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Alleviating the burden: The impact of interpersonal and digital communication on depressive symptoms in cancer survivors

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ABSTRACT

Objective: Depression is common among cancer survivors, yet communication processes that may alleviate or exacerbate distress remain underexplored. Guided by the Ecological Model of Communication in Medical Encounters, this study examines how interpersonal and digital communication are associated with depressive symptoms among cancer survivors.

Methods: Data were drawn from the 2024 Health Information National Trends Survey (HINTS 7) and included 827 cancer survivors. Depressive symptoms was the outcome. Communication variables included talking about health concerns with friends and family, patient-centered communication (PCC) with healthcare providers, and online support group engagement. Two weighted binary logistic regression models were fitted to explore the objective.

Results: In the unadjusted model, higher levels of PCC and talking about health with friends and family were associated with lower odds of depressive symptoms, whereas frequent online support engagement was associated with higher odds. In the adjusted model, PCC remained protective (aOR = 0.47, 95% CI [0.30, 0.74], p = .003), while frequent online engagement remained associated with higher odds of depressive symptoms (aOR = 3.21, 95% CI [1.13, 9.11], p = .036). Fair or poor self-rated health was the strongest predictor (aOR = 7.86, 95% CI [3.18, 19.44], p < .001). Income below $20 K, younger age, and being 2–5 years post-diagnosis were also significant.

Conclusion: Clinical communication is an essential resource for cancer survivors' mental health. While communication-based social support may be beneficial in everyday contexts, the extent of online engagement among cancer survivors needs more guidance and attention for better mental health outcomes.

1. Introduction

Cancer is a major public health concern in the United States with a significant psychological toll [1]. Depression is the most reported comorbid condition among cancer survivors [2]. Approximately 20–25% of cancer patients experience clinically significant depressive symptoms; these rates are substantially higher than those in the general population [2]. This heightened risk is often driven by uncertainty surrounding diagnosis and prognosis, treatment side effects, and disruptions to daily life [3,4]. Depression among cancer patients has consistently predicted poorer quality of life, reduced treatment adherence, and adverse survival outcomes [5].

Most research on depression in cancer patients has focused on clinical factors such as cancer type, treatment side effects, physical symptom burden, and other treatment-related determinants [6]. Limited literature has examined how everyday communication processes within social and clinical environments shape survivors' psychological experiences beyond clinical care [7].

Communication is a key mechanism through which social support is sought, exchanged and experienced, and has been identified as a critical factor that alleviate the psychological burden of cancer [5]. This study focuses on three communication-based forms of social support: talking about health concerns with friends and family, patient-centered communication (PCC) with healthcare providers, and social media interactions with others facing similar conditions. The literature has documented how these factors improve coping and resilience [8],

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mental health outcomes [9], and reduce uncertainty for cancer patients [10].

However, few studies have examined how multiple communication-based forms of social support work together to influence depression in cancer survivorship. For example, past research has linked PCC to mental health outcomes [11], engagement in online support communities to well-being [12] and health-related interpersonal communication and PCC to emotional well-being [13]. These studies have not examined these three communication processes jointly within a single framework, limiting understanding of how they may simultaneously influence depressive symptoms among cancer survivors.

Guided by the Ecological Model of Communication in Medical Encounters [14,15], this study integrates interpersonal and digital communication contexts to advance understanding of communication as a multifaceted determinant of depression in cancer survivors [16,17]. This study contributes to the literature by highlighting the importance of examining interpersonal and digital communication environment simultaneously, as interventions can target these areas to alleviate the psychological burden of cancer survivors.

1.1. Theoretical framework

The study uses the Ecological Model of Communication in Medical Encounters (Ecological Model) as the theoretical foundation. The Ecological Model, developed by Street [15] and expanded by Head & Bute [14], identifies five different communication levels that shape health communication experiences and outcomes: interpersonal (e.g., clinical interactions, talking with family/ friends), organizational (e.g., workflow), media (e.g., internet), cultural (e.g., race/ socio-economic status), and political-legal (e.g., malpractice litigation). These levels work together to shape how patients communicate, access support, and interpret their health experiences.

