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## Relationship between Fatalistic Cancer Beliefs and Risky Health Behaviors

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## Relationship between Fatalistic Cancer Beliefs and Risky Health Behaviors

### Abstract

**Background:** There is limited research on how fatalism influences risky health behaviors that are linked to higher cancer risks. This study investigates the relationship between risky health behaviors (tobacco smoking, electronic cigarette use, and heavy alcohol drinking) and fatalistic cancer beliefs while controlling for healthcare-related self-efficacy and sociodemographic and clinical factors among adults without a history of cancer.

**Methods:** We used cross-sectional data from the 2020 Health Information National Trends Survey (HINTS) 5 Cycle 4. The study sample included noninstitutionalized adults (aged  $\geq 18$  years without a self-reported cancer history ( $n=2,464$ )). The outcome variable was risky health behaviors comprised of tobacco smoking, electronic cigarette use, and heavy alcohol drinking. We combined these three risky behaviors into a binary variable (0, not having risky health behavior; 1, having  $\geq 1$  risky health behavior). The key independent variable was cancer fatalistic beliefs. We used descriptive statistics and multivariate logistic regression analyses.

**Results:** Overall, 50% of the sample were women, 64.7% of participants self-identified as non-Hispanic White, 16.4% as Hispanic, and 10.6% as non-Hispanic Black. About 43% of participants reported having at least one risky health behavior. While holding all other factors constant, each unit increase in cancer fatalism score was associated with 30.0% higher odds of increased risky health behaviors (OR=1.30, 95% CI 1.04-1.62,  $p=.021$ ) among adults without a history of cancer.

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3 25 **Conclusion:** By understanding the relationship between cancer-related fatalistic beliefs and risky  
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5 26 health behaviors, cancer prevention outreach programs can be personalized to suit the unique  
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7 27 needs of specific individuals and communities.  
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13 29 **Keywords:** Cancer; Primary Prevention; Health Risk Behaviors; Tobacco Use; Vaping; Alcohol  
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16 30 Drinking  
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3 53 By the end of 2024, about 2 million new cancer cases are expected to occur in the U.S.<sup>1</sup>  
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5 54 Adopting health behaviors such as maintaining a healthy diet, exercising, not smoking, not  
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7 55 engaging in excessive alcohol drinking, and adhering to cancer screening guidelines may prevent  
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9 56 these cancer cases by 50%.<sup>2</sup> Moreover, according to the World Health Organization, other  
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11 57 factors can also be related to cancer prevention, such as maintaining a healthy body weight and  
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13 58 avoiding processed meat, ultraviolet radiation, and other pollutants.<sup>3</sup> In this paper, we focus on  
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15 59 cigarette smoking, electronic cigarette use, and alcohol consumption because these behaviors  
16  
17 60 have the potential to interact significantly and multiply health consequences due to their  
18  
19 61 addictive qualities.<sup>4,5</sup> All of these substances are known carcinogens, and approximately  
20  
21 62 one-third of cancer cases are believed to result from exposure to class one carcinogens, with  
22  
23 63 tobacco usage playing a prominent role as the primary factor,<sup>6-10</sup> yet 28.3 million (11.5%) adults  
24  
25 64 aged 18 and over in the US currently smoke cigarettes.<sup>11</sup> Moreover, the prevalence of e-  
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27 65 cigarette use continues to increase, reaching 6%,<sup>12</sup> and about 14% of adults engage in  
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29 66 binge alcohol drinking.<sup>13</sup> Therefore, understanding the psychosocial aspects of the use of  
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31 67 these substances is essential for cancer prevention.  
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### 38 ***Cancer Fatalism and Risky Behaviors*** 39 40

41 69 Cancer fatalism is a multidimensional concept often operationalized by beliefs of  
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43 70 predetermination, pessimism, inevitable death, and helplessness when a diagnosis of cancer is  
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45 71 present.<sup>14</sup> Cancer fatalism can be more prevalent among specific population groups, such as  
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47 72 racial and ethnic minorities, individuals with lower socioeconomic status, lower educational  
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49 73 attainment, or residents of rural areas.<sup>15-18</sup> Therefore, fatalistic belief explorations hold  
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51 74 significance in promoting healthcare among general population with specific focus in under-  
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53 75 resourced communities.  
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3 76 Cancer fatalism has been identified as a barrier to participation in certain cancer  
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5 77 screening, prevention, detection, and treatment activities.<sup>14,19,20</sup> For example, a study reported  
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7 78 that individuals who held higher cancer fatalistic beliefs were less likely to undergo a fecal  
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9 79 immunochemical test for colon cancer than those who did not.<sup>21</sup> Information seeking related to  
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11 80 cancer prevention and control is also reported to be low among individuals with higher fatalistic  
12  
13 81 beliefs.<sup>14</sup> Thus, cancer fatalistic beliefs may lead to lower utilization of cancer-preventative  
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15 82 screening and knowledge. In this study, we are focusing on three major risky health behaviors—  
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17 83 cigarette smoking, e-cigarette use, and heavy alcohol drinking. Evidence is clear that cigarette  
18  
19 84 smoking and heavy alcohol consumption increase the risk of developing cancer significantly.<sup>6</sup>  
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21 85 Research shows that cigarette smoking is responsible for about 20% of all cancer cases and about  
22  
23 86 30% of all cancer deaths in the US.<sup>9</sup> Globally, little over four percent of cancer cases were due  
24  
25 87 to alcohol consumption in 2020.<sup>6</sup> When it comes to e-cigarette use, recent studies have  
26  
27 88 questioned the safety of e-cigarette use and pointed toward the possibility of carcinogenic risks  
28  
29 89 associated with its use.<sup>7,8</sup> Considering the strong link between risky health behaviors and cancer  
30  
31 90 incidence, it is essential to evaluate the role of cancer fatalistic beliefs in the adoption of risky  
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33 91 health behaviors and their interplay with other individual-level factors that can affect this  
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35 92 relationship.  
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### 43 ***Purpose***

