




The Relationship Between Cancer Cognition, Coping Ability and Behavioral Intention of Secondary Cancer Prevention Among Rural Residents in Shandong Province

Wenning Sun ^{1-3,*}, Xingli Ma ^{1-3,*}, Ao Zhang ¹⁻³, Yingjie Wang ¹⁻³, Boyang Fan ¹⁻³, Huifang Zhang ¹⁻³, Haining Yu⁴, Haipeng Wang ¹⁻³

¹Department of Social Medicine and Health Management, School of Public Health, Cheeloo College of Medicine, Shandong University, Jinan, 250012, People's Republic of China; ²NHC Key Laboratory of Health Economics and Policy Research (Shandong University), Jinan, 250012, People's Republic of China; ³Center for Health Management and Policy Research, Shandong University (Shandong Provincial Key New Think Tank), Jinan, 250012, People's Republic of China; ⁴Shandong Cancer Hospital and Institute, Shandong First Medical University and Shandong Academy of Medical Sciences, Jinan, 250117, People's Republic of China

*These authors contributed equally to this work

Correspondence: Haipeng Wang, Shandong University, 128# Wenhua Xi Road 44, Jinan, Shandong, 250012, People's Republic of China, Email wanghaipeng@sdu.edu.cn; Haining Yu, Shandong Cancer Hospital and Institute, 440# Jiyan Road, Jinan, Shandong, 250117, People's Republic of China, Email yuhaining@sdfmu.edu.cn

Background: Secondary prevention plays a crucial role in reducing cancer-related deaths. Previous studies have indicated that cancer cognition and coping ability significantly influence behavioral intention towards secondary prevention. However, limited research has explored the relationship between the three, particularly among rural residents. Rural areas often face challenges like limited healthcare access and lower health literacy, impacting prevention intentions. This study aims to explore the path associations between cancer cognition, coping ability, and behavioral intention for cancer secondary prevention among rural residents.

Methods: A cross-sectional survey was conducted in Shandong Province, China, from August 10 to September 10, 2023. Using a multi-stage stratified random sampling method, 453 valid questionnaires were obtained. Univariate and bivariate analysis were conducted for preliminary assessment, and structural equation modeling (SEM) was used to examine the relationships among cancer cognition, coping ability, and secondary prevention intention.

Results: 22.3% of participants reported an intention to engage in secondary cancer prevention. Cancer cognition was positively associated with both prevention intention ($\beta=0.06$, $p<0.001$) and coping ability ($\beta=0.82$, $p<0.001$), while coping ability was also positively associated with prevention intention ($\beta=0.64$, $p<0.001$). The SEM demonstrated a good model fit (GFI=0.841, CFI=0.916, IFI=0.916, TLI=0.906, RMSEA=0.056, SRMR=0.036, AGFI=0.812, PGFI=0.715).

Conclusion: Cancer cognition positively influences coping ability, which subsequently increases the intention to engage in secondary prevention among rural residents in Shandong Province. Tailored interventions to improve cancer cognition and coping ability are vital for enhancing prevention intention among rural residents.

Keywords: cancer cognition, coping ability, secondary prevention, rural residents, structural equation modeling

Introduction

According to estimates of the World Health Organization (WHO), there were approximately 19.9 million new cancer cases and 10 million cancer-related deaths globally in 2022, of which 24.15% of the new cases and 26.42% of the deaths occurred in China.¹ In recent years, due to an aging population and worsening environmental conditions, the incidence and mortality rates of cancer in China presented an upward trend, making it one of the leading causes of death.² In 2022, the cancer mortality rate in urban areas of China was 92.37 per 100,000, whereas in rural areas the mortality rate was

103.97 per 100,000, suggesting that cancer mortality remains higher in rural regions compared to urban areas.³ Cancer has been a prominent threat to public health for rural residents in China.

The WHO emphasizes that early screening, diagnosis, and treatment play a crucial role in reducing cancer-related mortality, referred to as secondary cancer prevention.⁴ Recent research has introduced novel detection strategies, including cancer biomarkers (e.g., for prostate cancer) and AI-assisted endoscopic image recognition, which have shown promise in enhancing the accuracy and efficiency of early cancer detection.^{5,6} Since 2005, the Chinese government has implemented multiple initiatives to promote secondary cancer prevention among residents.⁷ However, rural residents face greater challenges than their urban counterparts in accessing healthcare, particularly cancer screening.⁸ Moreover, people living in rural areas are more likely to receive a cancer diagnosis only after symptom onset.⁹ A 2016 survey across four Chinese provinces reported rural screening rates of 45.4% for liver cancer, 28.6% for gastric cancer, and 26.0% for esophageal cancer.¹⁰ Therefore, identifying effective strategies to strengthen rural residents' intention toward secondary cancer prevention is critical to improving screening uptake and the effectiveness of early treatment.

Multiple factors influence individuals' intention to engage in secondary cancer prevention, including perceived health status, access to medical resources, and cancer-related knowledge.^{11,12} Among these factors, limited cancer cognition hinders individuals' ability to recognize the importance of early detection and weakens their motivation to participate in preventive health behaviors.¹³ Cancer cognition is defined as an individual's understanding of the fundamentals of cancer, including its causes, symptoms, and risk factors.¹⁴ Prior research has mainly examined its association with health behaviors and service utilization, including screening uptake and treatment adherence.^{15,16} Limited knowledge has been linked to misconceptions about cancer risk and a distrust or fear of preventive measures.¹⁶ Low levels of cancer cognition are more commonly observed among individuals with lower educational attainment, older adults, and rural residents.¹⁷ In rural China, restricted access to health information, low health literacy, and limited contact with healthcare professionals contribute to persistent knowledge gaps.¹⁸ While the link between cancer cognition and secondary prevention intention is acknowledged, the underlying mechanism remains insufficiently understood.

