Published in final edited form as:

Support Care Cancer. 2021 January ; 29(1): 331–340. doi:10.1007/s00520-020-05497-8.

Comparing the roles of social context, networks, and perceived social functioning with health-related quality of life among self-reported rural female cancer survivors

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Abstract

PURPOSE: Rural women, compared to urban, experience worse survivorship outcomes, including poorer health-related quality of life (QOL). There is a need to characterize the role of multilevel social factors that contribute to QOL, including context, networks, and functioning. Our objectives were to: 1) use latent class analysis to identify distinct classes of social context and social networks, and 2) examine how multilevel social factors (context, networks, and functioning) are associated with health-related QOL.

METHODS: We recruited self-identified rural survivors to the Illinois Rural Cancer Assessment (2017–2018), via community-based sampling methods and participants completed the survey online, by phone, or on paper. We used latent class analysis to generate multidimensional variables for contextual and network factors. We next modeled each social factor as a predictor in separate, bivariable linear regressions for the QOL outcomes, followed by multivariable, adjusted regressions.

RESULTS: For our first objective, there were three classes each of county-level contexts (1- highly rural, socioeconomically disadvantaged, and mostly lacking in cancer-related services; 2-

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CONFLICT OF INTEREST

Ms. Carnahan, Dr. Rauscher, Dr. Watson, Dr. Altfeld, Dr. Zimmermann, Dr. Ferrans, and Dr. Molina have no financial relationships to disclose. Ms. Carnahan reports this manuscript is a component of their working dissertation and will be included in as a chapter in the thesis. The authors have full control of all primary data and will all the journal to review the data if requested.

mostly rural, moderately disadvantaged, and underserved; 3- mostly metropolitan, less disadvantaged, and most-resourced) and social networks (1-no caregivers; 2-only spousal caregivers with whom they communicated daily; 3-multiple caregivers with varying daily communication). For our second objective, among all social factors, only functioning was associated with better mental health-related QOL. No factors were associated with physical health-related QOL.

CONCLUSIONS: Our findings suggest a rich diversity of social context and networks among rural female cancer survivors, and social functioning is particularly important for mental health-related QOL.

Keywords

Cancer Survivors; Rural Health; Quality of Life; Sociological Factors; Latent Class Analyses

BACKGROUND

Rural women, compared to urban, experience higher incidence of and mortality from many common cancers, higher rates of late stage diagnoses, and less access to treatment.^{1,2} While survivorship may be poorer, there are an increasing number of rural cancer survivors.^{2,3} Rural populations are grossly understudied along the cancer continuum, including survivorship. Less than 5% of the National Cancer Institute's (NCI) research portfolio funds rural population studies, and less than 5% of published survivorship research conducted by NCI-designated cancer centers concerns rural populations.^{4,5} Perhaps further complicating the inclusion of rural populations in research is the use of multiple objective measurements of rurality, including the Rural-Urban Continuum Code (RUCC), the Rural-Urban Commuting Area Codes (RUCA), Urban Influence Codes (UIC), and the US Census Bureau's Urban Areas and Urban Clusters delineation. The NCI recommends, at minimum, using RUCC classifications in rural cancer research, as RUCC describes heterogeneity among rural populations that extends beyond an urban dichotomy.⁶ In addition to objective measures, individuals have perceptions about their residence and its degree of ruralness that may not align with the aforementioned classification schemes.⁷ Ultimately, the best operationalization of rurality may depend on the research question at hand. Objective measures may be particularly useful when focusing on concrete aspects of rurality (e.g., geographic dispersion, healthcare access). Conversely, self-identification may be particularly useful when focusing on cultural and social aspects of rurality (e.g., norms, values). Such variation in definitions not only affects existing research, but also likely our approaches to survivorship care.