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45 94 The ultimate goal of this research is to gain a deeper understanding of cancer-related  
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47 95 fatalistic beliefs and their association with risky health behaviors to help healthcare professionals  
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49 96 and policymakers develop interventions targeted to promote cancer prevention services. Thus,  
50  
51 97 the objective of the current study is to investigate the relationship between cancer-related  
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53 98 fatalistic beliefs and three risky health behaviors (cigarette smoking, e-cigarette use, and heavy  
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3 99 alcohol drinking) among adults without a self-reported cancer history while controlling for  
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5 100 individual-level socio-demographic and clinical factors and health efficacy. We hypothesize that  
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7 101 individuals with higher fatalistic beliefs scores will be more likely to report having at least one  
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10 102 risky health behavior.

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## 104 **Methods**

### 105 *Data Source and Sample*

106 For the current study, we used cross-sectional data from the 2020 Health Information  
107 National Trends Survey (HINTS) 5 Cycle 4. HINTS is a population-based, nationally-  
108 representative survey of U.S. non-institutionalized adults aged 18+ years established in 2004 by  
109 the National Cancer Institute, one of the agencies affiliated with the US Department of Health  
110 and Human Services. It gathers data on the public's need for health-related information, access to  
111 it, and usage patterns, as well as perceptions, behaviors, communication, and knowledge  
112 concerning cancer. Data for HINTS 5 cycle 4 were collected between February 2020 and June  
113 2020 by self-administered mailed questionnaire. The overall response rate was 36.7%. A total of  
114 3,865 respondents were included in the HINTS 5, Cycle 4.<sup>22</sup>

115 We included adults (aged  $\geq 18$  years) without a self-reported cancer history for the  
116 current study. Those who reported "yes" to the following question, "Have you ever been  
117 diagnosed as having cancer?" were excluded from the current study ( $n = 626$ ). Further, we  
118 excluded observations with missing values and with multiple responses selected in error ( $n =$   
119 775) to help reduce bias and increase accuracy in our analysis. Thus, the final analytic sample  
120 consisted of 2,464 adults (aged  $\geq 18$  years) without a self-reported cancer history. The HINTS is

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3 121 a publicly available deidentified dataset (contains no individual or state identifiers). Therefore,  
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5 122 no Institutional Review Board approval was required.

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8 123 ***Measures***

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10 124 ***Outcome Variable.*** The dependent variable was risky health behaviors, which consisted of three  
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12 125 specific behaviors: tobacco use, e-cigarette use, and alcohol use. Tobacco use was categorized as  
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14 126 1 (current tobacco users) or 0 (no tobacco use). Current tobacco use was defined as individuals  
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16 127 who had smoked at least 100 cigarettes in their lifetime and currently reported smoking every  
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18 128 day or some days. No tobacco users were individuals who did not smoke 100 cigarettes in their  
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20 129 lifetime and former smokers who smoked at least 100 cigarettes in their entire lifetime but  
21  
22 130 reported not smoking at all during data collection. E-cigarette use was categorized as 1 (current  
23  
24 131 e-cigarette users, those who had ever used an e-cigarette, even if it was just one or two times, and  
25  
26 132 currently used an e-cigarette every day or on some days) or 0 (former or no e-cigarette use). To  
27  
28 133 measure alcohol consumption, participants were asked two open-ended questions: "During the  
29  
30 134 past 30 days, how many days per week did you have at least one drink of any alcoholic  
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32 135 beverage?" and "During the past 30 days, on the days when you drank, about how many drinks  
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34 136 did you drink on average?" Following the 2020-2025 Dietary Guidelines for Americans,<sup>23</sup>  
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36 137 participants who reported consuming more than one drink per day on average were classified as  
37  
38 138 heavier drinkers (1) and those who did not were classified as not heavy drinkers (0). We then  
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40 139 combined these three health behaviors into a single variable and categorized them as 0 (not  
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42 140 having any risky health behavior) or 1 (having  $\geq 1$  risky health behavior).

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46 142 ***Independent Variable.*** The key independent variable of interest was cancer fatalistic beliefs.  
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48 143 Study participants were asked the following question: "How much do you agree or disagree with  
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3 144 each of the following statements?" followed by three statements: (1) It seems like everything  
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5 145 causes cancer (item N2a); (2) There's not much you can do to lower your chances of getting  
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7 146 cancer (Item N2b); and (3) There are so many different recommendations about preventing  
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10 147 cancer it's hard to know which ones to follow (Item N2c). The cancer fatalism items featured in  
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12 148 the HINTS surveys are distinct and have been consistently used by previous research to  
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15 149 demonstrate the potential for predicting cancer prevention behaviors.<sup>14,19,24</sup> Each statement had  
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17 150 four response choices: 1 = strongly agree, 2 = somewhat agree, 3 = somewhat disagree, and 4 =  
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19 151 strongly disagree, with suboptimal internal consistency ( $\alpha = 0.61$ ).<sup>25</sup> Following previous studies,  
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21 152 we investigated each cancer fatalism measure separately and combined them as an overall  
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24 153 score.<sup>19,26</sup> First, for each statement, we created binary variables by combining strongly agree and  
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26 154 somewhat agree into one category and somewhat disagree and strongly disagree into another  
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28 155 category. We also combined all three statements to yield an overall score for fatalistic beliefs. To  
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30  
31 156 create the combined score, we first reverse-coded the responses so that 1 = strongly disagree, 2 =  
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33 157 somewhat disagree, 3 = somewhat agree, and 4 = strongly agree. The overall scores ranged from  
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35 158 1 (not having fatalistic beliefs) to 4 (having fatalistic beliefs), with a higher number indicating  
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38 159 higher fatalistic beliefs. Then, we used a cut-off score from the overall score to report  
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40 160 participants with high fatalistic beliefs (overall score  $\geq 3$ ) and low fatalistic beliefs (overall score  
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42 161  $< 3$ ).

