

Gender Differences In The Association Between Unmet Support Service Needs And Mental Health Among American Cancer Caregivers

Yiqing Qian (✉ yqq@email.unc.edu)

University of North Carolina at Chapel Hill <https://orcid.org/0000-0002-3850-2394>

Erin E. Kent

University of North Carolina at Chapel Hill <https://orcid.org/0000-0003-2503-2191>

Research Article

Keywords: cancer caregiver, family caregiving, gender, mental health, support services

Posted Date: November 29th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-1015346/v1>

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Version of Record: A version of this preprint was published at Supportive Care in Cancer on March 19th, 2022. See the published version at <https://doi.org/10.1007/s00520-022-06966-y>.

Abstract

Purpose: Cancer caregiving can be distressing, and many caregivers have support service needs. Given the role gender has played in shaping norms around caring, gender may influence caregiving experiences. Using Behavioral Risk Factor Surveillance System data, 2015-2018, we aimed to examine gender as an effect modifier of the unmet support service needs and mental health association among cancer caregivers.

Methods: Our n=5,814 sample represented approximate 4.8 million caregivers. Mental health was operationalized as number of mentally unhealthy days over the past 30 (MUDs) and Frequent Mental Distress (FMD, MUDs \pm 14 days). Unmet supportive care needs included endorsement of needing but not receiving caregiving classes, help accessing services, support groups, counseling, and respite care. We conducted zero-inflated negative binomial (ZINB) and logistic regression analyses to examine the associations between unmet needs with MUDs and FMD and then tested gender as an effect modifier.

Results: Cancer caregivers reported an average of 6 MUDs. Approximately 20% of caregivers reported FMD, and 17% reported having any unmet needs. Gender moderated the unmet needs and FMD association. Among female caregivers, those with unmet needs were more likely to report FMD (aOR: 2.157; 95%CI: 1.449, 3.211); among male caregivers, no association was found (aOR: 0.951; 95%CI: 0.457, 1.978). In the ZINB model of MUDs, no significant moderation effect of gender was found.

Conclusion: Though distress does not appear to vary by gender, having unmet support needs may negatively affect mental health in female cancer caregivers. Studies on gendered experiences can inform strategies to meet caregiver needs.

Introduction

Supporting families and friends with cancer can bring mental health challenges to caregivers, such as psychological distress, depression, and anxiety [1–3]. According to data from the National Alliance for Caregiving gathered in 2015, half of cancer caregivers report experiencing high levels of emotional stress as a result of providing care, which is significantly higher than family caregivers for individuals of other health conditions [1]. Given the common occurrence of cancer progression or recurrence, cancer caregivers may also experience feelings of fear, uncertainty, powerlessness, and hopelessness [4]. Despite the fact that caregiving experiences are highly individualized and that the underlying stress-coping process is complex [5], caregiver mental health could be influenced by many factors, including care-recipient cancer diagnosis and treatment regimen [5]; caregiving activities, such as weekly hours spent on caregiving and tasks performed [5]; cognitive appraisals, such as perceptions of needs and unmet needs for support services and social support [6]; as well as multi-level contextual factors, such as caregivers' gender, race ethnicity, financial status, geographic location, healthcare institutions, and culture [5, 7, 8].

Gender roles may influence caregiver choice to provide care, their stress coping process, and mental health outcomes [9]. According to the Gender Role Theory, traditionally, many cultures and societies were

established with the premise that women take on nurturing and caregiving roles [10]. Conversely, caregiving is less commonly modeled or encouraged for many men [10]. Different societal expectations encourage or even coerce women to take on caregiving roles over men when there is a need [9]. Systematic reviews on gender and caregiving show the complicity of gender differences in stress and mental health associated with cancer caregiving [9, 11]. Despite gendered expectations in caregiving, women who are cancer caregivers often report higher levels of distress and more symptoms of depression and anxiety than men who are caregivers [12, 13]. Men tend to have more positive appraisals of caregiving, such as feelings of self-worth when taking on the unexpected role of family caregiver; on the contrary, women report more burden and lower self-esteem related to caregiving due to higher role standards they perceived [12].

A caregiver's gender also intersects with other factors influencing their coping process, which further complicates gendered effects on the associations between caregiving and mental health. Examples of important intersectional factors include the caregiver's relationships with the care-recipient [14], specific caregiving tasks they perform [15], and approaches to caregiving they adopt [16]. In addition, research has shown gender differences among caregivers in their coping strategies and attitudes and utilization of various types of supportive resources. For example, some studies show that men are more reluctant to seek out and use formal support services for self-care and to assist their caregiving tasks; on the contrary, they may be more willing to turn to their families and peers, i.e. other men caregivers, for support [16].

Furthermore, potential caveats in existing research may have biased our understanding on gender effects in cancer caregiving. First, the empirical findings of gender differences are often based on small clinic-based or convenience samples, which may be insufficiently powered to detect the differences and overall limited generalizability regarding the findings [11]. Studies of large population-based samples are needed to further explore the gender modification effects. Second, male caregivers are less represented in literature compared with female caregivers and research on male cancer caregivers are scarce [16]. Third, many potential moderation hypotheses around gender beyond simple group comparison have not been fully explored empirically. Previous research has shown coping styles may be different between female and male caregivers, which may underlie gendered differences seen in caregiving distress [9]. An association between unmet support services needs and worse mental health among cancer caregivers has been found [6]. However, it is not clear if female and male caregivers' mental health are influenced differently by perceptions of having unmet supportive care needs.

In the current study, to further illuminate gender differences in cancer caregivers' mental health, we use data from the population-based sample of the 2015-2018 Behavioral Risk Factor Surveillance System (BRFSS). Specifically, we examined a) whether gender differences in caregiving characteristics, mental health, and unmet support service needs exist, and b) whether gender moderates the association between unmet needs and mental health outcomes in American cancer caregivers.