Based on the Theory of Planned Behavior (TPB), behavioral intention is jointly shaped by attitude, perceived behavioral control, and subjective norms. Perceived behavioral control reflects an individual's confidence and ability to perform a given behavior.¹⁹ In the context of cancer prevention, coping ability can be regarded as a manifestation of perceived behavioral control, representing an individual's capacity to respond to cancer-related threats.²⁰ Specifically, it encompasses the behavioral capacity to acquire relevant information, seek timely treatment, or social support.¹⁴ Unlike cancer knowledge, coping ability reflects how individuals mobilize internal and external resources when facing health risks.²¹ Existing studies highlight the potential of interventions aimed at enhancing individuals' coping capacity to improve secondary prevention.²² Although cancer cognition has been widely associated with preventive behaviors, it may also influence prevention intentions indirectly by enhancing coping ability. When individuals possess more accurate knowledge about cancer, they are more likely to perceive themselves as capable of recognizing warning signs, making informed decisions, and utilizing appropriate health services.²³

Existing studies on secondary cancer prevention have primarily examined its current status, determinants, and screening or diagnostic approaches for specific cancer types.^{24–26} However, few studies have comprehensively examined the inter-relationships among cancer cognition, coping ability, and secondary prevention behavioral intention, focusing instead on the individual relationships between these concepts.^{27–29} Moreover, there is a notable lack of evidence specifically targeting rural populations, who face disproportionately higher cancer mortality rates and more limited access to health information and medical resources. Therefore, this study focuses exclusively on rural populations to explore the relationships among cancer cognition, coping ability, and secondary cancer prevention behavioral intention. The findings aim to inform more tailored strategies for enhancing prevention intention and reducing the rural cancer burden.

Methods

Study Design and Setting

This study was conducted in Shandong Province, an eastern province in China with a population of over 100 million, from August 10 to September 10, 2023. A multistage stratified random sampling method was employed to select the

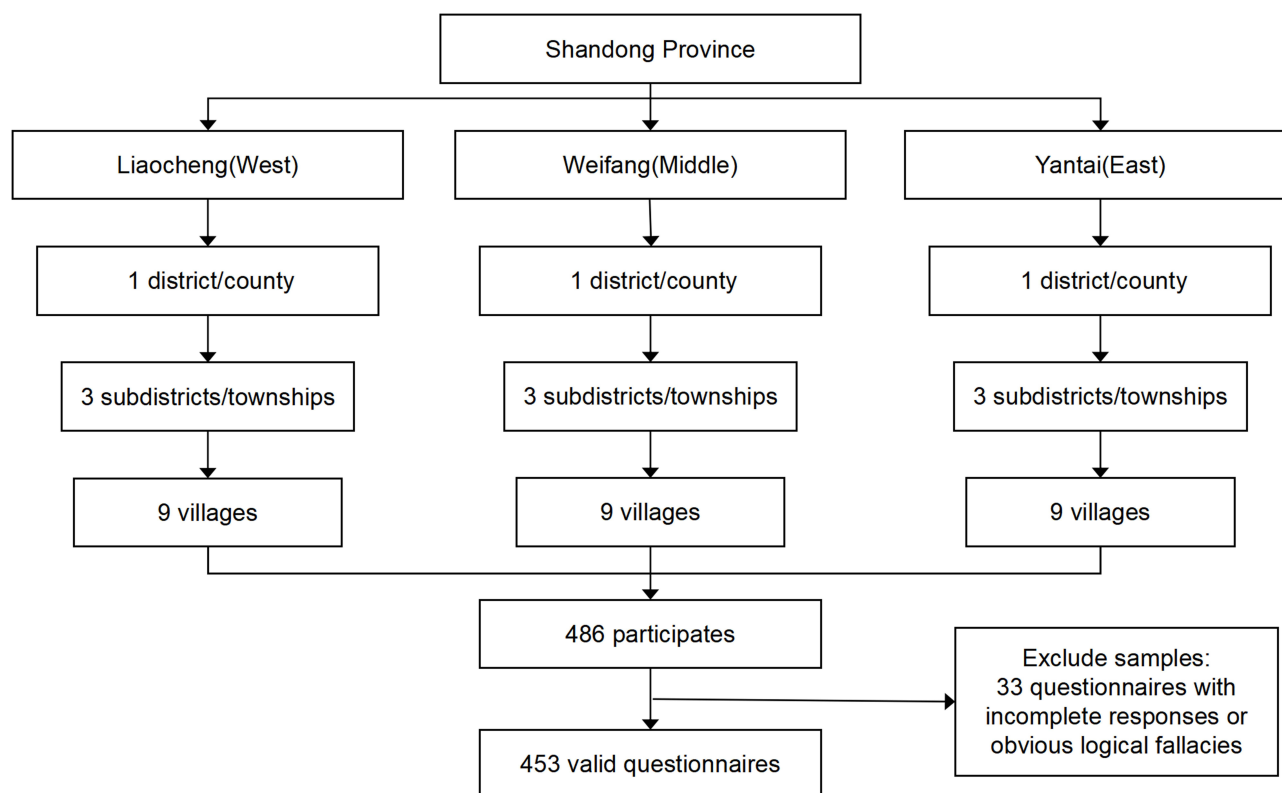


Figure 1 Multi-stage stratified random sampling framework.

participants following the three steps below (Figure 1). Firstly, according to the socioeconomic levels and geographic location, three cities were selected in Shandong province, namely, Yantai (high economic level, in the east), Weifang (middle economic level, in the middle), and Liaocheng (low economic level, in the west). Secondly, one district/county was randomly selected in each city, and three subdistricts/townships were randomly selected from each district/county. Thirdly, three villages were randomly selected in each subdistrict/township. Finally, a total of 27 villages were selected as sample units.

Sample Size Calculation

The required sample size was calculated using the standard formula for estimating a population proportion: $N = \frac{Z_{\alpha/2}^2(1-p)p}{\delta^2}$, where $Z_{\alpha/2}=1.96$, $p=0.5$ (a conservative estimate used when the true proportion is unknown, maximizing the product $p(1-p)$), and the allowable margin of error $\delta=0.05$.³⁰ Based on this calculation, the minimum sample size was approximately 385. Considering a potential 10% non-response rate, the adjusted sample size was 424. To achieve the required minimum sample size and ensure field feasibility, 16 or more residents were randomly selected from each sample village. In total, 486 questionnaires were distributed. Of these, 33 were excluded from the sample because of an uncompleted questionnaire or obvious logical error in the questionnaire. Finally, a total of 453 individuals were included in the database, with a response rate of 93.2%.