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45 162 **Covariates.** Based on the literature, we included a robust set of individual-level covariates, such  
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47 163 as socio-demographic and clinical characteristics, to account for well-established factors  
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49 164 associated with cancer fatalism.<sup>17,18</sup> Moreover, we added covariates that are related to better  
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52 165 health outcomes by influencing cancer prevention behaviors, such as self-efficacy (confidence in  
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54 166 taking good care of their health) and healthcare provider visits.<sup>27,28</sup> Self-reported individual-level

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3 167 demographic variables included age (18-49, 50-64, 65-74, 75+), sex (male, female), race and  
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5 168 ethnicity (non-Hispanic Black, Hispanic, non-Hispanic White, Other), and marital status  
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8 169 (married, not married). Socioeconomic variables included annual household income (<\$34,000,  
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10 170 \$35,000 to < \$75,000,  $\geq$  75,000), education attainment (college graduate and postgraduate, some  
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12 171 college, high school or lower level), and health insurance coverage (yes, no). Clinical variables  
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15 172 were frequency of provider visits in the past 12 months (no visit, 1-2 visits,  $\geq$  3 visits); general  
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17 173 health status (excellent/very good, good, fair/poor health); and chronic health conditions, which  
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19 174 included diabetes, hypertension, heart conditions (heart attack, angina, or congestive heart  
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21 175 failure), lung disease (asthma, emphysema, or chronic bronchitis), and depression or anxiety  
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24 176 disorder. Study participants were categorized as not having chronic health conditions, having one  
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26 177 condition, two conditions, and three or more chronic health conditions.  
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29 178 Self-efficacy was measured by asking participants, "Overall, how confident are you about  
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31 179 your ability to take good care of your health?" with response choices ranging from not at all  
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34 180 confident to completely confident. We combined the five choices into three categories  
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36 181 (very/completely confident, somewhat confident, and a little/not confident at all).  
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### 39 182 *Statistical Analyses*

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42 183 We first calculated unweighted frequencies of sample characteristics. Then, we applied  
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44 184 the recommended sample weights provided in the HINTS 5 Cycle 4 dataset. These sample  
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46 185 weights ensure valid inferences from the sample to the target population while minimizing non-  
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49 186 response and non-coverage biases to the greatest extent possible.  
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52 187 Sample weight accounts for the number of people in the population that the sampled  
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54 188 person represents. We calculated descriptive statistics, weighted percentages with their  
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189 corresponding 95% confidence intervals (CI), and weighted means and standard errors (SE) for  
190 study variables to describe sample characteristics. We conducted multivariable logistic  
191 regression analyses to investigate the relationship between cancer fatalism score and risky health  
192 behaviors among study participants while controlling for all other covariates in the model. We  
193 estimated weighted adjusted odds ratios (aORs) and their 95% CIs; a 2-sided P value of .05 was  
194 considered statistically significant. All analyses were conducted in STATA v. 17.

## 196 **Results**

### 197 *Sample Characteristics*

198 The final sample included 2,464 noninstitutionalized U.S. adults (aged  $\geq 18$  years)  
199 without a self-reported cancer history. After applying the weights, the sample represents  
200 184,859,216 noninstitutionalized U.S. adults without a self-reported cancer history. Table 1  
201 provides details about the study sample. The majority of the sample (58.2%) were aged between  
202 18-49 years, married (55.5%), and about half were men (50.04%). A total of 64.7% of the sample  
203 self-identified as non-Hispanic White, 16.4% as Hispanic, and 10.6% as non-Hispanic Black. In  
204 terms of self-efficacy, 69.2% of the sample self-reported to be either completely confident or  
205 very confident about their ability to take good care of their health. In the past year, 16.9% self-  
206 reported no past year clinic visit, and 56.1% had at least one chronic health condition.

### 208 *Health Behaviors*

209 Table 2 shows the health behaviors of the study participants. A total of 14.5% were  
210 current cigarette smokers, and 7.8% were current e-cigarette users. During the past 30 days,  
211 32.4% of the sample self-reported having, on average,  $\geq 2$  drinks per day on the days when they  
212 drank. Regarding combined risky health behaviors, 43.0% of participants self-reported having at  
213 least one risky health behavior, and 57.0% reported having no risky health behaviors.

### 214 ***Cancer Fatalism***

215 Table 2 presents the cancer fatalism of study participants. Overall, 71.6% reported that they  
216 either strongly or somewhat agree with the fact that everything causes cancer, and 28.7%  
217 strongly or somewhat agree with the statement that there is not much you can do to lower your  
218 chances of getting cancer. The majority of the participants (74.7%) agreed that there are many  
219 different recommendations for cancer prevention, and it is hard to decide which ones to follow.  
220 The average cancer fatalism score (combined from three statements) reported by the study  
221 sample was 2.61 (SE = 0.02, 95% CI 2.57-2.64). By making a cutoff score, 31.8% of study  
222 participants had higher fatalistic beliefs, and 65.2% had lower fatalistic beliefs.