Methods

Data Source

Data for this study came from the Behavioral Risk Factor Surveillance System (BRFSS) conducted by the Centers for Disease Control and Prevention (CDC), which is a national system of telephone surveys that collect data from U.S. residents regarding their chronic health conditions, health-related behaviors, and use of healthcare services [17]. Since 2009, the CDC has included an optional Caregiving Module as part of this survey, screening whether a respondent has served as a caregiver in the past 30 days or expects to in the next 2 years. From respondents who respond in the affirmative, the module assesses the care recipient's major health problem, the care recipient's relationship to the caregiver, duration and hours per week spent on caregiving, caregiving tasks, any unmet support service needs. The de-identified BRFSS data is publicly available. Therefore, this study was deemed exempted from institutional review board approval.

Study population

The sample included respondents who answered "Yes" to the question "During the past 30 days, did you provide regular care or assistance to a friend or family member who has a health problem or disability?" and selected cancer as the major health problem of the care recipient. To increase the statistical power for this study, we merged the most recent BRFSS data from four years of annual survey waves, 2015 to 2018. The study sample consists of 5,814 self-identified cancer caregivers across 45 states, which represents an estimated 4,792,344 individuals in these states. Detailed information of participating states is listed in the Appendix.

Measures

Mentally Unhealthy Days and Frequent Mental Distress

The dependent variable, cancer caregivers' mental health, was measured using a question asking about mentally unhealthy days (MUDs): "Thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" The responses range from 0 to 30 days. In addition, MUDs were dichotomized and labeled in accordance with other studies as Frequent Mental Distress [18], such that a response of 14 or more mentally unhealthy days was coded as 1 ("distressed") and below 14 was coded as 0 ("not distressed"). MUD was developed by CDC in the 1990s and has been used in national surveys.²⁰ Both MUD and FMD have been used in other empirical studies [19].

Unmet needs for support services

Unmet needs for support services was accessed by asking the question "Of the following support services, which one do you most need, that you are not currently getting?" Responses included: "Classes about giving care, such as giving medications," "Help in getting access to services," "Support groups,"

“Individual counseling to help cope with giving care,” “Respite care,” and “You don’t need any of these support services.” A binary variable was created for reporting any unmet needs or no unmet needs.

Caregiving characteristics

Caregiving characteristics in this study included care recipient-caregiver relationship, caregiving intensity, and caregiving tasks that a caregiver performed. Relationship categories included spouse or partner, parents or parents-in-law, other relatives (child, siblings, grandparents, grandchild, and others), and family friends. Caregiving intensity was constructed from two dimensions including hours per week caregiving and duration in months as operationalized in literature⁶. Specifically, average weekly time caregiving was dichotomized as more or less than 20 hours, and caregiving duration was dichotomized at more or less than 2 years. The caregiving intensity variable had four categories, including high hours/long duration, high hours/short duration, low hours/long duration, and low hours/short duration. Caregiving tasks categories include no personal care or household tasks, personal care only, household task only, and personal care & household tasks.

Socio-demographic variables

Caregivers’ sociodemographic information included their age, gender, race/ethnicity, education, marital status, household income, employment, and region of the country. Age at the survey included three categories: 18 to 34, 35 to 54, and above 55 years old. Gender was a binary variable with male as 1 and female as 0. Race included three categories: non-Hispanic White, non-Hispanic Black, and other races, including Hispanics, Asian, American Indian or Native American, Native Hawaiian or other Pacific Islander, and multiracial. Education included three categories: graduated from high school or less, attended some college or technical school, and graduated from college or technical school. Marital status was a binary variable as 1 denotes “currently married or partnered” and 0 denotes “unmarried.” Household income categories included less than \$25K, \$25K-50K, and above \$50K. Employment status is a binary variable with employed as 1 and unemployed as 0. Region include Northeast (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, New Jersey, New York, Pennsylvania), Midwest (Illinois, Indiana, Michigan, Ohio, Wisconsin, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota), South (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, District of Columbia, West Virginia, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma, Texas), and West (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming, Alaska, California, Hawaii, Oregon, Washington).

Statistical analyses

Descriptive statistics included unweighted and weighted means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Chi-square tests and two-sample t-tests were conducted to compare the differences between women caregivers and men caregivers. To examine the moderation hypothesis of gender on the associations between unmet needs and mental health outcomes, we conducted (1) logistic regression models to examine the association between unmet

needs and FMD (the main effect model) and the moderation effect of gender on this association (model including an interaction term between gender and unmet need); and (2) zero-inflated negative binomial regression models (ZINB) as suggested by Zhou et al. [20] and the distribution of MUDs in our sample (Figure 1) to examine the association between unmet needs and MUDs (the main effect model) and the moderation effect of gender (model including an interaction term between gender and unmet need). In all models, we adjusted for all socio-demographics and caregiving characteristics listed above. All statistical analyses were conducted addressing the complex survey design of BRFSS by incorporating sampling weights in R Studio 1.1.383 [21] and Stata 16 [22]. Results were considered as significant for a two-sided p -value <0.05 .

