

Original Research Article

A Social Relations and Networks Perspective of Depressive Symptoms in Older African Americans Relative to Two Other Ethno-racial Groups

Felichism W. Kabo, PhD,* Toni C. Antonucci, PhD, and James S. Jackson, PhD

Institute for Social Research, University of Michigan, Ann Arbor.

*Address correspondence to: Felichism W. Kabo, PhD, Institute for Social Research, University of Michigan, 426 Thompson St. Ann Arbor, MI 48106-1248. E-mail: fkabo@umich.edu

Received: June 21, 2018; Editorial Decision Date: January 7, 2019

Decision Editor: J. Jill Suitor, PhD

Abstract

Background and Objectives: Family ties and role relationships through their effects on exchanges of resources and social support are critical health contexts for older African Americans. We studied the influence of affect-based (positive or negative) social relations and respondent-role network centrality on depressive symptoms in older African Americans compared to two ethno-racial groups, Black Caribbeans and Non-Hispanic Whites.

Research Design and Methods: We used data from the multigenerational 2004 National Survey of American Life Family Connections across Generations and Nations Study (NSAL 3-Gen). For respondents aged 50 years or older, we used tie affect (positive or negative) to code family role relations and two-mode (where an entity or thing is connected to a different type of entity, here individuals are connected to role relations) family networks. We used survey linear regressions to probe the independent association of relations and networks on depressive symptoms among older African Americans as compared to Black Caribbeans and Non-Hispanic Whites.

Results: Negative and positive relations are significantly associated with depressive symptoms, but there were some ethno-racial differences. For example, the negative *Father* relation is significantly associated with greater depressive symptoms among African Americans, but not in Black Caribbeans and Non-Hispanic Whites. Negative two-mode networks (connections from individuals to role relations) are significantly associated with depressive symptoms among African Americans and in the two comparison ethno-racial groups, while there is no significant association between positive networks and depressive symptoms.

Discussion and Implications: We found that negative relations had larger effects on depressive symptoms than positive ones, and conversely that negative networks had larger effects than positive networks. Simultaneously modeling social relations and networks could potentially enhance our understanding of the links between social structure, and depressive symptoms among older adults in African American and other ethno-racial minorities.

Translational Significance: The results suggest that social relations and networks should be considered as targets for interventions designed to reduce depressive symptoms, but that the interventions should heed differences between African Americans and other ethno-racial groups. Based on the research findings, efforts should be directed towards the development of relational- and network-based solutions to depression and other mental health issues, and the incubation of policies and interventions that target specific social relations, for example, the *Father* relation among African Americans. These findings suggest the potential for the generation of relatively low-cost solutions that can be tuned to accommodate ethno-racial differences, and that facilitate or ease implementation at the societal level.

Keywords: African Americans, Depression and anxiety, Intergenerational, Role relations, Two-mode networks

Background and Objectives

The United States is experiencing rapid social changes that have significant implications for the social and instrumental support that social networks can provide; at a time when even kin relationships are in a process of transformation and increasing complexity (Antonucci & Wong, 2010). Social relations and networks are critical contexts with important implications for health and well-being (Umberson & Montez, 2010). Individuals assume multiple family roles which affect their health and well-being. Roles are normative scripts or expectations for individual behavior in relation to a core or situational identity (Biddle, 1986). Social network analysis of relations and networks in African Americans may significantly enhance our knowledge of how the social environment shapes health outcomes and disparities. For example, African Americans report more daily interactions with family members relative to non-Hispanic Whites (Taylor et al., 2013), making the family's social context an important consideration with respect to the external factors that shape their health.

Social Relations and Networks: A Closer Look at African Americans

Individuals connect to family and kin networks through three primary role relations which are the focus of this paper: spouses/partners, parents, and children (Rossi & Rossi, 1990). African Americans tend to reside in networks with large numbers of family members (Ajrouch, Antonucci, & Janevic, 2001). Older African Americans, just like other older adults, are more likely to seek assistance from their spouse and children (Kaufman, Kosberg, Leeper, & Tang, 2010; Shanas, 1979), and accept social support from more distant kin and non-kin only when close kin are unavailable (Cantor, 1979; Chatters, Taylor, & Jackson, 1985). Not only does African American family structure differ from that of other racial and ethnic groups (Billingsley, 1988), but the effects of family relations differ for African Americans relative to other racial and ethnic groups (Dunifon & Kowaleski-Jones, 2002).

The link from quality of social relations to health and well-being outcomes is complex and contingent on contextual factors, such as socioeconomic status, stage of life, and race or ethnicity. We focus on the gaps in understanding how the quality of social relations and networks influence health among African Americans compared to Black Caribbeans and Non-Hispanic Whites. Not only do African Americans have smaller and more family-dominated social networks than whites, but they also have more contact with their network members (Ajrouch et al., 2001; Taylor,

Chatters, Woodward, & Brown, 2013). The nature of the contact or interaction also matters. For example, negative interactions are more predictive of negative health outcomes such as hypertension (Rook, 2015; Sneed & Cohen, 2014). African Americans are especially susceptible to hypertension (Ostchega, Dillon, Hughes, Carroll, & Yoon, 2007) which has been shown to be influenced by levels of social support received and the quality of social relations and interactions (Bell, Thorpe, & Laveist, 2010; Cornwell & Waite, 2012).

Low levels of social support and negative social interactions also have significant influence on depressive symptoms among African Americans (Lincoln & Chae, 2012; Miller et al., 2004; Taylor, Chae, Lincoln, & Chatters, 2015). Analysis of relationship type and quality can enhance knowledge of the mechanisms by which relations and networks affect health among African Americans (Antonucci, Birditt, & Webster, 2010). We use *two-mode* network analysis—a mode is a class of entities, in our case individuals and role relations—to bring together insights from role theory and the network perspective in our examination of the effects of social structure on depressive symptoms in African Americans relative to other ethno-racial groups. Therefore this study is a departure from works that employ *one-mode* network analysis, or the study of relations between members of the same class, such as person-by-person or organization-by-organization networks.

From Role Relations to Two-Mode Social Networks

Individuals occupy multiple roles in the family. *Role theory* posits that individuals are engaged in a collection of social roles. A role is associated with patterned or characteristic behaviors and is linked to scripts or expectations for behavior that are understood and accepted both by the focal individual and by others (Biddle, 1986). The “mother” and “child” roles in a family have different scripts for how they interact with the rest of the family, and individuals in these roles are expected to behave in ways that are role consonant. In this study, network role relations are ascertained by responses to questions on household relationships (see below). Figure 1 shows three individuals (circles) who are connected to other individuals who occupy four types of family role relationships (squares), namely: “Spouse_Partner”, “Mother”, “Father”, and “Child”.

