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Research Paper

## Association between social connectedness and stress or anxiety among older cancer survivors during the 2020–2021 winter surge of the COVID-19 pandemic

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## ABSTRACT

**Introduction:** Our goal was to estimate a relative decreased rate of social connectedness to family and friends, increased rate of stress or anxiety during the 2020–2021 winter surge of the COVID-19 pandemic, and investigate the association between social connectedness and stress or anxiety among a nationally representative sample of older adults with cancer history.

**Materials and Methods:** We used population-based, nationally representative cross-sectional data from the Medicare Current Beneficiary Survey COVID-19 Winter 2021 Community Supplement. The study cohort included community-living Medicare beneficiaries aged 65 years and older who self-reported cancer history (other than skin cancer) ( $n = 1650$ ). Sample weights were applied to account for the complex survey design, with results generalizable to 8.5 million Medicare beneficiaries with cancer history. The outcome was self-reported feelings of stress or anxiety during the 2020–2021 winter surge of the COVID-19 pandemic. The independent variable was social connectedness, defined as feeling less socially connected to family and friends during the 2020–2021 winter surge of the COVID-19 pandemic. We conducted weighted descriptive statistics and multivariable logistic regression analyses.

**Results:** Overall, 42.5% of beneficiaries reported decreased social connectedness to family and friends, and 37.8% reported increased feelings of stress or anxiety during the 2020–2021 winter surge of the COVID-19 pandemic. After adjusting for all covariates, participants who reported decreased social connectedness had 154% higher odds of increased feelings of stress or anxiety (adjusted odds ratio [AOR] = 2.54, 95% confidence interval [CI] = 2.00–3.20,  $p \leq 0.001$ ) compared to those who reported more or about the same social connectedness to family and friends. The odds of increased feelings of stress or anxiety were also higher for those who self-reported as Hispanic vs. non-Hispanic White beneficiaries (AOR = 1.35, 95% CI = 1.10–1.73,  $p = .016$ ), women vs. men (AOR = 1.85, 95% CI = 1.43–2.38,  $p \leq 0.001$ ), and those who reported depression history vs. not reporting depression history (AOR = 2.55, 95% CI = 1.86–3.48,  $p \leq 0.000$ ).

**Discussion:** An estimated 3.6 million older adults with cancer history reported decreased social connectedness to family and friends, and 3.2 million reported increased feelings of stress or anxiety during the 2020–2021 winter surge of the COVID-19 pandemic. Identifying these adults and referring them to appropriate supportive care resources and services are essential to help them cope with negative feelings.

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## 1. Introduction

To date, there have been over 86 million confirmed cases with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that caused over 1 million deaths from coronavirus disease 19 (COVID-19) in the United States (U.S.) [1]. The evidence is clear that older adults aged  $\geq 65$  years and those with underlying chronic conditions are at increased risk for death and severe health complications if they acquire COVID-19 [2–5]. Because of the compromised immune system of individuals with cancer diagnosis due to cancer treatment and the disease itself, these individuals are at much greater risk for mortality from COVID-19 [6]. In fact, individuals with a history of cancer diagnosis are at 7% greater risk for mortality from COVID-19 than those without cancer history [2]. Since 64% of cancer survivors are aged  $\geq 65$  years and over 60% have at least one additional comorbid condition, older cancer survivors are at particularly high risk for severe health outcomes if they acquire COVID-19 [2,7,8].

The pandemic has had an outsized negative social impact on older cancer survivors due to the stay-at-home orders that led to societal and community changes during surges of COVID-19. Cancer survivors must not only manage the uncertainty surrounding their cancer prognosis, but also manage the feelings of loneliness and psychological distress (e.g., anxiety, depression, fear) of an increased risk of COVID-19 mortality. Social connectedness, feelings of belonging and closeness to community, social world, and other people through trusting and supportive interpersonal relationships, is vital for individuals' health and well-being [9,10]. The social connections that individuals have with their family members, friends and others have a significant influence on psychological health [11–13]. Through these connections, individuals communicate with each other and share information, knowledge, help, and support. They also influence each other's emotions, behaviors, and health outcomes [14–17]. Research shows that people who feel connected to others have high self-esteem and lower stress, and those who feel less connected have poor mental and physical health and feelings of loneliness [18–21].