Results

Sample characteristics

Sample characteristics are presented in Table 1. Out of all 4,792,344 cancer caregivers, the majority were female (56.52%), non-Hispanic white (71.03%), and 35 years old or greater (75.95%). A majority of the caregivers had an education level above high school (59.99%), were employed (67.75%), were married or lived with a partner (59.16%), had household income of \$50K or above (51.31%), and were employed (56.71%). On average, caregivers report about 6 MUDs (SE=0.31) and 19.57% caregivers reported FMD during the past 30 days. About 16.66% of caregivers reported having any unmet support service needs, among which help in getting access to service was the most prevalent unmet need. The biggest group of care recipients were caregivers' mothers, fathers, or parents-in-law (36.18%). Regarding caregiving intensity, most caregivers reported their caregiving took less than 20 hours per week (73.06%), including 52.86% of caregivers also with a shorter duration providing care (less than 2 years). Tasks performed by caregivers also varied but most caregivers (46.51%) performed both personal care and household tasks. (Table 1)

Table 1
Sample characteristics of cancer caregivers, BRFSS 2015-2018

| | Unweighted frequency (N=5,814) | Weighted percentage (N= 4,792,344) |
|-------------------------------------|---|---|
| Region | | |
| Northeast | 1,262 | 30.42% |
| Midwest | 1,422 | 19.92% |
| South | 1,832 | 32.49% |
| West | 1,298 | 17.17% |
| Age (years) | | |
| 18 – 34 | 684 | 24.05% |
| 35 – 54 | 1,831 | 38.38% |
| Over 55 | 3,299 | 37.56% |
| Sex | | |
| Female | 3,742 | 56.52% |
| Male | 2,070 | 43.48% |
| Race | | |
| White | 4,574 | 71.03% |
| Black | 489 | 12.58% |
| American Indian or Alaskan Native | 85 | 1.47% |
| Asian | 72 | 1.58% |
| Native Hawaiian or Pacific Islander | 18 | 0.23% |
| Other race | 25 | 0.28% |
| Multiracial | 170 | 2.63% |
| Hispanic | 286 | 10.20% |
| Marital status | | |
| Married, partnered | 3,595 | 59.16% |
| Not married | 2,190 | 40.84% |
| Household income | | |
| Less than \$25,000 | 1,263 | 26.42% |

| | Unweighted frequency (N=5,814) | Weighted percentage (N= 4,792,344) |
|---|---|---|
| \$25,000 - \$50,000 | 1,272 | 22.27% |
| \$50,000 or above | 2,508 | 51.31% |
| Education | | |
| Graduate high school or less | 1,948 | 40.01% |
| Attended college or technical school | 1,727 | 32.03% |
| Graduated college or technical school | 2,129 | 27.95% |
| Employment | | |
| Employed | 2,880 | 56.71% |
| Unemployed | 2,907 | 43.29% |
| Relationship with care-recipient | | |
| Spouse or partner | 1,219 | 16.14% |
| Parent or Parent-in-law | 1,735 | 36.18% |
| Other relatives | 1,604 | 29.71% |
| Friends | 1,226 | 17.97% |
| Caregiving intensity | | |
| Lower hours Shorter Duration | 2,943 | 52.86% |
| Higher hours Shorter Duration | 808 | 14.70% |
| Lower hours Longer Duration | 1,070 | 20.20% |
| Higher hours Longer Duration | 595 | 12.23% |
| Caregiving tasks | | |
| No personal care or household tasks | 1,087 | 15.76% |
| Personal care only | 320 | 5.41% |
| Household tasks only | 1,919 | 32.32% |
| Personal care & Household tasks | 2,443 | 46.51% |
| Unmet needs | | |
| No unmet needs | 4,804 | 83.34% |
| Any unmet needs | 835 | 16.66% |

| | Unweighted frequency (N=5,814) | Weighted percentage (N= 4,792,344) |
|------------------------------------|---|---|
| Caregiving class | 73 | 1.81% |
| Help in getting access to service | 381 | 7.76% |
| Support groups | 159 | 3.52% |
| Individual counseling | 119 | 2.13% |
| Respite care | 103 | 1.43% |
| Mentally unhealthy days, Mean (SE) | 5.32(0.12) | 5.96 (0.31) |
| Frequent mental distress | | |
| Not Distressed | 4,740 | 80.43% |
| Distressed | 992 | 19.57% |

Bivariate results about gender differences in sociodemographic and caregiving characteristics, mental health, and unmet support service needs

As shown in Table 2, most bivariate gender differences in caregivers' socio-demographic and caregiving characteristics were not statistically significant. However, compared to male caregivers, female caregivers were more likely to be married or partnered (62.10% vs 55.18%, Chi-squared = 28.329, $p=0.0274$) and not employed (47.80% vs 37.47%, Chi-squared = 62.049, $p=0.0005$). Moreover, female caregivers were more likely to perform both personal care and household tasks than male caregivers (50.73% vs 40.97%, Chi-squared 63.263, $p=0.005$).

Table 2
Sample characteristics by gender

| | <i>Female</i> | | <i>Male</i> | | Chi-square /T-test (p-value) |
|---|--------------------|--------|--------------------|--------|------------------------------------|
| | Frequency /Mean | %/SE | Frequency /Mean | %/SE | |
| Mentally unhealthy days | 6.4535 | 0.3825 | 5.3342 | 0.5248 | -1.7166 (0.0861) |
| Frequent mental distress | | | | | 12.48 (0.1814) |
| Not Distressed | 2,109,943 | 78.79% | 1,703,968 | 82.50% | |
| Distressed | 568,049 | 21.21% | 361,514 | 17.50% | |
| Unmet needs | | | | | 13.185 (0.1243) |
| No unmet needs | 2,171,533 | 81.77% | 1,715,208 | 85.36% | |
| Any unmet needs | 483,967 | 18.23% | 294,171 | 14.64% | |
| Classes about giving care | 47,324 | 9.78% | 37,405 | 12.72% | |
| Help in getting access to services | 220,741 | 45.61% | 141,804 | 48.20% | |
| Support groups | 102,984 | 21.28% | 61,537 | 20.92% | |
| Individual counseling to help coping with giving care | 72,818 | 15.05% | 26,757 | 9.10% | |
| Respite care | 40,100 | 8.29% | 26,668 | 9.07% | |
| Caregiving intensity | | | | | 11.254 (0.6337) |
| Lower hours Shorter Duration | 1,282,469 | 51.39% | 1,074,630 | 54.58% | |
| Higher hours Shorter Duration | 378,812 | 15.18% | 278,409 | 14.14% | |
| Lower hours Longer Duration | 500,943 | 20.07% | 402,237 | 20.43% | |
| Higher hours Longer Duration | 333,143 | 13.35% | 213,502 | 10.84% | |
| Caregiving tasks | | | | | 63.263 (0.0050) |
| No personal care or household tasks | 389,219 | 14.48% | 361,548 | 17.47% | |
| Personal care only | 153,671 | 5.72% | 104,036 | 5.03% | |
| Household tasks only | 781,220 | 29.07% | 756,272 | 36.54% | |

