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Original Research Article

The longitudinal impacts of secondary caregiver networks on primary caregiver's social isolation and depression

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Abstract

Background and Objectives: Caregiving for older adults often leads to increased social isolation and depression among primary caregivers. Secondary caregiver networks (SCNs) may provide crucial support, potentially mitigating these adverse outcomes. This study aimed to identify the SCN support patterns and examine their impacts on primary caregivers' social isolation and depression over 2 years, as well as potential differences in the associations by gender and race.

Research Design and Methods: Data from the 2015 and 2017 National Study of Caregiving (NSOC) and National Health and Aging Trends Study (NHATS) were used. Latent profile analysis identified distinct SCN support patterns. Mixed-effects models assessed associations between SCN patterns, social isolation, and depression.

Results: Among 782 primary and 1,003 secondary caregivers, three SCN support patterns (low, medium, and high) were identified. Higher SCN support was associated with lower social isolation at baseline, but increased social isolation over time. Depression increased over time, but was not associated with SCN support. No significant gender and racial differences were found.

Discussion and Implications: While SCN support initially reduces social isolation among primary caregivers, its effectiveness diminishes over time. The study highlights the necessity for continuous social and mental health support for primary caregivers, regardless of SCN support level, to better address the evolving demands of caregiving.

Keywords: family caregiving, secondary caregiver support, social and mental health, gender and racial disparities

Translational Significance: This study demonstrates that while secondary caregiver network (SCN) support initially reduced primary caregivers' social isolation, it did not prevent its increase over time, and had no significant impact on depression. These findings highlight the need for sustained, adaptable support systems. Potential strategies to strengthen SCN collaboration include family-based care coordination meetings, structured peer-support groups, and digital caregiving platforms. Although gender and racial interactions with SCN support were not significant, interventions should still address broader structural barriers to support more equitable caregiving environments and improve caregivers' long-term social and mental health outcomes.

Background and objectives

Caring for older adults with long-term care needs may impose substantial stress on family caregivers, primarily due to the demanding nature of caregiving tasks and the emotional burden of supporting a loved one (Zarit & Zarit, 2015). This stress may lead to social isolation and mental health challenges, including depression, as caregivers prioritize the care recipient's needs over their own social interactions and well-being (Hajek & König, 2016; Liang et al., 2023). Secondary caregivers, such as other family members, may mitigate these negative outcomes by providing respite and emotional support, potentially enhancing the primary caregiver's social and mental health (Liang et al., 2022; Thomson et al., 2022). However, the impact of caregiving and the efficacy of secondary support can vary significantly by race and gender. Research suggests that African American caregivers, for instance, often face more intense caregiving duties and associated stress compared to their White counterparts (Aranda et al., 2021; Dilworth-Anderson et al., 2020). These disparities highlight the need for further investigation into how primary caregivers receive and utilize support from secondary caregivers, and how such support influences their social and mental health across diverse racial and gender backgrounds.

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Social isolation and depression among family caregivers

The stress process model (SPM) of caregiving provides a framework for understanding how caregiving-related stressors impact mental and social well-being (Pearlin et al., 1990). This model distinguishes between primary stressors (e.g., care recipient's functional and cognitive impairments, daily caregiving responsibilities) and secondary stressors (e.g., social isolation, role strain). Studies indicate that 40% to 70% of family caregivers experience clinical symptoms of depression, often stemming from isolation and loneliness (Gallagher & Wetherell, 2020; Liang et al., 2023). Depression, in turn, exacerbates social disconnectedness, creating a detrimental feedback loop that can lead to additional adverse health outcomes, including physical inactivity, smoking, hypertension, obesity, cognitive decline, and even suicide or premature death (Loi et al., 2024; Ninla-AeSong et al., 2023)

While many existing formal support services, such as respite care, offer temporary relief from caregiving tasks, they do not directly address the primary stressors, the ongoing demands of caregiving that contribute to long-term caregiver burden (Zebrak & Campione, 2021). This study builds upon the SPM by examining support from secondary caregivers as a potential resource that may mitigate these primary stressors over time. Unlike formal respite services, secondary caregiver support represents informal, often family-based, caregiving networks that help distribute tasks, provide emotional support, and reduce isolation (Song et al., 2023). Despite their potential benefits, the role of secondary caregiver support remains underexplored in research and practice, particularly in relation to its long-term impact on social isolation and depression among primary caregivers.

The role of secondary caregiver support

Social support is crucial in alleviating the burden on caregivers of older adults (Tough et al., 2022). In the United States, it is common for older adults to receive care from a network of multiple caregivers, including a primary caregiver and several secondary caregivers, who help distribute care responsibilities and potentially lessen the load on any single individual (Andersson & Monin, 2017; Ellis et al., 2022). According to the SPM, direct support from secondary caregivers can alleviate the caregiving stress of primary caregivers, thereby buffering against the negative consequences on social and mental health outcomes, such as reduced stress and better physical health (Liang et al., 2022; Thomson et al., 2022; Tough et al., 2022).

While secondary caregiver support is theorized to alleviate caregiving burden, empirical research remains limited regarding the specific ways in which secondary caregivers contribute to primary caregivers' long-term social and mental health outcomes. Most studies conceptualize secondary caregivers as part of the primary caregiver's broader social network and often compare their role to formal caregiving resources, which overlooks their distinct contributions within the caregiving network (Ponnala et al., 2018; Rodríguez-Madrid et al., 2018). Additionally, some research categorizes caregivers into secondary, tertiary, or other hierarchical roles, which, while useful in family studies for describing the overall caregiving structure for older adults, becomes challenging when accounting for differences in family caregiving composition and the varying levels of support provided by multiple caregivers (Dilworth-Anderson et al., 1999; Usita et al., 2004).