Participants and Data Collection

The inclusion criteria for eligible rural residents were: (1) aged ≥ 18 years; (2) holding local household registration; (3) conscious and able to communicate normally; and (4) willing to participate and having signed an informed consent form.

In this study, with the assistance of local community health workers, eligible residents were randomly selected from the resident registry and invited to the village clinics to participate in the survey. Considering the generally low educational attainment of the rural residents, one-to-one interviews were conducted by trained graduate students in

public health, who received standardized training in interview protocols to ensure data quality. The study was approved by the Ethics Committee of the School of Public Health, Shandong University, China. All participants volunteered to take part in the survey, and informed consent was obtained before the survey.

Measurements

Cancer Cognition and Coping Ability

Cancer cognition and coping ability in this study were measured using scales developed by Liu for Chinese residents.²⁰ These instruments have demonstrated good reliability and validity in rural populations,^{20,31} with previously reported internal consistency values of Cronbach's $\alpha = 0.856$ (KMO = 0.88) for the Cancer Cognition Scale and $\alpha = 0.808$ (KMO = 0.81) for the Cancer Coping Ability Scale. Confirmatory factor analyses further supported the construct validity of both instruments (The Cancer Cognition Scale: RMSEA=0.069, CFI=0.903, IFI=0.903, GFI=0.927; The Cancer Coping Ability Scale: RMSEA=0.054, CFI=0.890, IFI=0.890, GFI=0.905).²⁰ The Cancer Cognition Scale comprises 17 items rated on a 5-point Likert scale (1 to 5), with total scores ranging from 17 to 85. The Cancer Coping Ability Scale contains 13 items, also rated from 1 to 5, with total scores ranging from 13 to 65. The full list of items for both scales is provided in the [Supplementary Materials](#). In the present study, both scales demonstrated excellent internal consistency, with Cronbach's α values of 0.944 and 0.830, respectively.

Behavioral Intention for Secondary Cancer Prevention

Behavioral intention for secondary cancer prevention in this study was assessed using the Intention Scale for Early Detection, Diagnosis, and Treatment, derived from the Health Literacy Questionnaire for Cancer Prevention and Control in China.³² This national instrument was developed through multi-stage expert validation and has been widely used in large-scale public health assessments. The scale comprised 8 dichotomous items (scored 0–1; total score 0–8), the full contents of which are detailed in the [Supplementary Materials](#). The item contents are listed in the [Supplementary Materials](#). Although individual items were binary, the total score was treated as a continuous indicator to reflect gradations in behavioral intention. The scale showed acceptable internal consistency in our sample (Cronbach's $\alpha = 0.665$).

Covariates

Covariates include individual demographic (gender, age, marital status), socioeconomic characteristics (education level, careers, annual income), health status (self-reported health, family history of cancer), and cancer-related cognition (perceived necessity of understanding cancer knowledge, perceived financial burden of cancer prevention and treatment). To enhance comparability and interpretability, the covariates were categorized based on health surveillance and prior research conventions. Age was grouped into 18–59, 60–75, and ≥ 75 years.³³ Education level was classified as illiterate/semiliterate, primary school, and junior high school or above.³⁴ Marital status was dichotomized into “married” and “other”.³⁵ Annual household income was categorized as $<10,000$, 10,000–29,999, and $\geq 30,000$ Chinese Yuan (CNY).³⁶ Self-reported health was grouped as “good”, “fair”, and “bad”.³⁷ Binary coding (yes/no) was applied to family history of cancer and perceived necessity of understanding cancer knowledge.³⁸ The perceived financial burden of cancer prevention and treatment was measured using a 5-point Likert item. For analysis, responses were dichotomized into “heavy” (≥ 3) and “not heavy” (≤ 2) to enhance interpretability, following prior studies.³⁹

Statistical Analysis

Data were analyzed using SPSS 22.0 and AMOS 28.0. Descriptive statistics were presented as frequencies and percentages for participants' demographic characteristics. Group differences in secondary cancer prevention intention were assessed using one-way ANOVA and independent samples *t*-tests. Multiple linear regression analyses were conducted to identify factors associated with behavioral intention. Pearson correlation coefficients were calculated to examine relationships among cancer cognition, coping ability, and behavioral intention.

To explore the internal pathways linking cancer cognition, coping ability, and behavioral intention for secondary cancer prevention, a theory-driven structural equation model (SEM) was developed using maximum likelihood estimation. The model included two latent constructs (cancer cognition and coping ability), and one observed outcome variable

(behavioral intention). Multicollinearity diagnostics among latent variables were conducted, with all variance inflation factors (VIFs) below 3. Guided by the TPB and prior research,¹⁹ the model posited both direct and indirect effects of cancer cognition on behavioral intention via coping ability, and constructs pathways accordingly. Statistical significance was set at $P < 0.05$.

Results

Sample Characteristics

Table 1 presents the demographic and health-related characteristics of the 453 participants and the results of univariate analyses regarding behavioral intention for secondary cancer prevention. The average behavioral intention score across all participants was 4.53 ± 1.42 .

Table 1 Sample Characteristics and Univariate Analysis of Behavioral Intention for Secondary Cancer Prevention