Given the heterogeneity of rurality and associated definitions, it is no wonder that there have been conflicting findings when examining urban-rural cancer disparities. For example, some of the existing literature has suggested that, when compared to urban, rural female cancer survivors have lower health-related quality of life (QOL), higher psychological morbidity, and worse mental health.^{8–10} Yet, other research has found no differences in, or even better QOL among rural survivors.¹¹ These conflicting findings suggest that there is rich—and poorly understood—variation among rural female survivors. Multilevel social factors (context, networks, and functioning) represent a major opportunity to understand this

variation, as they represent well-known predictors of QOL among survivors.^{12,13} Yet, existing research has lacked: 1) multi-dimensional measurement of social factors at different levels; and 2) simultaneous assessment of relationships between different social levels and QOL. This has likely hindered our ability to provide appropriate survivorship care to this highly heterogeneous group of survivors. In relation to the first gap, our framework (Figure 1) described in detail below, the factors that constitute **social contexts** (rurality, socioeconomic disadvantage, access to cancer-related supportive services)^{8,10,14–16} and **social networks** (number and type of caregivers, daily communication with caregivers, household size)¹⁷ In relation to the second gap, we describe existing research that has characterized the relationships of these social factors to QOL as well as **perceived social functioning**, defined as subjective perceptions of support received and satisfaction with the social context.^{18,19}

Social Context

Theoretically, greater rurality, greater economic disadvantage, and limited access to services should be associated with worse QOL among rural survivors. Yet, there is variation in evidence regarding rurality and QOL among survivors with some studies showing better, and others showing worse QOL by degree of rurality.^{8,20} The relationships between disadvantage and access to cancer support services and survivors' QOL are relatively unknown. These conflicting findings indicate the need for multidimensional measurement when considering associations between context and QOL. For example, mixed findings between rurality and QOL may be due to differences in co-occurring relationships between rurality and economic disadvantage or access to supportive services, and not simply rurality alone. Among urban populations, access to cancer-related support services might matter for QOL, but this may not be the case among rural. Many rural dwellers reside in this setting because they prefer more privacy, autonomy, and isolation; thus, access to cancer-related supportive services may not be as important to survivors' QOL.²¹

Social Networks

The **types of social networks** women have, including spouses and households, may lead to greater quantity and regularity of caregiver engagement; however, much of the extant literature has considered these factors independently from each other and primarily in urban settings.²² Relationships may manifest differently in rural settings when compared to urban. Larger networks and more communication are not necessarily positively associated with QOL among rural survivors; rural women may prefer smaller networks due to rural norms regarding close-knit communities and privacy.^{20,23} Their cancer may require them to engage network members with whom they would not normally engage due to the need for assistance and support.^{20,24} Altogether, this research suggests the importance of examining network characteristics together (e.g., how many, whom, how often engaged) *and* understanding that their relationships to QOL may differ (e.g., weaker relationships) from those found in general populations due to rural norms.

Social Functioning

Rural populations report lower levels of social functioning than urban populations placing them at increased risk for worse health-related QOL.²⁵ In contrast to network and contextual factors, we posit that social functioning is universally important survivors. Perceived social functioning reflects satisfaction with one's social context. Thus, while different social contexts may lead to differences in social functioning among rural and urban survivors (e.g., more caregivers and social satisfaction), its effect on QOL is likely similar.

Current Study

In summary, multilevel social factors and their effects on rural survivorship are likely unique—they must be studied to develop effective interventions. We specifically advocate for the use of multidimensional measurements of context and networks, which may be more precise and result in greater understanding of how these factors are associated with QOL. Finally, we know less about the relative contributions of these factors to QOL, as they are typically not considered concurrently. Theory and emergent literature suggest that more proximal intrapersonal social factors (e.g., social functioning) may be stronger predictors than contextual and network factors; however, this cannot be determined from existing studies, which generally compare network and intrapersonal, but exclude contextual factors.¹⁹ Relatedly, most literature has focused on urban survivors, who may be different from rural survivors.²⁶

To address these gaps, the objectives of the current study were to: 1) use latent class analysis to identify distinct classes of social context and distinct classes of social networks, and 2) examine how multilevel social factors (context, networks, and functioning) are associated with QOL. Given our interest in multilevel social factors, we used two definitions of rurality. We used self-identification as rural as an eligibility criterion, given the influence of social networks and perceived functioning on health-related QOL likely reflected rural cultural norms (e.g., social networks, perceived functioning). Conversely, we used an objective measure (RUCC) for social contexts, given that its influence on health-related QOL likely reflects objective characteristics of the environment.