Accordingly, this study conceptualizes depressive symptoms among cancer survivors as shaped by communication processes at different levels. Integrating these two levels; interpersonal and digital communication, the study provides a holistic view of how both processes can help alleviate depressive symptoms and enhance the overall well-being of cancer survivors [18].

The interpersonal context emphasizes how communication between patients, healthcare providers, and close networks such as friends and family fosters trust, emotional reassurance, and shared understanding [19,20]. Through PCC, providers validate patients' experiences and reduce uncertainty, while discussions with family and friends offer emotional support that helps patients cope with the psychological burden of cancer [14].

The media context highlights how patients use digital platforms to seek health information, join online communities, and share their experiences [21]. These interactions can provide informational support, reassurance, and a sense of belonging as patients connect with others who understand their challenges [14,15]. However, these benefits may coexist with exposure to distressing content, misinformation, and social comparison, which can undermine psychological well-being [22] of cancer survivors.

1.2. Talk health with friends and family: Impact on depressive symptoms

Within the ecological model, interpersonal communication includes the everyday interactions with loved ones about their health concerns and illness experiences [14]. This provides informal support to the patients by offering emotional resonance, shared concern, and care to help them cope with the emotional burden of cancer, ultimately reducing feelings of isolation and depression [23]. Prior research shows that social support significantly enhances emotional well-being and even survival outcomes in cancer patients [24]. Similarly, perceived social support is strongly linked to reduced depression and improved quality of life [25]. These findings suggest that higher levels of informal support are expected to be associated with lower depressive symptoms among cancer survivors.

H1. Frequent conversations about health concerns with family and friends are associated with lower odds of depressive symptoms among cancer survivors.

1.3. Patient-centered communication: Impact on depressive symptoms

PCC is a form of interpersonal communication in which healthcare providers consider the patients' perspective during consultations, exchange information and provide emotional support. PCC emphasizes on empathy, active listening and collaborative decision making to improve psychological outcomes [14]. Within the Ecological Model, PCC contributes to reducing depressive symptoms by shaping how patients interpret, process and cope with health information, thereby helping them address their concerns effectively. For example, Zamanian et al. [26], highlight that patients who engage more frequently with mental health professionals report lower levels of depression due to reassurance, symptom management, and validation of concerns. The consistent availability of professional support can function as a protective factor against emotional distress by reducing feelings of helplessness and isolation [27]. Similarly, Elkefi et al. [28], explored the relationship between PCC and trust in doctors during their early cancer diagnosis and found that PCC enhances satisfaction and trust among newly diagnosed cancer patients which makes them very comfortable and improves their psychological well-being. Based on this evidence, it is anticipated that higher levels PCC will be associated with lower depressive symptoms.

H2. Stronger PCC is associated with lower odds of depressive symptoms among cancer survivors.

1.4. Online support engagement: Impact on depressive symptoms

Patients actively seek information about their health on online platforms to understand their diagnosis, treatment options, recommendations, and prognosis [14]. By joining communities and sharing their experiences, patients learn how others manage their cancer care, emphasizing that interaction and engagement online can reduce uncertainty and empower patients; however, research indicates that not all information-seeking is beneficial [29]. While online communities often provide reassurance, coping mechanisms, and a sense of belonging [9,10], information overload and exposure to conflicting or stigmatizing content may heighten distress [30,31].

While online support interaction may offer informational and emotional support, frequent or unmoderated engagement may increase distress among survivors.

H3. Frequent health-related online support engagement is associated with higher odds of depressive symptoms among cancer survivors.

