



**ARTICLE**

# The Association between Illness-Related Stigma and Mental Well-Being among Cancer Survivors in Yunnan, China

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**ABSTRACT: Background:** Stigma affects the mental well-being of cancer survivors. However, data are scarce regarding the extent to which specific types of stigmas, enacted stigma (stigma from others), and self-stigma (internalized stigma), affect mental well-being. The objective of this study is to describe the extent to which overall illness-related stigma, self-stigma, and enacted stigma are associated with mental well-being among cancer survivors. **Methods:** A cross-sectional study in Kunming, Yunnan, China, was conducted. Eligible participants were adult cancer survivors who completed a phone-to-WeChat, self-administered survey. Illness-related stigma was measured with the Stigma Scale for Chronic Illnesses, 8-item version (SSCI-8). Mental well-being was assessed with the WHO-5 (range: 0 to 100 points). We analyzed data using multivariable regression analyses with adjustment for age, sex, education, income, occupation, social support (measured using the MSPSS), resilience (measured using the CD-RISC-10), and financial burdens (measured using the EORTC QLQ-C30). **Results:** We summarized characteristics and used multivariable linear regression to assess the association between stigma and WHO-5, adjusting a priori for confounders. In logistic regression, we modeled low well-being (WHO-5 < 50 points) with logistic regression and explored dose-response using stigma quartiles. Of 480 invited patients, 432 (90.0%) participated. Overall, 62% had good mental well-being (WHO-5 > 50 points); ~60% reported high social support, 50% high resilience, and ~30% financial burdens. In multivariable models, overall stigma was inversely and significantly associated with well-being ( $\beta = -0.27$ , 95% CI:  $-0.52, -0.02$ ), enacted stigma was not ( $\beta = -0.35$ ; 95% CI:  $-0.75, 0.05$ ), and self-stigma showed a stronger inverse association ( $\beta = -0.85$ , 95% CI:  $-1.47, -0.23$ ). **Conclusions:** Logistic regression using stigma quartiles and a binary WHO-5 outcome showed the same pattern, with self-stigma effects plateauing in higher quartiles and overall/enacted stigma following an inverse U-shape. Self-stigma was adversely associated with mental well-being among cancer survivors in Yunnan. The findings provide potentially useful basic information for stakeholders in oncology and mental health.

**KEYWORDS:** Cancer survivors; stigma; mental well-being; China; cross-sectional study

## 1 Introduction

Cancer is a major global health issue, with nearly 20 million new cases and 9.7 million deaths in 2022. The most common cancers are lung cancer, colorectal cancer, thyroid cancer, liver cancer, gastric cancer, female breast cancer, esophageal cancer, cervical cancer, prostate cancer, and pancreatic cancer. Advancements in cancer screening and treatment have led to improved survival rates. Cancer-specific mortality has significantly declined in the United States [1] and China [2] during the 1990s through the 2010s.

With the reduction in cancer-specific mortality comes the need to care for cancer survivors, i.e., individuals in the period between cancer diagnosis and the end of life [3]. Caring for cancer survivors includes physical health as well as mental health. Cancer survivors often experience emotional distress after the initial diagnosis, which can lead to mental health issues such as stress, anxiety, and depression [4–6]. One outcome that has not been extensively covered is mental well-being, i.e., an individual's ability to realize their potential, work productively and creatively, build strong and positive relationships, and contribute to their community [7].

Among cancer survivors, positive mental well-being enables individuals to engage more effectively in their recovery process. Well-being among cancer survivors is influenced by a variety of psychosocial determinants. One factor that warrants further study is illness-related stigma. Link and Phelan [8] conceptualized stigma as a process involving labeling, stereotyping, separation, status loss, and discrimination, all occurring within a context of power imbalance. Stigma manifests at multiple levels: structural stigma (i.e., policies or cultural norms that restrict opportunities), enacted stigma (i.e., prejudice, social exclusion, discrimination from others), and self-stigma (i.e., negative stereotype, prejudice, and discrimination that one has towards oneself) [9–11]. Illness-related stigma refers to the negative attitudes and discriminatory behaviors toward one's medical condition [12]. Cancer-related stigma also encompasses multiple dimensions, including internalized feelings of shame and self-blame as well as enacted stigma [13]. While the Cancer Stigma Scale (CASS) is widely used, it primarily measures public attitudes toward cancer patients rather than the patients' own views and experiences, and thus does not capture enacted and self-stigmas [14,15]. The Stigma Scale for Chronic Illnesses, 8-item version (SSCI-8) has been developed for patients of various chronic conditions and assesses both self-stigma and enacted stigma from the patient's perspective. However, given the existing patterns of association between stigma and mental well-being reported in the literature for other diseases [16,17]. The same relationship may exist among cancer survivors. We hereby hypothesize that cancer survivors who experienced higher levels of stigma have a lower level of mental well-being than those who experienced less stigma.