METHODS

Setting, Participants, Sampling, Recruitment, and Data Collection

For the present study, we conducted a secondary analysis using data from the Illinois Rural Cancer Assessment (IRCA), a statewide cross-sectional assessment examining health among rural cancer survivors and caregivers.²⁷ We recruited participants (January 2017–September 2018) through multiple non-probability-based methods, including using electronic and physical flyers, and word-of-mouth. Additionally, we used commercially purchased cellular and landline phone lists. Research personnel sent text messages and a flyer to cellular numbers 1–2 days prior to calling. Landlines only received a phone call.

Self-reported eligibility requirements were: 1) 18 years or older, 2) cancer survivor or caregiver, and 3) rural residence in Illinois. After providing informed consent, participants completed the survey online, by phone, by self-administration via mail, or in-person at a

cancer-related event. Data were entered into a Qualtrics database by participants or staff, depending on survey administration. Participants received a \$15 or \$25 incentive (incentive increased during recruitment). The University of Illinois at Chicago Institutional Review Board and the University of Illinois Cancer Center Protocol Review Committee approved the study.

The overall sample included 227 cancer survivors and caregivers. Caregivers (n=88) and males (n=24) were excluded, as the present study concerns female survivors. Given low representation of racial and ethnic minority participants,¹⁶ we excluded those (n=7) who reported their race/ethnicity as something other than non-Hispanic white. Finally, we excluded participants missing complete data for the QOL outcome (n=4), resulting in a final sample of 104.

Measures

Quality of life outcomes—We used the Short Form-12 Health Survey to measure the main outcomes, physical and mental health-related QOL.²⁸ The instrument assesses general health, physical functioning, role functioning, bodily pain, vitality, and mental health. Scores range from 0 (lowest level) to 100 (highest level of health). Test-retest correlation was 0.89 and 0.76 for physical and mental health-related QOL, respectively.²⁸

Contextual factors—We used RUCC to measure **rurality**, which considers a county's population size, degree of urbanization, and adjacency to metropolitan areas.²⁹ We treated this as a continuous variable, and scores range from 1 (most metropolitan) to 9 (most rural).³⁰ Our use of a continuous score increased our ability to capture the heterogeneity of rurality among participants and aligned with others' calls for the use of continuous rurality measures in analytic processes.³⁰

We created a composite **socioeconomic disadvantage** variable using county-level estimates from the 2013–2017 American Community Survey.³¹ This variable was developed based on the Social Deprivation scale and included information about households without a vehicle, household income, households with food stamps/SNAP benefits, populations <100% of the federal poverty level, adults with less than a high school diploma, households receiving cash public assistance, the median value of owner-occupied housing, female householders with children, and the unemployment rate.³² It was treated as a continuous variable, and scores ranged from 3.83 (most disadvantaged) to –2.15 (least disadvantaged).

We identified **cancer-related supportive services** using a public American Cancer Society database (<https://www.cancer.org/treatment/support-programs-and-services.html>). We summed the total number of resources in each county and created tertiles (T1: 0–2 services, T2: 3–5 services, T3: 6+ services) based on data distribution.

Social network factors—We measured the **number of caregivers** using the Modified General Social Survey (GSS) and treated it as a continuous variable.³³ Survivors were asked to self-report up to five individuals from whom they received care (“Since the time you were first diagnosed with cancer, has any friend or family member provided care to you during or after your treatment?”).

We assessed **daily communication with all caregivers** from survivors' responses indicating whether or not they had daily communication with their caregiver(s).³³ Responses were dichotomized to having or not having daily communication.

We characterized **caregiver type** using the item from the GSS concerning how the survivor was connected to caregivers (spousal, familial, or friend).³³

Finally, we recorded **household size** as the total number of people in the household, including the respondent.

