity, had social ties to heterosexuals. The majority of transgender participants were also connected to lesbian (78%), gay men (76%), and bisexual (54%) individuals as well as their own gender identity group members (90%). Most lesbian respondents (98%) were connected to their own sexual identity group members; and many lesbian respondents (81%) were connected to gay men although only about a third were connected to bisexual (33%) and transgender individuals (31%). Gay male participants showed a similar pattern; while 98% had ties to other gay men and 64% to lesbian individuals, only 25% had social ties to bisexual and only 20% to transgender individuals. Among bisexual participants, only 52% indicated a presence of social ties to other bisexual individuals, whereas 78% had social ties to lesbian individuals and 84% to gay men; and about a fifth reported ties to transgender individuals. Note that Table 2 only provides a two-dimensional view on the reported social ties. Examination of the overall multivariate distribution of social ties across gender and sexual identity categories is beyond the scope of this article (Morris, 1991).

**Table 2.** The Number of Respondents Who Reported Social Ties Across Sexual and Gender Identity Groups.

| Respondent | Social ties to … | | | | | No ties |
|---|---|---|---|---|---|---|
| | Lesbian | Gay male | Bisexual | Transgender | Heterosexual | |
| Lesbian, $n = 529$ | 514 | 422 | 172 | 161 | 503 | 6 |
| Gay male, $n = 1,128$ | 720 | 1,102 | 277 | 230 | 1,048 | 6 |
| Bisexual, $n = 94$ | 71 | 76 | 49 | 23 | 84 | 3 |
| Transgender, $n = 136$ | 105 | 102 | 72 | 121 | 121 | 2 |

## Results From Multiple Regression Analysis

We performed multiple regression analyses for two outcome variables: the log-network size and the network diversity index. Subsequently, we report results for cases with complete covariate information: 435 lesbian nontransgender women, 915 gay nontransgender men, 63 nontransgender bisexual men and women, and 106 transgender men and women. In addition, we carried out a sensitivity analysis where missing data on covariates were multiply imputed using multivariate imputation by chained equations (Buuren & Groothuis-Oudshoorn, 2011). The identified significant predictors and the directions of association were the same in the multiple imputation analysis as those reported here.

First, we used regression analyses to examine the relationship of social network size with sexual and gender identity, age-group, and gender. There were 743 individuals between 50 and 64 years of age, 685—between 65 and 79, and 118—80 or older. Unconditional on any other covariates, transgender individuals were found to have larger log-network size on average than the other groups ($p$ value $= .013$). The individuals aged 80 and older had smaller networks than younger adults (p value $= .004$). Female participants had larger networks on average than male (p value $< .001$).

We then used multiple regression analyses to examine associations between log-network size and diversity index of social networks and background characteristics, family relations, identity disclosure, and community involvement. We considered including the survey mode—article or Internet—as an additional covariate but did not find significant mode effects net of other covariates. Using multiple regression analysis for log-network size as the outcome, controlling for other covariates, the results (Table 3) showed that among background characteristics, a larger social network size was associated with female gender, transgender identity, and employment; a smaller

**Table 3.** The Results of Multiple Linear Regression of Social Network Size.

|  | b | SE | t Value | p |
|---|---|---|---|---|
| **Background characteristics** |  |  |  |  |
| Age 50–64 | (Ref) |  |  |  |
| Age 65–79 | .052 | .060 | .87 | .384 |
| Age 80+ | −.054 | .109 | −.49 | .621 |
| Gender, female | .172 | .058 | 2.97 | .003 |
| Gay or lesbian | (Ref) |  |  |  |
| Bisexual | .191 | .134 | 1.43 | .153 |
| Transgender | .381 | .109 | 3.50 | .001 |
| Household income, at or below 200% FPL | −.256 | .064 | −3.99 | .000 |
| Education, some college or more | .184 | .114 | 1.60 | .109 |
| Non-Hispanic White | .067 | .080 | .84 | .402 |
| Employed | .223 | .060 | 3.73 | .000 |
| # of chronic conditions | .003 | .020 | .13 | .895 |
| **Family relations** |  |  |  |  |
| Child | .191 | .066 | 2.91 | .004 |
| Having a partner or spouse | .148 | .056 | 2.66 | .008 |
| **Identity disclosure** |  |  |  |  |
| Out to friend | .219 | .135 | 1.62 | .106 |
| Out to neighbor | .347 | .080 | 4.35 | .000 |
| **Community Involvement** |  |  |  |  |
| No religious activity | (ref) |  |  |  |
| Religious activity, <once a week | .233 | .062 | 3.77 | .000 |
| Religious activity, >once a week | .410 | .083 | 4.93 | .000 |
| Service utilization | .161 | .062 | 2.62 | .009 |