Another knowledge gap regarding the association between stigma and mental well-being is that stigma includes both the patient's self-stigmatization (internalized stigma) and the enacted stigma (stigma that the patient experiences from others). Self-stigma affects mental well-being by eroding self-esteem, increasing shame and hopelessness, and leading to withdrawal from social and health-promoting activities [18]. In contrast, enacted stigma influences mental well-being through external experiences of discrimination and social exclusion, which generate chronic stress, social isolation, and distrust of healthcare systems [19,20]. Differentiating these associations is essential for designing targeted interventions. If enacted stigma were a stronger determinant of mental well-being than self-stigma, then anti-discrimination measures should be prioritized. If self-stigma were a stronger determinant of mental well-being than enacted stigma, then the priority should be on developing informed care counseling practices. However, previous studies treated stigma as a single construct and did not distinguish between these two forms, thereby limiting our understanding of their potentially different impacts on psychological outcomes. In other words, it remains unclear which type of stigma exerts a stronger influence on mental well-being in cancer survivors.

Kunming City is the largest city in Yunnan Province, southwestern China, with hospitals offering comprehensive cancer care that attracts patients from various regions in the province. This setting offers an opportunity to describe mental well-being and its potential determinants among cancer patients. The findings from this study can be useful for local stakeholders to advocate for appropriate resource allocation, particularly those who work in oncology and mental health. Thus, the objectives of this study are: (1) to describe the extent to which overall illness-related stigma is associated with mental well-being; (2) to

describe the extent to which illness-related self-stigma is associated with mental well-being; (3) to describe the extent to which illness-related enacted stigma is associated with mental well-being.

## **2 Materials and Methods**

### ***2.1 Study Design and Setting***

We conducted a hospital-based cross-sectional study at the Second Affiliated Hospital of Kunming Medical University. This tertiary hospital serves a diverse catchment area that encompasses multiple cities and districts. The Hospital primarily serves Kunming and its surrounding areas (with the majority Han Chinese accounting for 86% of the population). The Hospital participates in tiered healthcare and medical insurance policies; thus, patients come from diverse economic backgrounds in urban and rural areas.

### ***2.2 Study Participants and Sample Size Calculation***

Our participants included cancer survivors living in Yunnan Province, China. Inclusion criteria were: (1) Age 18 years or older; (2) Diagnosed with any type of cancer; (3) Receiving treatment at the Second Affiliated Hospital of Kunming Medical University on the day of data collection. Exclusion criteria were: (1) history of significant complications (e.g., severe organ dysfunction or chronic infections) that impair daily activities; (2) inability to complete the questionnaire due to severe comorbidities or cognitive impairment.

This study was conducted as a part of a larger study with the objective to describe the prevalence of mental health problems among cancer survivors. For the main study, we calculated the required sample size based on the findings of previous studies and assumed that the prevalence of depression among cancer survivors was 33% [21]. We applied the standard sample size formula for estimation of proportions at 95% confidence and 5% margin of error, which yielded a sample size of  $n = 341$  patients. We expected that 20% of the potential participants would refuse participation, and adjusted the sample size to  $n = 341/(1-0.20) \approx 426$  participants (final sample size,  $n = 426$  participants).

### ***2.3 Study Instruments***

Our study instrument was a self-administered structured questionnaire with 3 sections: (1) mental well-being; (2) illness-related stigma; (3) sociodemographic and psychosocial characteristics. The investigators developed the study instrument based on a review of the literature and internal discussions. The first author (ZYT) translated English-language questions and standardized tools into Mandarin Chinese, then back-translated the instrument into English by a freelance translator who had never seen the original version. We then compared the original and back-translated English to check the accuracy of the Mandarin Chinese translation and finalized the draft instrument accordingly. We presented the draft instrument in Mandarin Chinese to oncologists at the study hospital for additional comments, further revised the draft instrument based on the feedback, and finalized the study instrument. We programmed the finalized questionnaire and created an online version of the study instrument using the Questionnaire Star (*Wen Juan Xing*) application [22].

#### ***2.3.1 Exposure Measurement: Illness-Related Stigma***

The investigators measured illness-related stigma by adapting the Stigma Scale for Chronic Illnesses 8-item version (SSCI-8). Similar to the method in the previous study, we added the response for each of the 8 items to create the Stigma Score [23] and used the sum as a continuous exposure variable. Each item is originally rated on a 5-point Likert scale ranging from 1 (“never”) to 5 (“always”). In the present study, item responses were rescaled from 1–5 to 0–4 before summation to facilitate interpretation of the scores.