Perceived social functioning—We measured perceived social functioning with the Functional Assessment of Cancer Therapy - General (FACT-G) instrument's subscale, Social and Family Well-Being.¹⁸ The FACT-G's Cronbach's Alpha reliability coefficient is 0.88 and it has been delivered successfully on the internet to female cancer survivors.^{18,34,35} This 7-item subscale is used to assess cancer patients' perceptions of family support and illness acceptance, friend support, communication of illness, and closeness to partner.¹⁸ Higher scores (range 0–28) indicate better perceived social functioning.

Statistical Analysis

We used SPSS (Version 25.0, IBM Corporation, Armonk, NY) to perform all procedures. First, we characterized sociodemographic and health-related characteristics and assessed data for missingness (Table 1). We used multiple imputation methods for two covariates: household income (missing, n=6) and time since last treatment (missing, n=1). Unless otherwise specified, we adjusted models for age, individual-level socioeconomic status (SES) (education, household income, and insurance status), and time since last treatment.

Latent class analysis—We used latent class analysis (LCA) to generate composite variables (latent class descriptions) for contextual and network factors using the two-step cluster analysis procedure in SPSS. LCA is considered a person-centered approach to create classes or groups based on patterns in responses, resulting in subgroups of individuals with whom they are more alike, compared to individuals in other classes.³⁶

The contextual class variable included three factors. Rurality and disadvantage were included as standardized, continuous values and cancer-related support services were categorized into tertiles, as previously described. Due to sample size limitations, we set the number of fixed classes to three, using Bayesian information criterion (BIC). A lower BIC indicates a better model fit for the data distribution.³⁶

To create the social network classes, we examined six factors. These included the number of caregivers, household size, having a spousal caregiver, whether or not they had daily communication with their caregiver(s), and whether family or friends were caregivers.

Associations between QOL and multilevel social factors—We modeled each social factor (context latent class variable, network latent class variable, and social functioning) as a single predictor of each QOL outcome in separate bivariable linear regression models, followed by multivariable, adjusted linear regressions. In a series of

sensitivity analyses, we ran each bivariable and multivariable model using only non-imputed data. Finally, we ran the same models including only nonmetropolitan (RUCC 4–9) participants only.

RESULTS

Sample Description

The mean age of the 104 female, non-Hispanic white rural cancer survivors was 56.00 ± 11.79 years (Table 1). Over half had less than a bachelor's degree and reported an annual household income of less than \$50,000. Most had private insurance (64%), 41% had completed treatment more than 5 years prior, and breast was the most common cancer site reported (47%).

Latent Class Analyses

Social context classes—The LCA procedures generated three distinct social context classes (Table 2). The three-class model fit BIC score was 192.01. Compared to the two-class cluster, the ratio of BIC changes was 0.52, indicating that the three-class cluster was the preferred fit. The first class was counties that were highly rural, most socioeconomically disadvantaged, and mostly lacking in cancer-related support services ($n=39$). The second class was mostly rural, moderately disadvantaged, and had fewer resources ($n=33$). The third class was mostly metropolitan, the least disadvantaged, and had the most resources ($n=32$).

Social network classes—The results of the LCA procedures identified three classes of rural cancer survivor social networks (Table 2). The three-class model fit BIC score was 473.59. Compared to the two-class cluster, the ratio of BIC changes was 0.66. The first class of caregiver networks ($n=22$) were those that included only a spousal caregiver with whom they communicated with daily. The second class ($n=56$) was networks that included at least one non-spousal and/or non-familial caregiver, although 70% reported that one of their multiple caregivers was a spouse. There was varying level of daily communication. The third network class ($n=26$) was survivors without any caregivers.

Associations Between QOL and Multilevel Social Factors

Physical health QOL—In adjusted models, no significant associations were observed for contextual or network factors, or perceived social functioning with physical health QOL.

Mental health QOL—Survivors who perceived better social functioning reported better mental health QOL, but no significant associations were observed between the contextual or network factors (Table 3, Model 3-Mental health QOL). In the multivariable model, the association between social function and mental health QOL persisted (Table 3, Mental Health QOL-Model 4). These patterns were repeated in the sensitivity analyses with non-imputed data (Appendix) and when we only included survivors from nonmetropolitan (RUCC 4–9) counties (Appendix).