| | <i>Female</i> | | <i>Male</i> | | Chi-square |
|----------------------------------|---------------|--------|-------------|--------|--------------------|
| | Frequency | %/SE | Frequency | %/SE | /T-test |
| | /Mean | | /Mean | | (p-value) |
| Personal care & Household tasks | 1,363,407 | 50.73% | 848,092 | 40.97% | |
| Relationship with care-recipient | | | | | 3.975 (0.8717) |
| Spouse or partner | 445,061 | 16.53% | 322,651 | 15.58% | |
| Parent or Parent-in-law | 978,758 | 36.36% | 746,756 | 36.05% | |
| Other relatives | 806,179 | 29.95% | 606,775 | 29.29% | |
| Friends | 461,985 | 17.16% | 395,211 | 19.08% | |
| Age (years) | | | | | 29.598 (0.0691) |
| 18 – 34 | 627,910 | 23.21% | 524,699 | 25.21% | |
| 35 – 54 | 979,622 | 36.21% | 856,027 | 41.13% | |
| Over 55 | 1,097,651 | 40.58% | 700,452 | 33.66% | |
| Race | | | | | 19.474 (0.2562) |
| White, non-Hispanic | 1,954,061 | 73.21% | 1,380,473 | 68.27% | |
| Black, non-Hispanic | 324,253 | 12.15% | 266,492 | 13.18% | |
| Others, Hispanic included | 390,760 | 14.64% | 375,168 | 18.55% | |
| Marital status | | | | | 28.329 (0.0274) |
| Married, partnered | 1,674,196 | 62.10% | 1,133,247 | 55.18% | |
| Not married | 1,021,606 | 37.90% | 920,605 | 44.82% | |
| Household income | | | | | 24.867 (0.1297) |
| Less than \$25,000 | 640,353 | 27.96% | 458,322 | 24.62% | |
| \$25,000 - \$50,000 | 543,949 | 23.75% | 382,033 | 20.52% | |
| \$50,000 or above | 1,106,226 | 48.30% | 1,021,342 | 54.86% | |
| Education | | | | | 25.96 (0.0916) |

| | <i>Female</i> | | <i>Male</i> | | Chi-square |
|---------------------------------------|---------------|--------|-------------|--------|--------------------|
| | Frequency | %/SE | Frequency | %/SE | /T-test |
| | /Mean | | /Mean | | (p-value) |
| Graduate high school or less | 1,008,134 | 37.30% | 903,848 | 43.46% | |
| Attended college or technical school | 927,504 | 34.32% | 606,249 | 29.15% | |
| Graduated college or technical school | 766,835 | 28.38% | 569,416 | 27.38% | |
| Employment | | | | | 62.049 (0.0005) |
| Unemployed | 1,289,051 | 47.80% | 776,758 | 37.47% | |
| Employed | 1,407,773 | 52.20% | 1,296,129 | 62.53% | |
| Region | | | | | 15.736 (0.4513) |
| Northeast | 837,036 | 30.94% | 615,047 | 29.55% | |
| Midwest | 576,415 | 21.31% | 378,026 | 18.16% | |
| South | 859,302 | 31.77% | 697,752 | 33.53% | |
| West | 432,430 | 15.99% | 390,352 | 18.76% | |

Female caregivers reported average 6.45 MUDs (SE=0.38), which was 1.12 days higher than men (mean=5.33, SE=0.52), but the difference was not statistically significant ($t=-1.71$, $p=0.086$). Similarly, there was no significant gender difference in FMD (Chi-squared=12.48, $p=0.181$), although the female caregivers had a slightly higher percentage of frequent mental distress than male caregivers (21.21% vs 17.50%). For unmet support services need, no significant gender difference was found in reporting any unmet needs, although the percentage was higher in female caregivers (18.23% vs 14.64%, Chi-squared=13.185, $p=0.124$). Among men and women caregivers who reported having unmet needs, "help in getting access to services" was the most prevalent concern for both female (45.61%) and male caregivers (48.20%). Compared with female caregivers, male caregivers were less likely to report an unmet need for individual counseling to help them coping with giving care (15.05% vs 9.10%) but more unmet needs in classes about giving care (9.78% vs 12.72%) (Table 2).

Gender moderated the association between unmet support service needs and frequent mental distress

Having unmet support services needs was associated with worse mental health outcomes overall. Compared with caregivers with no unmet support service needs, caregivers with unmet needs reported higher numbers of MUDs (means 9.89 vs 5.51, 95%CI of difference in mean: 1.77, 4.99) and were more

likely to meet the criteria of FMD (29.34% vs 18.32%, chi-square=37.70, p=0.0003). In the logistic regression model without interaction term, we found a positive association between unmet support service needs and FMD (aOR=1.676, 95%CI: 1.158, 2.425), after controlling for caregivers' caregiving intensity, caregiving task, and relationship with care recipients, age, gender, race, education, marital status, household income, employment, and region (Table 3). In the ZINB model without interaction term, having any unmet needs and higher numbers of MUDs were positively associated but the association was not significant (b=0.009, 95%CI: -0.155, 0.173), after controlling for all covariates (Table 4). Moreover, male gender was significantly associated with lower odds of having FMD (aOR=0.677, 95%CI: 0.465, 0.984).