- We summed the answers from the questions F1, F2, F4, F5, F8 as enacted stigma;
- We summed the answers from the questions F3, F6, and F7 as self-stigma and used that as separate scores for additional analyses.

### *2.3.2 Outcome Measurement: Mental Well-Being*

In this study, mental well-being is assessed using the 5-item World Health Organization Well-Being Index (WHO-5). We summed the score to a range of 0 to 25, then transformed the score to a scale of 0 to 100 points, as per the previous literature [24], and used the score in the analyses. As per the WHO's protocol [25], we considered participants who had a score of 50 points or lower to have poor mental well-being, and those who scored higher than 50 points to have good mental well-being.

### *2.3.3 Other Sociodemographic and Psychosocial Characteristics of the Participants*

In addition to stigma and mental well-being, we also asked questions about the participants' age, gender, occupation, education level, income level, social support, resilience, and financial burdens. These characteristics are independently associated with the outcome according to the literature [26,27]. We consider these characteristics to be potential confounders and adjust for them in multivariable analyses accordingly. We assessed social support using the Multidimensional Scale of Perceived Social Support (MSPSS), which measures perceived emotional, informational, and practical support; higher total scores indicate higher levels of perceived support [28]. We measured resilience using the 10-item Connor–Davidson Resilience Scale (CD-RISC-10), where higher scores indicate greater resilience [29]. We assessed financial burdens with a question item adapted from the European Organization for Research and Treatment of Cancer's QLQ Core Questionnaire (EORTC QLQ-C30), namely: "During the past week, has your physical condition or medical treatment caused you financial difficulties?". The answer choices were on a 4-point scale from 0 (*Not at all*) to 3 (*Very much*), with higher scores indicating greater financial difficulties [30].

## **2.4 Participant Recruitment and Data Collection**

The first author (ZYT) recruited two medical master's degree students at a local medical university to become the study's research assistants. The first author (ZYT) provided training to the assistants for three days. Training covered core research ethics (participants' privacy, participants' confidentiality, and data security), study protocols, remote contact data collection procedures (phone-based participant information and verbal informed consent), and data quality control (eligibility verification, real-time completeness checks, and secure data handling). The training also included a detailed reading of the study instrument and the administration and scoring of the SSCI-8 and WHO-5 scales.

We requested and received permission from the study hospital's administration to access patient information. We then accessed the patient database and identified those who met the study criteria, randomly selected the eligible patients, and obtained the patients' telephone numbers. The investigation team members then made telephone calls to the patients, introduced themselves, provided information about the study, and asked for verbal informed consent. If the patient agreed to participate, the principal investigator then requested the patient's WeChat messenger ID and sent a message with a summary of the study information and a request for the participant to take a screenshot of their phone upon completion of the questionnaire so that the research team could transfer 20 Chinese Yuan as compensation for their participation. The investigator then sent a separate message with a link to the online anonymized self-administered questionnaire for the study. We did not record the participants' names on the study documents or the data collection instrument.

Verbal informed consent was obtained from all individual participants included in the study. This study's protocol was approved by the Ethics Committee of The Second Affiliated Hospital of Kunming Medical University (Approval No.: 2025-101).

## 2.5 Statistical Analysis

After the interview, the participants submitted their responses to the survey data collection system. The principal investigator (ZYT) logged in and downloaded the in-progress data at regular intervals to check the data structure to detect quality-related issues, but did not detect any problems during the study period. The principal investigator then cleaned the study data and prepared a final data set for analysis.

For data analyses, we used descriptive statistics to summarize participant demographic characteristics, self-reported experiences of stigma (self-stigma and enacted stigma), and responses to the mental well-being measurement questions. We then used bivariate and multivariate analyses to describe the association between stigma and mental well-being. We used linear regression with adjustment for the potential confounders identified a priori based on the literature. We visualized the findings with line graphs showing unadjusted and adjusted regression lines, reported the regression coefficients ( $\beta$ ) and 95% confidence intervals (CIs) in a table, and used the confidence intervals to assess statistical significance. All analyses included overall stigma, as well as sub-domains of self-stigma and enacted stigma.