Characteristics	n	%	Secondary Cancer Prevention		
			Mean \pm SD	t/F	P
All	453	100.0	4.53 \pm 1.42		
Gender				0.225	0.822
Male	150	33.1	4.55 \pm 1.44		
Female	303	66.9	4.51 \pm 1.41		
Age				6.086	0.002
18-59	122	26.9	4.82 \pm 1.34		
60-75	240	53.0	4.52 \pm 1.41		
>75	91	20.1	4.14 \pm 1.47		
Education level				9.170	<0.001
Illiterate/semiliterate	126	27.8	4.12 \pm 1.37		
Primary school	138	30.5	4.51 \pm 1.60		
Junior high school and higher	189	41.7	4.80 \pm 1.24		
Marital status				3.620	<0.001
Married	376	83.0	4.63 \pm 1.35		
Other	77	17.0	4.00 \pm 1.60		
Careers				-4.562	<0.001
Farmers	364	80.4	4.41 \pm 1.48		
Non-farmer	89	19.6	5.00 \pm 0.98		
Annual income (CNY)				7.431	0.001
<10,000	193	42.6	4.23 \pm 1.44		
10,000–29,999	133	29.4	4.73 \pm 1.40		
\geq 30,000	127	28.0	4.83 \pm 1.09		
Self-reported health status				5.580	0.004
Good	273	60.3	4.57 \pm 1.30		
Fair	129	28.5	4.67 \pm 1.54		
Bad	51	11.3	3.92 \pm 1.59		
Family history of cancer				1.134	0.257
Yes	85	18.8	4.68 \pm 1.48		
No	368	81.2	4.49 \pm 1.40		
The necessity of understanding cancer knowledge				8.486	<0.001
Yes	221	48.8	5.06 \pm 1.25		
No	232	51.2	4.01 \pm 1.38		
Perceived financial burden of cancer prevention and treatment				3.709	<0.001
Heavy	347	76.6	4.66 \pm 1.32		
Not heavy	106	23.4	4.08 \pm 1.62		

Abbreviations: n, number; SD, standard deviation; CNY, Chinese Yuan.

Most participants were female (66.9%) and aged between 60–75 years (53.0%). Over half had at least primary education, and the majority were married (83.0%) and farmers (80.4%). Notably, 42.6% had an annual income below 10,000 CNY, and 18.8% reported a family history of cancer. More than half of the residents (51.2%) did not think it was necessary to know about cancer-related knowledge. In addition, 76.6% of participants felt that the financial burden of cancer prevention and treatment was high.

Univariate analyses showed significant group differences in behavioral intention based on age ($F=6.086$, $P=0.002$), education level ($F=9.170$, $P<0.001$), marital status ($t=3.620$, $P<0.001$), occupation ($t=-4.562$, $P<0.001$), income ($F=7.431$, $P=0.001$), and self-reported health status ($F=5.580$, $P=0.004$). In contrast, gender and family history of cancer were not statistically significant.

Moreover, participants who perceived cancer knowledge as necessary had significantly higher behavioral intention scores (5.06 ± 1.25) than those who did not (4.01 ± 1.38) ($t=8.486$, $P<0.001$). Similarly, those who perceived a lower financial burden reported higher intentions (4.66 ± 1.32 vs. 4.08 ± 1.62 ; $t=3.709$, $P<0.001$).

Factors Associated with Behavioral Intention of Secondary Cancer Prevention

To identify independent predictors, multiple linear regression was performed (Table 2). After adjusting for demographic covariates, the following factors remained significantly associated with behavioral intention. The perceived necessity of understanding cancer knowledge ($B=-0.281$, 95% CI= $-0.450\sim-0.112$, $P=0.001$), perceived financial burden of cancer prevention ($B=-0.390$, 95% CI= $-0.680\sim-0.100$, $P=0.009$) and treatment were both negatively associated with rural residents' behavioral intentions toward secondary cancer prevention. Cancer cognition ($B=0.018$, 95% CI= $0.008\sim0.028$, $P=0.001$) and coping skills were positively ($B=0.018$, 95% CI= $0.000\sim0.036$, $P=0.046$) associated with rural residents' behavioral intention for secondary cancer prevention. These findings suggest that cognitive and coping ability play a greater role than most sociodemographic variables in influencing rural residents' intention toward secondary cancer prevention.

Table 2 Multiple Linear Regression Analysis of Factors Influencing the Behavioral Intention of Secondary Cancer Prevention

Characteristics	B	P	95% CI of B	
			LB	UB
(Cons)	2.160	0.008	0.582	3.738
Gender	0.081	0.565	-0.195	0.357
Age 60-75	0.294	0.086	-0.041	0.629
Age >75	0.293	0.207	-0.162	0.748
Primary school	0.018	0.916	-0.313	0.349
Junior high school and higher	-0.198	0.321	-0.588	0.192
Marital status	0.298	0.100	-0.057	0.653
Careers	0.129	0.470	-0.222	0.480
10,000–29,999	-0.036	0.824	-0.350	0.278
≥30,000	0.110	0.568	-0.266	0.486
Family history of cancer	0.079	0.624	-0.237	0.395
The necessity of understanding cancer knowledge	-0.281	0.001	-0.450	-0.112
Perceived financial burden of cancer prevention and treatment	-0.390	0.009	-0.680	0.100
Self-reported health status fair	0.216	0.131	-0.064	0.496
Self-reported health status bad	-0.383	0.064	-0.787	0.021
Cancer cognition	0.018	0.001	0.008	0.028
Cancer coping ability	0.018	0.046	0.000	0.036

Abbreviations: B, unstandardized coefficients; CI, confidence interval; LB, lower bound; UB, upper bound.