DISCUSSION

In this study, we: 1) used multi-dimensional measurement to identify classes of social contexts and networks; and 2) examined which factors at which levels (contexts, networks, perceived functioning) were associated with physical and mental health QOL among female rural cancer survivors.

We identified three distinct classes of social contexts. The county-level contexts differed by degree of rurality, county-level socioeconomic disadvantage, and access to cancer-related support services. The first class was highly rural, the most socioeconomically disadvantaged, and was generally lacking in cancer-related support services. On the other end of the spectrum was a context that included mostly metropolitan counties, was less disadvantaged, and had better access to cancer-related support services. In some ways this study mimics a rural-urban comparison, given we essentially compared three groups, two mostly rural and one mostly metropolitan; however, all participants *self-identified as rural*. Thus, our approach provides a more nuanced perspective of the heterogeneous contexts in which rural cancer survivors reside. Simultaneously, our comparisons of these different social contexts are challenging to interpret, given residents from the “mostly metropolitan” counties identified as rural and do not likely represent most residents in metropolitan countries at large. These challenges, as noted in the Introduction, highlight the importance of ongoing discussions regarding the operationalization of rurality and the need for frameworks to drive *which* type of measurement should be used *when*.

Rural female cancer survivors experienced three types of caregiver networks: 1) networks including only a spouse with whom they had daily communication, 2) networks of friends and/or family, and sometimes spouses with varying daily communication, and 3) survivors reporting no caregiver network. These categories align with other work documenting the variation in rural women’s preferences and access regarding their caregiver network composition, as some prefer to rely mostly on their spouse, some on friends, and others prefer isolation, perhaps due to the traditionally stoic natures of rural populations, and the desire for privacy and isolation.^{20,23,37}

When comparing the roles of multilevel social factors on QOL, female survivors who reported better perceptions of social functioning had better mental health QOL. Neither the context nor network was associated with QOL. This finding, that the attitudinal factor matters more to mental health QOL than the objective measurements of contexts and networks, aligns with research documenting the positive relationship between perceived social functioning and mental health.^{38,39}

Implications for Survivorship Care Among Rural Survivors

A growing body of research focuses on the delivery of survivorship care among rural and other underserved backgrounds, largely focusing on individual-level and interpersonal-level factors.^{15,19} Our study highlights how this work may be augmented through considering multilevel social factors, including heterogeneity among rural survivors as well as the associations of multilevel social factors for QOL. Specifically, our research suggests that while focusing on social functioning may be particularly crucial for improving rural

survivors' well-being, care teams may improve their quality of care by engaging survivors to discuss their social contexts (e.g., availability of local survivorship resources, degree of rurality and economic hardship) and available social networks (e.g., caregivers, quality/quantity of caregiving). Such discussions may lead to a greater understanding of available resources, thus improving perceived social functioning and associated QOL in the long-term.

Strengths

Our study had several strengths. First, our LCA approach allowed us to examine multidimensional social factors and may be a valuable tool for researchers engaged in rural cancer survivorship work. This is particularly helpful since rural populations have low population densities and adequate sample sizes may be a challenge.⁴⁰ Second, despite our knowledge of the importance of multilevel social factors on survivorship, many publicly available cancer-related surveillance datasets fail to include these factors. In our study, we were able to leverage such data from a small but in-depth observational, quantitative study.²⁷

Limitations

There are a number of limitations to consider when interpreting the study's findings. Given the fairly small sample size, our ability to detect statistically important findings were limited. Additionally, IRCA participants were from a self-selected, convenience-based sample and may not reflect the diversity of rural female cancer survivors in Illinois or the US. In particular, our study may not capture how race or ethnicity and heterogeneity in social determinants of health-particularly the role of socioeconomic disadvantage-impacts QOL.^{40–42} Although IRCA participants were similar to nationally representative rural populations in regard to age and private insurance status, they generally had higher education attainment and a larger annual household income.^{43–45} Thus, the findings should be generalized with caution. Finally, this study was limited due to the lack of measurement of other intrapersonal and psychosocial factors, such as social/emotional needs, and coping styles.