*Note.* Log transformation was applied to social network size.

social network size was associated with living at or below 200% FPL. Age, education, race/ethnicity, chronic conditions were not associated with social network size, controlling for other covariates. Of family relations, both having a partner or spouse and having a child had significant positive influence on social network size. Of identity disclosure factors, controlling for other covariates, being out to neighbor was positively associated with social network size, whereas being out to best friends was not. Religious activity and service utilization were also positively associated with social network size. We note that, because of logarithm transformation, estimates should be interpreted on the multiplicative scale for network size. For example, controlling for other covariates, those being out to neighbor have networks that are $1.41 = \exp(0.347)$ or 41% larger on average than those individuals who are not out to neighbors.

Table 4 presents multiple regression results for network diversity as the outcome. Of background characteristics, younger age (50–65 and 65–80 vs. 80+), female gender, bisexual identity (vs. gay/lesbian), transgender identity, and employment were associated with increased network diversity whereas income, education, race/ethnicity, and chronic conditions were not. Of family relations, having a child was positively associated with network diversity but having a partner or spouse was not. Both identity disclosure measures, being out to friends and neighbor, were significantly associated with an increase in network diversity. In addition, community involvement including religious activities and service utilization were associated with elevated diversity in social networks. To investigate the association of individual characteristics with diversity *net of network size*, we obtained results from the multiple regression analyses controlling for the social network size. We use these results conditional on network size for the subsequent interpretation. The following characteristics were found to be significantly associated with larger network diversity, net of network size, and controlling for other covariates: age, female gender, transgender identity, religious activity, service utilization, and being out to friend (Table 4).

## Discussion

Although there is increasing attention to health disparities among LGBT people (Institute of Medicine, 2011) and emerging evidence suggests that the size of social network is associated with better health among LGBT older adults (Fredriksen-Goldsen et al., 2013), little is known about the correlates of social networks in these populations. Based on a large cross-sectional survey, we found that when controlling for covariates, network size was positively associated with being female, transgender, employed, having higher income, having a partner and having a child, identity disclosure to neighbor; and participation in religious activities and in programs or services for LGBT older adults. When controlling for social network size, we also found that network diversity was positively associated with younger age, being female and transgender, identity disclosure to a friend, and participation in religious activity and service use.

A number of social gerontologists studied health benefits and correlates of support networks, but there has been considerably less research on more general social relations even though they may also play important roles in determining health outcomes, especially at old age (Granovetter, 1973; Gray,

**Table 4.** The Results of Multiple Linear Regression of Social Network Diversity after Controlling for Network Size.

| | Model without controlling for network size | | | | Model after controlling for network size | | | |
|---|---|---|---|---|---|---|---|---|
| | b | SE | t Value | p | b | SE | t Value | p |
| Log network size | — | — | — | — | .463 | .023 | 20.62 | .000 |
| Background characteristics | | | | | | | | |
| Age 50–64 | (ref) | | | | (ref) | | | |
| Age 65–79 | −.099 | .059 | −1.68 | .094 | −.124 | .052 | −2.36 | .019 |
| Age 80+ | −.403 | .107 | −3.76 | .000 | −.379 | .095 | −3.99 | .000 |
| Gender, female | .193 | .057 | 3.38 | .000 | .114 | .051 | 2.24 | .025 |
| Gay or lesbian | (ref) | | | | (ref) | | | |
| Bisexual | .293 | .132 | 2.22 | .027 | .205 | .117 | 1.75 | .080 |
| Transgender | .731 | .108 | 6.80 | .000 | .555 | .095 | 5.82 | .000 |
| Household income, at or below 200% FPL | −.097 | .063 | 1.54 | .124 | .021 | .056 | .37 | .708 |
| Education, some college or more | .040 | .113 | .35 | .724 | −.045 | .100 | −.45 | .652 |
| Non-Hispanic White | .064 | .079 | .80 | .421 | .033 | .070 | .47 | .641 |
| Employed | .184 | .059 | 3.11 | .002 | .080 | .052 | 1.53 | .126 |
| # of chronic conditions | .008 | .019 | .39 | .695 | .006 | .017 | .37 | .709 |
| Family relations | | | | | | | | |
| Child | .161 | .065 | 2.48 | .013 | .072 | .057 | 1.26 | .208 |
| Having a partner or spouse | .075 | .055 | 1.37 | .170 | .007 | .049 | .14 | .886 |
| Identity disclosure | | | | | | | | |
| Out to friend | .438 | .134 | 3.28 | .001 | .337 | .118 | 2.86 | .004 |
| Out to neighbor | .165 | .079 | 2.10 | .036 | .005 | .070 | .06 | .948 |
| Community Involvement | | | | | | | | |
| No religious activity | (ref) | | | | (ref) | | | |
| Religious activity, <once a week | .305 | .061 | 4.99 | .000 | .197 | .054 | 3.63 | .000 |
| Religious activity, >once a week | .450 | .082 | 5.49 | .000 | .260 | .073 | 3.56 | .000 |
| Service utilization | .194 | .061 | 3.18 | .002 | .119 | .054 | 2.21 | .027 |