2. Method

2.1. Sample

Data were drawn from the Health Information National Trends Survey (HINTS) 7, conducted by the National Cancer Institute [32]. This survey was designed to assess U.S. adults' health-related knowledge, attitudes, behaviors, and outcomes. HINTS 7 was administered from March to September 2024 using a stratified two-stage random sampling design and included 7278 respondents. Since this study focused on cancer patients who had engaged with medical professionals, we included respondents who answered "Yes" to the question "Have you ever been diagnosed as having cancer?" and excluded those who answered "None" or had missing responses to the question "In the past 12 months, not counting times you went to an emergency room, how many times did you see a doctor, nurse, or other health professional to get care for yourself?" This criterion ensured that PCC reflected recent clinical interactions. Respondents with missing data on any study

variable were excluded using listwise deletion. One respondent with unknown gender was also excluded because the small cell size did not permit stable estimation. The sample selection process is presented in Fig. 1. The final analytic sample consisted of 827 respondents.

2.2. Measurement

2.2.1. Dependent variable

The primary outcome was depressive symptoms. It was measured using PHQ−2, a widely used tool for detecting major depressive disorder in primary care settings [33,34]. Participants were asked how often in the past two weeks they had been bothered by [1] little interest or pleasure in doing things and [2] feeling down, depressed, or hopeless. Each question was originally coded: 1 = Nearly every day, 2 = More than half the days, 3 = Several days, and 4 = Not at all. These were reverse-coded and rescaled (0 = Not at all to 3 = Nearly every day) to align with standard PHQ−2 scoring guidelines. The two items were then summed to produce a composite score from 0 to 6. Respondents with PHQ−2 score of 3 or higher were classified as screening positive for depression, while those scoring below 3 were classified as not screening positive.

2.2.2. Independent variables

PCC was measured by seven items that represent the core functions of patient-centered interactions [35]. Respondents indicated how often health professionals: (a) "give you chance to ask all the health-related questions you had," (b) "give the attention you needed to your feelings and emotions," (c) "involve you in decisions about your health care as much as you wanted,"(d) "make sure you understood the things you needed to do to take care of your health,"(e) "explain things in a way you could understand," (f) "spend enough time with you," and (g) "help you deal with feelings of uncertainty about your health or health care" during the previous 12 months on a 4-point Likert scale ranging from 1 ("Always") to 4 ("Never"). Following scoring procedures used by prior HINTS studies by Liu & Yeo [36], Ahn et al. [37], and Wu [38], responses were reverse-coded so that higher scores indicated greater interactions. Scores were averaged for respondents with at least four valid responses. The resulting PCC score ranged from 1 to 4, with higher scores reflecting better interaction. The PCC scale demonstrated good internal consistency (Cronbach's alpha = 0.93).

Online support engagement was measured with one item adapted from prior research [39]. Respondents were asked to identify how frequently they "Interacted with people who have similar health or medical issues on social media or online forums." within the past 12 months. This item focuses on health-related interactions rather than general social networking, allowing individuals to share experiences, seek advice, and offer mutual support. It aligns with core functions of social media, such as social networking, information seeking, producing, and sharing [40,41]. Responses were originally coded on a 5-point scale (1 = almost every day, 5 = never) and were reversed so that higher values indicated more frequent interaction (5 = almost every day, 1 = never). Given the highly skewed distribution of this variable, with approximately 77% of respondents reporting never engaging, and small cell sizes across the higher-frequency categories (almost every day; at least once a week), responses were recoded into three categories to ensure stable estimation: Never, Infrequent (less than once a month or a few times a month), and Frequent (at least once a week or almost every day).

Talking about health concerns with friends and family was assessed using the item, "Do you have friends or family members that you talk to about your health?" Responses were originally coded as 1 = yes and 2 = no and were recoded so that higher values indicated having friends or family members with whom respondents discussed their health.

