



# Self-perceived burden mediates the relationship between self-stigma and quality of life among Chinese American breast cancer survivors

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## Abstract

**Purpose** Cancer-related self-stigma (the internalized sense of shame about having cancer) has been found to associate with poorer quality of life (QoL) among cancer survivors. However, culturally salient illness beliefs (e.g., cancer is contagious; cancer is a result of karma; and cancer brings shame to the family) may make Chinese cancer survivors vulnerable to self-stigmatization. This study examined the association between self-stigma and QoL among Chinese American breast cancer survivors (BCS). To understand the potential mechanism, the mediating role of self-perceived burden to caregivers between self-stigma and QoL was also examined.

**Methods** Chinese American BCS ( $n = 136$ ) were recruited through community-based cancer associations. Participants' self-stigma, self-perceived burden, and QoL were measured in a questionnaire package.

**Results** Structural equation modeling results supported the proposed mediation model in predicting physical QoL ( $\chi^2(100) = 123.041$ , CFI = 0.982, TLI = 0.975, RMSEA = 0.041) and emotional QoL ( $\chi^2(84) = 137.277$ , CFI = 0.958, TLI = 0.940, RMSEA = 0.069), with satisfactory model fit indices. Both the indirect effects from self-stigma to QoL via self-perceived burden (physical:  $\beta = -0.13$ ; 95% CI =  $-0.22, -0.07$  and emotional:  $\beta = -0.11$ ; 95% CI =  $-0.22, -0.04$ ) and the direct effects from self-stigma to poorer QoL were significant (physical:  $\beta = -0.22$ ; 95% CI =  $-0.34, -0.10$  and emotional:  $\beta = -0.39$ ; 95% CI =  $-0.54, -0.23$ ), suggesting a partial mediation effect of self-perceived burden between self-stigma and QoL.

**Conclusions** Self-stigma could reduce physical and emotional QoL through increasing self-perceived burden. Interventions aiming to reduce Chinese American BCS' self-stigma and perceptions of burdensomeness may facilitate improvement in QoL, which in turn promotes better cancer survivorship.

**Keywords** Cancer · Oncology · Quality of life · Burden · Self-stigma · Chinese

## Introduction

Breast cancer is the most common cancer among Asian American women [1]. A growing population of those breast

cancer survivors makes it increasingly important to take care of the survivors' quality of life (QoL). This study aimed to examine the association between self-stigma and QoL among Chinese American breast cancer survivors (BCS), as well as investigating whether self-perceived burden mediates that association.

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## Cancer-related stigma and its cultural relevance among Chinese

Self-stigma refers to the phenomenon that members of a devalued group are aware of the negative stereotypes and prejudice against them, making them endorse and internalize such feelings, beliefs, and behaviors towards themselves [2]. Previous studies primarily focus on stigma towards sexual minorities, people having mental disorder, and those with HIV/AIDS; fewer studies target at cancer survivors [3]. The

impact of cancer-related self-stigma on the patients' well-being still needs to be better understood.

According to the attributional model [4], controllability and responsibility for the health condition are important predictors of stigmatization. People make attributions about the cause and controllability of other people's or their own illness that lead to inferences about responsibilities. These inferences lead to emotional reactions (e.g., anger and pity) and subsequent coping behaviors. In Chinese society, there is a personal responsibility attached to cancer. A qualitative study found that Chinese American BCS were likely to attribute cancer diagnosis to unhealthy lifestyles (e.g., diet, sleep, and stressful work) [5], implying that those BCS may feel accountable for their illness. When individuals believe they have the responsibility for their own disease, they are more likely to experience self-stigma and negative emotional reactions [6].

Culturally salient illness beliefs may also make Chinese cancer survivors vulnerable to self-stigmatization. Some Chinese people believe that cancer is resulted from immoral behaviors by the individuals/ancestor (karma) or bad luck [7]. Cancer-related myths (e.g., "cancer is contagious") are not only common among the general public but also among cancer survivors themselves [7–9]. Cancer may also expose the entire family to the risk of social ostracism [7, 10, 11]. That potentially explains why Chinese women may not be willing to share their diagnosis with other people and seek out for support because they feel ashamed. Research suggests that stigmatized individuals internalize the negative evaluations held by other people about their health status [12], implying that others' beliefs about the disease could increase self-stigma among the patients. With these myths and negative stereotypes, we expect that Chinese American BCS are vulnerable to self-stigmatization.