Table 3
Logistic Regression on Frequent Mental Distress

| | Model without interaction term | | | | Model with interaction term | | | |
|-------------------------------------|--------------------------------|-------|-------|-----------------|-----------------------------|-------|-------|-----------------|
| | aOR | SE | p | 95%CI | aOR | SE | p | 95%CI |
| Unmet needs | | | | | | | | |
| No unmet needs | Ref | | | | Ref | | | |
| Any unmet needs | 1.676 | 0.316 | 0.006 | 1.158, 2.425 | 2.157 | 0.438 | 0.000 | 1.449, 3.211 |
| Sex | | | | | | | | |
| Female | Ref | | | | Ref | | | |
| Male | 0.677 | 0.129 | 0.041 | 0.465, 0.984 | 0.789 | 0.169 | 0.269 | 0.519, 1.200 |
| Unmet needs*Sex | | | | | 0.441 | 0.182 | 0.047 | 0.197, 0.989 |
| Caregiving intensity | | | | | | | | |
| Lower hrs Shorter Duration | Ref | | | | Ref | | | |
| Higher hrs Shorter Duration | 2.314 | 0.610 | 0.001 | 1.380, 3.881 | 2.266 | 0.585 | 0.002 | 1.365, 3.760 |
| Lower hrs Longer Duration | 1.143 | 0.241 | 0.527 | 0.756, 1.727 | 1.118 | 0.235 | 0.597 | 0.740, 1.689 |
| Higher hrs Longer Duration | 1.508 | 0.456 | 0.175 | 0.833, 2.730 | 1.486 | 0.442 | 0.184 | 0.829, 2.663 |
| Caregiving tasks | | | | | | | | |
| No personal care or household tasks | Ref | | | | Ref | | | |
| Personal care only | 0.719 | 0.275 | 0.389 | 0.340, 1.521 | 0.703 | 0.270 | 0.360 | 0.331, 1.493 |
| Household tasks only | 0.776 | 0.235 | 0.403 | 0.428, 1.406 | 0.750 | 0.225 | 0.338 | 0.416, 1.352 |
| Personal care & Household tasks | 1.037 | 0.342 | 0.913 | 0.543, 1.979 | 1.012 | 0.327 | 0.970 | 0.537, 1.907 |
| Relationship with care-recipient | | | | | | | | |
| Spouse or partner | Ref | | | | Ref | | | |

| | Model without interaction term | | | | Model with interaction term | | | |
|--------------------------------------|--------------------------------|-------|-------|-----------------|-----------------------------|-------|-------|-----------------|
| Parent or Parent-in-law | 0.698 | 0.177 | 0.155 | 0.424, 1.147 | 0.683 | 0.173 | 0.131 | 0.416, 1.121 |
| Other relatives | 1.044 | 0.287 | 0.877 | 0.608, 1.790 | 1.028 | 0.277 | 0.920 | 0.605, 1.744 |
| Friends | 0.675 | 0.213 | 0.214 | 0.363, 1.254 | 0.656 | 0.206 | 0.180 | 0.355, 1.214 |
| Age (years) | | | | | | | | |
| 18 – 34 | Ref | | | | Ref | | | |
| 35 – 54 | 1.106 | 0.268 | 0.677 | 0.688, 1.780 | 1.102 | 0.265 | 0.687 | 0.688, 1.764 |
| Over 55 | 0.475 | 0.110 | 0.001 | 0.303, 0.747 | 0.475 | 0.109 | 0.001 | 0.303, 0.747 |
| Race | | | | | | | | |
| White, non-Hispanic | Ref | | | | Ref | | | |
| Black, non-Hispanic | 0.591 | 0.155 | 0.045 | 0.354, 0.990 | 0.593 | 0.156 | 0.047 | 0.354, 0.993 |
| Others, Hispanic included | 0.452 | 0.119 | 0.003 | 0.269, 0.758 | 0.474 | 0.123 | 0.004 | 0.285, 0.787 |
| Marital status | | | | | | | | |
| Not married | Ref | | | | Ref | | | |
| Married or partnered | 0.644 | 0.128 | 0.027 | 0.436, 0.950 | 0.645 | 0.126 | 0.025 | 0.440, 0.946 |
| Household income | | | | | | | | |
| Less than \$25,000 | Ref | | | | Ref | | | |
| \$25,000 - \$50,000 | 0.780 | 0.173 | 0.262 | 0.505, 1.204 | 0.767 | 0.168 | 0.226 | 0.500, 1.178 |
| \$50,000 or above | 0.633 | 0.149 | 0.052 | 0.400, 1.004 | 0.618 | 0.146 | 0.041 | 0.389, 0.982 |
| Education | | | | | | | | |
| Graduate high school or less | Ref | | | | Ref | | | |
| Attended college or technical school | 1.071 | 0.238 | 0.759 | 0.693, 1.654 | 1.083 | 0.238 | 0.717 | 0.704, 1.665 |

| | Model without interaction term | | | | Model with interaction term | | | |
|---|--------------------------------|-------|-------|--------------|-----------------------------|-------|-------|--------------|
| Graduated college or technical school | 0.996 | 0.215 | 0.985 | 0.652, 1.521 | 0.987 | 0.213 | 0.952 | 0.646, 1.507 |
| Employment | | | | | | | | |
| Unemployed | Ref | | | | Ref | | | |
| Employed | 0.702 | 0.130 | 0.057 | 0.488, 1.010 | 0.729 | 0.138 | 0.095 | 0.504, 1.056 |
| Region | | | | | | | | |
| Northeast | Ref | | | | Ref | | | |
| Midwest | 1.087 | 0.235 | 0.700 | 0.711, 1.661 | 1.067 | 0.231 | 0.765 | 0.698, 1.630 |
| South | 1.263 | 0.268 | 0.272 | 0.833, 1.916 | 1.244 | 0.261 | 0.298 | 0.825, 1.877 |
| West | 1.536 | 0.420 | 0.116 | 0.899, 2.626 | 1.524 | 0.417 | 0.124 | 0.891, 2.607 |
| Note: aOR=adjusted odds ratio; SE=standard error; CI=confidence interval. | | | | | | | | |