A network perspective in caregiving research considers the broader system of care by recognizing that multiple individuals contribute to caregiving support rather than focusing solely on the primary caregiver (Hu et al., 2022; Song et al., 2023). Research has emphasized the importance of viewing caregiving as a collective effort to better understand how support is distributed across multiple caregivers (Ellis et al., 2022). The current study maintains a distinction between the primary caregiver, who undertakes the majority of caregiving responsibilities (typically 70% of total care hours), and secondary caregivers, who provide varying levels of supplementary support.

By applying a network perspective specifically to secondary caregiver support, this study integrates multiple indicators (i.e., the number of secondary caregivers involved, the diversity of care tasks performed, and the intensity of care provided by each secondary caregiver) to describe the overall level of support from secondary caregiver network (SCN) to the primary caregiver. This approach captures caregiving as a shared process while still recognizing the central role of the primary caregiver in providing most of the direct care.

Variations between women and men, Black and White

Research indicates that family caregivers' experiences, such as caregiving burden, health outcomes, and social support, often vary significantly by gender and race (Fabius et al., 2020; Sharma et al., 2016). These differences are shaped by deeply rooted sociocultural expectations in the United States regarding caregiving roles. For example, women, who comprise the majority of caregivers, are often socialized to take on caregiving responsibilities due to traditional gender norms (Choi & Kang, 2015). As a result, women caregivers often face greater societal pressure to assume primary caregiving roles, leading to more intense caregiving demands and higher levels of stress, anxiety, and depression compared to men (Carpinelli Mazzi et al., 2020; Sharma et al., 2016). Additionally, women are more likely to provide personal care (e.g., bathing, feeding, toileting), which is physically and emotionally demanding, while men tend to focus on financial management or medical decision making (Fabius et al., 2020; Willert & Minnotte, 2019). Because of these role expectations, women caregivers may be less likely to receive adequate assistance from their SCNs, potentially exacerbating social isolation and depression.

Black caregivers, in contrast, often rely on collectivist family structures, in which caregiving responsibilities are more widely distributed across extended family members (Dilworth-Anderson & Gibson, 2002; Kasper et al., 2000). Rooted in historical resilience and strong kinship networks, Black caregivers in the United States frequently receive more informal support from extended family, which may explain why they tend to have larger SCNs and receive more hours of assistance than White caregivers (Liang et al., 2022). However, despite having larger SCN networks, Black caregivers experience higher rates of financial strain, employment disruptions, and chronic stress due to systemic inequalities that limit access to formal caregiving resources (Templeman et al., 2024).

These sociocultural factors suggest that SCN support is not equally distributed and may function differently among primary caregivers across gender and racial groups in the United States. Thus, this study adopts a diversity perspective to examine how gender and racial differences shape the ways in which secondary caregiver support influences primary caregivers' social isolation

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and depression. A diversity perspective acknowledges that caregiving experiences are not uniform but instead shaped by sociocultural norms, structural inequalities, and differing access to support networks (Dilworth-Anderson et al., 2020).

The study aims

The current study aims to (a) identify distinct patterns of SCN support, (b) examine the longitudinal effects of SCN support on the social and mental health of primary caregivers, and (c) assess whether these effects differ between women and men, as well as between Black and White caregivers. For exploratory Aim 1, we expect to identify several distinct latent groups of SCN support based on network size, care tasks, and the intensity of assistance provided by secondary caregivers. For Aim 2, based on the SPM, we hypothesize that primary caregivers with higher SCN support will be less likely to experience social isolation and depression over a 2-year period, as increased support may help buffer against caregiving-related stress. For exploratory Aim 3, we expect that women and Black caregivers may benefit more from SCN support in reducing social isolation and depression, given their historically greater reliance on informal caregiving networks. The findings of this study have the potential to inform the development of tailored interventions and policies that address the unique needs of diverse caregiver populations, ultimately improving the well-being of primary caregivers and enhancing the collaboration with caregiving networks.

Research design and methods

Data and sample

This study used data from the 2015 and 2017 National Study of Caregiving (NSOC) and the corresponding National Health and Aging Trends Study (NHATS). NHATS is a nationally representative survey that collects data from Medicare beneficiaries aged 65 years and older on their health status, living conditions, and care needs (Kasper & Freedman, 2014). Each NHATS participant identifies up to five caregivers who assist with mobility, self-care, or household activities, and provides detailed information on the tasks and intensity of the assistance. National Study of Caregiving interviews these nominated caregivers to collect additional data on caregiving activities, as well as the personal, social, and health characteristics of caregivers (Freedman, Skehan, et al., 2019). The data sets are linked through the participant ID of NHATS respondents (spid), allowing for the integration of caregiver and care recipient data. The 2017 NSOC data set follows up with caregivers identified in 2015, enabling longitudinal analysis.

The final sample was derived from NHATS participants who met the following inclusion criteria: (a) residing in the community, (b) completing the interview without a proxy, and (c) having complete data on key variables, including functional limitations and cognitive status. Caregivers were identified based on NHATS respondents' reports of receiving assistance on a regular schedule, defined as assistance provided either on specific days per week or certain days per month. If caregiving frequency was reported in either format, the caregiver was retained in the sample. NHATS respondents also reported the number of hours each caregiver provided per visit day, allowing for the calculation of total monthly caregiving hours for each caregiver. The primary caregiver was identified as the individual providing the most monthly caregiving hours (Liang et al., 2022). All remaining unpaid caregivers for that NHATS respondent were classified as secondary caregivers. To focus on racial disparities, only primary caregivers who self-identified as non-Hispanic White or non-Hispanic Black were included.

To ensure data completeness, we excluded 18 primary caregivers (2.3% of the primary sample) with missing values on social isolation and depression and 44 secondary caregivers (4.3% of the secondary caregiver sample) with missing values on care task participation. Given their low likelihood of systematic differences from the retained sample, their exclusion was unlikely to impact the validity of findings. The final analytic sample consisted of 782 primary caregivers and 1,003 secondary caregivers.