In the winter of 2020–2021, the COVID-19 pandemic entered its second year. There is a need to evaluate cancer survivors' responses after an unprecedented year and a half of pandemic-related policies and mandates enforcing social distancing and isolation. Currently, limited research is available about cancer survivors' level of social connectedness and its influence on stress or anxiety during this time among older adults with a history of cancer diagnosis who are especially at high risk for poor health outcomes during the pandemic. Using population-based data, this study aims to (1) estimate the relative decreased rate of social connectedness to family and friends and increased rates of stress or anxiety and (2) investigate the association between social connectedness and stress or anxiety among Medicare beneficiaries aged 65 and older years with cancer history.

## 2. Materials and Methods

### 2.1. Data Source and Study Participants

This study used cross-sectional data from Medicare Current Beneficiary Survey (MCBS) COVID-19 Winter 2021 Community Supplement Public Use File. The MCBS, sponsored by the Centers for Medicare and Medicaid Services (CMS), is a multi-purpose longitudinal survey of Medicare beneficiaries aged 65 and older and beneficiaries aged 64 and younger with certain disabling conditions residing in the US. The 2021 MCBS COVID-19 survey was a nationally representative, a cross-sectional phone survey of Medicare beneficiaries living in the community during the time of the interview. Beneficiaries were enrolled in Medicare from the beginning of 2020 and are still alive and were continuously enrolled through the time of the COVID-19 Winter 2021 Supplement. The COVID-19 Winter 2021 15-min survey was conducted between March 1 and April 25, 2021. The survey collected data on the

deferred medical care, availability of telemedicine visits, access to the internet, consequences for social, financial, and emotional well-being, and COVID-19-related information such as testing, vaccination, social distancing, hand washing, and other preventive health behaviors. The survey items were adapted from a range of sources such as the National Center for Health Statistics COVID-19 Research and Development Survey; Census Bureau's American Community Survey; November 2019 Current Population Survey Computer and Internet Use Supplement; National Health Interview Survey. The items were intended to align with other federal surveys on similar topics.

The COVID-19 Winter 2021 survey includes data on 11,107 Medicare beneficiaries weighted to be nationally representative of 57,387,274 beneficiaries. The overall response rate was 79.6%. Additional information about the survey is available at the CMS MCBS website [22].

Our study population included community-living Medicare beneficiaries aged 65 years and older who self-reported cancer history (other than skin cancer). Individuals with skin cancer usually are not included in these registry studies because skin cancers are underreported [23]. The COVID-19 Winter 2021 supplement surveyed Medicare beneficiaries either themselves or through a proxy respondent. For the current study, we excluded observations completed by proxy respondents ( $n = 1352$ ). We further excluded observations due to missing values on study variables. Of the 11,107 participants who completed the survey, we included 1650 participants with cancer history and with complete data on study variables (Fig. 1). No Institutional Review Board approval was needed as the analyses of publicly available and de-identified data are not considered as human subjects research according to Code of Federal Regulations part 46.102.

### 2.2. Study Variables

The outcome of interest was self-reported feelings of stress or anxiety over the past six months. Participants were asked the following question “[Since (REFERENCE DATE)...] have you felt more stressed or anxious, less stressed or anxious, or about the same?” with responses 1 = more stressed or anxious, 2 = less stressed or anxious, and 3 = about the same. The COVID-19 Winter 2021 supplement used a reference date as “Since November 1, 2020”. We created a binary variable with 0 = less/about the same stressed or anxious by combining categories “less stressed or anxious” and “about the same” and 1 = more stressed or anxious.

The key independent variable was self-reported social connectedness, defined as feeling less socially connected to family and friends over the past six months. Participants were asked the following question “[Since (REFERENCE DATE)...] have you felt more socially connected to family and friends, less socially connected to family and friends, or about the same?” with responses 1 = more socially connected, 2 = less socially connected, and 3 = about the same. We created a binary variable with 0 = more/about the same socially connected by combining categories “more socially connected” and “about the same” and 1 = less socially connected.