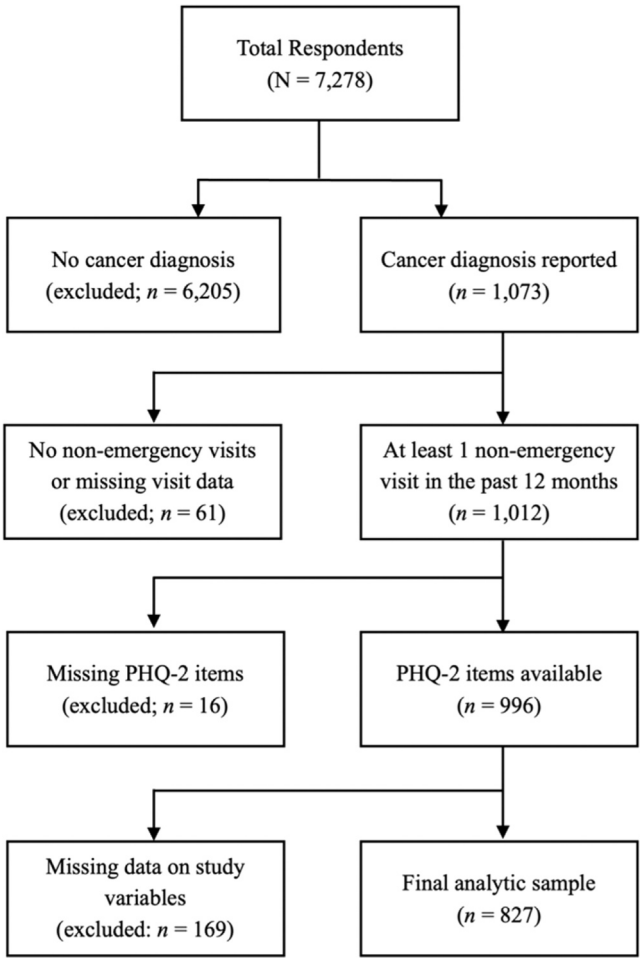

Fig. 1. Flow diagram of sample selection.

2.2.3. Control variables

Demographic variables were included as covariates in the adjusted model (Model 2). Age was treated as a continuous variable, gender was coded as (female, male). Education, originally coded on a scale from 1 (less than 8 years) to 7 (postgraduate), was recategorized into High School or Less, Post High School or Some College, and College Graduate or More. Annual household income, initially coded from 1 ($0–$9999) to 9 ($200 K or more), was recoded into four categories: less than $20 K, $20 K to less than $50 K, $50 K to less than $100 K, and $100 K or more. Race/ethnicity was coded as Hispanic, Non-Hispanic Black, Non-Hispanic White, and Other (Non-Hispanic American Indian or Alaska Native, Non-Hispanic Asian, Non-Hispanic Native Hawaiian or other Pacific Islander, and Non-Hispanic Multiple Races) [42]. In addition to these demographic covariates, Model 2 adjusted for two cancer-related clinical characteristics. General health status was assessed using a single item ("In general, would you say your health is…") with responses recategorized into three groups: Excellent/Very Good, Good, and Fair/Poor. Time since diagnosis was derived from the survey item assessing the year of first cancer diagnosis, with the original response categories: more than 10 years, 6–10 years, 2–5 years, and less than 1 year.

2.3. Statistical analysis

Data were analyzed using R (version 4.5.3). Descriptive statistics were used to summarize participants' characteristics. The dataset was weighted using HINTS survey weights to produce nationally representative estimates. All analyses were conducted with jackknife replicate weights to account for the complex survey design of HINTS 7. Two weighted binary logistic regression models were estimated. Model 1 included only the communication variables as predictors to directly test

Hypotheses 1–3. Model 2 additionally controlled for age, sex, race/ethnicity, income, education, general health status, and time since cancer diagnosis. Adjusted odds ratios (aOR) and 95% confidence intervals were reported. Statistical significance was set at $p < .05$. Multicollinearity in Model 2 was assessed using generalized variance inflation factors (GVIFs), with adjusted GVIF values [GVIF^(1/(2*DF))] examined to account for categorical predictors with multiple degrees of freedom (DF) [43,44]. Adjusted GVIF values below 2 were considered indicative of negligible multicollinearity. Sensitivity analysis was also conducted by restricting the sample to respondents who responded "No" to the question "Has a doctor or other health professional ever told you that you had depression or anxiety disorder?" and re-estimating Model 2 to assess the robustness of findings independent of pre-existing depression diagnosis.