In Figure 1, the first-generation individual G1 has positive “Mother” and “Child” connections, and a negative “Spouse_Partner” connection. Note that this individual has no “Father” connection. The second-generation individual G2 has positive “Spouse_Partner”, “Mother”, and “Father” connections, and a negative “Child” connection. Finally, the third-generation individual G3 has positive

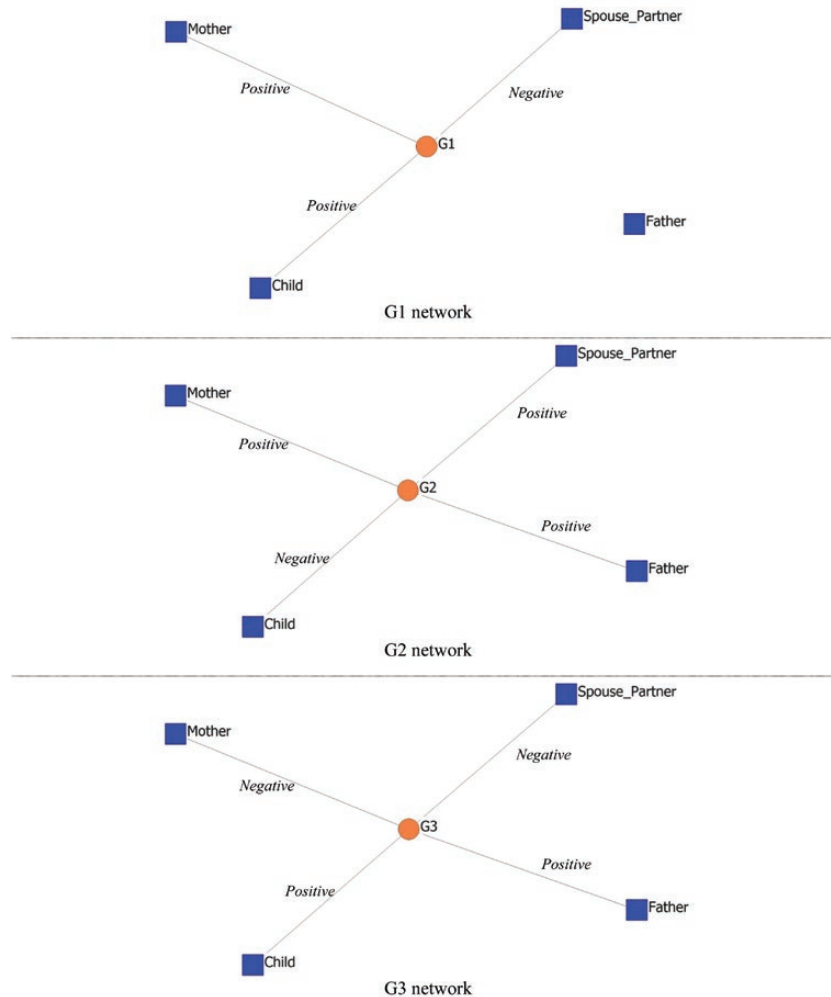


Figure 1. Role relations for three individuals in a multigenerational (G1, G2, and G3) household.

“Father” and “Child” connections, and negative “Spouse_Partner” and “Mother” connections.

Leaning on anthropological conceptions of social structure as a network of roles, we propose a form of network analysis where entities or things (individuals, organisms, organizations, nations, etc.) are connected to unlike entities, in our case individuals connected to role relations, thereby enabling us to understand population- or epidemiological level effects of family networks. This type of network is called a *two-mode network*, where mode refers to a class of entities or nodes (things) that are connected in the network (Borgatti, 2012). We also extend the affect of social relations to the networks they form. Positive role relationships are used to create positive respondent-role networks, and negative role relationships are similarly used to generate negative respondent-role networks.

Positive or Negative Aspects of Relations

Social relations have both significant positive or negative effects on the health of individuals across ethno-racial

groups. For example, African Americans with hypertension benefit from greater social support (Bell et al., 2010), while negative treatment by adult children is associated with depressive symptoms in African American parents (Milkie, Bierman, & Schieman, 2008). Therefore, we incorporate positive or negative affect in our models of social relations and social networks. Research on the positive or negative qualities of relationships and interactions confirms popular beliefs about the benefits of positive ties, but also reveals surprising results for their negative aspects. Generally, social relations (and support) are positively associated with better health and well-being outcomes (Antonucci, Birditt, & Akiyama, 2009; House, Umberson, & Landis, 1988). However, closer scrutiny of the link from social relations (and support) to health and well-being outcomes shows that the negative aspects of social relations and interactions may have greater influence than the positive aspects (Antonucci, Akiyama, & Lansford, 1998; Rook, 1984, 1997).

Finally, some studies suggest that relations can be simultaneously positive and negative, particularly for close

family relations such as spouses, children, parents, and siblings (Fingerman, Hay, & Birditt, 2004). Ambivalence theory has been largely applied to parent-child relations. Ambivalent relations are proposed to be both supportive and stressful, provide solidarity and conflict, or invoke both positive and negative sentiments from the parties involved (Bengtson, Giarrusso, Mabry, & Silverstein, 2002; Fingerman, Chen, Hay, Cichy, & Lefkowitz, 2006; Pillemer & Suito, 2002). A recent study questions this assumption. The authors disaggregated the positive and negative dimensions used to create indirect measures of intergeneration ambivalence and found that the negative component was the primary driver in the link between relational ambivalence and psychological well-being (Gilligan, Suito, Feld, & Pillemer, 2015).

More research is needed to explicate whether indirect measures of ambivalence have any greater power than negative relational aspects alone in predicting individual health outcomes. In this study, we are not able to address the issue of relational ambivalence directly. Rather, we employ the more limited approach of treating the negative and positive aspects of social relations separately (see Rook, 2015). A constraint of the tools and methods we employed to generate and visualize the two-mode networks is that the connections between individuals and role relations had to be conceptualized in binary terms, and could not simultaneously be positive and negative. We recognize that this approach contradicts a body of literature that indicates that positive and negative relationship qualities are independent constructs, rather than opposite ends of the same continuum. Ties or connections that capture the magnitude of the relationship in ordinal or continuous terms may lend themselves to network analysis of ambivalent relations, but are beyond the scope of this paper.

From Social Networks to Social Support

Close and enduring relationships, such as family relations, can have positive or negative impacts on individuals across the life course (Eddy, Martinez, Metzler, & Heyman, 2014; Milkie et al., 2008). Families offer both tangible (such as financial assistance) and intangible (such as emotional assistance) support to their members. Ethnic minority families, such as African Americans, excel at providing family support, likely as a consequence of cultural expectations (Weine & Siddiqui, 2009). Though not unique to African Americans, parental support and positive relations (with parents) is critical to the well-being and psychosocial development of children, the effects of which are felt across the life course (McBride, Paikoff, & Holmbeck, 2003). Network analysis in family research dates from the mid-20th century. Pioneering work by social anthropologists began to use network-based explanations to explain a range of family-related outcomes such as division of labor among husbands and wives (Bott, 1957). Bott's classic study found a direct correlation between the connectedness

of a married couple's network, and the strictness of their division of labor. Later studies by psychologists and sociologists established associations between dimensions of family networks, such as quality of contact between parents and adult children, and health well-being (Pinquart & Sörensen, 2000).

Many recent studies of networks and health have relied on support constructs defined as the presence of people who can provide social (emotional, financial, or other informal) support to the focal individual (Bell et al., 2010; Cornwell & Waite, 2012). Social support is a resource of social networks. Studies of social support have shown that relations have positive health benefits for groups such as African Americans (Bell et al., 2010). Therefore, formal social network analysis may help us understand how the attributes and structures of the relationships individuals have with others shape their health and well-being either by influencing support exchanges, or by explaining the flow of support to and from the focal individual. Social network analysis is the formal, disciplined inquiry into the patterns of ties or relations among actors, typically people. Where many social support studies focus on the existence of ties and view networks as reducible to individual traits, social network analysis focuses on the interrelationships between various components of the network's structure (Smith & Christakis, 2008). The advantage of the social network approach is that the aggregate effects of network ties, such as social relations, are neither linear nor additive. The entire network has properties that are not encompassed by its constituent parts or components (Watts, 2004).