To understand the association between stigma scores and mental well-being in a more complete manner, we also categorize participants by their stigma score quartiles and dichotomize participants according to their mental well-being score. We considered participants to have either a low level or a good level of mental well-being based on the common cut-off at 50 points [25]. We analyzed data using bivariate analyses followed by multivariable logistic regression analyses. We presented the findings regarding the association as supplementary analyses. We included overall stigma, self-stigma, and enacted stigma in the same manner as the main figure and table. All analyses were conducted using R (4.2.2) [31].

## 3 Results

A total of 480 patients were invited to participate in our study, of whom 432 agreed (response = 90.0%). Most of our participants were under 50 years of age, female, had post-secondary education, and worked in white-collar occupations (Table 1). Approximately three-fifths of the participants scored at a high level for social support, and half scored at a high level on the resilience scale. Three out of ten participants reported a high level of financial burden.

With regard to stigmatization (Table 2), there was greater variation in enacted stigma compared to self-stigma. The pattern of distribution was similar in all items. The most common type of enacted stigma was others acting uncomfortable around the participant. The most common type of self-stigma was the participant feeling embarrassed because of their physical limitations. Responses to mental well-being measurement questions in the WHO-5 also had similar distributions for all items. When the scores were converted to the 100-point scale, 62% of the participants were categorized as having good mental well-being (scored more than 50 points on the converted scale).

With regard to the overall stigma and mental well-being, after adjusting for potential confounders, overall stigma had a negative and significant association with mental well-being (Adjusted  $\beta = -0.27$ , 95% CI:  $-0.52, -0.02$ ) (Fig. 1A and Table 3). When the analyses were limited to only the enacted stigma, we also found a negative but non-significant association (Adjusted  $\beta = -0.35$ , 95% CI:  $-0.75, 0.05$ ) (Fig. 1B and Table 3). In contrast, self-stigma was significantly associated with mental well-being (Adjusted  $\beta = -0.85$ , 95% CI:  $-1.47, -0.23$ ) (Fig. 1C and Table 3). Analyses of the data, with the stigma scores converted

into quartiles and well-being categorized as good or bad mental well-being, also yielded similar results (Supplementary Table S1). For self-stigma, the association plateaued in the third and fourth quartiles. For overall and enacted stigma, the prevalence of having poor mental well-being was lowest in the first quartile (lowest level of stigma) and highest in the third quartile (high, but not the highest level of stigma), which was coherent with an inverse U-shaped (or inverted hockey-stick) pattern of association.

**Table 1:** Characteristics of the study participants (N = 432).

| Characteristic                                      | Frequency (%), unless Otherwise Indicated |
|---|---|
| <b>Sociodemographic characteristics</b>             |   |
| <b>Age group</b>                                    |   |
| 18 to 49 years                                      | 317 (73.4%)                               |
| 50 to 59 years                                      | 62 (14.4%)                                |
| 60 to 69 years                                      | 38 (8.8%)                                 |
| 70 years or older                                   | 15 (3.5%)                                 |
| <b>Gender</b>                                       |   |
| Female  | 251 (58.1%)                               |
| Male  | 181 (41.9%)                               |
| <b>Ethnicity</b>                                    |   |
| Han Chinese   | 335 (77.5%)                               |
| Ethnic minority (e.g., Zhuang, Man, Hui, Miao)      | 97 (22.5%)                                |
| <b>Education level</b>                              |   |
| Primary Education or Below                          | 71 (16.4%)                                |
| Secondary Education                                 | 136 (31.5%)                               |
| Post-Secondary Education                            | 225 (52.1%)                               |
| <b>Monthly household income (in CNY) (n = 376)*</b> |   |
| Less than 5000 CNY                                  | 147 (34.0%)                               |
| 5001 to 10,000 CNY                                  | 156 (36.1%)                               |
| 10,001 to 20,000 CNY                                | 86 (19.9%)                                |
| 20,001 to 30,000 CNY                                | 25 (5.8%)                                 |
| 30,001 to 40,000 CNY                                | 8 (1.9%)                                  |
| 40,001 to 50,000 CNY                                | 3 (0.7%)                                  |
| More than 50,000 CNY                                | 7 (1.6%)                                  |
| <b>Occupation</b>                                   |   |
| Management  | 51 (11.8%)                                |
| Professional  | 71 (16.4%)                                |
| Service   | 31 (7.2%)                                 |
| Sales   | 19 (4.4%)                                 |
| Laborer   | 40 (9.3%)                                 |
| Self-employed                                       | 49 (11.3%)                                |
| Unemployed  | 9 (2.1%)                                  |
| Retired   | 47 (10.9%)                                |
| Others  | 115 (26.6%)                               |
| <b>Marital status</b>                               |   |
| Single  | 113 (26.2%)                               |
| Married with children                               | 276 (63.9%)                               |
| Married, no children                                | 23 (5.3%)                                 |
| Widows/Divorced/Separated                           | 20 (4.6%)                                 |
| <b>Health insurance</b>                             |   |
| Uninsured   | 12 (2.8%)                                 |
| Public insurance/Government insurance               | 395 (91.4%)                               |
| Private/Other insurance                             | 25 (5.8%)                                 |
| <b>Ability to pay for healthcare</b>                |   |
| No  | 102 (23.6%)                               |
| Yes   | 330 (76.4%)                               |