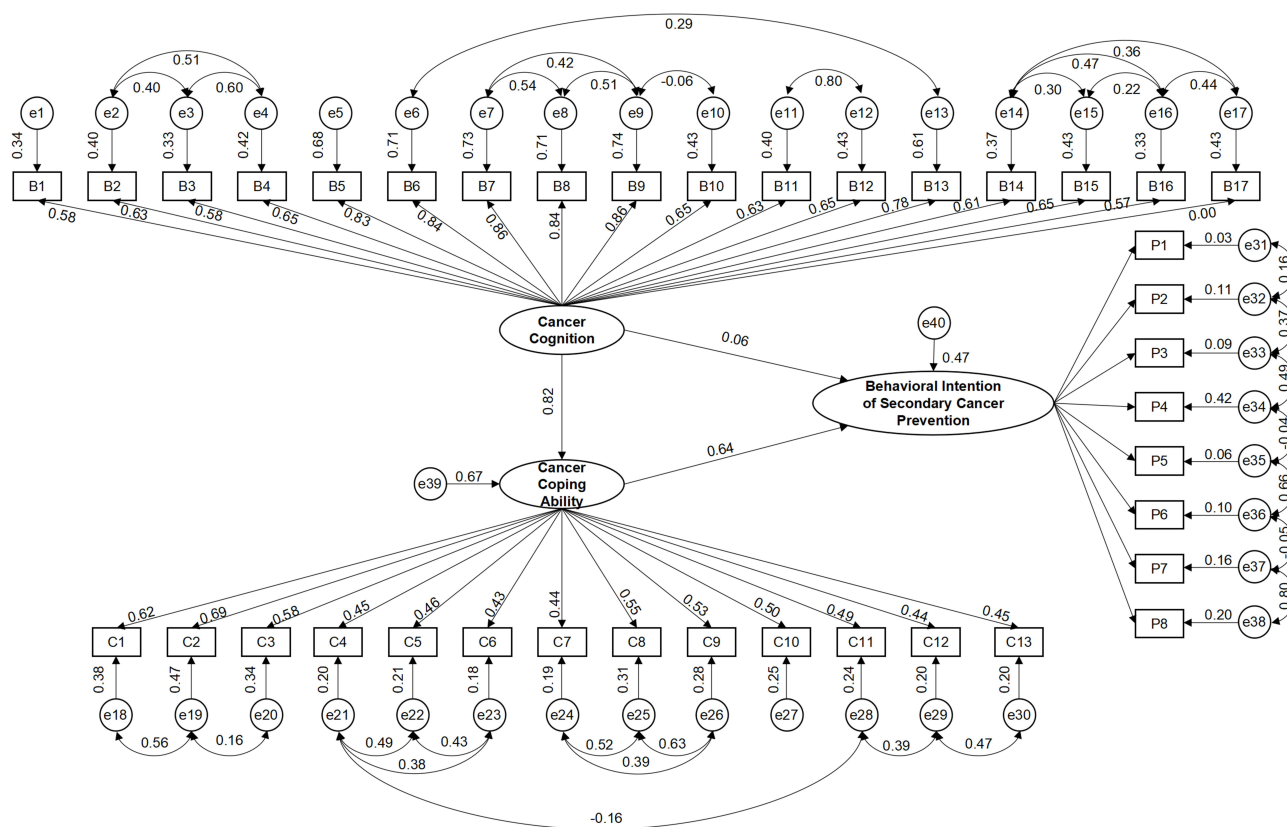


Figure 2 The path relationships between cancer cognition, coping ability and behavioral intention of secondary cancer prevention examined using SEM.

Notes: B1~B17 represent the 17 observed items measuring cancer cognition; C1~C13 represent the 13 items measuring cancer coping ability; P1~P8 represent the 8 items measuring secondary cancer prevention behavioral intention; Measurement errors are denoted by e; All specific items are listed in the [Supplementary Materials](#).

Path Relationship Between Cancer Cognition, Coping Ability and Behavioral Intention of Secondary Cancer Prevention

The path relationship between cancer cognition, coping ability and behavioral intention of secondary cancer prevention is shown in [Figure 2](#). The final SEM model was obtained by increasing residual correlations and modification indices. The model fit indices of the SEM were generally acceptable (GFI=0.841, CFI=0.916, IFI=0.916, TLI=0.906, RMSEA=0.056, SRMR =0.036, AGFI=0.812, PGFI=0.715), indicating a reasonable to good model fit. Cancer cognition was significantly associated with coping ability ($\beta = 0.82$, $P < 0.001$) and had a direct positive effect on behavioral intention ($\beta = 0.06$, $P < 0.001$). Coping ability also had a positive effect on behavioral intention ($\beta = 0.64$, $P < 0.001$). The findings indicate that cancer cognition is strongly associated with coping ability, which partially mediates the relationship between cognition and behavioral intention for secondary cancer prevention. This highlights the important interconnected role of cognition and coping in shaping prevention intentions.

Discussion

This study suggested the relationship among cancer cognition, coping ability, and secondary prevention behavioral intention among the rural residents in Shandong province. The results showed that while higher cancer cognition was directly associated with stronger preventive behavioral intention, and coping ability played a crucial explanatory role in this relationship. This finding underscores the importance of both adequate cancer cognition and coping ability in shaping preventive behavioral intentions in rural populations.

Currently, 22.3% of rural residents in Shandong Province intend to engage in secondary cancer prevention, a rate notably higher than that reported in Guangxi (17.00%) and Jinan (11.35%).^{40,41} This observed disparity likely reflects the influence of the Healthy China Initiative: Implementation Plan for Cancer Prevention and Control (2023–2030) and the

government's heightened promotion on early cancer diagnosis and treatment in recent years.⁴² However, despite these policy efforts, overall intention remains low among rural residents in Shandong province, suggesting that top-level designs have yet to fully translate into effective grassroots implementation. Barriers such as limited screening facilities, shortages of medical personnel, and transportation difficulties persistently hinder early cancer detection and treatment in rural areas.⁴³ Consequently, optimizing healthcare resource allocation and improving access to screening services are urgently needed to enhance rural residents' intention for cancer secondary prevention behaviors.⁴⁴

Our study demonstrated a positive correlation between cancer cognition and secondary prevention behavioral intention, which aligns with the TPB suggesting that knowledge can shape health-related attitudes and intentions.¹⁹ A higher level of cancer cognition implies greater awareness of risk factors, prevention strategies, and early detection methods, which are essential for forming preventive intentions.⁴⁵ However, we found that cancer cognition among rural residents was notably lower than in more educated populations such as university students,⁴⁶ suggesting that educational attainment significantly influences cancer knowledge. This highlights the need for tailored health education efforts in rural settings, with a focus on conveying the progressive nature of cancer and the benefits of early detection.^{44,47}

Beyond knowledge, our findings highlight the critical role of cancer coping ability in influencing behavioral intention. Empirically, previous studies have demonstrated that coping ability, such as problem-focused strategies, and information or resource acquisition, can enhance screening intention and follow-up behaviors.^{48,49} This also aligns with the TPB and Protection Motivation Theory, which highlight internal coping resources as central to behavioral intentions.^{19,50} Moreover, unlike structural factors such as income or healthcare access, coping ability is modifiable and can be enhanced through targeted interventions, including self-efficacy training and peer support.⁵¹ Strengthening coping ability may thus offer a practical and cost-effective approach to promoting prevention intention among rural populations.