Despite its potential, social network analysis has been under-utilized in health research in ethno-racial minorities, especially African Americans. A broader limitation of network analyses within family research is their individual-level focus—one individual within the larger network (Carr, Springer, & Williams, 2014). This, unfortunately, limits our ability to better understand the structural effects of family and kin networks across individuals. We address these gaps by modeling the health effects of both relations and networks among older adults in a nationally representative sample of multiple generation family members, and by analyzing their networks of individuals and roles. Our approach maps well on anthropological conceptions of social structure as a network of roles, rather than individuals (Borgatti, Mehra, Brass, & Labianca, 2009).

Network Approach to the Study of Health Outcomes

Social network analysis has great potential for untangling the complex factors that contribute to health outcomes and disparities. The network perspective is oriented to the analysis of the regular, structural patterns of relations connecting sets of entities, such as individuals and families. Health outcomes and disparities can be better understood by focusing on family relations because of their association with social support provision, influence on individuals' positive and negative

health behaviors, as well as diseases or health conditions (Smith & Christakis, 2008; Umberson & Montez, 2010).

While classic network research on health outcomes focused on the transmission of infectious diseases, by the 1990s, there was an acceleration in the use of network analysis to study chronic disease (Valente & Pitts, 2017). The growth in the application of network analysis to study health was more apparent in public health research than in family research. In part, this reflects a limitation of the data collected for family research, where respondents answer questions on their own health, extant relations, as well as relationship quality (Carr et al., 2014). This type of data make it difficult to conduct epidemiological analyses of the structural effects of family networks if one approaches the network as a system of entities or nodes connected to like entities, for example, a person-by-person network. This type of *one-mode network* analysis—or the study of relations between members of the same class such as individuals connected to other individuals, or organizations connected to other organizations—is typical of most network studies. As we note earlier, two-mode networks are characterized by connections between members of one class (e.g., individuals) and members of another class (e.g., role relations). Unlike one-mode networks, two-mode networks facilitate comparisons of social structure among and across groups where respondents answer questions on individuals in their lives, but not on the same individuals as is the case with probability samples.

Study Goals and Hypotheses

We present and test a network-centric framework that models individuals' links to relations and networks on the basis of the incidence and quality of individual-role ties. We model relations as separate constructs, and collectively as networks because we hypothesize that: (a) relations influence individuals based on their affective properties, and the effects of negative or positive relations are directly proportional to their affect; and (b) social networks exert collective influences on health that are not just a function of network connections, but also of the affect of these connections. A unique aspect of our study is the analysis of two-mode respondent-role relation networks to study health among multigenerational families (Cornwell, Marcum, & Silverstein, 2015). This approach enables us to make comparisons across individuals with respect to the impacts of family networks on health.

Our specific hypotheses are that:

- H1a:** Positive role relationships are associated with fewer depressive symptoms
- H1b:** Negative role relationships are associated with more depressive symptoms
- H2a:** Higher centrality in the positive respondent-role network is associated with fewer depressive symptoms
- H2b:** Higher centrality in the negative respondent-role network is associated with more depressive symptoms

Research Design and Methods

We here employ a two-fold approach to explore how relations, and in the aggregate their resultant networks, influence the health and well-being of older African Americans in comparison to older individuals from other ethno-racial groups. First, we analyze how role relations affect depressive symptoms based on the quality of these ties; specifically for spouse/partner, mother, father, and child relations. Second, we use these quality-based ties to construct two-mode respondent-role relations networks. Subsequently, we assess how the individual's centrality in the respondent-role relation networks (population level) is associated with individuals' depressive symptoms. Specifically, we assess the associations between depressive symptoms and an individual's centrality in their positive and negative networks. This unique combination of methods has significant potential in explicating the complex effects of social relations and networks for ethno-racial minorities such as African Americans. The approach also has implications for family research broadly as it shows the potential of population- or epidemiological network analysis using traditional family research data.

Data are from the 2004–2005 National Survey of American Life Family Connections across Generations and Nations Study (NSAL 3-Gen). Modeled on the 1979–81 National Survey of Black Americans Three Generation Family Study (Jackson & Hatchett, 1986), the NSAL 3-Gen uses the nationally representative NSAL cross-section survey as the “parent” study for a three-generation family study (Jackson et al., 2004). When the respondents from the NSAL cross-section survey (Focal Rs) had living family members (Family Rs) from at least two other contiguously connected generations, interviews were conducted with one randomly chosen representative from each of those two generations. The cross-section respondent (Focal R) was re-interviewed with an abbreviated form of the three-generation instrument. In the course of the data collection, it became clear that more Focal Rs than anticipated were either unable or unwilling to provide contact information for the other family members who needed to be interviewed. Therefore the NSAL 3-Gen sample contains three triad types: monads (one generation, 10%), dyads (two generations, 39%), and triads (three generations, 51%).

The NSAL 3-Gen study provides unique data, because of: (a) the nationally representative sampling design; (b) the probability selection of eligible intergenerational family members; and (c) the nonrestrictive multigenerational sample (i.e., not restricted to one type of triad formation). Therefore, it is uniquely suited to consider population-level network effects. Furthermore, the study facilitates an examination of the reciprocal influences between and among intergenerational family members, and between families and their environments (Gauthier & Moody, 2014; Lippold & McNamee, 2014).

NSAL 3-Gen Sample Description

The NSAL 3-Gen sample is nationally representative ($N = 2,303$) reflecting three ethno-racial groups: African Americans ($N = 860$), Caribbean Blacks ($N = 663$), and Non-Hispanic Whites ($N = 780$). The sample has an age distribution ranging from 13 to 105 (mean = 47.3, median = 47, $SD = 20.1$) and in terms of gender distribution is 64.2% female. In this study, we focus on older adults, defined as individuals aged 50 years and older ($n = 1,055$). The ethno-racial breakdown of this subsample is: 373 African Americans, 264 Black Caribbeans, and 418 Non-Hispanic Whites. The group has an age range of 50–105 (mean = 65.7, median = 64, $SD = 11.2$) and is 68.7% female. Additional summary statistics and pairwise correlations are available in [Supplementary Tables S1–S8](#) of the [Supplementary Materials](#).

Variables and Measures

Dependent variable: Depressive symptoms

The Center for Epidemiologic Studies Depression scale (CESD) is a self-report screening tool and is one of the most commonly used measures of depressive symptoms in epidemiological and clinical studies. The original scale had 20 items which evaluated the following major domains of depressive symptoms: negative affect (7 items), positive affect (4 items), somatic symptoms (7 items), and interpersonal problems (2 items). The 12-Item Center for Epidemiologic Studies Depression scale (CESD-12), the depressive symptom variable, is an abbreviated version of the original scale designed to lower respondent burden and ease administration of the scale. CESD-12 consists of a composite measure of 12 standardized items scored from 0 to 30 where a higher value indicates more depressive symptoms.