**Table 1: Cont.**

| Characteristic                     | Frequency (%), unless Otherwise Indicated |
|------------------------------------|---|
| <b>Most recent routine checkup</b> |   |
| <12 months before the survey       | 322 (74.5%)                               |
| 1–2 years before the survey        | 86 (19.9%)                                |
| 2–5 years before the survey        | 24 (5.6%)                                 |
| <b>Social support</b>              |   |
| Low (12–36 points)                 | 12 (2.8%)                                 |
| Moderate (37–60 points)            | 160 (37.0%)                               |
| High (60–84 points)                | 260 (60.2%)                               |
| <b>Resilience</b>                  |   |
| Low (0–13 points)                  | 26 (6.0%)                                 |
| Moderate (14–26 points)            | 190 (44.0%)                               |
| High (27–40 points)                | 216 (50.0%)                               |
| <b>Financial burdens</b>           |   |
| High                               | 127 (29.4%)                               |
| Low                                | 305 (70.6%)                               |

Note: \*Monthly household income data were missing for 56 participants who did not report this information.

**Table 2: Distribution of illness-related stigma and mental well-being among cancer survivor participants (N = 432).**

| Characteristic   | Frequency (%) or Mean $\pm$ SD |
|--|--------------------------------|
| <b>Illness-related stigma: Responses to the Stigma Scale for Chronic Illnesses 8-item version (SSCI-8) Questions</b> |                                |
| F1. Because of my illness, some people seemed uncomfortable with me.   |                                |
| Never (1 point)  | 119 (27.5%)                    |
| Rarely (2 points)  | 124 (28.7%)                    |
| Sometimes (3 points)   | 99 (22.9%)                     |
| Often (4 points)   | 72 (16.7%)                     |
| Always (5 points)  | 18 (4.2%)                      |
| F2. Because of my illness, some people avoided me.   |                                |
| Never (1 point)  | 137 (31.7%)                    |
| Rarely (2 points)  | 135 (31.2%)                    |
| Sometimes (3 points)   | 94 (21.8%)                     |
| Often (4 points)   | 51 (11.8%)                     |
| Always (5 points)  | 15 (3.5%)                      |
| F3. Because of my illness, I felt left out of things.  |                                |
| Never (1 point)  | 157 (36.3%)                    |
| Rarely (2 points)  | 117 (27.1%)                    |
| Sometimes (3 points)   | 72 (16.7%)                     |
| Often (4 points)   | 66 (15.3%)                     |
| Always (5 points)  | 20 (4.6%)                      |
| F4. Because of my illness, people were unkind to me.   |                                |
| Never (1 point)  | 175 (40.5%)                    |
| Rarely (2 points)  | 119 (27.5%)                    |
| Sometimes (3 points)   | 65 (15.0%)                     |
| Often (4 points)   | 59 (13.7%)                     |
| Always (5 points).   | 14 (3.2%)                      |
| F5. Because of my illness, people avoided looking at me.   |                                |
| Never (1 point)  | 171 (39.6%)                    |
| Rarely (2 points)  | 108 (25.0%)                    |
| Sometimes (3 points)   | 75 (17.4%)                     |
| Often (4 points)   | 64 (14.8%)                     |
| Always (5 points)  | 14 (3.2%)                      |

Table 2: Cont.