Importantly, our study found that the direct association between cancer cognition and prevention intention was relatively weak, while coping ability showed a stronger influence. At the same time, cognition was strongly associated with coping ability, suggesting that knowledge may primarily influence behavioral intention indirectly by enhancing one's capacity to cope. In rural settings, entrenched beliefs including fear of diagnosis and stigma, together with limited healthcare access, frequently hinder individuals from developing behavioral intentions based solely on their cancer-related knowledge.^{52,53} In such contexts, coping ability plays a critical enabling role by helping individuals access resources, seek social and informational support, and navigate emotional and logistical barriers.⁴⁹ Therefore, health strategies should focus not only on increasing knowledge, but also on strengthening coping skills to effectively translate cognition into preventive intention.

This study found that younger individuals showed greater preventive intention than older residents, which may be explained by generational variations in lifestyle, health habits, and openness to preventive measures.⁵⁴ Residents reporting good health often showed lower willingness to participate in secondary prevention, potentially linked to emotionally driven risk perceptions.⁵⁵ Heightened personal disease risk assessment typically triggers fear and anxiety, which can increase screening propensity. Notably, individuals perceiving cancer prevention as a substantial economic burden exhibited lower behavioral intention. Consistent with prior studies, financial anxiety emerged as a significant barrier to cancer screening adherence.⁵⁶ These findings highlight the need for integrated strategies that combine financial support with targeted psychosocial interventions to effectively promote cancer secondary prevention behaviors in rural populations.

Limitations

There are several limitations in this study. First, the use of self-reported data may introduce recall bias, and face-to-face interviews may introduce social desirability bias. Second, as a cross-sectional study without a non-rural control group, the ability to infer causality or conduct between-group comparisons is inherently limited. Future research should consider longitudinal designs and incorporate both rural and non-rural populations to better examine causal relationships and enhance explainability. Third, the sole sourcing of samples from three Shandong regions limits the representativeness of the study. Nevertheless, we mitigated this by strategically selecting samples with demographic features akin to the national rural average, considering geography and economic development. Fourth, dichotomizing perceived financial burden may simplify analysis but reduce sensitivity. Similarly, the behavioral intention score (ranging from 0 to 8),

derived from eight binary items, was treated as continuous in linear regression. While this approach is statistically acceptable, it may not capture all distributional nuances. In addition, the behavioral intention scale exhibited relatively low internal consistency (Cronbach's $\alpha = 0.665$), which may affect the stability of the regression and SEM estimates.

Conclusion

This study indicated that, among rural residents in Shandong province, both cancer cognition and coping ability were associated with intention to engage in secondary cancer prevention, with coping ability exhibiting a stronger association. Cancer cognition appears to be related to behavioral intention primarily via coping ability. These findings suggest that enhancing coping ability, alongside improving knowledge, is essential for promoting preventive intentions. Effective interventions should integrate health education with coping-focused support. Meanwhile, addressing structural barriers such as limited healthcare access and financial constraints remains critical to support behavioral intention toward prevention. Given the cross-sectional design and regional focus, generalizability is limited. Future longitudinal studies incorporating objective behavior measures and comparative analyses across rural and urban settings are needed to clarify these associations further.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

All methods were carried out in accordance with relevant guidelines and regulations or the Declaration of Helsinki. The institutional review board of Shandong University School of Public Health approved the study protocol before data collection. Informed consents were obtained from all participants prior to questionnaire administration.

Acknowledgment

The authors thank all the participants in this study. We are also grateful to all the individuals who conducted the data collection and entry.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

The research was supported by the Shandong First Medical University (Shandong Academy of Medical Sciences) Youth Science Fund cultivation and funding program (202202-032) and Shandong Province Medical Health Science and Technology Development Plan Project (202112070475).

Disclosure

The authors report no conflicts of interest in this work.

References

1. Cancer IAfRo. Cancer today. Available from: <https://gco.iarc.fr/today/en>. Accessed August 12, 2025.
2. He S, Xia C, Li H, et al. Cancer profiles in China and comparisons with the USA: a comprehensive analysis in the incidence, mortality, survival, staging, and attribution to risk factors. *Sci China Life Sci.* 2024;67(1):122–131. doi:10.1007/s11427-023-2423-1
3. Han B, Zheng R, Zeng H, et al. Cancer incidence and mortality in China, 2022. *J Nat Cancer Center.* 2024;4(1):47–53. doi:10.1016/j.jncc.2024.01.006