Independent variable: Social relations

For each of the four primary relations in this study, two items were used in generating quality-based role relations. The first was an item that asked the respondent to indicate the existence of that relationship. Using the Mother relation as an example, the item was “*Is your Mother or the woman who raised you still living?*” The second was an ordinal item that indicated the quality of the relationship, and for the Mother relation the item was “*Overall, how well do you and your Mother get along together? Would you say very well, fairly well, not too well or not well at all?*” For each of the four relations, a “positive quality relation” variable was created contingent on an existing relation, and the respondent getting along *very well* or *fairly well* with the other person in the dyad. Conversely, a “negative quality relation” variable was created if the relation existed, and the respondent got along *not too well* or *not well at all* with the other person in the dyad. We created “negative quality” and “positive quality” relations variables for the spouse/partner, mother, father, and child role relations.

Independent variable: Two-mode respondent-role relations networks

We conducted network analysis using respondents’ role relations. We generated and visualized our network graphs using the Ucinet and NetDraw software programs (Borgatti, 2002; Borgatti, Everett, & Freeman, 2002). Recall that in two-mode networks actors are connected to like actors only indirectly via a mutual tie with an unlike or different type of entity. In [Figure 1](#), for example, the links between G1, G2, and G3 on the one hand, and “Spouse_Partner”, “Mother”, “Father”, and “Child” on the other hand represent a two-mode network in that they directly connect two different types of entities, individuals and role relations. Connections between individuals in this network are indirect, and only where the individuals are linked to the same role relation. The individuals in the fictional family are G1, G2, and G3 ([Table 1](#)). There are no direct connections between the individuals. For example, there are three indirect connections between G1 and G2, through the *Mother*, *Spouse/Partner*, and *Child* role relations. We are also interested in the affective quality of relations (see the binary “Negative” and “Positive” relations from [Table 1](#)). For the “Positive” network, the only link between G1 and G2 is through the *Mother* role. For the “Negative” network, there is no link between G1 and G2. That is, the two individuals are disconnected. For the purpose of the present analyses in each of the four role relations, we assume the “Negative” and “Positive” relations are mutually exclusive; that is, contrary to ambivalence theory, one can have a negative or positive relation with the father role, but not both ([Table 1](#)).

Characterizing the nonfocal individuals in networks as role relations ([Figure 1](#) and [Table 1](#)) enables us to perform population-level analysis of how the social context affects individuals. Degree centrality measures are computed for the two-mode respondent-role relation networks, where *degree* is the normalized number of role relations to which the respondent is connected. We use degree for its simplicity of interpretation relative to other more complex measures of centrality.

Sociodemographic variables

The models also consider a number of sociodemographic variables: age, gender, and years of education. Network size is known to decrease with age (Ajrouch et al., 2001; Smith et al., 2015). The Convoy Model helps us capture the complexity of social structure across time and context as it conceptualizes how social relations and networks are different across the focal individual’s life (e.g., childhood

Table 1. Affect and Role Relations in a Multigenerational Triad

	Spouse_Partner	Mother	Father	Child
G1	Negative	Positive		Positive
G2	Positive	Positive	Positive	Negative
G3	Negative	Negative	Positive	Positive

vs adulthood) because of developmental and contextual processes, and personal and situational factors (Antonucci, Ajrouch, & Birditt, 2014; Antonucci et al., 2009; Kahn & Antonucci, 1980). Studies have also found associations between gender and educational attainment with respect to network size, proximity, and contact frequency (Ajrouch, Blandon, & Antonucci, 2005; Fischer & Beresford, 2015).

Statistical Models

Depressive symptoms were regressed on social relations and networks using survey ordinary least squares (OLS) regressions. To account for the complex design of the NSAL 3-Gen sample, analyses were done using the *svy* commands in Stata 12 (StataCorp, 2011). These *svy* commands enable us to account for the weighting, clustering, and stratification in the NSAL study. With complex survey data, assumptions of the independence of cases are violated hence the need to employ models that account for this. The basic equation of the linear OLS model is (ϵ is the intercept):

$$y = \beta_0 + \beta_1 X_i + \epsilon_i \quad (1)$$

The “negative” and “positive” relations and the degree centrality measures from the “positive” and “negative” networks are the predictors in OLS models of depressive symptoms (CESD-12). The models consider age, gender, and years of education. We also modeled the associations of social relations and networks with depressive symptoms among African Americans relative to the other two ethnic-racial groups, Black Caribbeans and Non-Hispanic Whites.

Results

In this section, we first present results from the descriptive analysis of the social relations and networks, and

second present the results of the regression modeling of the relations and networks. In discussing the regression models, particular attention is paid to the four hypotheses outlined above.

Descriptive Analysis

In the interest of brevity, we restrict our descriptions of social relations and networks to the entire sample only. Positive quality relations ($N = 1,853$) occur at a higher frequency than negative quality ones ($N = 115$) and more people have higher centrality in positive networks ($N = 855$) than negative ones ($N = 107$). For negative relations, the highest frequency is for the *Father* role ($N = 61$) while the lowest frequency is for the *Child* role ($N = 12$). For positive relations, the highest and lowest frequencies are for the *Mother* ($N = 543$) and *Father* ($N = 334$) roles, respectively. There are eight times as many people with non-zero centralities in the positive network as there are in the negative network. A visual representation of these networks is presented in the graphs shown in Figures 2 and 3.

Two-Mode Respondent-Role Relation Networks

Figures 2 and 3 show the two-mode networks for the entire NSAL 3-Gen sample where circles are individuals and squares are role relations. The two networks are also configured such that the size of the nodes is directly proportional to its degree centrality. Note that the network graphs are generated iteratively by fitting a spring embedding layout with node repulsion and equal edge length biasing (Borgatti, 2002). Node repulsion improves readability by separating nodes that would otherwise be too close to each other. Biasing for equal edge length makes the paths or distances

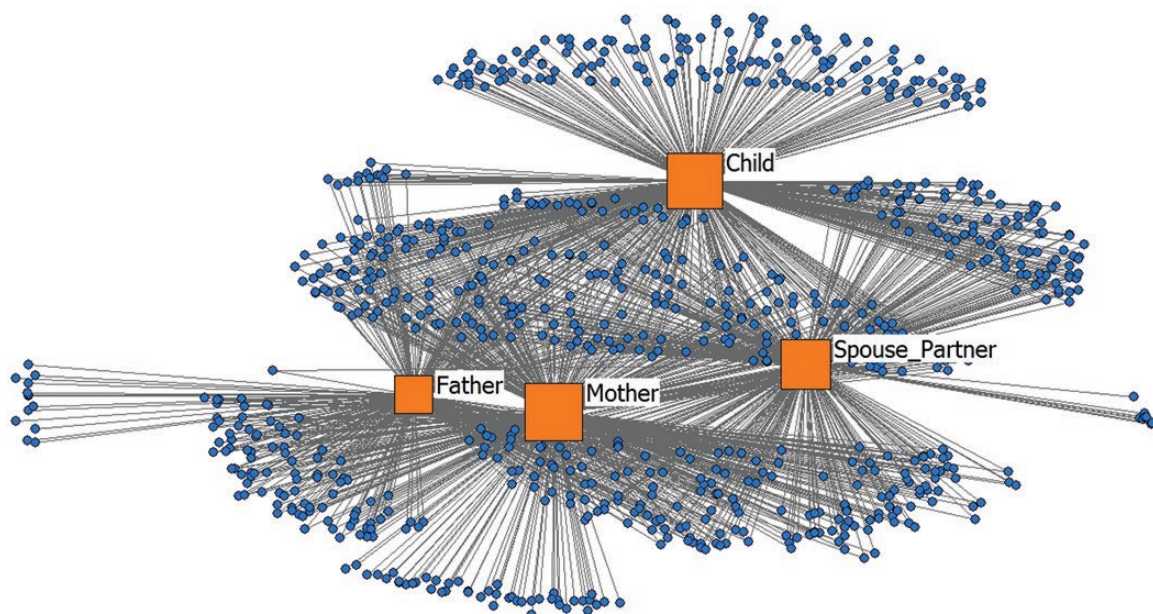


Figure 2. “Positive” two-mode individual-role relation network (ties = 1,853), node size by degree.