A meta-analysis has suggested the negative impact of self-stigma on mental health of the stigmatized individuals, including lowered self-esteem, life satisfaction, and overall well-being [3]. Similarly, the way that cancer survivors see themselves in relation to the world has consequences for their well-being [13]. It has also been found that self-stigma is associated with poorer mental health among lung cancer survivors [14]. It is also important to extend our understanding to the linkage between self-stigma and physical well-being, as most of the current studies focused on the relationship between self-stigma and mental health.

### Self-perceived burden in the Chinese context and its relationship with patients' well-being

Given the potential negative impact of self-stigma on QoL, the mechanism that links these two variables is worth exploring. We proposed self-perceived burden as a potential mediator between self-stigma and QoL. Self-perceived burden is defined as care recipients' empathic concern regarding the

impact on others due to their illness and care needs, plus the resulting feelings of guilt, distress, and responsibility [15]. A review reported that self-perceived burden was a significant problem among 19–65% of terminally ill patients [16]. Chinese cancer survivors tend to feel burdensome to their family for some reasons. First, Chinese people tend to focus on interdependent view of self and see personal needs secondary to relational goals. Having breast cancer may be regarded as a disgrace to the family and disrupting interpersonal harmony [17]. Second, some culturally salient gender role norms like "women should prioritize family over self" are also commonly endorsed by Chinese [8]. Such norms suggest that Chinese women should be self-sacrificing, nurturing their family, and serving as caregivers but not as dependents [8]. A qualitative study found that Chinese American BCS felt sorry for not being able to fulfill multiple social roles (e.g., mother, spouse, and daughter) [5]. In traditional patient-caregiver relationships, the reassignment of family roles and responsibilities may make the patient feel as if they benefit too much or they invest too little in the relationship [18]. Patients' perceptions of over-benefiting or under-investing may result in feelings of burdensomeness towards the caregivers [18]. Hence, self-perceived burden may be particularly relevant to Chinese women with breast cancer.

Studies have examined the link between self-perceived burden and well-being (both physical and psychological aspects) among cancer survivors in the USA [19, 20] and in Canada [21]. In an Asian context, Oeki et al. also found that self-perceived burden was associated with poorer physical functions and mental health among Japanese cancer patients [22]. To the best of our knowledge, the literature lacks empirical studies examining the association between self-perceived burden and Chinese American BCS' well-being. We expect that self-perceived burden would mediate the relationship between self-stigma and physical and emotional QoL.

### Study hypotheses

Based on existing studies [14, 19, 22], we hypothesized that self-stigma would be associated with poorer physical and emotional QoL. Self-perceived burden was hypothesized to mediate between self-stigma and QoL, such that self-stigma would be associated with higher self-perceived burden, which would then be associated with poorer physical and emotional QoL.

## Methods

### Participants

This research examined the hypotheses based on the baseline data from a larger intervention study for Chinese American BCS ( $n = 136$ ) [23]. Inclusion criteria included (1) having a

breast cancer diagnosis, (2) having completed breast cancer surgery within 5 years, and (3) being comfortable writing and speaking Chinese (i.e., Mandarin/Cantonese). Prospective BCS were introduced that the objective of the study was to understand their adjustments to cancer. They were recruited through community cancer organizations in Los Angeles, New York, and Houston by advertisements on the organization website and newsletters. Similar recruitment channels were used in studies exploring cancer-related beliefs among Chinese American BCS [10, 24, 25]. This study protocol was approved by the Institutional Review Board at the University of Houston.