Implications for Future Research & Conclusions

We believe this study is an important contribution to the growing literature regarding rural cancer survivorship. As the number of rural survivors increases, we must consider their QOL. There are opportunities for research to be more inclusive of rural populations, either as rural-specific, given that most work regarding multilevel social factors and QOL has been done with urban populations, or as comparative research examining urban-rural differences. This work can broaden our understanding of contexts and networks, and is important given the heterogeneity of rural populations. Future work should also consider the relative effects of multilevel social factors; these factors may have interactive and/or additive effects not measured here. Finally, there are opportunities to explore mediators of social functioning on QOL. For example, there may be protective factors that buffer cancer's impact on QOL for some rural survivors, but not others.

Clinical settings that serve rural populations may also incorporate some of these findings into efforts directed toward survivorship care. For example, asking questions about their caregiver social networks may be important for identifying survivors at risk for mental

health detriment, and subsequent effect on QOL. At-risk women could receive referrals to mental health providers during survivorship planning. Given more survivors are living longer past diagnosis, we must continue to explore efforts to address all domains of health.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements:

The Illinois Rural Cancer Assessments study was an intramurally funded project supported by the University of Illinois at Chicago's Center for Research on Women and Gender and University of Illinois Cancer Center. We thank the cancer survivors who graciously provided their time and information, thereby making this research possible. We would also like to thank the following individuals who contributed their efforts to the study: Martasia Carter, Emily Hallgren, Jocelyne Lemus, Patricia Newton, Lillian Oluchi Nwigwe, Kryztal Peña, Lillian San Miguel, Mona Strahan, and Nidhi Suthar. Lastly, this manuscript is a component of Leslie Carnahan's working dissertation and will be included in as a chapter in the thesis.

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Figure 1: Multilevel Social Factors and Health-Related Quality of Life

Table 1:

Survivor sociodemographic characteristics and health-related factors (n=104)

	Missing	Mean	SD
Age	0%	56.00	11.79
		n	%
<50 years old		30	29
50–64 years old		47	45
65–83 years old		27	26
Education	0%		
<Bachelor's Degree		59	57
Bachelor's Degree		45	43
Household income	6%		
≤\$50,000		47	48
>\$50,000		51	52
Current insurance status	0%		
Private		66	64
Not private		38	36
Individual-level socioeconomic status ¹	6%		
Most (1.30 to 0.64)		33	34
Mid (0.62 to −0.03)		32	33
Least (−0.05 to −1.82)		33	33
Time since last treatment	1%		
In treatment		29	28
≤ 5 years ago		32	31
>5 years ago		42	41
First cancer site	1%		
Breast		49	47
Other		17	16
Skin		12	12
Lymph		12	12
Gastro-intestinal		6	6
Gynecological		7	7
Contextual factors	Missing	n	%
Rurality ²	0%		
Nonmetropolitan counties (RUCC 4–9)		64	62
Metropolitan counties (RUCC 1–3)		40	38
Socioeconomic disadvantage ³	0%		
Most (0.65 to 1.6)		38	36
Mid (−0.03 to 0.59)		32	31
Least (−2.0 to −0.05)		34	33
Cancer-related support services	0%		

	Missing	Mean	SD
0–2 resources		39	37
3–5 resources		33	32
6 or more resources		32	31
Network (caregiver) factors	Missing	Mean	SD
Number of caregivers	0%	1.93	1.70
Total household size	0%	2.55	1.28
	Missing	n	%
Spousal caregiver	0%	61	59
Daily communication with all caregivers	0%	40	39
At least one non-spousal family caregiver	0%	47	45
At least one non-family member caregiver	0%	27	26
Functioning⁴	Missing	Mean	SD
Social functioning	0%	18.60	5.12
Quality of life⁵	Missing	Mean	SD
Physical	0%	44.49	11.92
Mental	0%	48.99	10.93

¹ Individual-level socioeconomic status is a z-standardized composite score, ranging from 1.30 to -1.82, wherein a higher score indicates a higher socioeconomic status, and it includes education, household income, and current insurance status.