Measurements

Support from SCN

The measure of SCN support was guided by a network perspective that conceptualizes caregiving as a system of interconnected relationships, where the structure, roles, and intensity of contributions shape caregiving outcomes. In this framework, SCNs can be distinguished based on their composition (size), functional diversity (types of tasks), and intensity (time commitment). Larger networks may provide broader support, whereas smaller networks may offer concentrated but intensive care (Song et al., 2023). Thus, integrating these three network-based indicators can help understand the role of multiple caregivers as a network. This approach moves beyond simple dichotomous categorizations (e.g., presence vs absence of support) to reveal distinct profiles of caregiving support, which can help explain differences in primary caregivers' social isolation and depression over time. The three SCN support indicators include: (a) the size of the SCN (number of secondary caregivers), (b) the number of care domains that secondary caregivers helped with (i.e., self-care, household chores, mobility, and medical care; ranges from 1 to 4), and (c) the care intensity of secondary caregivers (hours/month) (Hu et al., 2022; Liang et al., 2022).

Social isolation of primary caregivers

The social isolation of primary caregivers in this study was measured using a composite framework that integrates both objective social disconnectedness and subjective loneliness, following the approach outlined by Cornwell & Waite (2009) and Wister et al. (2019). Objective social disconnectedness was assessed through five NSOC items: whether the caregiver has family or friends to talk to about important matters, family or friends to visit, church participation, club participation, and volunteer work (Pohl et al., 2017). For each item where the response indicated a lack of connection or participation, one point was assigned. The total score ranged from zero to five, with higher scores representing greater objective social disconnectedness.

A single-item loneliness scale was used to capture the subjective domain of social isolation. The primary caregivers were asked, "How often did you feel lonely during the last month?", and the response was from one (never) to five (every day). The composite measure that includes both objective social disconnectedness and subjective loneliness has good internal consistency and convergent validity (Liang et al., 2023). The total score ranges from 1 to 10, with higher scores indicating a higher level of social isolation (Cronbach's $\alpha = 0.74$ in wave one, and 0.75 in wave two).

Depression of primary caregivers

Depressive symptoms in primary caregivers were assessed using the Patient Health Questionnaire-2 (PHQ-2), a widely used screening tool in public health and mental health research

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(Monahan et al., 2009). The PHQ-2 is derived from the longer PHQ-9 and offers the advantage of being brief, time-efficient, and effective for identifying depression in large-scale studies (Monahan et al., 2009). The two items of the scale ask how often during the last month the respondent "had little interest or pleasure in doing things" and "felt down, depressed, or hopeless." Each item is scored from one (not at all) to four (nearly every day), with a total score ranging from two to eight. Higher scores indicate more severe depression.

Gender and race of primary caregivers

The gender of primary caregivers was measured as a binary variable (women/men). Race and ethnicity were assessed through a two-step process: respondents were first identified by race (White/Black/Native American/Asian/Hawaiian or Pacific Islander), and then by ethnic Hispanic/Latino identity (yes/no). For the purposes of this study, only non-Hispanic White and non-Hispanic Black primary caregivers were included, resulting in a binary race variable (Black/White). This decision was based on two factors: (a) the focus of the study is on comparing Black and White caregivers, and (b) the data set primarily consists of White and Black participants, with Hispanic caregivers comprising less than 10%, which did not reflect sufficient variance in SCN support in the analysis to draw meaningful conclusions.

Covariates

The study analyses also adjusted for sociodemographic characteristics and caregiving-related contextual factors of primary caregivers at baseline (2015), in accordance with the SPM (Pearlin et al., 1990). Sociodemographic characteristics include age (<55, 55–64, 65–74, and 75– years), education level (< high school, high school, and >high school), marital status (married/with partner, unmarried), and annual household income (<$20,000, $20,000-$39,999, $40,000-$69,999, and >$70,000). Caregiving-related contextual factors include whether the primary caregiver coresides with the older adult (yes/no), primary caregiver's relationship with older adults (spouse/partner, adult child, and others), caregiving duration (more vs less than a year), and caregiving intensity (hours/month). Caregiver burden was assessed using four 3-point scale items, asking whether the caregiver feels (1) exhausted at night, (2) overwhelmed with responsibilities, (3) lacking time for themselves, and (4) stressed by frequent changes in the care recipient's needs. The total score ranges from 4 to 12, with higher scores indicating greater caregiver burden (Liang et al., 2020).

Care demands were measured using functional limitations and dementia status of older adults and were included as time-varying variables, accounting for changes between 2015 and 2017. Functional limitations were assessed as the total number of difficulties reported across 12 activities: eating, bathing, toileting, dressing, doing laundry, shopping, cooking, banking, managing medications, getting out of bed, moving around the home, and going outside. Higher scores indicate greater functional impairment. Dementia status was classified as a binary variable (presence vs absence of probable/possible dementia), based on NHATS' validated dementia classification algorithm (Shekan & Spillman, 2013). Supplementary Table 1 lists the questions from the NHATS and NSOC surveys used to construct key variables.

Analytic strategies

All statistical analyses were conducted using STATA/SE version 16.1, with a significance level set at $\alpha = 0.05$ for two-sided tests. Descriptive statistics were calculated for key variables and covariates: categorical variables were summarized as frequencies and percentages, and continuous variables as means and standard deviations. McNemar's χ^2 and paired t-tests were conducted to compare the changes in categorical and continuous key variables between the two waves, respectively.

To identify distinct patterns of SCN support, a Latent Profile Analysis (LPA) was conducted. Latent Profile Analysis is a person-centered statistical approach used to classify individuals into mutually exclusive subgroups based on the similarity of their responses across multiple continuous indicators (Hickendorff et al., 2018). While SCN support could be examined using separate continuous variables, this approach assumes that caregiving network size, care tasks, and intensity can function both independently and interrelatedly. Latent Profile Analysis allows for a data-driven identification of naturally occurring SCN support patterns that would not be apparent through separate variable analysis (e.g., large SCN but limited hours per secondary caregiver).