The participants reported a mean age of 57.8 years (SD = 9.21) and having been living in the USA for 18.5 years (SD = 10.4). Most of the participants were married (64.7%). Regarding cancer characteristics, 52.2% were diagnosed within 2 years at the time of study enrollment; 65.4% had stage I or stage II breast cancer at diagnosis. A vast majority of the participants (93.4%) had a surgery due to breast cancer (Table 1).

## Measures

**Self-stigma** Four items from the Chinese version of the Self-Stigma Scale-Short Form [26] was used to measure participants' self-stigma as a BCS. As its original version was validated to measure self-stigma among concealable minorities in Hong Kong, we replaced these minorities' descriptions with "breast cancer survivor" for this study. Based on our findings in a qualitative study examining the psychosocial challenges of Chinese American BCS [5], five items were chosen from its original 9-item scale to fit the context and experience among Chinese BCS. Among the selected items, one item "my identity as a breast cancer survivor is a burden to me" was removed due to high conceptual overlapping with the proposed mediator of the study (i.e., self-perceived burden). The remaining four items still capture the cognitive, affective, and behavioral aspects of self-stigma [26], providing a comprehensive assessment of the concept (see Fig. 1 for the items). Participants were asked to rate the extent they agree on the statements on a 4-point Likert scale (1 as *totally disagree*, 4 as *totally agree*) and the ratings were averaged. A higher mean score indicated higher self-stigma.

**Self-perceived burden** Four items from the Self-Perceived Burden Scale [19] were used. The scale measured the frequency of which cancer survivors perceived they caused burden to their caregivers since cancer diagnosis. It was translated from English to Chinese and back-translated by two bilingual psychology researchers. The forward-translated and back-translated versions were compared and discussed. Modifications were made to produce the finalized versions which reflected the intended meanings of the original English items. Based on our findings in a qualitative study examining the psychosocial challenges of Chinese American

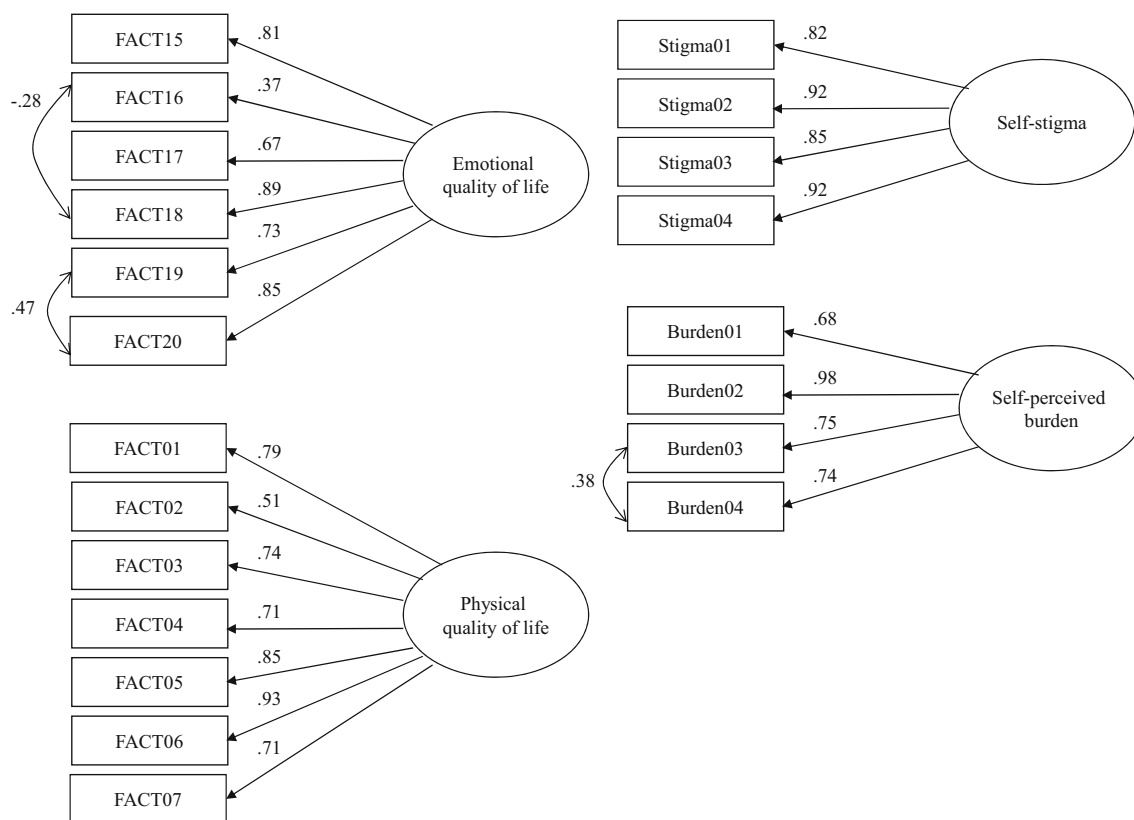
**Table 1** Sample characteristics ( $n = 136$ )