4. Mitsutake S, Shibata A, Ishii K, Oka K. Association of eHealth literacy with colorectal cancer knowledge and screening practice among internet users in Japan. *J Med Internet Res.* 2012;14(6):e153. doi:10.2196/jmir.1927
5. Bergengren O, Pekala KR, Matsoukas K, et al. 2022 update on prostate cancer epidemiology and risk factors-A systematic review. *Eur Urol.* 2023;84(2):191–206. doi:10.1016/j.eururo.2023.04.021
6. Areia M, Mori Y, Correale L, et al. Cost-effectiveness of artificial intelligence for screening colonoscopy: a modelling study. *Lancet Digit Health.* 2022;4(6):e436–e444. doi:10.1016/s2589-7500(22)00042-5
7. Cao M, Li H, Sun D, et al. Cancer screening in China: the current status, challenges, and suggestions. *Cancer Lett.* 2021;506:120–127. doi:10.1016/j.canlet.2021.02.017
8. Li M, Ni P, Zuo T, Liu Y, Zhu B. Cancer literacy differences of basic knowledge, prevention, early detection, treatment and recovery: a cross-sectional study of urban and rural residents in Northeast China. *Front Public Health.* 2024;12:1367947. doi:10.3389/fpubh.2024.1367947
9. Wang H, Hua X, Yao N, et al. The urban-rural disparities and associated factors of health care utilization among cancer patients in China. *Front Public Health.* 2022;10:842837. doi:10.3389/fpubh.2022.842837
10. Li J, Li H, Zeng H, et al. Trends in high-risk rates and screening rates for the population-based cancer screening program on esophageal, stomach and liver cancer in China, 2010–2016. *J Nat Cancer Center.* 2021;1(3):101–107. doi:10.1016/j.jncc.2021.05.001
11. Dawid A, Borzikowsky C, Freitag-Wolf S, et al. Evaluation of prevention behaviour and its influencing factors with respect to cancer screening. *J Cancer Res Clin Oncol.* 2022;148(7):1559–1567. doi:10.1007/s00432-022-03963-w
12. Oringtho S, Mwaka AD, Garimoi Orach C, Wabinga H. Awareness of cervical cancer risk factors and preventive approaches, and perceived causes of cervical cancer among secondary school girls: a cross-sectional study in Northern Uganda. *Ann Med.* 2024;56(1):2374860. doi:10.1080/07853890.2024.2374860
13. Son Y-J, Kim S-H, Kim GY, Son H. Associations between health literacy, cancer-related knowledge, and preventive health behaviors in community-dwelling Korean adults. *J Health Communication.* 2017;22(12):999–1006. doi:10.1080/10810730.2017.1401687
14. Diviani N, Schulz PJ. What should laypersons know about cancer? Towards an operational definition of cancer literacy. *Patient Educ Couns.* 2011;85(3):487–492. doi:10.1016/j.pec.2010.08.017
15. Musuka G, Mukandavire Z, Murewanhema G, et al. HIV status, knowledge and prevention of cervical cancer amongst adolescent girls and women: a secondary data analysis. *Pan Afr Med J.* 2022;41. doi:10.11604/pamj.2022.41.262.32615
16. Zanobini P, Bonaccorsi G, Giusti M, et al. Health literacy and breast cancer screening adherence: results from the population of Tuscany, Italy. *Health Promot Int.* 2023;38(6). doi:10.1093/heapro/daad177
17. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Ann Intern Med.* 2011;155(2):97–107. doi:10.7326/0003-4819-155-2-201107190-00005
18. Li H, Zeng H, Zheng R, et al. Association of cancer awareness levels with the risk of cancer in rural China: a population-based cohort study. *Cancer.* 2020;126(20):4563–4571. doi:10.1002/cncr.33029
19. Ajzen I. The theory of planned behavior. *Organ Behav Human Decision Processes.* 1991;50(2):179–211. doi:10.1016/0749-5978(91)90020-T
20. Liu JLJ, Cui Y, Zhang N, Wang J. Development and revision of cancer health literacy scale for Chinese residents. *Chinese J Cancer Prevention Treatm.* 2020;27(18):1498–1502+1514.
21. Mensah ABB, Mikare M, Mensah KB, et al. Impact of cancer diagnosis and treatment: a qualitative analysis of strains, resources and coping strategies among elderly patients in a rural setting in Ghana. *BMC Geriatr.* 2023;23(1):540. doi:10.1186/s12877-023-04248-8
22. González González S, Fernández Rodríguez C, Pérez Rodríguez J, Amigo I. [Depression secondary prevention in primary care] Prevención secundaria de la depresión en atención primaria. *Psicothema.* 2006;18(3):471–477.
23. Hu Q, Hu W, Han W, Pan L. Web-based short video intervention and short message comparison of repeat blood donation behavior based on an extended theory of planned behavior: prospective randomized controlled trial study. *J Med Internet Res.* 2022;24(12):e37467. doi:10.2196/37467
24. Wu L, Chen G-Z, Zeng Z-R, et al. Analysis of breast cancer screening results and influencing factors of breast cancer in Guangdong province from 2017 to 2021. *J Epidemiol Glob Health.* 2024;14(1):131–141. doi:10.1007/s44197-023-00176-3
25. Thrift AP, Wenker TN, El-Serag HB. Global burden of gastric cancer: epidemiological trends, risk factors, screening and prevention. *Nat Rev Clin Oncol.* 2023;20(5):338–349. doi:10.1038/s41571-023-00747-0
26. Campi R, Rebez G, Klatté T, et al. Effect of smoking, hypertension and lifestyle factors on kidney cancer - perspectives for prevention and screening programmes. *Nat Rev Urol.* 2023;20(11):669–681. doi:10.1038/s41585-023-00781-8
27. McNaughton CD, Jacobson TA, Kripalani S. Low literacy is associated with uncontrolled blood pressure in primary care patients with hypertension and heart disease. *Patient Educ Couns.* 2014;96(2):165–170. doi:10.1016/j.pec.2014.05.007
28. Morris NS, Field TS, Wagner JL, et al. The association between health literacy and cancer-related attitudes, behaviors, and knowledge. *J Health Communication.* 2013;18(Suppl 1):223–241. doi:10.1080/10810730.2013.825667
29. Parviniannasab AM, Faramarzian Z, Hosseini SA, Hamidizadeh S, Bijani M. The effect of social support, diabetes management self-efficacy, and diabetes distress on resilience among patients with type 2 diabetes: a moderated mediation analysis. *BMC Public Health.* 2024;24(1):477. doi:10.1186/s12889-024-18022-x
30. Zhenqiu S, Yongyong X. *Medical Statistics (Four Edition)*. People's Medical Publishing House (PMPH); 2002.
31. Qin Y, Binbin Y, Na L. The status and influencing factors of cancer health literacy among rural residents in Shandong. *J Community Med.* 2022;20(22):1249–1253+1259. doi:10.19790/j.cnki.JCM.2022.22.02
32. Shi JF, Mao AY, Liu CC, et al. Health literacy and awareness of cancer control in urban China, 2005–2017: overall design of a national multicenter survey. *Zhonghua Yu Fang Yi Xue Za Zhi.* 2020;54(1):108–112. doi:10.3760/cma.j.issn.0253-9624.2020.01.020
33. Gibson RC, James K, Waldron NK, Abel WD, Eldemire-Shearer D, Mitchell-Fearon K. Patterns of depressive symptoms among younger elderly (60–74 years old) and older elderly (≥ 75 years old) in Jamaica. *Int Psychogeriatr.* 2019;31(8):1217–1224. doi:10.1017/s104161021800162x
34. Wang J, Wang Y, Korivi M, Chen X, Zhu R. Status of sedentary time and physical activity of rural residents: a cross-sectional population-based study in Eastern China. *Front Public Health.* 2022;10:838226. doi:10.3389/fpubh.2022.838226
35. Negash BA, Bayu NH, Woretaw AW. Knowledge, attitude, and associated factor towards cervical cancer prevention among primary and secondary school female teachers in Gondar town, North West Ethiopia, 2022. *BMC Womens Health.* 2023;23(1):365. doi:10.1186/s12905-023-02498-7
36. Junchao F, Wei L, Zhipeng C, Wenqiang Y, Hongwei G, Jinwei H. Analysis of rural resident' cognition and signing intention to family doctors. *Chinese Health Service Manag.* 2019;36(07):524–526.