### 223 ***Relationship Between Cancer Fatalism and Risky Health Behaviors***

224 Table 3 presents the findings of the multivariable logistic regression model. The findings  
225 showed that while holding all other factors constant, each unit increase in cancer fatalism score is  
226 associated with 30.0% higher odds of increased risky health behaviors among adults without a  
227 history of cancer (aOR = 1.30, 95% CI 1.04-1.62,  $p = .021$ ). Findings also showed that younger  
228 age (18-49 years) and people without health insurance have higher odds of reporting risky health  
229 behaviors. Compared to non-Hispanic White individuals, Hispanic individuals (aOR = 0.42,  
230 95% CI 0.25-0.69,  $p = .001$ ), non-Hispanic Black individuals (aOR = 0.49, 95% CI 0.30-0.80,  $p$   
231 = .006) and individuals of other races (aOR = 0.53, 95% CI 0.30-0.92,  $p = .026$ ) had lower odds

232 of reporting at least one risky behavior. Participants with higher education attainment (holding at  
233 least a college degree) had significantly lower odds of reporting at least one risky health behavior  
234 than those with high school or lower levels of education attainment (aOR = 0.62, 95% CI 0.40-  
235 0.94,  $p = .025$ ). Male participants had 60% higher odds of reporting at least one risky health  
236 behavior than female participants (aOR = 1.60, 95% CI 1.19-2.14,  $p = .002$ ). For health-related  
237 self-efficacy, respondents who self-reported little or no confidence at all about taking good care  
238 of their health were 54% less likely to have one or more risky health behaviors (aOR = 0.46,  
239 95% CI 0.23-0.93,  $p = .031$ ) compared to their counterparts who expressed higher confidence in  
240 taking good care of their health.

241

## 242 Discussion

243 Using nationally representative, population-based data, this study investigated the  
244 relationship between fatalistic cancer beliefs and risky health behaviors among adults without a  
245 history of cancer. Overall, this study contributes to understanding the psychosocial dimensions of  
246 cancer preventive behaviors. Previous investigations have highlighted a link between the absence  
247 of preventive behaviors, such as infrequent exercise, non-smoking, and inadequate consumption  
248 of five or more servings of fruits and vegetables, and the presence of stronger fatalistic beliefs  
249 regarding cancer<sup>19</sup> Additionally, certain risky behaviors, notably cigarette smoking, have been  
250 associated with specific beliefs about cancer with some evidence pointing in the direction that  
251 people who smoke overestimate their risk for cancer, while other studies indicate that they  
252 underestimate their risk for cancer.<sup>29</sup> Our study results demonstrated a positive relationship  
253 between cancer fatalism and risky health behaviors. However, to the best of our knowledge, this  
254 study is the first of its kind in the field, examining the relationship between cancer fatalism and a

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3 255 combination of three risky health behaviors, including cigarette smoking, e-cigarette smoking,  
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5 256 and heavy alcohol drinking. Limited evidence exists to thoroughly investigate and understand the  
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7 257 intricate psychosocial factors that underlie cancer fatalism and its impact on risky health  
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9 258 behaviors. Thus, the comparison of our study findings with the current literature is limited. In  
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11 259 this nationally representative sample, 43.0% of individuals reported engaging in one of the risky  
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13 260 health behaviors. Future studies are critically needed to better understand the role of cancer  
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15 261 fatalism in the prevention of these risky health behaviors that have detrimental effects on an  
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17 262 individual's chances of prevention against certain cancers.

22 263 Cancer-related fatalistic beliefs can be influenced by various social, cultural, and  
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24 264 economic factors. Research shows that people from under-resourced financial and educational  
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26 265 circumstances often hold more fatalistic beliefs, which can create obstacles in obtaining the  
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28 266 healthcare services, information, and resources essential for preventing cancer, in addition to  
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30 267 other factors.<sup>30,31</sup> Cultural beliefs can influence how people approach cancer prevention. For  
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32 268 example, some communities might see cancer as inevitable, making them less likely to take steps  
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34 269 to prevent it.<sup>32</sup> Faith or spiritual practices may also impact cancer fatalism beliefs.<sup>33</sup> Addressing  
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36 270 these underlying factors is essential for promoting health equity in cancer prevention. By  
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38 271 understanding the fatalistic associations and their underlying causes, interventions can be tailored  
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40 272 to specific communities and individuals, considering the context of unique social, cultural, and  
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42 273 economic circumstances. Culturally tailored faith-based interventions may be a means to educate  
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44 274 individuals from diverse backgrounds on cancer prevention behaviors.<sup>34</sup> Community-based  
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46 275 strategies such as partnering with community health workers and paraprofessionals can enhance  
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48 276 cancer awareness, reduce cancer-related cultural, religious, or spiritual stigmas, and ultimately  
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50 277 reduce disparities in cancer prevention and screening in under-resourced communities.<sup>35</sup>