Based on previous research focused on stress or anxiety, we included other covariates in the adjusted model for their potential to confound the relationship between social connectedness and stress or anxiety. The following self-reported covariates were included in the analysis: age (65–74,  $\geq 75$  years), sex (male, female), race and ethnicity (non-Hispanic Black, Hispanic, non-Hispanic White, and Other [American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, two or more races, unknown races]), annual household income ( $< \$25,000$  and  $\geq \$25,000$ ), metropolitan status (metropolitan, non-metropolitan), US census regions (Northeast, Midwest, South, West), having access to the internet (yes, no), Medicare and Medicaid dual eligibility status (non-dual, full eligible, partial eligible, and qualified Medicare beneficiary [QMB] eligible only), living status (alone, not alone), depression history (yes, no), and unable to get medical care because of COVID-19 pandemic (yes, no).

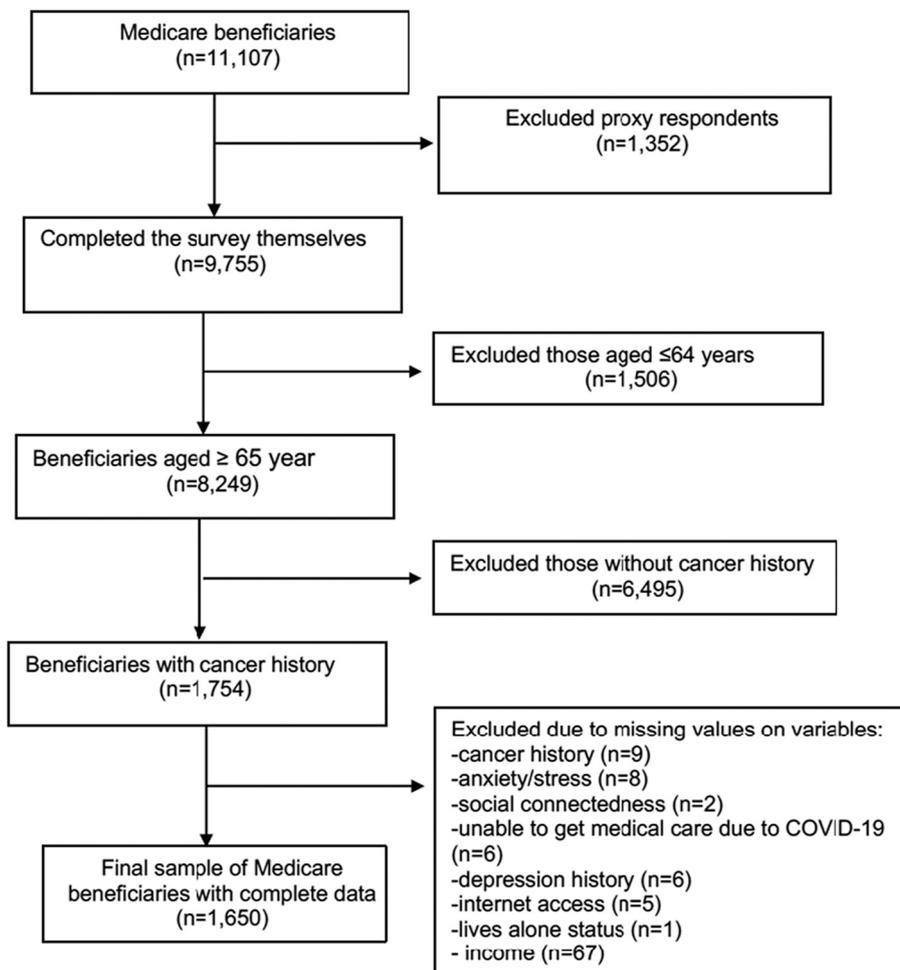


Fig. 1. Flow chart of study participants.

### 2.3. Statistical Analyses

First, we reported unweighted frequencies and then applied sample weights to account for the complex survey design of the MCBS COVID-19 Winter 2021 supplement and to provide population estimates. Then, we conducted weighted descriptive statistics, percentages and 95% confidence intervals (CI) for study variables overall and stratified by social connectedness. To examine the association between decreased social connectedness and increased feelings of stress or anxiety, we conducted weighted multivariable logistic regression analyses adjusted for study covariates. We estimated the adjusted odds ratios (AOR) and 95% CI with balanced repeated replication (BRR) using Fay's adjustment of 0.3. Associations were examined in two-side test at 5% significance level. All analyses were conducted using Stata, version 17.0 (StataCorp).