In this study, the three indicators used to define the latent profiles were SCN size, the number of care domains covered by SCN, and care intensity per capita (hours per month per secondary caregiver). Care intensity per capita was selected instead of total care intensity to mitigate issues of multicollinearity with SCN size and to prevent large variances in total care hours from disproportionately influencing the model. SCN profiles were identified using only 2015 NSOC data. These profiles were treated as baseline caregiving structures, and we examined how primary caregivers in different SCN groups experienced changes in social isolation and depression from 2015 to 2017. Several model fit indices can help determine the optimal number of latent profiles, including AIC, BIC, aBIC, LMR-LRT, and BLRT.

Aim 2 examined the longitudinal associations of the identified latent SCN support patterns with social isolation and depression of primary caregivers. Both outcome variables are continuous, and mixed-effects models were estimated to account for the repeated measures of caregivers over time. The models included random intercepts to capture individual-level variability and fixed effects for the latent SCN support patterns on outcomes. Aim 3 introduced moderation analysis, where interaction terms between latent SCN support patterns and the gender (women/men) and race (Black/White) of primary caregivers were separately introduced into the models. This approach enabled the investigation of whether the relationships between SCN support and the mental and social well-being of primary caregivers differed by gender or race. Covariates were included as fixed effects to control for their potential influence on the outcomes, while care recipient health measures (functional limitations and dementia status) were treated as time-varying variables to account for changes between 2015 and 2017. Sensitivity analyses were conducted using NSOC-provided sampling weights to adjust for differential probabilities of selection and nonresponse at both the NHATS sample person and caregiver levels (Freedman, DeMatteis, et al., 2019).

Results

Participants characteristics

Table 1 presents the descriptive characteristics of the study participants. The average age of the 782 primary caregivers was 64.63 years ($SD = 12.76$). The majority were women (67.26%), non-Hispanic White (66.24%), had at least a high school education (86.19%), and were married or living with a

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Table 1. The descriptive characteristics of participants in 2015.

Variable	Category	Frequency	%	Mean	*SD*
Primary caregivers (N = 782)					
Age (years)				64.63	12.76
	<55	165	21.32		
	55–64	208	26.87		
	65–74	210	27.13		
	75–	191	24.68		
Gender	Women	526	67.26		
	Men	256	32.74		
Race/ethnicity	Non-Hispanic White	518	66.24		
	Non-Hispanic Black	264	33.76		
Education level	Below high school	108	13.81		
	High school, no college	397	50.77		
	Bachelor and above	277	35.42		
Marital status	Married/with partner	501	64.07		
	Unmarried	281	35.93		
Annual household income	< $20,000	175	22.38		
	$20,000–$39,999	220	28.13		
	$40,000–$69,999	181	23.15		
	>$70,000	206	26.34		
Caregiving-related context					
Coresidence (yes)		495	63.30		
Relationship type	Spouse/partner	272	34.78		
	Adult child	396	50.64		
	Others	114	14.58		
Caregiving duration (>1 year)		719	91.94		
Care intensity (hours/month)				80.98	89.99
Caregiver burden				5.75	2.09
No. of functional limitations of older adults				6.35	3.07
Dementia status of older adults (yes)		304	38.87		
SCN characteristics (Total number of secondary caregivers = 1,003)					
Size				1.81	1.13
	0	228	29.16		
	1	292	37.34		
	2	146	18.67		
	3+	116	14.83		
Number of care domains				2.26	1.08
	1	173	31.23		
	2	160	28.88		
	3	127	22.92		
	4	94	16.97		
Care intensity (hours/month)	Overall			72.79	64.33
	Per secondary caregiver			37.71	38.79
	1–9	214	38.63		
	10–29	113	20.40		
	30–99	120	21.66		
	100–	107	19.31		

Note. SCN = Secondary caregiver network.

partner (64.07%). Regarding financial status, 31.08% had an annual household income below $40,000, while 30.18% reported incomes above $70,000. In terms of caregiving context, 63.30% of primary caregivers coresided with the older adults, with 34.78% identified as spouses/partners and 50.64% as adult children of the older adults. Most primary caregivers (91.94%) had been providing care for more than a year, with an average of 80.98 hrs of care per month (*SD* = 89.99). The mean caregiver burden score was 5.75 (*SD* = 2.09).

Regarding the SCN, 1,003 individuals met our criteria and were included in the analyses, indicating that each primary caregiver had an average of 1.81 (*SD* = 1.13) secondary caregivers providing regular caregiving support. Each SCN managed an average of 2.26 (*SD* = 1.08) care domains, and the overall care intensity undertaken by the SCN was 78.29 hrs per month (*SD* = 64.33), with each secondary caregiver contributing an average of 37.71 hrs (*SD* = 38.79).

Table 2 presents the descriptive statistics of two outcome variables of primary caregivers across two waves of data in 2015 and 2017. Social isolation scores increased significantly from a mean of 3.69 (*SD* = 1.71) in 2015 to 4.26 (*SD* = 1.94) in 2017 ($t = 9.50$, $p < .001$). Both subdimensions, namely social disconnectedness and perceived loneliness, showed significant increases. Regarding various aspects of social participation, the participation rates in all activities, except for club activity participation, decreased significantly. Depression levels also rose

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Table 2. Descriptive statistics of outcome variables in 2015 and 2017.

Variable	Wave 1 (2015)				Wave 2 (2017)				McNemar χ^2 (paired t)
	Frequency	%	Mean	*SD*	Frequency	%	Mean	*SD*	
Social isolation			3.69	1.71			4.26	1.94	(9.50***)
Social disconnectedness			2.18	1.27			2.63	1.64	(7.63***)
No friend/family to talk	149	16.91			278	31.56			49.88***
No visit to friend/family	203	23.04			301	34.17			34.55***
No church participation	348	39.50			442	50.17			38.75***
No club participation	594	67.42			615	69.81			1.85
No volunteering	671	76.17			731	82.97			23.68***
Loneliness			1.85	0.96			1.96	1.09	(3.28**)
Depression			3.08	1.36			3.42	1.57	(6.65***)

Note.
*$p < .05$.
**$p < .01$.
***$p < .001$.