3. Results

3.1. Descriptive statistics

The sample characteristics are summarized in Table 1. The weighted average age of respondents was 66.19 years (SD = 14.04). The sample was predominantly male (54.39%) and Non-Hispanic White (76.20%). Approximately 43.25% reported post-high school or some college education, and 37.20% reported annual household incomes of $100 K or more. The majority of respondents reported talking about their health with friends or family members (93.25%), while most reported never engaging in health-related online support groups (78.60%). Regarding general health status, 38.22% reported excellent or very good health, 39.17% reported good health, and 22.61% reported fair or poor health. Regarding time since cancer diagnosis, approximately half of respondents (45.48%) had been diagnosed more than 11 years prior, while 21.82% were diagnosed two to five years prior, 20.76% six to ten years prior, and 11.94% less than one year prior. The bivariate correlations are presented in Table 2.

3.2. Weighted regression

Two weighted logistic models were estimated (Table 3). In Model 1, all three communication variables were significant predictors of depressive symptoms. Talking about health with friends and family was associated with lower odds of depressive symptoms (aOR = 0.43, 95% CI [0.22, 0.84], p = .017), as was higher PCC (aOR = 0.43, 95% CI [0.29, 0.65], $p < .001$). Both frequent online support engagement (aOR = 3.66, 95% CI [1.63, 8.22], p = .003) and infrequent engagement (aOR =

Table 2
Bivariate correlation among communication variables and depressive symptoms.

	1	2	3	4
1. Depressive Symptoms	–			
2. PCC	−0.18***	–		
3. Online Support Engagement	0.16***	−0.12***	–	
4. Talk about health concerns with friends/ family	−0.12***	0.06	0.05	–

Note. Correlations are unweighted. $p < 0.001$***. PCC = Patient-Centered Communication

Table 1
Descriptive characteristics of the study sample vs. weighted national estimates.

	Study Sample (Unweighted) (N = 827)				National Estimates (Weighted) (N = 18,622,143)			
	M	**SD**	**Freq**	**%**	**M**	**SD**	**Freq**	**%**
Age	67.94	12.96			66.19	14.04		
PCC	3.39	0.62			3.41	0.62		
Sex								
Female			455	55.02			8,493,161	45.61
Male			372	44.98			10,128,982	54.39
Online Support Engagement								
Never			635	76.78			14,637,518	78.60
Infrequent			149	18.02			2,884,777	15.49
Frequent			43	5.20			1,099,847	5.91
Income								
Less than $20 K			110	13.30			1,747, 265	9.38
$20 K to Less than $50 K			226	27.33			5,526,195	29.68
$50 K to Less than $100 K			231	27.93			4,420,984	23.74
$100 K or More			260	31.44			6,927,699	37.20
Education								
High School or Less			154	18.62			3,921,571	21.06
Post High School or Some College			258	31.20			8,054,384	43.25
College Graduate or More			415	50.18			6,646,188	35.69
Talk about Health Concerns with Friends/Family								
No			78	9.43			1,257, 738	6.75
Yes			749	90.57			17,364,405	93.25
Race/Ethnicity								
Hispanic			78	9.43			1,291,253	6.93
Non-Hispanic Black			93	11.25			1,733,344	9.31
Non-Hispanic White			606	73.28			14,190,756	76.20
Other			50	6.05			1,406,790	7.55
General Health Status								
Fair/Poor			206	24.91			4,210,813	22.61
Good			325	39.30			7,294,146	39.17
Excellent/Very Good			296	35.79			7,117,185	38.22
Time Since Diagnosis								
Less than 1 Year			91	11.00			2,223,034	11.94
2–5 Years			182	22.01			4,063,257	21.82
6–10 Years			142	17.17			3,865,793	20.76
11 or More Years			412	49.82			8,470,059	45.48

Note. Unweighted frequencies and weighted percentages are reported for categorical variables. Weighted means and standard deviations (SDs) are reported for continuous variables. All weighted estimates are based on HINTS 7 survey weights. PCC = Patient-Centered Communication.