### 3. Results

A total of 1650 community-living Medicare beneficiaries with cancer history (other than skin cancer) were included in this study, corresponding to a population estimate of 8,513,225 Medicare beneficiaries with the characteristics presented in Table 1. The majority (56.0%) of the sample were aged between 65 and 74 years and female (57.6%). Overall, 6.5% self-reported as non-Hispanic Black, 7.0% Hispanic, and 81.0% non-Hispanic White, 82.0% were residing in Metropolitan areas, and 18.2% were living alone. Overall, 42.5% reported decreased social connectedness to family and friends, and 37.8% reported increased feeling of stress or anxiety during the past six months (Table 1).

As shown in Table 2, the proportion of decreased social

connectedness was higher among younger beneficiaries (aged 65–74 vs 75 and older), women vs. men, those with higher income, and those not living alone. In addition, a higher proportion of participants who had access to internet (44.8% vs. 28.0%,  $p \leq 0.001$ ) and were unable to get medical care due to COVID-19 (58.0% vs. 41.5%,  $p = .009$ ) reported decreased social connectedness to family and friends compared to their counterparts.

Table 3 presents findings from the multivariable logistic regression model. Compared to Medicare beneficiaries who reported more or about the same social connectedness to family and friends, those who reported decreased social connectedness had higher odds of increased feelings of stress or anxiety (AOR = 2.54, 95% CI = 2.00–3.20,  $p \leq 0.001$ ) over the past six months. The odds of increased feelings of more stress or anxiety were also higher for those who self-reported as Hispanic (AOR = 1.87, 95% CI = 1.13–3.11,  $p = .016$ ) compared to non-Hispanic White beneficiaries. Compared to men, women were 85% (AOR = 1.85, 95% CI = 1.43–2.38,  $p \leq 0.001$ ) more likely to report increased stress or anxiety. Those who reported depression history also had higher odds (AOR = 2.55, 95% CI = 1.86–3.48,  $p \leq 0.000$ ) of reporting increased feelings of stress or anxiety compared to those who did not report depression history.

### 4. Discussion

To our knowledge, this is the first population-based, nationally representative study of social connectedness and stress or anxiety among older cancer survivors during the second winter surge of the COVID-19 pandemic. The results of this study showed a decrease in social

**Table 1**  
Characteristics of Medicare beneficiaries with cancer history.

Characteristics	Unweighted frequencies	Weighted Percentage (95% CI)
	N = 1650	N = 8,513,225
Age		
65–74	638	56.0 (53.6–58.3)
≥75	1012	44.0 (41.7–46.4)
Sex		
Male	713	42.4 (39.8–45.05)
Female	937	57.6 (54.95–60.2)
Race and Ethnicity		
Non-Hispanic Black	98	6.5 (5.0–8.5)
Hispanic	130	7.0 (5.6–8.5)
Non-Hispanic White	1346	81.1 (78.5–83.4)
Other	76	5.4 (4.2–7.1)
Income		
<\$25,000	405	21.7 (19.3–24.3)
≥\$25,000	1245	78.3 (75.7–80.7)
Medicare-Medicaid dual eligibility in 2020		
Nondual	1495	91.9 (90.1–93.4)
Fully dual eligible	81	4.4 (3.3–5.8)
Partial	40	2.0 (1.5–2.7)
QMB eligible only	34	1.8 (1.1–3.0)
Residing Area		
Metro	1309	82.0 (79.2–84.5)
Non-metro	341	18.0 (15.5–20.8)
US census regions		
West	360	22.7 (20.6–24.9)
Northeast	331	20.3 (18.0–23.2)
Midwest	346	19.8 (17.6–22.1)
South	613	37.3 (34.3–40.3)
Living alone status		
No	1301	81.8 (79.4–84.0)
Yes	349	18.2 (16.0–20.6)
Social connectedness		
Less connected		42.5 (39.3–45.8)
More/same connected		57.5 (54.2–60.7)
Internet access		
Yes	1355	86.2 (83.8–88.2)
No	295	13.8 (11.8–16.2)
Unable to get medical care due to COVID-19		
Yes	90	6.2 (4.8–8.0)
No	1560	94.0 (92.0–95.1)
Depression History		
Yes	349	22.0 (19.7–24.5)
No	1301	78.0 (75.5–80.3)
Anxiety/stress		
More stressed/anxious	572	37.8 (34.5–41.3)
Less/same stress/anxiety	1078	62.2 (58.7–65.5)