Table 3. Predicted prevalence descriptive statistics of SCN support subgroups.

SCN support group	No. of primary caregivers	%	SCN size	No. of domains	Care intensity per capita
No SCN	228	29.16	/	/	/
Low SCN support	173	22.12	1.16 (0.42)	1.69 (0.56)	10.92 (10.81)
Medium SCN support	160	20.46	1.69 (0.97)	2.75 (0.71)	29.02 (21.89)
High SCN support	221	28.26	2.41 (1.29)	3.42 (0.49)	64.96 (49.29)

Note. SCN = Secondary caregiver network.

significantly, with mean scores increasing from 3.08 (*SD* = 1.36) to 3.42 (*SD* = 1.57) ($t = 6.65$, $p < .001$).

Latent profiles of SCN support

Latent profile analyses were conducted to identify potential latent patterns of SCN support received by primary caregivers. Models with two to five classes were estimated, and the three-class model was determined to be the most suitable based on six goodness-of-fit indices (AIC = 7769, BIC = 7829, aBIC = 7785, LMR-LRT = 268.55, BLRT = 279.17).

The analysis results confirmed that the three latent subgroups accurately represent the conceptual spectrum of SCN support levels, ranging from low to high. Consequently, each group was assigned a shorthand label: low SCN support, medium SCN support, and high SCN support (Table 3). Among 782 primary caregivers, 228 (29.16%) received no support from SCN, followed by 173 (22.12%) received low SCN support, 160 (20.46%) received medium SCN support, and 221 (28.26%) received high SCN support. The "Low" subgroup has an average SCN size of 1.16 (*SD* = 0.42), manages 1.69 care domains (*SD* = 0.56), and has a monthly care intensity per capita of 10.92 hrs (*SD* = 10.81). The "Medium" subgroup has an average SCN size of 1.69 (*SD* = 0.97), covering 2.75 care domains (*SD* = 0.71), and a monthly care intensity of 29.02 hours (*SD* = 21.89). The "High" subgroup has a larger SCN size of 2.41 (*SD* = 1.29), managing 3.42 care domains (*SD* = 0.49), and a higher monthly care intensity of 64.96 hrs (*SD* = 49.29).

Associations of SCN support with social isolation and depression

Model 1.1 examined the longitudinal associations between SCN support and social isolation among primary caregivers (Table 4). Model 1.1 revealed a significant negative association between SCN support levels and social isolation of primary caregivers in 2015. Compared to the no SCN group, primary caregivers with low (β = –0.36, 95% CI: –0.67, –0.05, $p < .05$) and high SCN support (β = –0.44, 95% CI: –0.75, –0.14, $p < .01$) had significantly lower levels of social isolation in 2015. The interaction terms between time and SCN support levels assessed changes in social isolation between 2015 and 2017 across different SCN support groups. The results indicated that, compared to the no SCN group, primary caregivers with low (β = 0.40, 95% CI: 0.05, 0.74, $p < .05$), medium (β = 0.35, 95% CI: 0.01, 0.70, $p < .05$), and high (β = 0.39, 95% CI: 0.07, 0.72, $p < .05$) SCN support experienced a significant increase in social isolation over the 2 years. Post hoc tests found no significant difference in social isolation between primary caregivers with and without SCN support in 2017. Supplementary Figure 1 illustrates the changes of social isolation scores across the four SCN support groups from 2015 to 2017.

Model 2.1 assessed the longitudinal associations between SCN support and depression among primary caregivers (Table 5). A significant time effect was observed, indicating that primary caregivers experienced a notable increase in depressive symptoms from 2015 to 2017 (β = 0.12, 95% CI: 0.08, 0.35, $p < .05$). However, SCN support levels did not show a significant association with depression, and the interaction terms between time and SCN support levels indicated no significant changes in depression across different SCN groups over time. Supplementary Figure 2 illustrates the changes of depression scores across the four SCN support groups from 2015 to 2017.

Gender and race interactions

For both social isolation (Models 1.2 and 1.3, see Table 4) and depression models (Models 2.2 and 2.3, see Table 5), no significant interactions were found between SCN support and the

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Table 4. Mixed-effect models of the longitudinal association between SCN support and social isolation of primary caregivers (782 participants and 1,564 observations).