	Frequency (%) / mean (SD)
<b>Demographic variables</b>	
Age	57.8 years (9.21)
Years in the USA	18.5 years (10.40)
<b>Marital status</b>	
Married	88 (64.7%)
Single/separated/divorced/widowed	46 (33.8%)
Missing	2 (1.5%)
<b>Highest education level</b>	
Below high school	23 (16.9%)
High school	29 (21.3%)
Some college	36 (26.5%)
College or above	47 (34.6%)
Missing	1 (0.7%)
<b>Annual household income (in USD)</b>	
< \$15,000	46 (33.8%)
\$15,000–\$45,000	43 (31.6%)
\$45,000–\$75,000	13 (9.6%)
> \$75,000	22 (16.2%)
Missing	12 (8.8%)
<b>Cancer- and treatment-related variables</b>	
Time since diagnosis	26.4 months (19.2)
Less than 1 year	31 (22.8%)
Between 1 and 2 years	40 (29.4%)
Between 2 and 5 years	59 (43.4%)
Missing	6 (4.4%)
<b>Stage of diagnosis</b>	
Stage 0	15 (11.0%)
Stage I	43 (31.6%)
Stage II	46 (33.8%)
Stage III	23 (16.9%)
Stage IV	4 (2.9%)
Missing	5 (3.7%)
<b>Treatments undergone<sup>a</sup></b>	
Surgery	127 (93.4%)
Chemotherapy	81 (59.6%)
Radiation	84 (61.8%)

<sup>a</sup> Participants might select more than one type of treatments if applicable, so the total percentage did not add up to 100%

BCS [5], four items were chosen from original Self-Perceived Burden Scale (see Fig. 1). Participants were asked to rate on a 4-point Likert scale (1 as *none of the time*, 4 as *most of the time*) and the ratings were averaged.

**Physical QoL and emotional QoL** The physical well-being (7 items) and emotional well-being (6 items) subscales from the Chinese version of the Functional Assessment of Cancer Therapy – Breast (FACT-B) were used [27]. On a 5-point



**Fig. 1** Latent variable measurement models for self-stigma, self-perceived burden, physical quality of life, and emotional quality of life. All factor loadings are significant at  $p < 0.001$ . Items selected from the Self-Stigma Scale were “I fear that others would know that I am a breast cancer survivor,” “I estrange myself from others because I am a breast cancer survivor,” “The identity of being a breast cancer taints my life,”

and “I avoid interacting with others because I am a breast cancer survivor.” Items selected from the Self-Perceived Burden Scale were “I am concerned that I am too much trouble to my caregiver,” “I worry that my caregiver is overextending himself/herself in helping me,” “I feel guilty about the demands that I make on my caregiver,” and “I feel that I am a burden to my caregiver”

Likert scale (0 as *not at all*, 4 as *extremely*), participants were asked to rate their QoL in the past week. A higher sum score from the items indicated better QoL. Sample items included “I have a lack of energy” (physical, reverse-coded) and “I am losing hope in the fight against my illness” (emotional, reverse-coded). The scale was reliable and valid among Chinese American BCS [27].

**Socio-demographic, cancer-related, and treatment-related variables** Socio-demographic variables (age, marital status, education, income, years in the USA), cancer- and treatment-related information (including cancer stage, time since diagnosis, and treatments undergone) were measured.