connectedness and an increase in stress or anxiety among Medicare beneficiaries with a cancer history during the 2020–2021 winter surge of the COVID-19 pandemic. We found evidence that the COVID-19 pandemic created an unprecedented social disruption for older cancer survivors. Specifically, an estimated 3.6 million older cancer survivors reported decreased social connectedness to family and friends, and 3.2 million reported increased feelings of stress or anxiety during the 2020–2021 winter surge of the COVID-19 pandemic. Subsequently, these survivors who reported decreased social connectedness were also more likely to report increased feelings of stress or anxiety. Our study mirrored other studies of individuals with history of cancer diagnosis and their feelings of social connectedness during the COVID-19 pandemic [24–26]. A recent study conducted by Javellana and colleagues (2022) found that 43% of patients with ovarian cancer reported increased loneliness due to the pandemic, and 34% reported fair and poor satisfaction with their social activities and relationships [25]. Another study found that 53% of oncology patients were categorized in a lonely group who reported a significantly higher level of social isolation, depression, and anxiety during the COVID-19 pandemic [26]. Similarly, Rentscher and colleagues (2021) found that loneliness

**Table 2**  
Proportion of social connectedness among Medicare beneficiaries, by demographic, socio-economic and clinical characteristics.

Characteristics	Same/More connected	Less connected	p-value
	N = 4,893,962	N = 3,619,263	
	Weighted Percentage (95% CI)	Weighted Percentage (95% CI)	
Age			<0.001
65–74	53.5 (48.6–58.3)	46.5 (41.7–51.4)	
≥75	62.6 (59.4–65.7)	37.4 (34.3–40.6)	
Sex			0.046
Male	61.3 (56.2–66.1)	38.7 (33.9–43.8)	
Female	54.7 (50.6–58.7)	45.3 (41.3–49.4)	
Race and Ethnicity			0.176
Non-Hispanic Black	62.7 (48.8–74.8)	37.3 (25.2–51.2)	
Hispanic	60.6 (49.7–70.6)	39.4 (29.4–50.3)	
Non-Hispanic White	56.0 (52.7–59.3)	44.0 (40.7–47.3)	
Other	68.9 (55.8–79.6)	31.1 (20.4–44.2)	
Income			0.004
<\$25,000	65.1 (59.0–70.7)	34.9 (29.3–41.0)	
≥\$25,000	55.4 (51.9–58.9)	44.6 (41.1–48.1)	
Medicare-Medicaid dual eligibility in 2020			0.144
Nondual	56.7 (53.4–59.9)	43.3 (40.1–46.6)	
Fully dual eligible	63.7 (47.8–77.0)	36.3 (23.0–52.12)	
Partial	76.3 (59.2–87.7)	23.7 (12.3–40.8)	
QMB eligible only	63.7 (42.7–80.6)	36.3 (19.4–57.3)	
Residing Area			0.447
Metro	57.0 (53.3–60.6)	43.0 (39.4–46.7)	
Non-metro	59.7 (53.5–65.7)	40.3 (34.3–46.5)	
US census regions			0.197
West	61.8 (55.2–68.0)	38.2 (32.0–44.8)	
Northeast	53.7 (46.4–60.8)	46.3 (39.2–53.6)	
Midwest	53.0 (45.0–60.9)	47.0 (39.1–55.0)	
South	59.3 (54.4–64.1)	40.7 (35.9–45.7)	
Living alone status			0.027
No	56.0 (52.5–59.4)	44.0 (40.6–47.5)	
Yes	64.4 (57.2–70.9)	35.6 (29.1–42.8)	
Internet access			<0.001
Yes	55.2 (51.68–58.59)	44.8 (41.41–48.32)	
No	72.0 (66.15–77.15)	28.0 (22.85–33.85)	
Unable to get medical care due to COVID-19			0.009
Yes	42.0 (30.3–54.7)	58.0 (45.5–69.7)	
No	58.5 (55.3–61.7)	41.5 (38.3–44.8)	
Depression History			0.068
Yes	52.9 (46.8–58.9)	47.1 (41.1–53.2)	
No	58.8 (55.3–62.2)	41.2 (37.8–44.7)	
Anxiety/stress			<0.001
More stressed/anxious	42.4 (37.5–47.6)	57.6 (52.4–62.6)	
Less/same stress/anxiety	66.6 (63.7–69.5)	33.4 (30.5–36.4)	