	Model 1.1	Model 1.2	Model 1.3
Variable	**β (95% CI)**	**β (95% CI)**	**β (95% CI)**
Time (2017 vs 2015)	0.31 (−0.04, 0.57)	−0.30 (−0.71, 0.11)	0.10 (−0.36, 0.16)
SCN support (ref: No support)			
Low	−0.36 (−0.67, −0.05)*	−0.49 (−1.02, 0.02)	−0.33 (−0.69, 0.03)
Medium	−0.14 (−0.46, 0.18)	−0.20 (−0.77, 0.36)	−0.19 (−0.58, 0.19)
High	−0.44 (−0.75, −0.14)**	−0.77 (−1.31, −0.24)**	−0.44 (−0.81, −0.07)*
Time × SCN support			
2017 × Low	0.40 (0.05, 0.74)*	0.72 (0.14, 1.30)*	0.49 (0.08, 0.91)*
2017 × Medium	0.35 (0.01, 0.70)*	0.51 (−0.12, 1.16)	0.29 (−0.13, 0.73)
2017 × High	0.39 (0.07, 0.72)*	0.76 (0.11, 1.29)*	0.59 (0.20, 0.99)**
Gender (female vs male)	−0.10 (−0.36, 0.15)	−0.33 (−0.77, 0.11)	−0.13 (−0.34, 0.09)
Time × Gender (2017 × female)		0.27 (−0.22, 0.76)	
SCN support × Gender			
Low × female		0.19 (−0.45, 0.83)	
Medium × female		0.09 (−0.58, 0.75)	
High × female		0.47 (−0.14, 1.09)	
Time × SCN support × Gender			
2017 × Low × female		−0.48 (−1.21, 0.24)	
2017 × Medium × female		−0.24 (−1.01, 0.53)	
2017 × High × female		−0.43 (−1.14, 0.27)	
Race (Black vs White)	−0.39 (−0.65, −0.12)**	−0.39 (−0.62, −0.16)**	−0.29 (−0.76, 0.16)
Time × Race (2017 × Black)			−0.05 (−0.57, 0.47)
SCN support × Race			
Low × Black			−0.11 (−0.77, 0.56)
Medium × Black			0.11 (−0.56, 0.78)
High × Black			−0.02 (−0.65, 0.59)
Time × SCN support × Race			
2017 × Low × Black			−0.27 (−1.02, 0.48)
2017 × Medium × Black			0.14 (−0.62, 0.91)
2017 × High × Black			−0.54 (−1.25, 0.18)
Age (ref: <55)			
55–64	−0.27 (−0.59, 0.05)	−0.22 (−0.51, 0.07)	−0.20 (−0.49, 0.08)
65–74	−0.33 (−0.69, 0.02)	−0.24 (−0.55, 0.07)	−0.24 (−0.55, 0.07)
75–	−0.35 (−0.79, 0.10)	−0.15 (−0.52, 0.22)	−0.12 (−0.49, 0.25)
Education (ref: Below high school)			
High school, no college	−0.29 (−0.67, 0.09)	−0.21 (−0.53, 0.10)	−0.22 (−0.53, 0.09)
Bachelor and above	−0.30 (−0.72, −0.13)**	−0.36 (−0.71, −0.02)*	−0.37 (−0.72, −0.02)*
Marital status (unmarried vs married)	0.59 (0.27, 0.91)***	0.55 (0.27, 0.83)***	0.56 (0.28, 0.84)***
Annual household income (ref: < $20,000)			
$20,000-$39,999	−0.29 (−0.64, 0.04)	−0.25 (−0.54, 0.04)	−0.24 (−0.53, 0.05)
$40,000-$69,999	−0.47 (−0.83. −0.10)*	−0.58 (−0.89, −0.26)**	−0.59 (−0.91, −0.27)**
>$70,000	−0.86 (−1.25, −0.47)**	−0.84 (−1.17, −0.50)**	−0.84 (−1.17, −0.50)**
Coresidence (yes vs no)	0.4 (0.12, 0.67)**	0.35 (0.08, 0.62)*	0.34 (0.07, 0.61)*
Relationship type (ref: Spouse)			
Adult child	0.06 (−0.34, 0.45)	0.09 (−0.30, 0.48)	0.08 (−0.31, 0.47)
Others	−0.39 (−0.85, 0.08)	−0.42 (−0.89, 0.05)	−0.44 (−0.91, 0.02)
Care duration (>1 year vs <1 year)	−0.03 (−0.45, 0.40)	−0.03 (−0.39, 0.33)	−0.04 (−0.40, 0.32)
Care intensity (hours/month)	0.01 (−0.01, 0.02)	0.01 (−0.01, 0.02)	0.01 (−0.01, 0.02)
Caregiver burden	0.04 (−0.01, 0.09)	0.04 (−0.01, 0.08)	0.04 (−0.01, 0.08)
No. of functional limitations of older adults	0.08 (0.05, 0.12)***	0.03 (−0.01, 0.06)	0.03 (−0.01, 0.06)
Dementia status (yes vs no)	0.49 (0.27, 0.71)***	0.54 (0.34, 0.73)***	0.53 (0.33, 0.72)***
LR test (χ^2)	109.79***	171.17***	170.54***

Note. ref = reference group; SCN = Secondary caregiver network.
*$p < .05$.
**$p < .01$.
***$p < .001$.

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Table 5. Mixed-effect models of the longitudinal association between SCN support and depression of primary caregivers (782 participants and 1,564 observations).