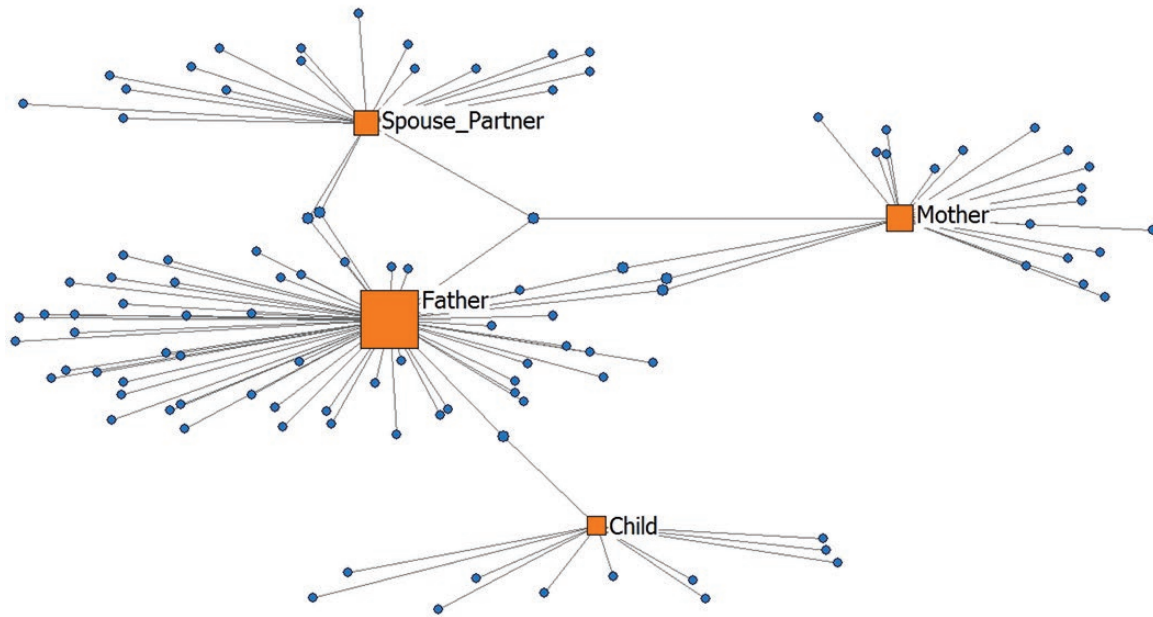


Figure 3. “Negative” two-mode individual-role relation network (ties = 115), node size by degree.

between pairs of nodes the same or similar. The negative quality network (tie density = 0.036) is much sparser than the positive quality network (tie density = 0.553). The node sizes, especially those of the role relations, show notable differences with respect to role relation prominence. There are also large differences in the number of ties or relations between the positive ($N = 1,853$) and negative ($N = 115$) networks.

In the positive quality network, the father role relation has the smallest size of the four role relations, while in the negative network the father role relation is the largest of the four primary relations. The iterative fitting locates nodes with the shortest path lengths closer to each other in the image or graph. For example, the *Father* and *Mother* pairs are closer to each other than the *Child* and *Spouse/Partner* pairs in Figure 2. A plausible interpretation is that a positive quality relation with either parent makes it more likely that one will have a positive relation with the other parent.

Regression Models

Summary statistics and pairwise correlations for the variables used in the regression modeling are shown in the Supplementary Tables S1–S8. The results from the regression modeling are shown in Tables 2 and 3. Recall that a positive correlation with the depressive symptom variable indicates worse mental health. For older adults in NSAL 3-Gen, we ran eight models, four each for social relations and networks as follows: entire sample (models 1 and 5), African Americans only (models 2 and 6), Black Caribbeans only (models 3 and 7), and Non-Hispanic Whites only (models 4 and 8). We will focus our discussion on the models specific to African Americans, especially noting similarities and differences with the models for Black

Caribbeans and Non-Hispanic Whites. We performed sensitivity analyses using models for all ages as opposed to only older adults (see Supplementary Tables S9 and S10 of the Supplementary Material). While some variables become more or less significant across these two sets of models, the overall pattern of effects for African Americans relative to Black Caribbeans and Non-Hispanic Whites is fairly stable.

Depressive Symptoms

For positive relations, *Child* is significantly associated with fewer depressive symptoms in African Americans (model 2), but not in Black Caribbeans and Non-Hispanic Whites (models 3 and 4). Older African Americans with a negative *Father* relationship score about 17 units more on the CESD-12 depressive symptoms scale. The findings therefore provide some support for hypothesis H1a.

For negative relations, *Father* is significantly associated with more depressive symptoms in African Americans (model 2), but not in Black Caribbeans and Non-Hispanic Whites (models 3 and 4). Older African Americans with a positive *Child* relationship score about 4 units less on the CESD-12 depressive symptoms scale. The results provide some support for hypothesis H1b.

Negative networks are significantly associated with more depressive symptoms among African Americans (model 6), and also among Black Caribbeans and Non-Hispanic Whites (models 7 and 8). For an older African American with a negative network, for every unit increase in the degree of network, a 15 unit increase in the CESD-12 depressive symptoms scale is predicted. This is comparable to Black Caribbeans (17 unit increase) and Non-Hispanic Whites (15 units increase). Positive networks are not significantly associated with depressive symptoms in African

Table 2. Associations between depressive symptoms (CESD-12) and social relations

<i>Model number</i>	(1)**	(2)**	(3)**	(4)
Variables	ALL50+	AFRAM50+	BLCAR50+	NHWHI50+
Spouse/Partner, Negative	4.354* (2.091)	5.168 (3.163)	7.475** (2.303)	2.717 (2.941)
Mother, Negative	-0.569 (1.607)	-0.257 (2.723)	-2.630 (1.781)	1.211 (1.712)
Father, Negative	1.808 (4.522)	17.40** (1.712)	-0.996 (1.312)	-3.290 (2.777)
Child, Negative	8.282** (3.085)	-3.410 (2.268)	5.474 (3.296)	11.46** (3.589)
Spouse/Partner, Positive	-1.462* (0.654)	0.00773 (1.053)	-1.334 (1.138)	-2.369* (0.921)
Mother, Positive	-0.731 (0.696)	-0.514 (1.009)	0.0272 (1.162)	-0.167 (0.849)
Father, Positive	0.0323 (0.715)	-0.0251 (1.260)	-0.658 (1.222)	0.246 (0.974)
Child, Positive	0.360 (1.252)	-3.988* (1.729)	-1.304 (3.369)	1.235 (1.351)
Age	-0.0740* (0.0360)	-0.0990+ (0.0544)	0.0708 (0.0565)	-0.0576 (0.0451)
Gender	1.015* (0.447)	1.838* (0.654)	1.543+ (0.790)	0.732 (0.651)
Years of Education	-0.423** (0.0940)	-0.785** (0.121)	-0.453** (0.154)	-0.215 (0.162)
<i>RACE3GEN: African American (Omitted Category)</i>				
RACE3GEN: Black Caribbean	-0.371 (0.807)			
RACE3GEN: Non-Hispanic White	-0.643 (0.501)			
Constant	17.38** (3.234)	25.45** (3.691)	8.962 (6.479)	12.80** (3.929)
Observations	1,048	371	259	418
R-squared	.175	.214	.292	.213

Note: The symbol next to the model number in the second row indicates the overall significance of the regression model using the notation in the row above, e.g., (1)** indicates model 1 is significant at $p < .01$.