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3 278 In our research, we considered various factors, like the presence of chronic illnesses and  
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5 279 socio-demographic characteristics, to better understand their relationship with health-related  
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7 280 behaviors. Prior research has shown that age,<sup>36,37</sup> sex,<sup>36,37</sup> health insurance,<sup>37,38</sup> education,<sup>39</sup> and  
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9 281 race<sup>36</sup> trends can be observed in the related literature estimating the prevalence of smoking, e-  
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11 282 cigarette, and alcohol use among U.S. adults. We found some similar results and trends in our  
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13 283 research. Therefore, our findings contribute to existing research by revealing that younger  
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15 284 individuals, males, non-Hispanic white individuals, and those without health insurance are more  
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17 285 likely to engage in risky health behaviors.  
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22 286 Our study findings also showed that those who expressed little or no confidence in their  
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24 287 ability to maintain good health were less likely to report engaging in one or more risky health  
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26 288 behaviors than those who felt confident in their health management skills. This suggests a  
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28 289 protective effect of not feeling fully satisfied with one's ability to care for oneself, leading to a  
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30 290 more cautious approach towards risky health behaviors. Although health-related self-efficacy is  
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32 291 generally known to positively influence health-related behaviors,<sup>40</sup> previous research has also  
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34 292 highlighted conflicting results. For example, a study using HINTS data found that overweight or  
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36 293 obese non-Hispanic Black individuals holding fatalistic beliefs and high self-efficacy have less  
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38 294 tendency to order food (fewer food items of less calorie food at a fast food or sit-down  
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40 295 restaurant) than their healthy non-Hispanic Black counterparts. However in the same study, high  
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42 296 self-reported self-efficacy negatively impacted weight management in individuals with obesity,  
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44 297 potentially due to overestimating their knowledge about physical activity when higher fatalistic  
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46 298 beliefs were present.<sup>41</sup> Therefore, further research is required to explore the relationship between  
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48 299 self-reported health-related self-efficacy and actual health behaviors when fatalistic beliefs are  
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50 300 present.  
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3 301 When high levels of fatalistic beliefs are detected, fostering long-term relationships with  
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5 302 patients can enable healthcare providers to gradually address these attitudes through regular  
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7 303 follow-up appointments, ongoing check-ins, and continuous education focused on adopting  
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9 304 healthier behaviors and reducing cancer-related risks.<sup>42</sup> Increasing health literacy may be another  
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11 305 strategy to mitigate the risk of cancer fatalism and the early adoption of cancer prevention  
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13 306 screening as lower health literacy is associated with higher cancer fatalistic beliefs and low  
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15 307 information seeking about cancer prevention behaviors.<sup>14</sup> Thus, improving health literacy may be  
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17 308 a positive measure to prevent cancer fatalistic beliefs and promote more empowerment and  
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19 309 awareness regarding the relevance of cancer screening and prevention. However, with any  
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21 310 amount of health literacy, cancer prevention messages must be portrayed in such a manner that  
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23 311 the information is not difficult to manage or process for people, as that cause causes information  
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25 312 overload and lack of action.<sup>43</sup>

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31 313 Media and television alone also play a crucial role in cancer fatalism. It is seen that there  
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33 314 is a change in cancer prevention behaviors following the broadcasting of a cancer incidence by a  
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35 315 popular television personality.<sup>44</sup> Leveraging such knowledge and opportunities may be an  
36  
37 316 efficient strategy to create mass awareness about cancer prevention and screening.<sup>44</sup> Sometimes  
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39 317 the media also propagates cancer research and prevention strategies with or without the  
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41 318 involvement of a person with relevant scientific expertise. All these steps may have a positive or  
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43 319 negative impact on the population regarding their cancer screening behaviors and information-  
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45 320 seeking.<sup>44,45</sup> The media can also influence cancer fatalism.<sup>43</sup> A recent meta-analysis on cancer  
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47 321 fatalism has pointed out that cancer fatalism is positively linked to TV exposure and information  
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49 322 avoidance and negatively linked to radio or internet exposure and cancer screenings.<sup>43</sup> Therefore,  
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323 more responsible acts and appropriate media outlets could be solicited to create cancer  
324 awareness.

325 Our study highlights the importance of integrating e-cigarette education into  
326 comprehensive cancer prevention strategies that also address heavy alcohol consumption and  
327 cigarette smoking. Nurses have a pivotal role in educating individuals about both traditional  
328 cigarette and e-cigarette use. Based on prior research, the United States Preventive Services Task  
329 Force report includes advice from nurses to participants about smoking cessation as an evidence-  
330 based tool for quitting smoking.<sup>46</sup> Particularly in community healthcare settings, nurses should  
331 prioritize discussions about e-cigarette use within the context of cancer prevention. It is crucial to  
332 emphasize that e-cigarette devices are not a healthier substitute for conventional smoking.<sup>8</sup> When  
333 individuals use these devices, exploring potentially risky health behaviors and providing relevant  
334 cancer prevention information becomes essential. Nurses can provide information about various  
335 Nicotine Replacement Therapy (NRT) options, such as nicotine gum, patches, or lozenges, and  
336 assist patients in selecting the most suitable method for their individual needs.<sup>47</sup> Hence, by  
337 leveraging the trusted role of nurses, cancer prevention efforts related to tobacco smoking, e-  
338 cigarette use, and heavy alcohol consumption can be significantly enhanced.