² Rurality was measured with the Rural-Urban Continuum Codes classification scheme. Counties classified as RUCC 4–9 are considered nonmetropolitan, wherein RUCC 4 counties have a population of <20,000 and are adjacent to a metro area and RUCC 9 counties are considered completely rural or 2,500 urban population and not adjacent to a metro area. Counties classified as RUCC 1–3 are considered metropolitan and include counties in metro areas of >1 million population (RUCC 1) to counties in metro areas of <250,000 population (RUCC 3).

³ County-level disadvantage z-standardized scores ranged from 3.83 (most disadvantaged) to -2.15 (least disadvantaged)

⁴ Score range from 0–28, wherein a higher score indicates better social functioning

⁵ Physical and mental health QOL measured with the SF-12, range 0 (worst health) - 100 (best health)

Table 2.

Latent class analysis results

Types of social contexts	Highly rural lacking in resources	Mostly rural	Moderate SES Fewer resources	Mostly metropolitan disadvantage	Least SES Most resources
Sample size	39	33		32	
Rurality (RUCC), M (SD)	5.90 (1.35)	4.00 (1.28)		2.34 (1.31)	
Reside in nonmetropolitan county (RUCC 4), %	92	76		9	
SES Disadvantage, M (SD)	0.32 (0.93)	0.30 (0.32)		0.13 (0.82)	
Resources, range	0 – 2	3 – 5		6	
Types of caregiver networks	Spousal caregivers	No caregivers	Multiple caregivers		
Sample size	22	26	56		
Number of non-spousal caregivers, M (SD)	1.00 (0)	0 (0)	3.20 (1.30)		
Type of caregiver, n (%)					
Spouse	22 (100)	0 (0)	39 (70)		
Family	0 (0)	0 (0)	47 (84)		
Friend	0 (0)	0 (0)	27 (48)		
Daily communication with network, n (%)	22 (100)	0 (0)	18 (32)		
Household size, M (SD)	2.31 (1.17)	2.46 (1.36)	2.68 (1.28)		

Table 3.

Analyses of associations between quality of life and multilevel social factors (n=104)

Model #	Adjusted bivari- able regressions	Physical-health QOL ¹			Mental health QOL ¹		
		Std B	95% CI	p-value	Std B	95% CI	p-value
1	Context			0.0A0			
	Most rural / Most disadvantaged	0.02	-0.18	0.22	0.83	-0.08	0.17
	Mostly rural / Moderate disadvantaged	-0.04	-0.24	0.16	0.69	-0.29	0.44
	More metropolitan / Least disadvantaged	REF	REF	REF	REF	REF	REF
2	Network						
	Spousal caregiver	0.03	-0.19	0.25	0.78	-0.21	0.27
	No caregivers	0.08	-0.14	0.30	0.46	-0.20	0.26
	Multiple caregivers	REF	REF	REF	REF	REF	REF
3	Social functioning	0.10	-0.08	0.28	0.28	0.30	0.64
	Adjusted multivariable regression	Std B	95% CI	p-value	Std B	95% CI	p-value
	Context						
	Most rural / Most disadvantaged	0.02	-0.18	0.22	0.84	-2.79	6.30
	Mostly rural / Moderate disadvantaged	-0.05	-0.25	0.16	0.64	-4.96	4.13
	More metropolitan / Least disadvantaged	REF	REF	REF	REF	REF	REF
4	Network						
	Spousal caregiver	0.00	-0.25	0.26	0.98	-0.29	0.13
	No caregivers	0.08	-0.14	0.30	0.49	-0.17	0.25
	Multiple caregivers	REF	REF	REF	REF	REF	REF
	Social functioning	0.12	-0.07	0.30	0.22	0.32	0.68
							<.0001

¹ Fully standardized coefficients for each factor modeled as a predictor in separate bivariable and multivariable linear regression models of each of the two QOL outcomes, while adjusting for age, individual socioeconomic status, and time since last treatment. P-values >0.20 are suppressed.