+ $p < .1$, * $p < .05$, ** $p < .01$.

Americans, and comparably in Black Caribbeans and Non-White Hispanics. The findings thus provide support for hypothesis **H2b**, but not for **H2a**.

With respect to the sociodemographic variables, the results suggest gender and education are associated with depressive symptoms among African Americans (models 2 and 6), and that the patterns in African Americans are more similar to those of Black Caribbeans (models 3 and 7) rather than Non-Hispanic Whites (models 4 and 8). Specifically, older African American females score 1.4–1.8 units higher CESD-12 depressive symptoms scale than their male counterparts. Conversely, for every unit increase in years of education, a 0.72–0.79 unit decrease in the CESD-12 depressive symptoms scale is predicted.

Discussion and Implications

We empirically modeled quality-based social relations and networks to examine their associations with depressive symptoms especially in older African Americans relative to Black Caribbeans and Non-White Hispanics. We employ the dual approach of modeling both relations and networks because the former can yield information on the salience of role relations, while the latter provides a robust means of aggregating social relations without implying additive effects, as when relations are merely summed. For networks, we focused on seldom-used two-mode networks for their potential in developing population-level models of the effects of social structure on individual outcomes. We also add the dimension of relational affect in defining social

Table 3. Associations between depressive symptoms (CESD-12) and social networks

Model number	(5)**	(6)**	(7)**	(8)*
Variables	ALL50+	AFRAM50+	BLCAR50+	NHWHI50+
Degree, Negative Network	15.14** (5.179)	15.39* (7.382)	17.44* (7.314)	15.18* (6.869)
Degree, Positive Network	-3.542+ (1.936)	-2.058 (2.776)	-3.506 (2.236)	-3.968 (2.677)
Age	-0.0738* (0.0360)	-0.117+ (0.0569)	0.0593 (0.0519)	-0.0587 (0.0478)
Gender	1.066* (0.489)	1.417+ (0.733)	1.838* (0.815)	0.843 (0.723)
Years of Education	-0.431** (0.0957)	-0.715** (0.123)	-0.427* (0.160)	-0.217 (0.168)
<i>RACE3GEN: African American (Omitted Category)</i>				
RACE3GEN: Black Caribbean	-0.354 (0.875)			
RACE3GEN: Non-Hispanic White	-0.707 (0.501)			
Constant	18.53** (3.034)	23.39** (5.346)	8.707+ (4.475)	14.58** (3.329)
Observations	1,048	371	259	418
R-squared	.146	.171	.263	.125
Standard errors in parentheses				

Note: The symbol next to the model number in the second row indicates the overall significance of the regression model using the notation in the row above, e.g., (5)** indicates model 5 is significant at $p < .01$.

+ $p < .1$, * $p < .05$, ** $p < .01$.

relations and subsequently networks as there are negative and positive aspects to social connections, especially ties to the following role relations: *Spouse/Partner*, *Mother*, *Father*, and *Child*. These results reinforce the complementary nature of modeling social relations and networks. Different positive and negative social relations have significant associations with depressive symptoms. However, only negative social networks have significant associations with depressive symptoms.

Individuals reported far fewer negative quality relations than positive quality ones. Moreover, the positive quality network had significantly more nodes and ties or connections than the negative quality network. The regression models, however, revealed greater associations (larger coefficients) for negative relations and networks than for positive relations and networks. These results support previous research findings that while negative aspects of relations are expressed at lower frequencies than the positive ones, they are more strongly associated with health and well-being (Newsom, Nishishiba, Morgan, & Rook, 2003; Newsom, Rook, Nishishiba, Sorkin, & Mahan, 2005; Rook, 1997). Even when both positive and negative relations are significantly associated with the outcome in a specific model, the negative relations have larger coefficients, suggesting that the protective powers of positive relations may be limited in the face of strong negative relations. For example, among

older African Americans (model 2), the negative *Spouse/Partner* relation ($\beta = 5.168$) has a much larger effect than either the positive *Father* relation ($\beta = -0.025$) or positive *Mother* relation ($\beta = -0.514$). This disparity in strength of influence is also seen when the negative and positive networks are compared. For example, among older African Americans (model 6), the negative network ($\beta = 15.39$) has a much larger effect than the positive network ($\beta = -2.058$).

Translational Implications

Overall, the results suggest that social relations and networks should be strongly considered as targets for interventions designed to improve depressive symptoms in older African Americans. The research findings suggest the potential for the development of relational- and network-based solutions to depression and other mental health issues among African Americans in the context of similarities and differences with other ethno-racial groups. These efforts could potentially lead to the generation of relatively low-cost solutions that can be tuned to accommodate the salience of specific relations or aspects of networks in groups such as African Americans, and that facilitate or ease implementation at the societal level.

Directions for Future Research

We characterized the affective quality of relations and networks in binary terms; they were either positive or negative.

This simplification could rightly be viewed as a limitation of our study in light of the body of work on ambivalence relations that indicates that negative and positive relations are independent, rather than being on opposite ends of the same continuum. Therefore, a logical extension of this study would simultaneously model relations and networks as positive and/or negative. Simultaneously operationalizing the negative and positive aspects of social relations and networks would enable additional tests of the robustness and validity of the construct of ambivalence, and its association with health.

A limitation to our approach is that we relied on single items to measure both positive and negative social relations. Future extensions of this study could explore whether there are any differences in the links between positive or negative affect in relations and networks with respect to whether the affect is measured using single- versus multi-item scales. This would establish whether the single-item measure approach has good convergent and discriminant validity, and ascertain its predictive validity relative to multi-item scales.

Another issue for exploration is whether the type of triad matters for individual health outcomes. Individuals in NSAL 3-Gen study are currently part of multigenerational families, since it was a prerequisite for entry into the study. However, once the study commenced it became clear that some of the focal respondents from the parent NSAL were unable to give reliable contact information for the other two individuals in this multigenerational triad (three biologically or early-life related family members across generations). Moreover, any of the two family members nominated by the focal respondent could have refused to participate in the study. These people are represented in the NSAL 3-Gen study as monads (one generation) or dyads (two generations). Rather than treat these cases as unfortunate limitations of the data collection process, one possibility would be to regard the triad type (monads, dyads, triads) as a realistic approximation of important dimensions of social networks, such as the capacity of providing social support. Social support across generations entails instrumental transfers of material resources, emotions, and affection that are correlated with contact frequency and geographic proximity. Therefore, another way to extend the analysis we present in this study is to model each of the triad types separately to ascertain whether the nature of participation in the study is itself an important way to explicate how social relations and networks shape individual health outcomes.