### 339 ***Limitations***

340 Our study has several limitations that need to be acknowledged. We used cross-sectional  
341 data that shows only the association between study variables and does not allow for establishing  
342 causal relationships. In our study, we were mainly focused on three risky health behaviors.  
343 However, future researchers should study other health behaviors as well, such as dietary  
344 practices, sedentary lifestyle or reluctance to exercise, sunscreen use, etc., for a more robust  
345 understanding of the impact of cancer fatalistic beliefs. Due to the secondary nature of the

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3 346 analysis, we were only focused on the pre-selected socio-demographic characteristics and other  
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5 347 survey questions developed by the HINTS. Therefore, several variables that may be associated  
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7 348 with the perception of cancer fatalism and risky health behaviors may be absent from the current  
8  
9 349 analysis. The data were self-reported, and participants may have underreported the risky health  
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11 350 behaviors. The study included adults without a cancer history. Therefore, the generalizability of  
12  
13 351 our findings beyond this population should be considered cautiously.  
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## 17 352 **Conclusion**

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20 353 We offer valuable insights that can support the development and implementation of  
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22 354 cancer prevention measures targeted at the psychosocial barrier of cancer fatalism. By gaining a  
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24 355 better understanding of the association between cancer-related fatalistic beliefs and risky health  
25  
26 356 behaviors, nurses, other healthcare professionals, and policymakers can develop strategies to  
27  
28 357 overcome these barriers effectively. This approach can reduce the long-term burden of cancer  
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30 358 and other health conditions related to cigarette smoking, e-cigarette use, and heavy alcohol  
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32 359 consumption.  
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395 [%20disease.](https://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/index.htm#:~:text=In%202021%2C%20nearly%2012%20of,with%20a%20smoking%2Drelated%20disease.)
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502 Table 1. Individual-level characteristics of adults without cancer history, HINTS 2020

Characteristics	Unweighted sample, n	Weighted sample,* % (95% CI)
	N= 2464	N=184,859,216
<b>Age</b>		
18-49	998	58.21% (55.88-60.51)
50-64	763	26.69% (24.54-28.96)
65-74	505	10.34% (9.60-11.14)
≥75	198	4.76% (4.18-5.41)
<b>Sex</b>		
Female	1410	49.96% (48.35- 51.57)
Male	1054	50.04% (48.43-51.65)
<b>Race and Ethnicity</b>		
Non-Hispanic White	1522	64.68% (63.29-66.06)
Hispanic	411	16.41% (15.18-17.71)
Non-Hispanic Black	323	10.59% (9.71-11.53)
Other	208	8.32% (7.49-9.24)
<b>Marital Status</b>		
Married	1387	55.45% (53.88-57.02)
Not Married	1077	44.55% (42.98-46.12)
<b>Education</b>		
High-school or less	532	26.79% (24.71- 28.97)
Some College	713	39.82% (37.59-42.10)
College-degree or more	1219	33.39% (32.18-34.62)
<b>Annual household Income</b>		
< \$34,000	651	22.49% (20.45-24.67)
≥ \$35,000 to < \$74,000	746	30.63% (27.43-34.02)
≥ \$75,000	1067	46.88% (43.33-50.46)
<b>Health Insurance</b>		

No	136	8.50% (7.21-10.01)
Yes	2328	91.50% (89.99-92.79)
<b>Self-efficacy</b>		
Confident-very confident	1763	69.18% (66.09-72.12)
Somewhat confident	600	26.33% (23.86-28.95)
A little or no confidence	101	4.49% (3.30-6.09)
<b>Provider Visit in the past year</b>		
No visits	332	16.89% (14.74-19.29)
1-2 visits	904	39.65% (35.96-43.46)
≥ 3 visits	1228	43.46% (40.13-46.85)
<b>General Health</b>		
Excellent-Very good	1279	52.78% (49.48-56.07)
Good	888	35.70% (32.73-38.77)
Fair-Poor	297	11.52% (9.56-13.82)
<b>Chronic Health Conditions</b>		
No chronic health conditions	930	43.95% (41.36-46.58)
1 chronic health condition	822	30.86% (27.93-33.96)
2 chronic health conditions	453	17.16% (14.98-19.60)
≥ 3 chronic health conditions	259	8.02% (6.64-9.66)

\*The weighted column reflects the generalizability of our findings to the adults living in the US. HINTS surveys adopted jackknife replication method, and we applied their recommended survey weight.



509 Table 2. Health behaviors and cancer fatalism of adults without cancer history, HINTS 2020

Characteristics	Unweighted sample, n	Weighted sample,* % (95% CI)
	<b>N= 2464</b>	<b>N=184,859,216</b>
<b>Smoking status</b>		
Non-smoker	2179	85.46% (82.3-88.14)
Current smokers	285	14.54% (11.86-17.70)
<b>E-cigarette use</b>		
Non-users	2377	92.21% (89.43-94.31)
Current users	87	7.79% (5.69-10.57)
<b>Past 30-day alcohol use</b>		
0-1 drink per day	1689	67.64% (64.13- 70.96)
2+ drinks per day	775	32.36% (29.04-35.87)
<b>Risky Behaviors</b>		
No-risky behaviors	1504	56.98% (53.51-60.38)
≥1 risky behavior	960	43.02% (39.62-46.49)
<b>Everything Causes Cancer (N2a)</b>		
Disagree	757	28.43% (25.48-31.59)
Agree	1707	71.57% (68.41-74.52)
<b>There's not much you can do to lower your chances of getting cancer (N2b)</b>		
Disagree	1807	71.35% (68.21-74.29)
Agree	657	28.65% (25.71-31.79)
<b>There are so many different recommendations about preventing cancer, it's hard to know which ones to follow (N2c)</b>		
Disagree	676	25.30% (22.84-27.94)
Agree	1788	74.70% (72.06-77.16)



<b>Cancer Fatalism Score</b>		
High score	789	34.81% (31.82-37.92)
Low score	1675	65.19% (62.08-68.18)
	<b>Mean</b>	<b>SE (95% CI)</b>
Cancer Fatalism Score	2.61	0.02 (2.57-2.64)

510 \*The weighted column reflects the generalizability of our findings to the adults living in the US. HINTS  
 511 surveys adopted jackknife replication method, and we applied their recommended survey weight.