Table 4
Zero-inflated Negative Binomial Regression on Mentally Unhealthy Days

| | Model without interaction term | | | | Model with interaction term | | | |
|-------------------------------------|--------------------------------|-------|-------|------------------|-----------------------------|-------|-------|------------------|
| | B | SE | p | 95%CI | B | SE | p | 95%CI |
| Unmet needs | | | | | | | | |
| No unmet needs | Ref | | | | Ref | | | |
| Any unmet needs | 0.009 | 0.084 | 0.914 | -0.155, 0.173 | 0.068 | 0.103 | 0.511 | -0.135, 0.271 |
| Sex | | | | | | | | |
| Female | | | | | | | | |
| Male | -0.053 | 0.095 | 0.579 | -0.239, 0.134 | -0.017 | 0.108 | 0.875 | -0.228, 0.194 |
| Unmet needs*Sex | | | | | -0.165 | 0.179 | 0.356 | -0.517, 0.186 |
| Caregiving intensity | | | | | | | | |
| Lower hrs Shorter Duration | Ref | | | | Ref | | | |
| Higher hrs Shorter Duration | 0.501 | 0.107 | 0.000 | 0.291, 0.712 | 0.496 | 0.106 | 0.000 | 0.288, 0.704 |
| Lower hrs Longer Duration | 0.118 | 0.124 | 0.339 | -0.124, 0.361 | 0.112 | 0.124 | 0.368 | -0.132, 0.355 |
| Higher hrs Longer Duration | 0.365 | 0.114 | 0.001 | 0.140, 0.589 | 0.353 | 0.115 | 0.002 | 0.127, 0.578 |
| Caregiving tasks | | | | | | | | |
| No personal care or household tasks | Ref | | | | Ref | | | |
| Personal care only | 0.043 | 0.232 | 0.853 | -0.412, 0.499 | 0.052 | 0.234 | 0.825 | -0.407, 0.511 |
| Household tasks only | -0.012 | 0.149 | 0.934 | -0.304, 0.279 | -0.018 | 0.148 | 0.906 | -0.308, 0.273 |
| Personal care & Household tasks | 0.067 | 0.139 | 0.630 | -0.206, 0.339 | 0.063 | 0.138 | 0.650 | -0.208, 0.333 |
| Relationship with care-recipient | | | | | | | | |
| Spouse or partner | Ref | | | | Ref | | | |

| | Model without interaction term | | | | Model with interaction term | | | |
|--------------------------------------|--------------------------------|-------|-------|-------------------|-----------------------------|-------|-------|-------------------|
| Parent or Parent-in-law | -0.073 | 0.137 | 0.595 | -0.343, 0.196 | -0.080 | 0.138 | 0.559 | -0.351, 0.190 |
| Other relatives | 0.187 | 0.132 | 0.157 | -0.072, 0.446 | 0.179 | 0.132 | 0.176 | -0.081, 0.438 |
| Friends | 0.027 | 0.172 | 0.875 | -0.311, 0.365 | 0.016 | 0.173 | 0.925 | -0.323, 0.355 |
| Age (years) | | | | | | | | |
| 18 – 34 | Ref | | | | Ref | | | |
| 35 – 54 | -0.058 | 0.121 | 0.630 | -0.296, 0.179 | -0.062 | 0.121 | 0.605 | -0.299, 0.174 |
| Over 55 | -0.174 | 0.115 | 0.131 | -0.401, 0.052 | -0.176 | 0.115 | 0.126 | -0.402, 0.050 |
| Race | | | | | | | | |
| White, non-Hispanic | Ref | | | | Ref | | | |
| Black, non-Hispanic | -0.070 | 0.157 | 0.656 | -0.377, 0.237 | -0.070 | 0.155 | 0.654 | -0.375, 0.235 |
| Others, Hispanic included | -0.342 | 0.131 | 0.009 | -0.599, -0.086 | -0.329 | 0.132 | 0.013 | -0.588, -0.071 |
| Marital status | | | | | | | | |
| Not married | Ref | | | | Ref | | | |
| Married or partnered | -0.063 | 0.089 | 0.478 | -0.237, 0.111 | -0.062 | 0.089 | 0.483 | -0.236, 0.112 |
| Household income | | | | | | | | |
| Less than \$25,000 | Ref | | | | Ref | | | |
| \$25,000 - \$50,000 | -0.255 | 0.118 | 0.031 | -0.486, -0.023 | -0.256 | 0.118 | 0.030 | -0.487, -0.026 |
| \$50,000 or above | -0.232 | 0.123 | 0.058 | -0.473, 0.008 | -0.236 | 0.122 | 0.053 | -0.476, 0.003 |
| Education | | | | | | | | |
| Graduate high school or less | Ref | | | | Ref | | | |
| Attended college or technical school | 0.084 | 0.104 | 0.418 | -0.119, 0.287 | 0.089 | 0.104 | 0.393 | -0.115, 0.293 |