### Analytic plan

Descriptive statistics (e.g., means, standard deviations, and distribution statistics) and Pearson correlation coefficients were computed for major variables using SPSS 22.0. Missing values were analyzed using expectation maximization (EM) algorithm in SPSS. We found only 0.7–5.2% of missing data across all the variables of interest in this paper,

and the pattern of missing values was random ( $p > 0.05$  in missing value analysis). Those missing values were imputed using the EM algorithm. Structural equation modeling (SEM) was used to evaluate the fitness of the hypothesized model in explaining the associations among self-stigma, self-perceived burden, and QoL. Prior to conducting SEM, we estimated the goodness-of-fit of the measurement models by confirmatory factor analysis (CFA). The SEM and CFA were conducted using AMOS 22.0.

We used individual items as the indicators to construct the measurement models of the variables (self-stigma, self-perceived burden, physical well-being, and emotional well-being). Given that each latent variable was composed of indicators from the same measure, error covariances were allowed according to the suggested modification indices in CFA [28].

We evaluated the hypothesized mediation model through examining of the overall model fit and standardized path coefficients [28]. In the structural models, the latent variables of both physical QoL and emotional QoL were used as the dependent variables. Mediation was tested through analyzing the direct and indirect effects among the independent and dependent variables. Model goodness-of-fit was evaluated using

indices recommended by researchers [29, 30]. Favorable fit indices include a chi-square to degrees of freedom ( $\chi^2/df$ ) ratio  $< 2$ , a root mean square error of approximation (RMSEA)  $\leq 0.08$ , a comparative fit index (CFI), and a Tucker–Lewis index (TLI)  $> 0.95$ .

To ensure the stability of the path coefficient estimates, the analysis for mediation model was also supplemented with 2000 bootstrap replications. Significance of indirect effect was examined by the 95% bias-corrected confidence intervals (CI) after bootstrapping. Confidence intervals were computed through the 2000 estimates from the indirect effect bootstrap samples. The highest and lowest 2.5% of the indirect effect estimates determined the confidence intervals. An indirect effect was considered statistically significant if the 95% CI did not include zero.

## Results

### Descriptive statistics and correlations among major variables

The skewness and kurtosis statistics did not indicate problems of non-normality among the major variables (Table 2). As hypothesized, self-stigma was associated with higher self-perceived burden ( $r = 0.41$ ) and poorer physical ( $r = -0.31$ ) and emotional ( $r = -0.51$ ) QoL. Self-perceived burden was negatively associated with physical ( $r = -0.36$ ) and emotional ( $r = -0.44$ ) QoL (all  $ps < 0.001$ ) (Table 2). We also examined the association between background variables (demographics, cancer-related variables) and the major variables of interests (self-stigma, self-perceived burden, and QoL). We found that time since diagnosis was associated with self-stigma ( $r = -0.23$ ,  $p < 0.01$ ); other background variables did not correlate significantly with the major variables of interests.

### Latent variable measurement models

Four measurement models for latent variables were individually constructed and evaluated by CFA (see Fig. 1). The latent variables for self-stigma, self-perceived burden, physical QoL, and emotional QoL were respectively constructed by 4 items, 4 items, 7 items, and 6 items from the measurement

scales. For independent variables, the measurement model for self-stigma had a satisfactory fit ( $\chi^2(2) = 0.970$ ,  $p = 0.616$ , CFI = 1.000, TLI = 1.012, RMSEA = 0.000). With the inclusion of one error covariance, the measurement model for self-perceived burden had a satisfactory fit ( $\chi^2(1) = 0.475$ ,  $p = 0.491$ , CFI = 1.000, TLI = 1.018, RMSEA = 0.000). For dependent variables, the measurement model for physical QoL had a satisfactory fit ( $\chi^2(14) = 12.78$ ,  $p = 0.544$ , CFI = 1.000, TLI = 1.005, RMSEA = 0.000). With the inclusion of two error covariances, the measurement model for emotional QoL also reported a satisfactory fit ( $\chi^2(7) = 9.083$ ,  $p = 0.247$ , CFI = 0.995, TLI = 0.985, RMSEA = 0.047). The CFA results supported that those measurement models were appropriate for further testing the structural model.