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For Peer Review

516 **Table 3.** Relationship between cancer fatalism and risky health behaviors among adults without  
 517 cancer history, HINTS 2020 (N= 2464 unweighted & 184,859,216 weighted\*)

Characteristics	Adjusted OR (95% CI)	<i>p</i>
<b>Cancer fatalism score</b>	1.30 (1.04-1.62)	.021
<b>Age</b>		
18-49	1	
50-64	0.99 (0.71-1.37)	.940
65-74	0.50 (0.32-0.80)	.004
≥75	0.22 (0.11-0.44)	< .001
<b>Sex</b>		
Female	1	
Male	1.60 (1.19-2.14)	.002
<b>Race and Ethnicity</b>		
Non-Hispanic White	1	
Hispanic	0.42 (0.25-0.69)	.001
Non-Hispanic Black	0.49 (0.30-0.80)	.006
Other	0.53 (0.30-0.92)	.026
<b>Marital Status</b>		
Married	1	
Not married	1.31 (0.92-1.85)	.127
<b>Education</b>		

High-School or less	1	
Some College	0.82 (0.52-1.29)	.383
College degree or more	0.62 (0.40-0.94)	.025
<b>Household Income</b>		
≥\$75,000	1	
<\$34,000	0.74 (0.46-1.17)	.189
≥ \$35,000-<\$74,000	0.88 (0.64-1.20)	.407
<b>Health Insurance</b>		
No	1	
Yes	0.42 (0.23-0.78)	.007
<b>Self-efficacy</b>		
Confident-very confident	1	
Somewhat confident	0.78 (0.54-1.14)	.199
A little or no confidence	0.46 (0.23-0.93)	.031
<b>Provider Visit in the past year</b>		
No visits	1	
1-2 visits	0.70 (0.47-1.05)	.084
3+ visits	0.84 (0.51-1.36)	.462
<b>General Health</b>		
Excellent-Very good	1	
Good	1.08 (0.77-1.50)	.655
Fair-Poor	1.19 (0.66-2.16)	.561
<b>Chronic Health Conditions</b>		

No-chronic health conditions	1	
1-chronic health condition	1.20 (0.89-1.61)	.223
2- chronic health conditions	1.29 (0.83-2.00)	.250
≥3 chronic health conditions	0.82 (0.52-1.29)	.388

518 \*The weighted column reflects the generalizability of our findings to the adults living in the US. HINTS  
519 surveys adopted jackknife replication method, and we applied their recommended survey weight.

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For Peer Review

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3 May 23, 2024  
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7 Response to the reviewers

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9 Dear Editor and Reviewers,  
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11 We sincerely appreciate the thoughtful comments and suggestions provided by the editorial team  
12 and reviewers on our manuscript. Please find our detailed responses below, with corresponding  
13 line numbers where modifications have been made in the main manuscript. For your  
14 convenience, the revised content is also included in the table below.  
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17 Thank you for considering our manuscript for publication in your esteemed journal.

18 Sincerely,  
19 Maryum Zaidi  
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22 **Editor's Comments to Author:**

Reviewer/Editor comments	Response
<p>23 24 25 26 27 1) Please include sample 28 sizes in tables. If all data in 29 the table is based on the 30 same sample size, the 31 sample size can be 32 included in parentheses at 33 the end of the table's title. 34 This is needed for Table 4. 35 36</p>	<p>Thank you very much for this comment. The sample size for all tables are the same. We have three tables in the manuscript. We see that the sample size is missing in Table 3 – We added the sample size to Table 3 since we do not have Table 4. Please see line 536.  (N= 2464 unweighted &amp; 184,859,216 weighted*)</p>
<p>37 38 2) Please identify/explain 39 the weighted sample size 40 better in the tables, so the 41 tables can be interpretable 42 on their own. 43 44 45 46 47</p>	<p>Based on the comment, we have edited the footnote for the tables.  *The weighted column reflects the generalizability of our findings to the adults living in the US. HINTS surveys adopted jackknife replication method, and we applied their recommended survey weight.</p>
<p>48 <b>Reviewer 2</b></p>	
<p>49 1-Please provide some 50 additional explanation for 51 why you chose the risky 52 health behaviors you 53 focused on, as there are 54 other risky health 55 behaviors that could have 56</p>	<p>We have provided the following rationale – Please see page 1 lines 60-65  According to the World Health Organization, other factors can also be related to cancer prevention, such as maintaining a healthy body weight and avoiding processed meat, ultraviolet radiation, and other pollutants. In this paper, we focus on</p>