increased significantly from before to during the COVID-19 pandemic among older women with breast cancer history and that was associated with worsening mental health [27]. Our study findings, combined with findings of other studies, suggest that many individuals with cancer history experience decreased social connectedness due to the COVID-19 pandemic, which led to increased stress and anxiety. Though the national response and ability to treat COVID continues to evolve and improve, our findings of a potential association between pandemic surges and social disconnectedness in older individuals with cancer history has relevance for future infectious pandemics, as well as future strains of COVID-19 if they begin to elude current treatment.

Decreased social connectedness to family members, friends, and others has significant implications for cancer survivors, as social connectedness may serve as a protective factor for social isolation and psychological distress [28,29]. Strong evidence is available that psychological distress among cancer survivors is associated with adverse outcomes, including lower quality of life, more physical symptoms, treatment nonadherence, and increased mortality [30–33]. Therefore,

**Table 3**  
Association between social connectedness and stress or anxiety among Medicare beneficiaries with cancer history.

Characteristics	Adjusted Odds ratio (95% CI)	p-value
Social connectedness		
More/same connected	1	
Less connected	2.53 (2.01–3.20)	<0.001
Age		
65–74	1	
≥75	0.87 (0.66–1.14)	0.310
Sex		
Male	1	
Female	1.85 (1.43–2.38)	<0.001
Race and Ethnicity		
Non-Hispanic White	1	
Non-Hispanic Black	0.75 (0.42–1.36)	0.353
Hispanic	1.87 (1.12–3.12)	0.016
Other	0.89 (0.46–1.71)	0.735
Income		
≥\$25,000	1	
<\$25,000	1.23 (0.88–1.72)	0.214
Medicare-Medicaid dual eligibility in 2020		
Nondual	1	
Fully dual eligible	0.67 (0.29–1.53)	0.336
Partial	0.86 (0.30–2.43)	0.769
QMB eligible only	0.83 (0.39–1.76)	0.629
Residing Area		
Metro	1	
Non-metro	0.89 (0.64–1.24)	0.501
US census regions		
West	1	
Northeast	1.20 (0.79–1.79)	0.390
Midwest	0.88 (0.50–1.52)	0.633
South	0.90 (0.62–1.28)	0.557
Living alone status		
No	1	
Yes	0.71 (0.46–1.08)	0.116
Internet access		
No	1	
Yes	1.26 (0.91–1.72)	0.150
Unable to get medical care due to COVID-19		
No	1	
Yes	1.66 (0.97–2.82)	0.062
Depression History		
No	1	
Yes	2.55 (1.86–3.48)	<0.001

timely detection and treatment of psychological distress can significantly improve the health outcomes of cancer survivors [34,35]. Being socially connected to family members, friends, and others is vital for preventing psychological distress [11–13]. In addition, previous studies reported that people with strong social connections have a nearly 50% decreased risk for premature mortality from all causes [36–38]. Thus, social connections are crucial in cancer survivors' lives and may buffer against stress and anxiety. Identifying cancer survivors who suffer a loss of connectedness and referring to psychosocial services are needed to help them to manage stress and anxiety due to the COVID-19 pandemic.