Despite the strength of the multigenerational design of the NSAL 3-Gen, one of its limitations is the cross-sectional nature of the study. We modeled the links between social ties (relations and networks) and depressive symptoms. Our study data do not allow us to capture the dynamics of social relations and networks over the life span. This limitation could be resolved by longitudinal network data collected from multigenerational households such as those in NSAL 3-Gen.

This study employed a unique approach to understand how social structure impacts depressive symptoms among

older African Americans. We constructed affect-based negative and positive relations based on four primary family roles: mother, father, child, and spouse/partner. Further, we used these relations to generate negative and positive two-mode respondent-role networks to examine associations between social environments and depressive symptoms among older African Americans. Our results reveal that different positive and negative role relations have significant effects on depressive symptoms. However, only negative networks are significantly associated with depressive symptoms among African Americans, and comparably among Black Caribbeans and Non-White Hispanics. Our results imply a need for more nuanced designs and interpretations of the effects of social ties and structure on depressive symptoms and mental health among African Americans and other ethno-racial minorities.

Admittedly, the four basic role relations used to construct the two-mode networks in this study, while straightforward to model and explain, do not fully capture the complex reality of the larger context of families. The omission of other types of family role relations in the study, such as step relations and sibblingships, should not be taken as a sign of our failure to recognize their importance. Rather, we hope that future studies that employ our approach will also utilize more encompassing sets of family relations that may include extended and fictive kin, and even close friendships.

In sum, the simultaneous modeling of both relations and networks in this exploratory study provides interesting insights on how social structures shape individuals' health outcomes. By employing formal network analysis to examine the links from family ties and structure to depressive symptoms, we highlight key dimensions of the social environment that we suggest warrant deeper analysis in future studies of health and health disparities among African Americans and other minority populations.

Supplementary Material

Supplementary material can be found at *Innovation in Aging*.

Funding

This work was supported by grants from the National Institute on Aging (grant number P30 AG015281); National Institute on Drug Abuse; the MacArthur Foundation; and the Michigan Center for Urban African American Aging Research.

Conflict of Interest

None reported.

References

- Ajrouch, K. J., Antonucci, T. C., & Janevic, M. R. (2001). Social networks among blacks and whites: The interaction between race and age. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 56, S112–S118. doi:10.1093/geronb/56.2.S112

- Ajrouch, K. J., Blandon, A. Y., & Antonucci, T. C. (2005). Social networks among men and women: The effects of age and socioeconomic status. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 60, S311–S317. doi:10.1093/geronb/60.6.S311
- Antonucci, T. C., Ajrouch, K. J., & Birditt, K. S. (2014). The convoy model: Explaining social relations from a multidisciplinary perspective. *The Gerontologist*, 54, 82–92. doi:10.1093/geront/gnt118
- Antonucci, T. C., Akiyama, H., & Lansford, J. E. (1998). Negative effects of close social relations. *Family Relations*, 47, 379–384. doi:10.2307/585268
- Antonucci, T. C., Birditt, K. S., & Akiyama, H. (2009). Convoys of social relations: An interdisciplinary approach. In V. L. Bengtson, D. Gans, N. Putney, & M. Silverstein (Eds.), *Handbook of theories of aging* (2nd ed., pp. 247–260). New York: Springer.
- Antonucci, T. C., Birditt, K. S., & Webster, N. J. (2010). Social relations and mortality: A more nuanced approach. *Journal of Health Psychology*, 15, 649–659. doi:10.1177/1359105310368189
- Antonucci, T. C., & Wong, K. M. (2010). Public health and the aging family. *Public Health Reviews*, 32, 512–531.
- Bell, C. N., Thorpe, R. J. Jr, & Laveist, T. A. (2010). Race/ethnicity and hypertension: The role of social support. *American Journal of Hypertension*, 23, 534–540. doi:10.1038/ajh.2010.28
- Bengtson, V., Giarrusso, R., Mabry, J. B., & Silverstein, M. (2002). Solidarity, conflict, and ambivalence: Complementary or competing perspectives on intergenerational relationships? *Journal of Marriage and Family*, 64, 568–576. doi:10.1111/j.1741-3737.2002.00568.x
- Biddle, B. J. (1986). Recent developments in role theory. *Annual Review of Sociology*, 12, 67–92. doi:10.1146/annurev.so.12.080186.000435
- Billingsley, A. (1988). *Black families in White America/Andrew Billingsley, with the Assistance of Amy Tate Billingsley*. New York, NY: Simon & Schuster.
- Borgatti, S. P. (2002). *NetDraw: Graph visualization software*. Harvard: Analytic Technologies.
- Borgatti, S. P. (2012). Two-mode concepts in social network analysis. In R. A. Meyers (Ed.), *Computational complexity: Theory, techniques, and applications* (pp. 2912–2924). New York, NY: Springer New York.
- Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). *Ucinet 6 for windows: Software for social network analysis*. Harvard: Analytic Technologies.
- Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. *Science (New York, N.Y.)*, 323, 892–895. doi:10.1126/science.1165821
- Bott, E. (1957). *Family and social network*. London, UK: Tavistock Publications.
- Cantor, M. H. (1979). Neighbors and friends: An overlooked resource in the informal support system. *Research on Aging*, 1, 434–463.
- Carr, D., Springer, K. W., & Williams, K. (2014). Health and Families. In J. Treas, J. Scott & M. Richards (Eds.), *The Wiley Blackwell companion to the sociology of families* (pp. 255–276). Oxford, UK: John Wiley & Sons, Ltd.
- Chatters, L. M., Taylor, R. J., & Jackson, J. S. (1985). Size and composition of the informal helper networks of elderly blacks. *Journal of Gerontology*, 40, 605–614.
- Cornwell, B., Marcum, C., & Silverstein, M. (2015). The social network approach in gerontological research. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 70, 87–90. doi:10.1093/geronb/gbu157
- Cornwell, E. Y., & Waite, L. J. (2012). Social network resources and management of hypertension. *Journal of Health and Social Behavior*, 53, 215–231. doi:10.1177/0022146512446832
- Dunifon, R., & Kowaleski-Jones, L. (2002). Who's in the house? Race differences in cohabitation, single parenthood, and child development. *Child Development*, 73, 1249–1264. doi:10.1111/1467-8624.00470
- Eddy, J. M., Martinez, C., Jr, Metzler, C., & Heyman, R. (2014). Family. In Z. Sloboda & H. Petras (Eds.), *Defining prevention science* (pp. 137–150). New York, NY: Springer US.
- Fingerman, K. L., Chen, P. C., Hay, E., Cichy, K. E., & Lefkowitz, E. S. (2006). Ambivalent reactions in the parent and offspring relationship. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 61, P152–P160.
- Fingerman, K. L., Hay, E. L., & Birditt, K. S. (2004). The best of ties, the worst of ties: Close, problematic, and ambivalent social relationships. *Journal of Marriage and Family*, 66, 792–808. doi:10.1111/j.0022-2445.2004.00053.x
- Fischer, C. S., & Beresford, L. (2015). Changes in support networks in late middle age: The extension of gender and educational differences. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 70, 123–131. doi:10.1093/geronb/gbu057
- Gauthier, R., & Moody, J. (2014). Anatomies of kinship: Preliminary network models for change and diversity in the formal structure of American families. In S. M. McHale, P. Amato & A. Booth (Eds.), *Emerging methods in family research* (Vol. 4, pp. 73–93). New York, NY: Springer International Publishing.
- Gilligan, M., Suito, J. J., Feld, S., & Pillemer, K. (2015). Do positive feelings hurt? Disaggregating positive and negative components of intergenerational ambivalence. *Journal of Marriage and the Family*, 77, 261–276. doi:10.1111/jomf.12146
- House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and processes of social support. *Annual Review of Sociology*, 14, 293–318. doi:10.2307/2083320
- Jackson, J. S., & Hatchett, S. (1986). Intergenerational research: Methodological considerations. In N. Datan, A. L. Greene & H. W. Reese (Eds.), *Life-span developmental psychology: Intergenerational relations* (pp. 51–76). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Jackson, J. S., Torres, M., Caldwell, C. H., Neighbors, H. W., Nesse, R. M., Taylor, R. J., Trierweiler, S. J., Williams, D. R. (2004). The national survey of American life: A study of racial, ethnic and cultural influences on mental disorders and mental health. *International Journal of Methods in Psychiatric Research*, 13(4), 196–207. doi:10.1002/mp.177
- Kahn, R. L., & Antonucci, T. C. (1980). Convoys over the life course: Attachment, roles, and social support. In P. B. Baltes & O. G. Brim (Eds.), *Life-span development and behavior* (Vol. 3, pp. 254–283). New York, NY: Academic Press.
- Kaufman, A. V., Kosberg, J. I., Leeper, J. D., & Tang, M. (2010). Social support, caregiver burden, and life satisfaction in a sample of rural African American and white caregivers of older persons with dementia. *Journal of Gerontological Social Work*, 53, 251–269. doi:10.1080/01634370903478989
- Lincoln, K. D., & Chae, D. H. (2012). Emotional support, negative interaction and major depressive disorder among African Americans and Caribbean blacks: Findings from the national