*Note.* Log transformation was applied to social network size.

2009; Wrzus et al., 2013). This article fills the gap by studying network size and network diversity of egocentric networks—including friends, acquaintance, and support networks—of LGBT older adults.

Many of our findings of the correlates of social network size and diversity among LGBT older adults are similar to those found among older adults in the general population. Thus, we find that women have larger social networks than men, similar to the general population (Cicirelli, 2010; Cornwell et al., 2008; McLaughlin et al., 2010) and consistent with other studies of the LGBT older adult communities (Grossman et al., 2000). In addition, we find that women have more diverse networks, which has not been documented in other studies of LGBT older adults.

Regarding gender identity, we find that transgender older adults have significantly larger and more diverse networks than nontransgender LGB older adults. This could be partly due to the fact that transgender communities have in part been developed through the use of electronic communications (Hill, 2005; Shapiro, 2004). Moreover, gender and sexual identities are not mutually exclusive. Transgender older adults in this study identify themselves as lesbian, gay male, bisexual, and also heterosexual; and they may have more opportunities to build social network in diverse communities than nontransgender LGB older adults. In addition, a previous study suggests that transgender older adults are more likely to have a child and less likely to live alone than nontransgender LGB older adults (Fredriksen-Goldsen, Cook-Daniels et al., 2014). Still, studies find that transgender adults have limited social support (Fredriksen-Goldsen et al., 2011; Witten, 2003). Further research is needed to better understand social networks of transgender older adults.

An interesting finding in this study concerns age. Controlling for other covariates, we find that age was not significantly associated with network size. However, age was significantly associated with network diversity, even after controlling for other covariates and network size. This finding seems to be contradictory to an earlier observation (Cornwell, 2009) that age is not associated with bridging among older adults; however, one needs to keep in mind two important distinctions. First, network diversity is arguably an imperfect measure of bridging potential. Second, in this cross-sectional study, age effects are confounded with cohort effects. Thus, the finding that LGBT individuals 80 years and older tend to have networks less diverse than their 50–64 years old counterparts may be due to differences in cohorts' experiences with social marginalization rather than age. This is just one example of a potential research question that requires longitudinal data for further investigation.

We find that, after controlling for other covariates, race/ethnicity, chronic conditions, and education were not significantly associated with network size. While the absence of these associations between network size and

race/ethnicity, health status, and education contradicts some prior findings in the general population (e.g., Ajrouch et al., 2005; Cornwell et al., 2008), this may be due to the composition of the study's sample. For example, because the majority of the participants were non-Hispanic White, it is difficult to detect differences among racial and ethnic groups in this study.

As we hypothesized, having a partner and having a child was also associated with larger size of social networks among LGBT older adults, which is similar to what has been found among older adults in the general population (McLaughlin et al., 2010). However, in this study, neither of these family relations were positively correlated with network diversity among LGBT older adults. It may be historically marginalized LGBT older adults rely more heavily on unmarried partner and friends of similar age in establishing their own social networks (Beeler, Rawls, Herdt, & Cohler, 1999; Grossman et al., 2000).

While identity disclosure to a neighbor was associated with greater social network size, disclosure to a best friend was not. However, identity disclosure to a friend was associated with a more diverse network but not with a larger network. This may reflect that relationships with friends, rather than neighbors, are often more intimate. Networks of LGBT older adults often constitute families of choice (Heaphy, 2009; Metlife Mature Market Institute & American Society on Aging, 2010; Muraco & Fredriksen-Goldsen, 2011) including friends, previous partners, and others. The development of friendships may therefore result in greater diversity among friends of various backgrounds. LGBT older adults are more likely than older heterosexuals to seek advice, assistance with personal matters, errands, emergencies, and emotional support from close friends (Metlife Mature Market Institute & American Society on Aging, 2010). The finding that identity disclosure to neighbors was associated with a greater network size is important. Considering findings from the Pew Research Center (2010) that 57% of the adults surveyed know some or none of their neighbors by name, suggests that relationships with neighbors may be less familiar or personal than with family and friends. Thus, it is conceivable that those who are willing to disclose their sexual identity to neighbors have larger social networks.