Our study findings also revealed that compared to men, women reported a higher percentage of decrease in social connectedness to family and friends during the second winter surge of the COVID-19 pandemic. Female sex was also a significant predictor for explaining stress or anxiety in the multivariable analysis. In fact, women were 85% more likely to report increased feelings of stress or anxiety compared to male beneficiaries. Our findings are consistent with the findings of the previous study investigating sex differences in social connectedness and anxiety and depression among the general population, with women reporting a higher percentage of anxiety, depression, stress, social isolation, and loneliness compared to men [39–41]. One explanation of such difference might be that women have different type of social connections, might value these connections differently, or are more

sensitive to social dissonance as compared to men. Future studies are needed to investigate sex-specific differences in social connectedness among cancer survivors.

The current study also found racial and ethnic differences in the feelings of increased stress or anxiety among beneficiaries with cancer history. Compared to non-Hispanic White participants, self-identified Hispanic participants had 87% greater odds of reporting increased feelings of stress or anxiety during the second winter surge of the COVID-19 pandemic. One possible explanation of such difference could be related to socioeconomic status. In our sample, Hispanic beneficiaries were more likely to report lower income compared to non-Hispanic White beneficiaries. Yet, we did not find racial and ethnic differences in the feelings of social connectedness. Other studies conducted among older adults found that Hispanic/Latinx individuals were more likely to feel lonely and experience decrease in their social connectedness compared to non-Hispanic White Individuals. They also found that older adults who live below the poverty line were more likely to feel lonely [42,43]. Although national, state, and local governments have given increased attention to health disparities recently, the progress in reducing and eliminating health disparities is not substantial. The enduring health disparities represent the biggest challenge facing the U. S. health care system, making their elimination a national priority. The findings of this study have a significant potential to contribute to current knowledge about racial and ethnic differences in psychological distress for individuals with cancer history. Tailored psychosocial interventions or care programs are needed to help and support cancer survivors from different racial and ethnic groups. In addition, future studies with a larger and more diverse sample are needed as most (81.0%) of the respondents in the current study were self-reported non-Hispanic White adults.

#### 4.1. Limitations

There are several limitations in the current study that need to be acknowledged, particularly in terms of the generalizability of the results. Our study sample included Medicare beneficiaries 65 years and older living in the community with history of cancer. Therefore, the study findings cannot be generalized to beneficiaries younger than 65 years of age with certain disabling conditions, those living in long-term facilities, and those without cancer history. It may also be difficult to generalize beyond Medicare beneficiaries. The cross-sectional nature of the data makes it difficult to investigate the change in social connectedness and stress or anxiety over time. Thus, longitudinal studies with longer follow-up timepoints are needed to investigate the changes in social connectedness and stress or anxiety among individuals with cancer history. All variables in the current study were self-reported; therefore, the results might be subject to response bias. Given that we relied on existing data for these analyses, we were limited to variables that had been collected and unable to account for other variables of interest in our analyses. There were some important variables missing from this dataset, such as time since cancer diagnosis, type of cancer, and whether participants were actively getting treatment. All these missing variables may be associated with the level of stress or anxiety. Social connectedness was measured with only one item, which may be a potential limitation. Future studies are needed to assess social connectedness using a well-developed, tested, and multi-item measure of social connectedness, such as the 20-item Social Connectedness Scale developed by Lee and colleagues (2001) [44].

#### 5. Conclusions

Increased feelings of stress or anxiety were prevalent among Medicare beneficiaries with cancer history during the winter of 2020–2021. Also, near half of the cancer survivors reported decreased social connectedness to family and friends at the end of the second year of COVID-19. These findings have implications for clinical practice and

future research as the pandemic continues. Identifying these survivors and referring them to appropriate supportive care resources and services are vital to help them cope with their negative feelings. Interventions or activities for reducing social isolation and promoting social connectedness among adult cancer survivors are needed to support this vulnerable population.

### Authors Contributions

H.P. and J.B.Y. designed the study and wrote the first draft of the study. H.P. performed the data analyses and S.J. reviewed and finalized it. All authors reviewed and revised the paper several times and approved the final version of the paper for submission.

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### Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000.

### Availability of Data

The data that support the findings of this study are openly available in Centers for Medicare & Medicaid Services at <https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/MCBS-Public-Use-File>

### Declaration of Competing Interest

James Yu received speaking and consulting fees from Boston Scientific and speaking fees from Myovant.

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