	Model 2.1	Model 2.2	Model 2.3
Variable	β (95% CI)	β (95% CI)	β (95% CI)
Time (2017 vs 2015)	0.12 (0.08 0.35)*	−0.15 (−0.37, 0.34)	0.11 (0.02, 0.34)**
SCN support (ref: No support)			
Low	−0.05 (−0.26, 0.25)	0.11 (−0.32, 0.54)	−0.01 (−0.31, 0.29)
Medium	0.22 (−0.05, 0.49)	0.04 (−0.41, 0.53)	0.19 (−0.13, 0.52)
High	0.10 (−0.15, 0.36)	0.18 (−0.27, 0.62)	−0.06 (−0.25, 0.37)
Time × SCN support			
2017 × Low	<.01 (−0.29, 0.30)	0.06 (−0.45, 0.57)	0.05 (−0.31, 0.41)
2017 × Medium	−0.01 (−0.32, 0.29)	0.13 (−0.43, 0.69)	−0.05 (−0.43, 0.33)
2017 × High	0.07 (−0.22, 0.35)	0.09 (−0.42, 0.61)	0.18 (−0.17, 0.53)
Gender (female vs male)	<.06 (−0.24, 0.12)	−0.06 (−0.43, 0.31)	0.06 (−0.24, 0.13)
Time × Gender (2017 × female)		0.17 (−0.26, 0.59)	
SCN support × Gender			
Low × female		−0.19 (−0.73, 0.34)	
Medium × female		0.23 (−0.33, 0.79)	
High × female		−0.11 (−0.63, 0.40)	
Time × SCN support × Gender			
2017 × Low × female		−0.07 (−0.70, 0.56)	
2017 × Medium × female		−0.21 (−0.88, 0.46)	
2017 × High × female		−0.04 (−0.66, 0.58)	
Race (Black vs White)	−0.05 (−0.24, 0.14)	0.04 (−0.23, 0.14)	−0.03 (−0.48, 0.42)
Time × Race (2017 × Black)			−0.03 (−0.48, 0.42)
SCN support × Race			
Low × Black			0.01 (−0.54, 0.57)
Medium × Black			0.07 (−0.49, 0.63)
High × Black			0.12 (−0.39, 0.64)
Time × SCN support × Race			
2017 × Low × Black			−0.12 (−0.78, 0.54)
2017 × Medium × Black			0.12 (−0.55, 0.79)
2017 × High × Black			−0.30 (−0.93, 0.33)
Age (ref: <55)			
55–64	0.02 (−0.22, 0.26)	0.01 (−0.23, 0.25)	0.02 (−0.22, 0.26)
65–74	−0.05 (−0.31, 0.21)	−0.06 (−0.32, 0.19)	−0.05 (−0.31, 0.21)
75–	−0.08 (−0.39, 0.23)	−0.09 (−0.41, 0.22)	−0.07 (−0.38, 0.24)
Education (ref: Below high school)			
High school, no college	−0.07 (−0.33, 0.19)	−0.07 (−0.33, 0.19)	−0.07 (−0.33, 0.19)
Bachelor and above	−0.01 (−0.29, 0.29)	−0.01 (−0.29, 0.29)	0.01 (−0.29, 0.29)
Marital status (unmarried vs married)	0.24 (0.01, 0.47)*	0.25 (0.01, 0.48)*	0.23 (−0.01, 0.47)
Annual household income (ref: < $20,000)			
$20,000-$39,999	−0.02 (−0.26, 0.22)	−0.02 (−0.27, 0.22)	−0.01 (−0.25, 0.23)
$40,000-$69,999	−0.31 (−0.57, −0.05)*	−0.32 (−0.58, −0.05)*	−0.31 (−0.58, −0.04)
>$70,000	−0.54 (−0.82, −0.26)**	−0.54 (−0.82, −0.21)**	−0.54 (−0.82, −0.26)
Coresidence (yes vs no)	0.03 (−0.19, 0.25)	0.02 (−0.21, 0.25)	0.03 (−0.19, 0.25)
Relationship type (ref: Spouse)			
Adult child	−0.32 (−0.65, 0.01)	−0.33 (−0.66, −0.01)*	−0.31 (−0.64, 0.02)
Others	−0.52 (−0.91, −0.14)**	−0.55 (−0.94, −0.16)**	−0.52 (−0.91, −0.13)**
Care duration (>1 year vs <1 year)	0.03 (−0.27, 0.33)	0.03 (−0.27, 0.33)	0.03 (−0.27, 0.33)
Care intensity (hours/month)	0.01 (−0.01, 0.02)	0.01 (−0.01, 0.02)	0.01 (−0.01, 0.02)
Caregiver burden	0.13 (0.09, 0.17)***	0.13 (0.09, 0.17)***	0.13 (0.09, 0.17)
No. of functional limitations of older adults	0.03 (0.01, 0.05)*	0.03 (0.01, 0.05)*	0.03 (0.01, 0.05)*
Dementia status (yes vs no)	0.30 (0.14, 0.47)***	0.30 (0.14, 0.47)***	0.30 (0.13, 0.46)***
LR test (χ^2)	161.87***	160.33***	160.87***

Note. ref = reference group; SCN = Secondary caregiver network.
*$p < .05$.
**$p < .01$.
***$p < .001$.

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gender or race of primary caregivers. This suggests that the effects of SCN support on social isolation and depression were similarly experienced by both women and men caregivers, as well as by Black and White caregivers. Notably, in Model 1.1, race was significantly associated with social isolation scores (β = v0.39, 95% CI: −0.65, −0.12, $p < .01$), indicating that Black caregivers generally experienced lower levels of social isolation compared to their White counterparts.

Discussion and implications

This study examined the longitudinal associations between SCN support and social isolation and depression among primary caregivers in the United States over a 2-year period. The findings identified three latent patterns of SCN support (i.e., low, medium, and high SCN support), indicating that the three indicators (i.e., SCN size, number of care domains, and care intensity per capita) were positively correlated. Mixed-effects analyses showed that higher SCN support was associated with lower social isolation among primary caregivers at baseline. However, longitudinally, primary caregivers with SCN support experienced significant increases in social isolation, resulting in similar levels of social isolation among primary caregivers with different SCN support levels after 2 years. Regarding depression, SCN support levels were not significantly associated with primary caregivers' baseline depression or longitudinal changes, but primary caregivers' depression scores significantly increased over the 2 years, regardless of SCN support. Notably, although Black caregivers experienced lower levels of social isolation compared to their White counterparts, the impact of SCN support on primary caregivers did not vary by gender or racial identity.

Gradient patterns of SCN support

The three latent patterns of SCN support suggest a gradient of support, which partially validates previous approaches that used a single indicator or treated multiple indicators separately in analyses, as multiple indicators are highly correlated and do not independently affect the levels of support primary caregivers receive from secondary caregivers (Thomson et al., 2022). The analysis did not find mixed patterns, such as a small network size, but more hours per secondary caregiver. This may be because the proportion of families with mixed SCN support patterns is relatively low, and the size and level of engagement of the SCN are more related to the functional limitations and care needs of older adults (Hu et al., 2022; Song et al., 2023). This finding reflects more common patterns of SCN support, providing insights into the function and collaboration within family caregiver networks.

Increased social isolation and depression despite SCN support

The social isolation scores of primary caregivers significantly increased from 2015 to 2017, characterized by a reduction in social connections and heightened feelings of loneliness. Notably, this increase was only observed among primary caregivers with SCN support, who had significantly lower social isolation levels at baseline compared to those without SCN support. This may be related to changes in SCN structure during the 2-year period, as the withdrawal of secondary caregivers or a decline in the support provided may increase the primary caregiver's burden. Alternatively, despite the SCN support remaining structurally stable, primary caregivers may still experience a ceiling effect, where those who already receive SCN support do not experience additional benefits as care demands increase (Thomson et al., 2022). In either case, may struggle to keep pace with evolving care demands and often pose coordination challenges, such as disagreements on care decisions, scheduling conflicts, and inconsistent availability, which may contribute to primary caregivers' stress and a diminished sense of social connection despite receiving assistance (Li et al., 2020; Liang et al., 2023). Over time, these factors may lead to emotional exhaustion and a loss of the perceived benefits of SCN support, reinforcing primary caregivers' feelings of isolation. Nonetheless, SCN may provide meaningful short-term relief by supplementing social networks, providing respite, and mitigating the social isolation of primary caregivers.