### Testing the mediation model

Based on our preliminary analysis, the time since diagnosis was also included in the model as it was shown significantly associated with self-stigma. The SEM results supported fitness of the hypothesized model in predicting physical QoL ( $\chi^2(100) = 146.44$ ,  $\chi^2/df = 1.46$ , CFI = 0.967, TLI = 0.960, RMSEA = 0.059) and emotional QoL ( $\chi^2(84) = 137.277$ ,  $\chi^2/df = 1.63$ , CFI = 0.958, TLI = 0.940, RMSEA = 0.069), with satisfactory model fit indices. The standardized path coefficients were significant between self-stigma and self-perceived burden ( $\beta = 0.43$ ,  $p < 0.001$ ) and between self-perceived burden and QoL (physical:  $\beta = -0.29$ ; emotional:  $\beta = -0.27$ ,  $ps < 0.001$ ). At the same time, the direct effect from self-stigma and QoL was also significant (physical:  $\beta = -0.23$ ; emotional:  $\beta = -0.39$ ,  $ps < 0.001$ ). The mediation model explained 19.3% and 31.2% of variances in physical QoL and emotional QoL. The results suggested that Chinese American BCS with higher self-stigma tended to report more self-perceived burden and poorer QoL. Those having higher levels of self-perceived burden were more likely to report poorer QoL. Results from bootstrapping supported the presence of a significant mediation effect. Both the indirect effects from self-stigma to poorer QoL via self-perceived burden (physical:  $\beta = -0.13$ ; 95% CI =  $-0.22$ ,  $-0.07$  and emotional:  $\beta = -0.11$ ; 95% CI =  $-0.22$ ,  $-0.04$ ) and the direct effects from self-stigma to poorer QoL were significant (physical:  $\beta = -0.22$ ; 95% CI =  $-0.34$ ,  $-0.10$  and emotional:  $\beta = -0.39$ ; 95% CI =  $-0.54$ ,  $-0.23$ ). These results

**Table 2** Descriptive statistics and correlations among major variables

	(1)	(2)	(3)	Mean (SD)	Skewness	Kurtosis	$\alpha$
1. Self-stigma	–			1.92 (0.85)	0.76	–0.28	0.93
2. Self-perceived burden	0.41**	–		2.31 (0.91)	0.23	–1.10	0.88
3. Physical quality of life	–0.31**	–0.36**	–	19.51 (6.61)	–0.67	–0.38	0.89
4. Emotional quality of life	–0.51**	–0.44**	0.56**	17.51 (5.54)	–0.90	–0.05	0.86