Table 3
Weighted logistic regression predicting depressive symptoms among cancer patients.

	Model 1 (Unadjusted)			Model 2 (Adjusted)		
Predictor	**β**	**aOR [95% CI]**	**P**	**β**	**aOR [95% CI]**	**P**
Interpersonal Communication						
Talk Health with Friends/Family	−0.85	0.43 [0.22, 0.84]	.017	−0.53	0.59 [0.24, 1.45]	.257
PCC	−0.84	0.43 [0.29, 0.65]	< .001	−0.76	0.47 [0.30, 0.74]	.003
Digital Communication						
Online Support Groups (ref = Never)						
Infrequent	0.79	2.21 [1.17, 4.17]	.019	0.50	1.64 [0.68, 3.95]	.275
Frequent	1.30	3.66 [1.63, 8.22]	.003	1.17	3.21 [1.13, 9.11]	.036
Covariates						
Age				−0.03	0.97 [0.95, 0.99]	.017
Female (ref = Male)				0.15	1.16 [0.67, 2.01]	.607
Race/Ethnicity (ref = Non-Hispanic White)						
Non-Hispanic Black				−1.30	0.27 [0.10, 0.72]	.013
Hispanic				0.58	1.79 [0.68, 4.68]	.248
Other				−0.08	0.92 [0.33, 2.57]	.881
Income (ref = More than $100k)						
Less than $20 K				1.17	3.21 [1.13, 9.12]	.037
$20 K to Less than $50 K				0.79	2.20 [0.84, 5.74]	.117
$50 K to Less than $100 K				−0.62	0.54 [0.20, 1.45]	.231
Education (ref = College Graduate)						
High School or Less				0.19	1.21 [0.49, 3.00]	.683
Post High School/Some College				−0.15	0.86 [0.47, 1.58]	.628
General Health (ref = Excellent/Very Good)						
Good				1.18	3.26 [1.48, 7.18]	.006
Fair/Poor				2.06	7.86 [3.18, 19.44]	< .001
Time Since Diagnosis (ref = 11 or More Years)						
Less than 1 Year				0.36	1.43 [0.49, 4.19]	.522
2–5 Years				0.85	2.35 [1.33, 4.16]	.006
6–10 Years				0.66	1.93 [0.84, 4.46]	.131
Constant	1.47			0.73		
Nagelkerke R^2	0.13			0.34		
p-value	< .001			< .001		

Note. All variables were entered simultaneously in the weighted logistic regression model.

2.21, 95% CI [1.17, 4.17], p = .019) were associated with higher odds of depressive symptoms compared to never engaging.

In Model 2, PCC remained a significant protective factor (aOR = 0.47, 95% CI [0.30, 0.74], p = .003). Frequent online support engagement also retained its significant association with higher odds of depressive symptoms (aOR = 3.21, 95% CI [1.13, 9.11], p = .036), while infrequent engagement was no longer significant (aOR = 1.64, 95% CI [0.68, 3.95], p = .275). Talking about health with friends and family attenuated to non-significance in the adjusted model (aOR = 0.59, 95% CI [0.24, 1.45], p = .257). General health status was the strongest predictor: cancer survivors with fair or poor health had nearly eight times higher odds of screening positive for depressive symptoms compared to those with excellent or very good health (aOR = 7.86, 95% CI [3.18, 19.44], p < .001), and those with good health had over three times higher odds (aOR = 3.26, 95% CI [1.48, 7.18], p = .006). Cancer survivors diagnosed two to five years prior had significantly higher odds compared to those diagnosed more than ten years ago (aOR = 2.35, 95% CI [1.33, 4.16], p = .006). Older age was associated with lower odds of depressive symptoms (aOR = 0.97, 95% CI [0.95, 0.99], p = .017). Income below $20,000 was associated with higher odds relative to income of $100,000 or more. Non-Hispanic Black participants had significantly lower odds of depressive symptoms compared to Non-Hispanic White participants. Sex, education, Hispanic ethnicity, other income categories, and other time-since-diagnosis categories were not statistically significant. Adjusted GVIF values for model 2 ranged from 1.22 to 1.83, confirming no issue of multicollinearity among predictors (see Supplementary Table S1).