- survey of American life. *Social Psychiatry and Psychiatric Epidemiology*, 47, 361–372. doi:10.1007/s00127-011-0347-y
- Lippold, M. A., & McNamee, C. B. (2014). Capturing the complexity of families using innovative methods. In S. M. McHale, P. Amato & A. Booth (Eds.), *Emerging methods in family research* (Vol. 4, pp. 263–280). New York, NY: Springer International Publishing.
- McBride, C. K., Paikoff, R. L., & Holmbeck, G. N. (2003). Individual and familial influences on the onset of sexual intercourse among urban African American adolescents. *Journal of Consulting and Clinical Psychology*, 71, 159–167. doi:10.1037/0022-006X.71.1.159
- Milkie, M. A., Bierman, A., & Schieman, S. (2008). How adult children influence older parents' mental health: Integrating stress-process and life-course perspectives. *Social Psychology Quarterly*, 71, 86–105. doi:10.1177/019027250807100109
- Miller, D. K., Malmstrom, T. K., Joshi, S., Andresen, E. M., Morley, J. E., & Wolinsky, F. D. (2004). Clinically relevant levels of depressive symptoms in community-dwelling middle-aged African Americans. *Journal of the American Geriatrics Society*, 52, 741–748. doi:10.1111/j.1532-5415.2004.52211.x
- Newsom, J. T., Nishishiba, M., Morgan, D. L., & Rook, K. S. (2003). The relative importance of three domains of positive and negative social exchanges: A longitudinal model with comparable measures. *Psychology and Aging*, 18, 746–754. doi:10.1037/0882-7974.18.4.746
- Newsom, J. T., Rook, K. S., Nishishiba, M., Sorkin, D. H., & Mahan, T. L. (2005). Understanding the relative importance of positive and negative social exchanges: Examining specific domains and appraisals. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 60, P304–P312.
- Ostchega, Y., Dillon, C. F., Hughes, J. P., Carroll, M., & Yoon, S. (2007). Trends in hypertension prevalence, awareness, treatment, and control in older U.S. Adults: Data from the national health and nutrition examination survey 1988 to 2004. *Journal of the American Geriatrics Society*, 55, 1056–1065. doi:10.1111/j.1532-5415.2007.01215.x
- Pillemer, K., & Sutor, J. J. (2002). Explaining mothers' ambivalence toward their adult children. *Journal of Marriage and Family*, 64, 602–613. doi:10.1111/j.1741-3737.2002.00602.x
- Pinquart, M., & Sörensen, S. (2000). Influences of socioeconomic status, social network, and competence on subjective well-being in later life: A meta-analysis. *Psychology and Aging*, 15, 187–224. doi:10.1037/0882-7974.15.2.187
- Rook, K. S. (1984). The negative side of social interaction: Impact on psychological well-being. *Journal of Personality and Social Psychology*, 46, 1097–1108. doi:10.1037/0022-3514.46.5.1097
- Rook, K. S. (1997). Positive and negative social exchanges: Weighing their effects in later life. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 52, S167–S169. doi:10.1093/geronb/52B.4.S167
- Rook, K. S. (2015). Social networks in later life: Weighing positive and negative effects on health and well-being. *Current Directions in Psychological Science*, 24, 45–51. doi:10.1177/0963721414551364
- Rossi, A. S., & Rossi, P. H. (1990). *Of human bonding: Parent-child relations across the life course*. New York: A. de Gruyter.
- Shanas, E. (1979). Social myth as hypothesis: The case of the family relations of old people. *The Gerontologist*, 19, 3–9. doi:10.1093/geront/19.1.3
- Smith, K. P., & Christakis, N. A. (2008). Social networks and health. *Annual Review of Sociology*, 34, 405–429. doi:10.1146/annurev.soc.34.040507.134601
- Smith, E. J., Marcum, C. S., Boessen, A., Almquist, Z. W., Hipp, J. R., Nagle, N. N., & Butts, C. T. (2015). The relationship of age to personal network size, relational multiplexity, and proximity to alters in the western United States. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 70, 91–99. doi:10.1093/geronb/gbu142
- Sneed, R. S., & Cohen, S. (2014). Negative social interactions and incident hypertension among older adults. *Health Psychology*, 33, 554–565. doi:10.1037/hea0000057
- StataCorp. (2011). *Stata statistical software: Release 12*. College Station, TX: StataCorp LP.
- Taylor, R. J., Chae, D., Lincoln, K., & Chatters, L. (2015). Extended family and friendship support networks are both protective and risk factors for major depressive disorder and depressive symptoms among African-Americans and black Caribbeans. *The Journal of Nervous and Mental Disease*, 203(2), 132–140. doi:10.1097/NMD.0000000000000249
- Taylor, R. J., Chatters, L. M., Woodward, A. T., & Brown, E. (2013). Racial and ethnic differences in extended family, friendship, fictive kin and congregational informal support networks. *Family Relations*, 62, 609–624. doi:10.1111/fare.12030
- Umberson, D., & Montez, J. K. (2010). Social relationships and health: A flashpoint for health policy. *Journal of Health and Social Behavior*, 51 (Suppl), S54–S66. doi:10.1177/0022146510383501
- Valente, T. W., & Pitts, S. R. (2017). An appraisal of social network theory and analysis as applied to public health: Challenges and opportunities. *Annual Review of Public Health*, 38, 103–118. doi:10.1146/annurev-publhealth-031816-044528
- Watts, D. J. (2004). The “new” science of networks. *Annual Review of Sociology*, 30, 243–270. doi:10.1146/annurev.soc.30.020404.104342
- Weine, S., & Siddiqui, S. (2009). Family determinants of minority mental health and wellness. In S. Loue & M. Sajatovic (Eds.), *Determinants of minority mental health and wellness* (pp. 1–33). New York: Springer.