| Characteristic   | Frequency (%) or Mean $\pm$ SD |
|--|--------------------------------|
| <b>Illness-related stigma: Responses to the Stigma Scale for Chronic Illnesses 8-item version (SSCI-8) Questions</b> |                                |
| F6. I felt embarrassed about my illness.   |                                |
| Never (1 point)  | 154 (35.6%)                    |
| Rarely (2 points)  | 109 (25.2%)                    |
| Sometimes (3 points)   | 100 (23.1%)                    |
| Often (4 points)   | 50 (11.6%)                     |
| Always (5 points)  | 19 (4.4%)                      |
| F7. I felt embarrassed because of my physical limitations.   |                                |
| Never (1 point)  | 150 (34.7%)                    |
| Rarely (2 points)  | 96 (22.2%)                     |
| Sometimes (3 points)   | 90 (20.8%)                     |
| Often (4 points)   | 73 (16.9%)                     |
| Always (5 points)  | 23 (5.3%)                      |
| F8. Some people acted as though it was my fault I have this illness.   |                                |
| Never (1 point)  | 176 (40.7%)                    |
| Rarely (2 points)  | 100 (23.1%)                    |
| Sometimes (3 points)   | 86 (19.9%)                     |
| Often (4 points)   | 54 (12.5%)                     |
| Always (5 points)  | 16 (3.7%)                      |
| Stigma scores overall (mean $\pm$ SD; range 0 to 40)   | 17.94 $\pm$ 8.62               |
| Enacted stigma score (Sum of F1, F2, F4, F5, F8; Mean $\pm$ SD; range 0 to 25)                                       | 11.09 $\pm$ 5.37               |
| Self-stigma score (Sum of F3, F6, F7; Mean $\pm$ SD; range 0 to 15)  | 6.84 $\pm$ 3.43                |
| <b>Mental well-being</b>   |                                |
| 1. I have felt cheerful and in good spirits.   |                                |
| Never (0 point)  | 14 (3.2%)                      |
| Some of the time (1 point)   | 78 (18.1%)                     |
| Less than half of the time (2 points)  | 72 (16.7%)                     |
| More than half of the time (3 points)  | 98 (22.7%)                     |
| Most of the time (4 points)  | 131 (30.3%)                    |
| All of the time (5 points)   | 39 (9.0%)                      |
| 2. I have felt calm and relaxed.   |                                |
| Never (0 point)  | 17 (3.9%)                      |
| Some of the time (1 point)   | 67 (15.5%)                     |
| Less than half of the time (2 points)  | 76 (17.6%)                     |
| More than half of the time (3 points)  | 111 (25.7%)                    |
| Most of the time (4 points)  | 115 (26.6%)                    |
| All of the time (5 points)   | 46 (10.6%)                     |
| 3. I have felt active and vigorous.  |                                |
| Never (0 point)  | 18 (4.2%)                      |
| Some of the time (1 point)   | 87 (20.1%)                     |
| Less than half of the time (2 points)  | 70 (16.2%)                     |
| More than half of the time (3 points)  | 99 (22.9%)                     |
| Most of the time (4 points)  | 115 (26.6%)                    |
| All of the time (5 points)   | 43 (10.0%)                     |
| 4. I woke up feeling fresh and rested.   |                                |
| Never (0 point)  | 22 (5.1%)                      |
| Some of the time (1 point)   | 68 (15.7%)                     |
| Less than half of the time (2 points)  | 93 (21.5%)                     |
| More than half of the time (3 points)  | 104 (24.1%)                    |
| Most of the time (4 points)  | 108 (25.0%)                    |
| All of the time (5 points)   | 37 (8.6%)                      |

Table 2: Cont.

| Characteristic   | Frequency (%) or Mean ± SD |
|--|----------------------------|
| <b>Illness-related stigma: Responses to the Stigma Scale for Chronic Illnesses 8-item version (SSCI-8) Questions</b> |                            |
| 5. My daily life has been filled with things that interest me.   |                            |
| Never (0 point)  | 19 (4.4%)                  |
| Some of the time (1 point)   | 83 (19.2%)                 |
| Less than half of the time (2 points)  | 71 (16.4%)                 |
| More than half of the time (3 points)  | 102 (23.6%)                |
| Most of the time (4 points)  | 115 (26.6%)                |
| All of the time (5 points)   | 42 (9.7%)                  |
| Mental well-being scores overall (mean ± SD; WHO-5 questionnaire raw, range 0 to 25)                                 | 14.03 ± 6.13               |
| Mental well-being scores overall (mean ± SD; WHO-5 questionnaire converted, range 0 to 100)                          | 56.11 ± 24.50              |
| Mental well-being categories (WHO-5 questionnaire converted)   |                            |
| Good (more than 50 points on the converted scale)  | 268 (62.0%)                |
| Poor (50 points or lower on the converted scale)   | 164 (38.0%)                |