In addition, frequency of religious activities and use of programs or services for LGBT older adults have made significant contributions to both the size and diversity of social networks. A positive association between involvement in religious activity and social network size among LGBT older adults is similar to the pattern observed in the general population (Cornwell et al., 2008). Americans 65 and older with social capital-rich networks were

shown to be frequent attendees at organized group meetings (Litwin & Shiovitz-Ezra, 2011).

This study has several potential limitations. The first limitation concerns selection of the study participants. Because the recruitment was done via community agencies serving LGBT and older adults, the study sample may not be fully representative of the U.S. LGBT population 50 and older. However, we should note that less than a third of this sample were current users of services. Another limitation stems from our definition of the sexual identity and gender identity groups used for eliciting social networks information. Our ultimate interest is in obtaining the complete picture for all possible combinations of sexual identity and gender identity categories. Nonetheless, we believe that this complete picture is not possible to achieve (except possibly in an interview setting) because of very small population proportions for some of the subgroups and the associated high respondent burden. In addition, regression analyses in this study did not control for the clustered (by agency) data collection, thus the independence assumption may not be fully warranted. Finally, the study results are conditional on network measures used. Aggregate assessments of social network size used in this study could overestimate the size of a network because sexual identity and gender identity are not mutually exclusive. For example, a respondent's acquaintance who is a transgender gay men may have been counted twice. In addition, the diversity measure that we used is an imperfect indicator of bridging potential. Subsequently, we briefly suggest alternative directions for measurement of bridging and some other directions for future research.

Measuring bridging potential for egocentric group-specific data is an open problem. Currently, there are two ways to identify bridging potential in networks—Burt's constraint measure (Burt, 2004) and Valente's bridging measures (Valente & Fujimoto, 2010)—both of which rely on identification of specific alters in the individual's network. In this article, we study group-specific egocentric networks of acquaintances in which respondent's alters are identified by group/category rather than by name and consider social network diversity—measured by the number of different groups/categories to which the respondent has social links—as an indicator of bridging potential for group-specific egocentric social network data. In ecology and biodiversity studies, the quantification of the number of types observed is often referred to as richness (Wiens & Donoghue, 2004) and is considered a variant of diversity measure. One might expect that an individual with acquaintances across different groups/categories has better chances to be positioned in a network serving as a bridge between different individuals who otherwise might not be connected to each other. In addition, such individuals have

better opportunities for obtaining information that would help to improve their lives (Erickson, 2003). More research is needed to understand network bridging potential (Cornwell, 2009; Gray, 2009) among LGBT older adults.

In addition, better understanding of social network structures is needed for developing a promising data collection method, respondent-driven sampling (RDS; Gile & Handcock, 2010) which has a potential for use in LBGT communities (Zea, 2010). RDS is an innovative link-tracing sampling strategy used by public health officials and social scientists to study hard-to-reach populations in the interest of making valid statistical inference (e.g., Johnston et al., 2008). However, feasibility of collecting network-based samples can be dramatically impacted by population network structures (Johnston, Whitehead, Simic-Lawson, & Kendall, 2010; Kogan, Wejnert, Chen, Brody, & Slater, 2011). Should LGBT network-based sampling and intervention studies be limited by sexual identity and/or gender identity or should they include different sexual identity and gender identity subgroups? This and other important questions related to network-based sampling are beyond the scope of this article.

Finally, while this study represents a first step at understanding the characteristics associated with social network size and diversity among LGBT older adults, additional research is needed to better understand the mechanisms that impact health. Given LGBT older adults are health disparate populations (Fredriksen-Goldsen et al., 2013), it is critical to further investigate the role of social networks in health prevention efforts. Interventions studies need to consider the potential use of social networks as tools for reaching and engaging difficult to reach segments of the population. Although this article does not make causal claims, correlates of social network size and diversity could be taken in consideration and further evaluated by practitioners for assessing risk factors and determining efficacy of interventions aimed at improving health outcomes among LGBT older adults.

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