Sensitivity analysis yielded broadly consistent findings (see Supplementary Table S2). PCC remained a protective factor (aOR = 0.36, 95% CI [0.16, 0.81], p = .019). Frequent online engagement was no longer statistically significant in this restricted subsample (aOR = 2.24, 95% CI [0.32, 15.79], p = .423), though the direction of association remained consistent with model 2. Similarly, talking about health with friends and family was not significant (aOR = 0.85, 95% CI [0.18, 3.93], p = .835), but the direction of the association remained protective, consistent with model 2.

4. Discussion

This study examined how interpersonal and digital communication-based forms of social support influence depressive symptoms among cancer survivors. Guided by Ecological Model [14,15], we found that all three communication variables were significant predictors of depressive symptoms in model 1. After adjusting for clinical and sociodemographic covariates, PCC and frequent online support engagement remained significant, while talking about health with friends and family attenuated to non-significance. General health status emerged as the dominant predictor; income and ethnicity also played a role.

4.1. The ecology of social support

Based on the Ecological Model, this study showed how the intersection of interpersonal and digital channels can simultaneously protect and endanger mental well-being. Understanding how survivors navigate these communication environments is essential for designing interventions that promote psychological resilience and health equity among cancer survivors [45,46].

4.2. Effects of communication-based social support

The negative associations between interpersonal communication and depressive symptoms emphasize the importance of supportive social environments. Survivors who discussed their health with family and friends reported lower odds of depressive symptoms. Talking through diagnosis, treatments, fears, and life disruption with loved ones may facilitate emotional coping [47]. This aligns with research showing that

close relational support enhances resilience, reinforces belonging, and reduces distress [24,25]. Affirming that conversations with trusted others can serve as a form of emotional regulation that mitigates uncertainty and loneliness throughout survivorship [48].

PCC emerged as the most consistent protective factor across all models, including the sensitivity analysis. Survivors reporting more attentive, empathetic, and participatory healthcare interactions were less likely to screen positive for depression [49]. When clinicians actively listen, validate emotional responses, address uncertainty, and engage survivors in decision-making, they enhance survivors' sense of control and understanding, which may help to alleviate depressive symptoms [41,50,51]. This protective role may be particularly important for underserved survivor populations, including individuals with lower socioeconomic status, racial and ethnic minority groups, and those receiving care in resource-limited settings. These groups often face barriers to accessing formal mental health screening and treatment services [52,53]. In this context, high-quality provider interactions, characterized by attentiveness, cultural sensitivity, and a preventive orientation, may serve as one of the few readily available avenues for recognizing and addressing emotional distress.