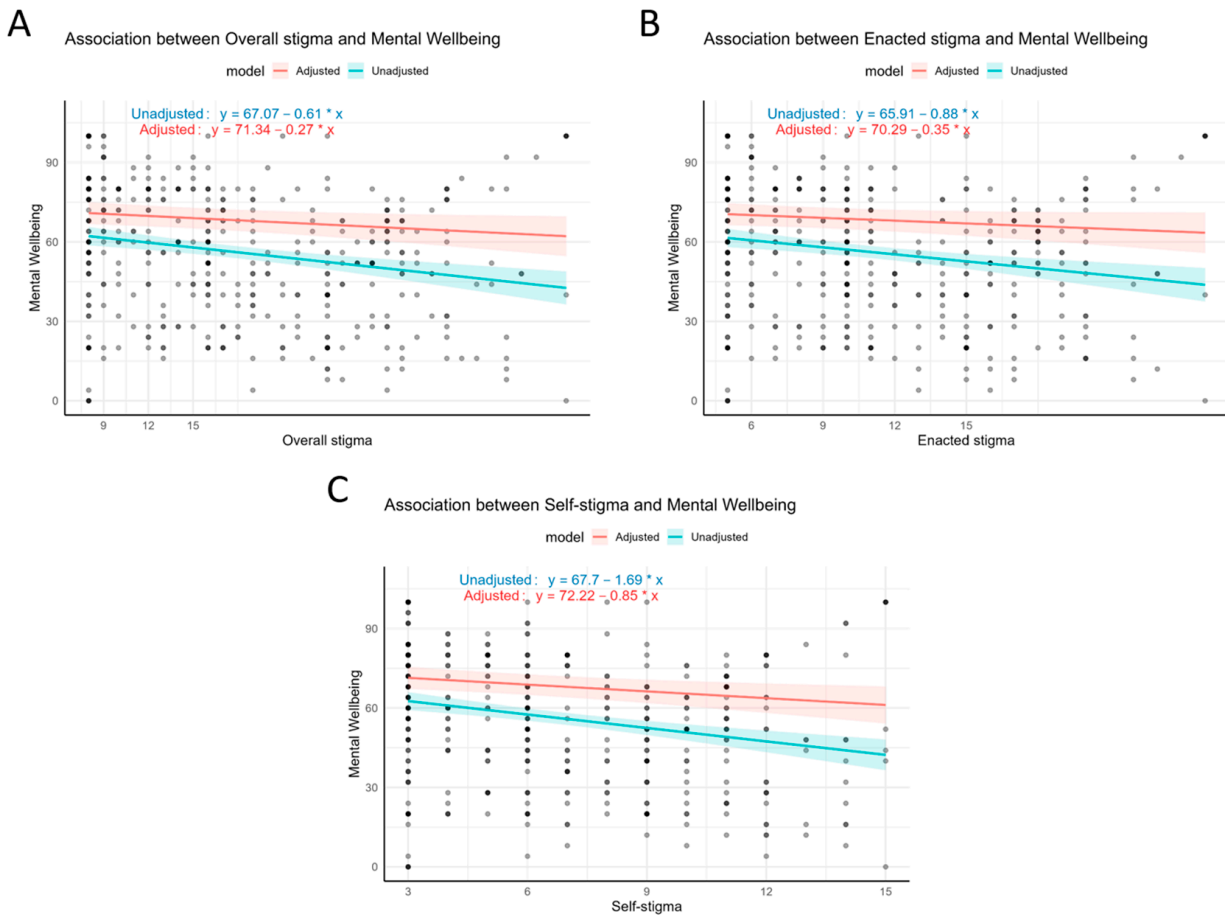


Figure 1: Association between stigma experience and mental well-being among cancer survivors. (A) Overall level; (B) Enacted stigma only; (C) Self-stigma only.

**Table 3:** Linear regression coefficient (crude and adjusted) on the association between stigma and well-being (N = 432).

| Predictor (Stigma)     | Crude $\beta$ (95% CI)            | Adjusted $\beta$ (95% CI)*        |
|------------------------|-----------------------------------|-----------------------------------|
| Total stigma (overall) | -0.61 (-0.87, -0.35) <sup>#</sup> | -0.27 (-0.52, -0.02) <sup>#</sup> |
| Enacted stigma         | -0.88 (-1.31, -0.46) <sup>#</sup> | -0.35 (-0.75, 0.05)               |
| Self-stigma            | -1.69 (-2.35, -1.04) <sup>#</sup> | -0.85 (-1.47, -0.23) <sup>#</sup> |

Note: \*Adjusted for age, sex, education, income, occupation, social support, resilience, and financial burdens. <sup>#</sup>Statistically significant association at 95% level of confidence.

#### 4 Discussion

In this hospital-based cross-sectional study, we described the level of well-being among cancer survivors and the extent to which well-being was associated with stigma (overall stigma, self-stigma, and enacted stigma). The findings of the study supported the study hypothesis, albeit to a limited extent. Although both self-stigma and enacted stigma were negatively associated with mental well-being, only self-stigma had a significant association. Additional analyses also showed potential dose-response, with a plateau pattern for self-stigma and an inverse U-shaped (upside-down hockey stick) pattern for enacted stigma. Although the findings of the study have the potential to contribute to the literature, a number of issues should be considered in their interpretation.