\* $p < 0.05$ , \*\* $p < 0.01$

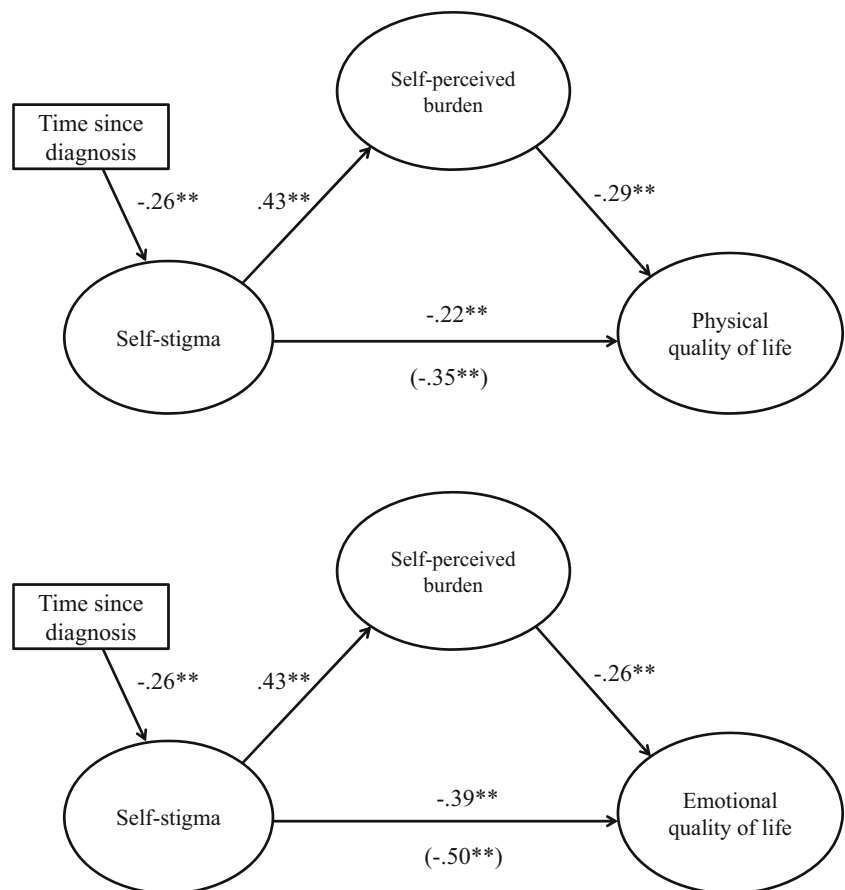
indicated a partial mediation effect of self-perceived burden between self-stigma and QoL (Fig. 2).

## Discussions

Consistent with a previous investigation showing the negative impact of self-stigma on mental health among lung cancer survivors in the USA [14], this study found a link between self-stigma and poorer physical and emotional QoL among Chinese American BCS. It indicated that internalization of the negative stereotypes and perceptions about being a breast cancer survivor could be detrimental to BCS' quality of life. In our supplementary analysis, we found that years in the USA was not associated with self-stigma ( $r = -0.07$ ,  $p > 0.05$ ). Suggested by other qualitative studies, even after years of immigration, there were still a proportion of Chinese American BCS believed that their cancer diagnosis might relate to karma and that cancer diagnosis would bring shame to the entire family [10, 11]. Chinese cultural beliefs may persistently guide Chinese American immigrant women the way they interpret and cope with breast cancer.

Self-perceived burden was also found to partially mediate between self-stigma and QoL, indicating that how cancer survivors view themselves could relate to their perception of burdensomeness to their caregivers and subsequently influence their well-being. For example, Helgeson found that higher survivor centrality (i.e., the extent to which an illness represents the self) was associated with more negative affect, poorer mental functioning, and greater psychological distress [31]. If the identity as a cancer survivor is more salient to an individuals' self-concept, (s)he may be more likely to be negatively affected. Park also showed that individuals who identified themselves as victims of cancer were more likely to report poorer mental well-being [32]. It would be important to elucidate how cancer survivors' identity (e.g., survivor and victim) and identity centrality contribute to self-stigma and other aspects of well-being. Furthermore, since self-perceived burden did not fully mediate the association, other mediators may be at play. It has been suggested that adaptation to the identity as a cancer survivor is likely to influence the survivors' interactions with other people (e.g., help-seeking behaviors), plus other cognitive and emotional processes (e.g., coping self-efficacy and internalized blame) [32]. Empirical studies have also supported the relationships

**Fig. 2** A mediation model for the relationships among self-stigma, self-perceived burden, and quality of life. Standardized path coefficients were presented. All structural path coefficients were statistically significant at  $***p < 0.001$ . The coefficients in the parentheses represented the direct path coefficients from self-stigma to quality of life without considering the indirect effects



between these variables and cancer survivors' well-being [33, 34]. Future research could examine how these processes impact different aspects of QoL among cancer survivors.

However, we found that the longer time since diagnosis was associated with lower self-stigma, indicating that feelings of self-stigma may reduce overtime post-diagnosis. While cancer can be viewed as challenging prior self-perceptions, it may be an opportunity for personal growth and reintegration of the self [35]. Cancer survivors may need time to accept their diagnosis, cognitively and emotionally process cancer-related information, adopt the identity as a cancer survivor, and find benefits from their cancer experience [35]. However, we did not find significant associations between self-stigma and other cancer- or treatment-related variables (e.g., cancer stage and treatments undergone), implying that those variables may be less important in affecting self-stigmatization. Exploring how socio-demographic and disease-related characteristics associate with self-stigma is warranted.