| | Model without interaction term | | | | Model with interaction term | | | |
|--|--------------------------------|-------|-------|----------------|-----------------------------|-------|-------|----------------|
| Graduated college or technical school | 0.013 | 0.121 | 0.915 | -0.224, 0.250 | 0.006 | 0.121 | 0.960 | -0.231, 0.243 |
| Employment | | | | | | | | |
| Unemployed | Ref | | | | Ref | | | |
| Employed | -0.201 | 0.093 | 0.031 | -0.384, -0.018 | -0.195 | 0.095 | 0.040 | -0.380, -0.009 |
| Region | | | | | | | | |
| Northeast | Ref | | | | Ref | | | |
| Midwest | 0.015 | 0.113 | 0.895 | -0.207, 0.237 | 0.015 | 0.113 | 0.897 | -0.206, 0.235 |
| South | -0.003 | 0.116 | 0.982 | -0.229, 0.224 | -0.006 | 0.115 | 0.962 | -0.231, 0.220 |
| West | -0.121 | 0.137 | 0.376 | -0.389, 0.147 | -0.115 | 0.139 | 0.411 | -0.387, 0.158 |
| Note: SE=standard error; CI=confidence interval. | | | | | | | | |

In the logistic regression model with the interaction term between gender and unmet needs, we found a significant moderation effect of gender on the association between unmet needs and FMD controlling for covariates. Specifically, among female caregivers, those with any unmet needs were more likely to report being FMD (aOR: 2.157; 95%CI: 1.449, 3.211); however, among male caregivers, no significant association between unmet needs and FMD was found (aOR: 0.951; 95%CI: 0.457, 1.978). In the ZINB moderation model on MUDs, no significant moderation effect of gender was found (b=-0.165, 95%CI: -0.517,0.186).

Discussion

In the current study, we examined mental health burden and unmet support services needs among female and male cancer caregivers in a large population-based sample. We based our analysis off of a sample representing approximately 4.8 million American family caregivers of adults living with cancers. These caregivers reported about 6 mentally unhealthy days on average during the past 30 days and about 20% met the criterion of frequent mental distress. About 17% of caregivers reported having any unmet support service needs. We also found that having any unmet needs was positively associated with a higher likelihood of frequent mental distress, after controlling for caregivers' sociodemographic and caregiving characteristics. This finding suggests that for cancer caregivers, the mismatch between needs of caregiver support services and actual access to those services could be a stressor, even after adjusting for other caregiving stressors such as high caregiving intensity, which is consistent with previous studies [6].

In exploring gender differences, we found that female caregivers were more likely to perform both personal care & household tasks, be married, and not employed ($p < 0.05$) but there were no significant gender differences in caregiving intensity, mental health outcomes, and unmet needs. Gender was not a significant predictor of number of mentally unhealthy days after controlling for caregiving characteristics and other demographic information. However, compared with female caregivers, male caregivers had a lower likelihood of FMD. The moderation analyses further showed that caregiver's gender moderated the association between unmet needs and FMD. Although some null results of gender differences are not consistent with some previous research reporting lower distress among male caregivers [15], we should note the difference may be attributable to different sampling approaches, such as clinic- vs population-based and variability across cancer types. On the other hand, the inconsistency across studies suggest that the underlying mechanisms of gender influences in family caregiving is complex. Some studies have suggested that lower levels of perceived role strains observed among some male caregivers could be attributable to a tendency of incorporating problem-centered approaches in caregiving (i.e., perceiving caregiving roles as problems needed to overcome or tasks to accomplish) [16].

Furthermore, gender could influence caregivers' attitudes and utilizations of support services in the stress coping. We found gender moderates the relation between unmet support services need and FMD such that among female caregivers, those with unmet needs were more likely to report FMD; among male caregivers, the association was not statistically significant. This finding suggests that for female cancer caregivers, more support services, such as support groups and respite care, may improve mental health and increase service access. However, the null finding among male cancer caregivers does not suggest that we should ignore their needs. Men tend to under-report needs for support [24]. Cultural biases discourage support-seeking among men. Some studies suggest that male family caregivers are resistant to receive or seek formal support service but are more willing to accept social support from families and friends [16]. In addition, different cultural expectations for caregiving, familiarity with certain caregiving tasks, and different needs for support may vary by gender. In our sample, male caregivers reported a higher percentage of unmet need in classes about caregiving skills than female caregivers. This may suggest gender differences in coping with caregiving challenges and a lack of preparation for caregiving roles given different gendered socialization experiences of caregiving and familial duties [10].

Limitations

Study findings should be interpreted with caution. First, due to data source limitations, we are unable to rule out the potential confounding effects of some key factors, such as care-recipients' stage of cancer and treatment received [5]. Second, since this is a cross-sectional study, we cannot establish temporality to fully justify that statistical associations found denote true causal relationships. Third, although we addressed survey design in all analyses, study findings cannot be generalized nationwide because samples were limited to the 45 states that participated in the Caregiver Module (see Appendix). Fourth, the mental health measures in this study (MUDs and FMD) reflect overall mental distress not specific to caregiving. Therefore, we should be cautious about direct comparison with other studies examining caregiver burden or mental health outcomes attributable to caregiving experiences. Finally, we would like

to acknowledge that the current analyses on gender differences were not able to include to caregivers from diverse gender identity groups. In the BRFSS core module, there are no other gender categories as response options except female and male. In our sample, there are only 2 participants with missing values on this binary gender variable. Among the 45 states participated in the Caregiver Module, only half (n=21 states) also participated in the Sexual Orientation and Gender Identity Module, among which 99.14% caregivers did not consider themselves as transgender (male-to-female, female-to-male, gender nonconforming).