This finding suggested that self-stigma may play a greater role in mental well-being compared to enacted stigma, which was consistent with findings from other studies [32,33]. However, the underlying mechanisms for the plateau and inverse U-shaped relationships are unknown. In this study, we measured stigma with the abbreviated version of the SSCI (SSCI-8) rather than the full version. With this instrument, we might have captured a narrower range of experiences and potentially underestimated the prevalence compared to the full scale [34]. Aspects of stigma (particularly those related to structural issues) might not have been fully represented in our study. Furthermore, the relationship between stigma and mental health seems to also be dependent on the patterns of recurrence of experiences, which were not comprehensively captured by our study instrument. Thus, the results of this study should be considered as preliminary findings that enable the generation of new hypotheses and prompt additional studies. Future studies should consider using more comprehensive stigma measurement tools and obtaining qualitative data on the context and potential underlying mechanisms of internal cognitive and emotional processes [32,35]. In addition, as the cross-sectional design of the study entailed measurement of both mental well-being and stigma at the same time, it is possible that the participant's level of mental well-being precedes and influences the reporting of stigma. In other words, the possibility of reverse causality could not be ruled out from the interpretation of the study findings. Future studies should consider using a cohort or longitudinal study design to overcome this constraint.

A related issue with the measurement of stigma was that our participants self-reported their experiences. This process was inherently subject to potential information biases. The questions regarding self-stigma included the history of negative thoughts toward oneself. These questions might have been prone to under-reporting due to the influences of social desirability and self-serving biases [36,37]. Additionally, response acquiescence bias—the tendency to agree with items regardless of content—might have inflated the prevalence of stigma, as the wording was mostly negative-sounding [38]. Similar concerns have been noted in prior stigma research [39,40] on other diseases. Future studies should consider incorporating multi-informant or mixed-method approaches to improve measurement accuracy.

A similar issue regarding measurement was also present in our well-being measurement tool, the WHO-5 instrument. The instrument was designed based on the frequency of designated feelings over the

past two weeks, but the wording of the answer choices (e.g., “most of the time”, “more than half of the time”, etc.) was not provided with a clear definition. If the interpretation of the choices varied systematically among the participants, information bias could have been introduced to the study. Future studies should consider the standardization of the measurement of such frequency. For example, the question could include the phrase “How many days in the past 14 days...”. Similarly, the answer choices could include clear definitions (e.g., “Most of the time (11 to 13 days) (4 points)”, “More than half of the time (8 to 10 days) (3 points)”, etc.).

The main strength of this study was the relatively large sample size for a population with rare diseases such as cancer, which enabled the study data to have relatively high statistical power. However, a number of limitations should be considered in the interpretation of the study findings. Firstly, our study had inherent issues with information biases, as mentioned in the preceding paragraphs. Secondly, the cross-sectional study design did not allow for ascertainment of temporality in the observed association. Stigmatization, particularly self-stigmatization, included viewpoints that could have changed over time, but our study could only capture self-stigmatization at the time of data collection. The same issue existed for mental well-being, which also could have changed over time. The phone-to-WeChat data collection method required participants to have access to smartphones and be familiar with WeChat, which may have systematically excluded older cancer survivors. This may have introduced selection bias and potentially limited the generalizability of the findings to the broader population of cancer survivors. Lastly, we only collected data from Yunnan Province, a province with relatively low resources, which might have affected the ability to generalize our findings to other regions or settings, such as tier-1 cities (e.g., Beijing, Shanghai, Shenzhen) or other countries.

## 5 Conclusions

In this hospital-based cross-sectional study, we found that self-stigma but not enacted stigma had a significant negative association with mental well-being among cancer survivors in Yunnan Province, China. In other words, different types of stigmas had different levels of association with mental well-being. The findings of the study have the potential to contribute useful basic information for stakeholders on mental health and oncology. However, issues pertaining to information bias, measurement, and generalizability should be considered in the interpretation of the study findings.

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**Availability of Data and Materials:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request. The Chinese original and English language translation of the study questionnaire (for sections relevant to the findings of this study) are also available from the corresponding author upon reasonable request.

**Ethics Approval:** Verbal informed consent was obtained from all individual participants included in the study. This study's protocol was approved by the Ethics Committee of The Second Affiliated Hospital of Kunming Medical University (Approval No.: 2025-101).

**Conflicts of Interest:** The authors declare no conflicts of interest.

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