### Limitations

This study had several limitations. First, we analyzed the data based on cross-sectional data. Causal relationships among the variables could not be elucidated. Future studies should investigate the longitudinal relationships among self-stigma, self-perceived burden, and QoL (e.g., using a cross-lagged panel design). Second, to reduce participants' burden in answering the questionnaires, we did not use the full scales to measure self-stigma and self-perceived burden. Given the scarcity of studies specifically for Chinese American BCS, the scales we used were not rigorously validated in this population. Informed by our qualitative findings among the same target population, we chosen the items that were culturally salient to capture the concepts among the Chinese American BCS. Those items showed satisfactory psychometric properties with the validation from confirmatory factor analyses. Furthermore, this study recruited a non-random sample of Chinese American BCS in the USA through cancer organizations and community activities. It is also possible that people who are more comfortable with their breast cancer survivor identity tend to participate in the study. These might be subject to self-selection bias. However, recruiting Chinese American BCS through the community is a common in empirical studies [10, 24, 25, 36], supporting that it was empirically acceptable for testing novel hypothesis like the current study. We also recommended future studies adding other ways (e.g., using Cancer Registry) to recruit Chinese American participants. Doing so may further enhance the sample representativeness.

### Research implications

Our findings provide important implications. First, this study unfolded one of the potential mechanisms explaining the relationship between self-stigma and QoL. Future studies could

examine if the mediation model applies to other clinical populations with varied cancer types. Levels of self-stigma and self-perceived burden can vary across patients with different cancer types [16]. Understanding so can inform practitioners if the target variables need to be adjusted for designing interventions for these populations. Second, patients' perceptions about their relative contribution/investment in the patient-caregiver relationship may affect how they regard themselves as burdensome to their caregivers. Previously, care recipients with stroke who perceived themselves as over-benefiting from the relationship reported a significantly higher self-perceived burden than those whose relationship was viewed as equitable or under-benefiting [37]. It is important to examine if the theory applies to cancer survivors' perception of burden and well-being. Third, the associations among self-stigma, burden, and QoL may be moderated by individual differences. People with higher levels of relational-interdependent self-construal (RISC) are more likely to pursue goals for the benefits of their family, in-groups, and society [38], implying that they may be more sensitive to the social role changes in relation to others after cancer diagnosis and relative contributions in the patient-caregiver relationship. Future research may examine if the associations among self-stigma, self-perceived burden, and QoL are stronger among people with higher RISC.

### Implications for future interventions

Our findings implied that interventions that mitigate self-stigma and self-perceived burden may improve patients' QoL. Researchers have started to examine effective stigma reduction strategies (e.g., psychoeducation) for populations that are vulnerable of being stigmatized. For example, a pilot study showed that a group-based psychosocial intervention could reduce internalized stigma among people with serious mental illnesses [39] through education sessions (e.g., myths and reality about the illness), peer support, strengthening positive aspects of oneself, and sharing of personal experience. Similarly, a study piloting a peer-support plus psychoeducation program among Chinese American BCS also found that peer mentoring could improve health and reduce self-stigma [40]. On the other hand, an acceptance-focused cognitive behavioral intervention was also found to be effective in reducing cancer-specific distress, depression, and stigma among lung cancer patients in Australia [41]. To reduce cancer survivors' cognitions of burdensomeness, it may also be important to enhance cancer survivors' communication skills to talk with caregivers about implications of the disease on family obligations, to express gratitude, and to provide training for self-care management. Hopefully, development of culturally appropriate interventions with the incorporation of these strategies could promote better survivorship among those self-stigmatized cancer patients.

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### Compliance with ethical standards

This study protocol was approved by the Institutional Review Board at the University of Houston.

**Conflict of interest** The authors declare that they have no conflicts of interest.

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