37. Bardage C, Pluijm SMF, Pedersen NL, et al. Self-rated health among older adults: a cross-national comparison. *Eur J Ageing*. 2005;2(2):149–158. doi:10.1007/s10433-005-0032-7
38. Kelly KM, Shedlosky-Shoemaker R, Porter K, Remy A, DeSimone P, Andrykowski MA. Cancer family history reporting: impact of method and psychosocial factors. *J Genet Couns*. 2007;16(3):373–382. doi:10.1007/s10897-006-9076-x
39. Ogunmodede AJ, Abiodun O, Makanjuola AB, Olarinoye JK, Ogunmodede JA, Buhari OI. Burden of care and psychological distress in primary caregivers of patients with type –2 diabetes mellitus in A tertiary hospital in Nigeria. *Ethiop J Health Sci*. 2019;29(6):697–708. doi:10.4314/ejhs.v29i6.6
40. Wu NHK, Yang L. Analysis on health literacy and its influencing factors about cancer prevention and control among urban residents in Guangxi. *Chinese J Dis Control Prevention*. 2019;23(06):711–716.
41. Liu Y-L, Gong S-P, Zhang J, Liu S-Q. Analysis of health literacy and influencing factors for tumour prevention and control among Jinan residents. *Public Health Manag China*. 2018;34(01):127–130. doi:10.19568/j.cnki.23-1318.2018.01.038
42. Cao W, Hu Y, Chen W. Promoting high-quality development of cancer control and prevention to effectively reduce the burden of cancer. *Bulletin Chinese Cancer*. 2024;33(1):1–5.
43. Huang M, Rozelle S, Cao Y, et al. Primary care quality and provider disparities in China: a standardized-patient-based study. *Lancet Reg Health-W Pac*. 2024;50:101161. doi:10.1016/j.lanwpc.2024.101161
44. Perez M, Abisaad JA, Rojas KD, Marchetti MA, Jaimes N. Skin cancer: primary, secondary, and tertiary prevention. Part I. *J Am Acad Dermatol*. 2022;87(2):255–268. doi:10.1016/j.jaad.2021.12.066
45. Shankar A, Roy S, Bhandari R, et al. Level of awareness of lung cancer risk factors, signs, symptoms and safe practices among college teachers of different states in India: do awareness programmes have an impact on adoption of safe practices? *Gulf J Oncolog*. 2015;1(19):57–62.
46. Wang A. Impact of cancer health literacy on health self-management behaviours of university students at a medical college. *Dalian Medical University*; 2022.
47. Brunet J, Sharma S. A scoping review of studies exploring physical activity and cognition among persons with cancer. *J Cancer Surviv-Res Pract*. 2023. doi:10.1007/s11764-023-01441-x
48. Ryan P. Integrated Theory of Health Behavior Change. *Clin Nurse Spec*. 2009;23(3):161–172. doi:10.1097/NUR.0b013e3181a42373
49. Zerbinati L, Folesani F, Caruso R, et al. Maladaptive coping styles moderate the relationship between information on cancer treatment and psychosocial symptoms: an Italian multicenter study. *Front Psychol*. 2024;15:1338193. doi:10.3389/fpsyg.2024.1338193
50. Balla J, Hagger MS. Protection motivation theory and health behaviour: conceptual review, discussion of limitations, and recommendations for best practice and future research. *Health Psychol Rev*. 2025;19(1):145–171. doi:10.1080/17437199.2024.2413011
51. Hou WK, Liang L, Lau KM, Hall M. Savouring and psychological well-being in family dyads coping with cancer: an actor-partner interdependence model. *Eur J Cancer Care*. 2019;28(4):e13047. doi:10.1111/ecc.13047
52. Jensen JD, Shannon J, Iachan R, et al. Examining rural–urban differences in fatalism and information overload: data from 12 NCI-designated cancer centers. *Cancer Epidemiol Biomarkers Prev*. 2022;31(2):393–403. doi:10.1158/1055-9965.EPI-21-0355
53. Wang Z, Xia Q, Meng P, et al. Social determinants of health and cancer screening in China. *Lancet Reg Health West Pac*. 2024;44:101043. doi:10.1016/j.lanwpc.2024.101043
54. Tahergorabi Z, Mohammadifard M, Salmani F, Moodi M. Breast cancer screening behavior and its associated factors in female employees in South Khorasan. *J Educ Health Promotion*. 2021;10(1):102. doi:10.4103/jehp.jehp_750_20
55. Klasko-Foster LB, Kiviniemi MT, Jandorf LH, Erwin DO. Affective components of perceived risk mediate the relation between cognitively-based perceived risk and colonoscopy screening. *J Behav Med*. 2020;43(1):121–130. doi:10.1007/s10865-019-00049-w
56. Jones SMW, Schuler TA, Padamsee TJ, Andersen MR. Financial anxiety is associated with cancer screening adherence in women at high risk of breast cancer. *Ann Behav Med*. 2021;55(12):1241–1245. doi:10.1093/abm/kaab010

Risk Management and Healthcare Policy

Publish your work in this journal

Risk Management and Healthcare Policy is an international, peer-reviewed, open access journal focusing on all aspects of public health, policy, and preventative measures to promote good health and improve morbidity and mortality in the population. The journal welcomes submitted papers covering original research, basic science, clinical & epidemiological studies, reviews and evaluations, guidelines, expert opinion and commentary, case reports and extended reports. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/risk-management-and-healthcare-policy-journal>

Dovepress
Taylor & Francis Group