In contrast, online support engagement showed a frequency-dependent association with depressive symptoms, consistent with H3. Compared with never engaging, both infrequent engagement and frequent engagement were associated with higher odds of depressive symptoms in the unadjusted model, with frequent engagement showing the strongest association [54]. Importantly, frequent engagement retained its significant association in the adjusted model, while infrequent engagement attenuated to non-significance, indicating that how frequently one engages matters. In the sensitivity analysis, frequent online engagement was no longer significant, likely reflecting reduced statistical power in the restricted subsample, though the direction of association remained consistent with the adjusted model. Although digital spaces can offer informational support and peer connection [55], they may also expose survivors to misinformation, social comparison, and emotionally distressing content. Within the Ecological Model, the media context represents an environment where cancer survivors continuously interpret and negotiate health information online, and exposure to conflicting narratives, emotionally overwhelming content, and negative [31,54,55] social comparisons may compound existing psychological distress among vulnerable survivors. As a result, promoting media literacy, supportive moderation, and emotional self-regulation in digital health communication is critical to reducing potential harm [56]. Nevertheless, it is equally plausible that the association reflects reverse causality: frequent online engagement could be a coping strategy as a result of psychological distress in survivorship [29,56–58]. The present study support this interpretation. First, general health status was the dominant predictor in the adjusted model, suggesting that poorer health underlies much of the distress observed in this sample. Second, the attenuation of most associations in the sensitivity analysis suggests that the observed relationships in the full sample may be driven, at least in part, by survivors with pre-existing psychological vulnerability. This could indicate that communication processes may operate differently depending on baseline mental health status and is consistent with the possibility that online engagement functions as a coping strategy among survivors already experiencing distress rather than serving as an independent contributor to depressive symptoms. Whether online engagement precedes or follows depressive symptoms, however, cannot be determined from cross-sectional data, and longitudinal research is needed to establish the direction of this relationship.

These findings support the ecological perspective that communication-based forms of social support across interpersonal and digital levels jointly shape depressive symptoms in survivorship [59]. PCC was consistently associated with lower odds of depressive symptoms, while frequent online engagement was associated with higher odds. General health status and time since diagnosis further contextualize these associations, highlighting that the psychological burden of cancer survivorship is shaped by both communication environments and clinical realities [60]. This reveals that the same communication channels that provide support and connection can also produce strain depending on their frequency and quality.

4.3. Practical implications

These results point to the need for interventions that strengthen both interpersonal and digital communication supports. Encouraging survivors to maintain open, supportive dialog with loved ones can promote emotional recovery, while equipping clinicians with PCC skills can enhance empathy and shared decision-making in cancer care [61]. Digital health campaigns and online support programs should be designed to promote credible information exchange, discourage misinformation, and integrate mental health literacy to help survivors navigate emotional challenges online.

5. Limitations and directions

This study has limitations. First, the cross-sectional design precludes causal inference, and the directionality between communication variables and depressive symptoms may not be determined. Depressive symptoms may influence how individuals communicate and seek information; longitudinal designs are needed to clarify the temporal ordering.

Second, all variables were self-reported and may therefore be subject to recall and social desirability bias, potentially affecting the observed associations. Additionally, online engagement was measured using a single item, which does not capture dimensions like platform type or interaction quality that may be related to psychological outcomes. Future work should use detailed measures of digital communication.

Third, residual confounding may remain because factors like cancer stage and treatment status were unavailable in the dataset. Future studies incorporating clinical data could better assess these relationships. Also, the HINTS survey captures only binary gender categories.

Finally, the analytic sample was restricted to survivors who reported at least one healthcare visit within the previous 12 months. This may limit the generalizability of the findings to survivors who experience barriers to healthcare access or who engage less frequently with healthcare services. Future research should examine whether the observed associations differ among survivors with varying levels of healthcare utilization.

6. Conclusion

This study examined interpersonal and digital communication-based social support and depressive symptoms among cancer survivors within an ecological framework. PCC was associated with lower odds of depressive symptoms, whereas frequent engagement in online support groups was associated with higher odds. These findings highlight the importance of communication environments in shaping psychological well-being during survivorship and suggest that efforts to strengthen supportive healthcare interactions while promoting healthy engagement with digital support resources may benefit cancer survivors.

CRediT authorship contribution statement

Ama Gyesiwaa Quansah: Writing – review & editing, Writing – original draft, Validation, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Qiwei Luna Wu:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Conceptualization.

Declaration of Competing Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.pec.2026.109753.

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