Implications

Although our study is not without caveats, this study is one of few population-based studies examining gender effects on mental health and unmet needs in family cancer caregivers. For future cancer caregiving research, more population-based studies representative of diverse caregiver and care-recipient populations are needed to further elucidate gender effects on the associations between unmet needs and mental health. Given the difficulty of detangling gender effects using a single binary variable, more in-depth qualitative or mixed-method research would inform understanding of these phenomena. As caregiving spans all cultures, racial/ethnic groups and generations in the U.S. [5], it would enrich our understandings on gender and cancer caregiving if there were focused on underrepresented subgroups of caregivers, such as racial minority, men, rural, and LGBTQ+ caregivers. Practice implications of this study suggest that support services implementation to be more attentive to individual needs and preferences, including tailoring the service content, delivery modes, and service reach for cancer caregivers of diverse gender identities. Our findings imply different pathways to meeting support needs than effective strategies for women.

In conclusion, though cancer caregiving distress did not appear to vary by gender in our study, we found that having unmet support needs may negatively affect mental health in female caregivers. Future research to explore gender differences in caregiving and coping in diverse populations can inform strategies to meet the needs of cancer caregivers.

Declarations

Funding: Funding for this research was provide by Graduate School at the University of North Carolina at Chapel Hill through 2020 Summer Research Fellowship (recipient: Yiqing Qian). Funding was also provided to Erin E Kent by Lineberger Comprehensive Cancer Center at the University of North Carolina at Chapel Hill.

Author contributions: Y.Q. conducted the literature review and statistical analyses and wrote the manuscript. Y.Q. and E.E.K. conceptualized the research questions and conducted data interpretations and manuscript revision. Both authors gave final approval of the version to be submitted.

IRB approval: This study used de-identified and publicly available BRFSS data. Therefore, this study was deemed exempt from institutional review board approval.

Duality of Interest: No potential conflicts of interest relevant to this manuscript were reported.

Acknowledgement: The authors wish to thank the Odum Institute at the University of North Carolina at Chapel Hill for their support in statistical methods.

Prior Presentation: Parts of this study were presented in abstract from the 2021 Society of Behavioral Medicine Annual Meeting & Scientific Session, Virtual, April 2021

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Figures

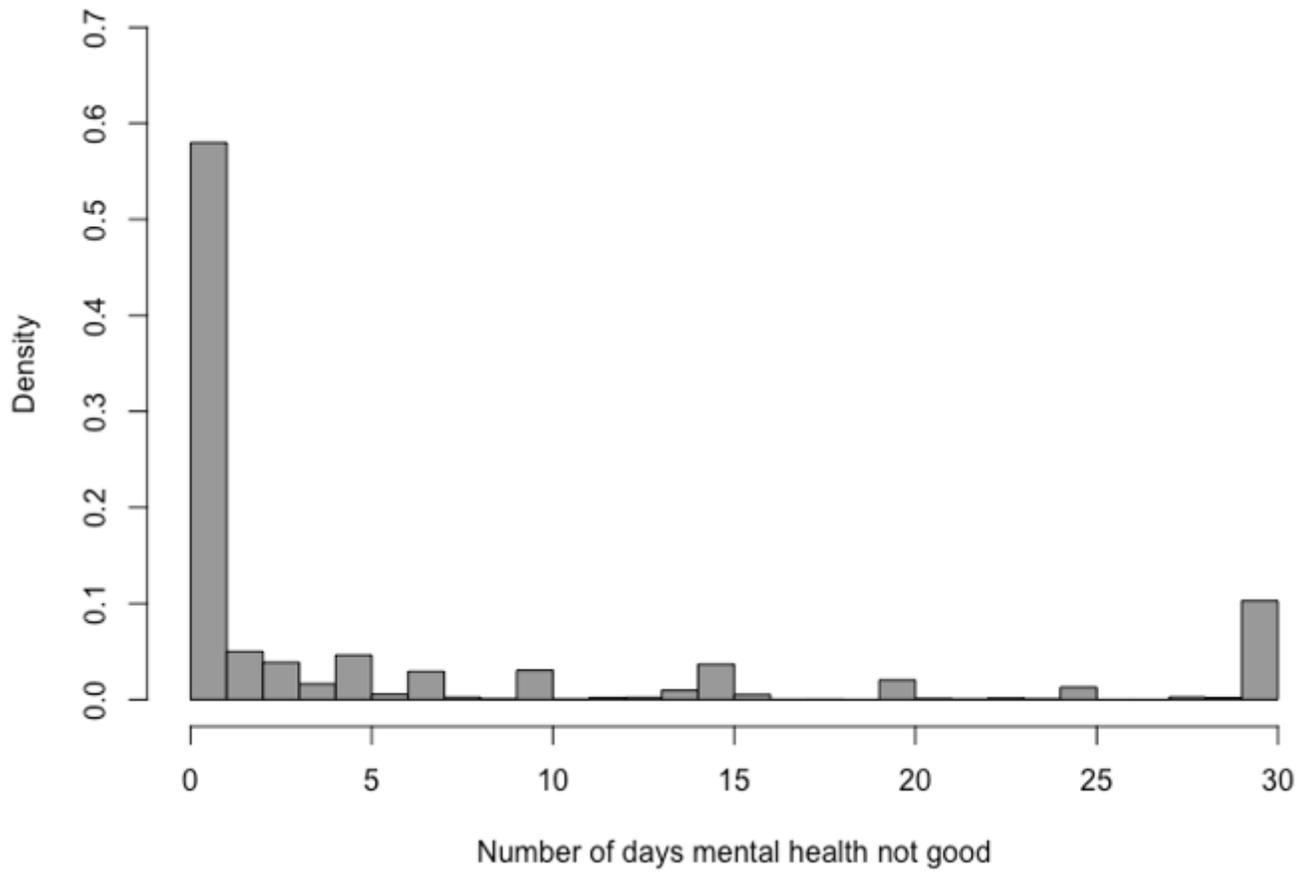


Figure 1

Distribution of mentally unhealthy days among cancer caregivers, BRFSS 2015-2018

Supplementary Files

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- [Appendix1.docx](#)