Similarly, primary caregivers' depression scores significantly increased from 2015 to 2017, which is consistent with previous research and highlights the importance of protecting family caregivers' mental health (Xie et al., 2022). However, no significant effects of SCN support were observed on either the baseline scores or their longitudinal changes. The persistent and increasing demands of caregiving can lead to chronic stress and social isolation, which are significant predictors of depression among caregivers (García-Alberca et al., 2012; Liang et al., 2023). Additionally, the physiological impacts of caregiving burden, such as declines in self-rated health, increased chronic conditions, and disrupted circadian rhythms, have been linked to increased depressive symptoms (del-Pino-Casado et al., 2019; Leggett et al., 2020). Future research could examine whether SCN support buffers the impact of caregiving burden on these physiological health factors, and how these interactions may influence primary caregivers' social isolation and depression.

Although consistent with previous research that Black primary caregivers experience lower social isolation than their White counterparts (Fabius et al., 2020; Idorenyin Imoh & Charity, 2023), this study found no effect of SCN support on social isolation and depression between women and men caregivers or between Black and White caregivers. Despite variations in SCN structure across demographic groups (Liang et al., 2022), SCN support may function similarly in terms of its influence on caregiver well-being. This lack of variation could reflect the common caregiving stressors faced across racial and gender groups, which may override any differential benefits of SCN support. For example, even when secondary caregivers provide assistance, primary caregivers may still experience increasing caregiving burdens and social isolation over time, regardless of their gender or racial background. Additionally, while Black caregivers often have larger SCN networks, they may still face systemic caregiving barriers, such as financial strain or lack of formal care options, that limit the effectiveness of SCN support in reducing isolation and depression (Dilworth-Anderson et al., 2020; Idorenyin Imoh & Charity, 2023). Future research should explore whether the quality of SCN support (e.g., emotional closeness, consistency of assistance) plays a role in protecting primary caregivers' social and mental health outcomes, as well as the intersections of SCN support with other social and care resources (e.g., health care services, community programs, workplace support policies, etc.).

Strengths and limitations

The primary strength of this study is the use of a nationally representative sample, which enhances external validity and allows for the generalization of findings to a broader population within the country. The sensitivity analysis using sampling weights

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reported comparable results, supporting the representativeness of the sample and the generalizability of the findings (available upon request). Second, the integrated measurement of SCN support, encompassing SCN size, number of care domains, and care intensity per capita, provides a comprehensive view of general SCN support patterns. Third, the analyses extend the research focus from caregiver burden to include social isolation and depression, critical aspects of caregiver well-being with significant implications for community and clinical practice.

However, the study's findings should be interpreted with some limitations in mind. First, the 2-year interval between waves may not fully capture the dynamics of social and mental health changes among primary caregivers. More frequent data collection would provide a clearer understanding of these changes and strengthen causal inferences. Second, SCN support was assessed only at baseline (2015) and not tracked longitudinally. While LPA effectively classifies SCN patterns at a single time point, it does not account for potential changes in caregiving networks over time. Third, the study focuses on regular hands-on care tasks, excluding emotional and financial support, as well as other sources of assistance from social networks or community resources. This may overlook key aspects of caregiving that contribute to caregiver well-being. Lastly, the study only includes women and men, and Black and White caregivers, potentially missing the experiences of other gender/sexual and racial/ethnic groups. These groups may face unique social and cultural challenges that affect how they form SCNs and seek support (Lee et al., 2023; Xie et al., 2022). Future studies should include a more diverse range of caregivers to capture varied caregiving experiences across different demographic backgrounds.

Implications and conclusion

This study used longitudinal data to investigate the effects of SCN support on the social isolation and depression of primary caregivers in the United States. Despite focusing exclusively on secondary caregivers who provided regular hands-on care assistance, over 70% of primary caregivers reported having an SCN. This underscores the need for research and policy to address family dynamics and promote collaborative efficacy to alleviate caregiving stress and enhance overall care quality. Although high SCN support was associated with lower social isolation at baseline, primary caregivers with SCN support experienced significant increases in social isolation over time. These findings suggest that more complex mechanisms are involved within the stress process, such as various bio-psycho-social factors and their interactions with caregiving dynamics (e.g., changes in care needs, collaboration with other caregivers), which can significantly impact the caregiving experience.

Given these findings, it is critical to develop practical interventions that enhance the effectiveness of SCN support. Family-based care coordination programs could improve communication and task-sharing among caregivers, reducing stress for the primary caregiver (Bass et al., 2013). Peer support networks and respite care services can provide emotional and practical relief, particularly for caregivers with limited external support (Zebrak & Campione, 2021). Additionally, policymakers and health care providers should consider integrating SCN assessments into caregiver support services to identify high-risk caregivers who may be at greater risk for social isolation and mental health declines. Future research should further examine the quality of SCN support, such as the consistency and reliability of assistance, to inform tailored interventions that address the unique needs of diverse caregiving populations.

This study calls for a multifaceted approach to caregiving support that recognizes both the benefits and potential limitations of SCN involvement. By promoting sustainable caregiving structures and addressing disparities in caregiving experiences, interventions can be designed to better support the long-term well-being of family caregivers in the United States.

Supplementary material

Supplementary material is available online at *Innovation in Aging* (https://academic.oup.com/innovateage)

Data availability

The study used publicly available data from the National Health and Aging Trends Study and the National Study of Caregiving, which can be accessed at: https://www.nhats.org. The study was not preregistered.

Author contributions

J.L. conceptualized and designed the study, conducted the analyses, and drafted the manuscript. M.P.A., Y.J., and K.H.W. contributed to the study design, advised on data analysis and interpretation, and critically revised the manuscript for important intellectual content. All authors read and approved the final version of the manuscript.

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Conflicts of interest

None declared.

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