<p>been included.</p>	<p>cigarette smoking, electronic cigarette use, and alcohol consumption because these behaviors have the potential to interact significantly and multiply health consequences due to their addictive qualities.</p>
<p>2-The reviewer had some concerns about the 3-question assessment used for cancer fatalism, and whether the 3-question instrument is valid and reliable.</p>	<p>These three questions from HINTS surveys are widely used in the existing literature. Based on the previous studies' findings, these questions can potentially predict behaviors for cancer prevention. We have added more references to support the use of these three questions. Please see page 7, lines 152-154. The cancer fatalism items featured in the HINTS surveys are distinct and have been consistently used by previous research to demonstrate the potential for predicting cancer prevention behaviors. Their original description can be found on this link. <a href="https://hints.cancer.gov/docs/Briefs/HINTS_Brief_9_010708.pdf">https://hints.cancer.gov/docs/Briefs/HINTS_Brief_9_010708.pdf</a></p>
<p>3-The reviewer felt that the discussion did not adequately address how this work fits within the existing literature on cancer fatalism. The reviewer seemed to think that the authors were not including some of the existing literature on cancer fatalism.</p>	<p>We have updated the cancer fatalism-related literature in our discussion related to the topics for our paper from the last three years. Specifically, these two references are included in our discussion. Please see page 14 &amp; 15 We have incorporated the following in our discussion Chen M, Kim HK. Cancer Fatalism in the Information Age: A Meta-Analysis of Communicative and Behavioral Correlates. <i>Communication Research</i>. 2024;51(1):83-111. doi:10.1177/00936502231205735 Brevik TB, Sæther KW. Approaching religious fatalism in cancer screening education. <i>Journal of Evaluation in Clinical Practice</i>.2024. n/a(n/a)doi:<a href="https://doi.org/10.1111/jep.13957">https://doi.org/10.1111/jep.13957</a></p>
<p><b>Reviewer 1</b></p>	
<p>1- You have focused on fatalism and risky health behaviors. However, you also present results that indicate relationships between key demographic variables and risky behavior as well as. Additionally, you present results about a relationship between self-efficacy and risky health behaviors.. I think you could consider expanding the scope of your manuscript to include</p>	<p>We have revised the manuscript to include the results from self-efficacy in our discussion please see lines 289-303, however since we treated self-efficacy and socioeconomic variables as co-variates and we are only reporting on some significant values that came up , we do not include them in the title to avoid changing our original aim for the paper.</p> <p>“Our study findings also showed that, those who expressed little or no confidence in their ability to maintain good health were less likely to report engaging in one or more risky health behaviors than those who felt confident in their health management skills. This suggests a protective effect of not feeling fully satisfied with one's ability to care for oneself, leading to a more cautious approach towards risky health behaviors. Although health-related self-efficacy is generally</p>

<p>all of these findings. Or limit the finding you present in the results section if they are not a focus of your manuscript. Your title could be more broad such as "Self-efficacy, cancer fatalism, and demographic variables and their relationship with risky health behaviors."</p>	<p>known to positively influence health-related behaviors <sup>39</sup>, previous research has also highlighted conflicting results. For example, a study using HINTS data found that overweight or obese non-Hispanic Black individuals holding fatalistic beliefs and high self-efficacy have less tendency to order food (fewer food items of less calorie food at a fast food or sit-down restaurant) than their healthy non-Hispanic Black Counterparts. However, in the same study, high self-reported self-efficacy negatively impacted weight management in individuals with obesity, potentially due to overestimating their knowledge about physical activity when higher fatalistic beliefs were present <sup>40</sup>. Therefore, further research is required to explore the relationship between self-reported health-related self-efficacy and actual health behaviors when fatalistic beliefs are present."</p>
<p>2-Abstract: The first sentence of the abstract is awkward, consider revising.</p>	<p>Revised please lines 8-9. There is limited research on how fatalism influences risky health behaviors that are linked to higher cancer risks.</p>
<p>3-Introduction: Grammar/Style needs work- the flow is awkward. For example: In the first paragraph, consider revising to: "By the end of 2023, it is expected that 1.9 new cancer diagnoses will occur in the US. Healthy behaviors (healthy diet, adequate exercise, avoiding smoking and excessive alcohol use, engaging in cancer screening) may prevent as many as 50% of these new diagnoses. Alcohol, tobacco, and e-cigarette use are carcinogens; exposure to these substances is associated with a ?? fold increase in cancer risk. Yet....."</p>	<p>We have revised the introduction and updated the 2023 to 2024 reference based on this comment and comment # Please see lines 57-71.</p> <p>By the end of 2024, about 2 million new cancer cases are expected to occur in the U.S. <sup>1</sup>. Adopting health behaviors such as maintaining a healthy diet, exercising, not smoking, not engaging in excessive alcohol drinking, and adhering to cancer screening guidelines may prevent these cancer cases by 50% <sup>2</sup>. Moreover, according to the World Health Organization, other factors can also be related to cancer prevention, such as maintaining a healthy body weight and avoiding processed meat, ultraviolet radiation, and other pollutants <sup>3</sup>. In this paper, we focus on cigarette smoking, electronic cigarette use, and alcohol consumption because these behaviors have the potential to interact significantly and multiply health consequences due to their addictive qualities. <sup>4,5</sup>. All of these substances are known carcinogens, and approximately one-third of cancer cases are believed to result from exposure to class one carcinogens, with tobacco usage playing a prominent role as the primary factor, <sup>6-10</sup> yet, 28.3 million (11.5%) adults aged 18 and over in the US currently smoke cigarettes <sup>11</sup>. Moreover, the prevalence of e-cigarette use continues to increase, reaching 6% <sup>12</sup>. Additionally, about 14% of adults engage in binge alcohol drinking <sup>13</sup>. Therefore, understanding the psychosocial aspects of the use of these substances is essential for cancer prevention.</p>

4- Purpose: Consider revising, "We are aiming to" to "The ultimate goal of this research is to...."	Revised as suggested. Please see lines 97-98 The ultimate goal of this research is to gain a deeper understanding of cancer-related fatalistic beliefs and their association with risky health behaviors to help healthcare professionals and policymakers develop interventions targeted to promote cancer prevention services.
5- Methods: you excluded observations with missing values or multiple responses selected in error. Can you follow that up with a brief rationale? It will be obvious to some readers, but others may not be aware of the reasons for excluding these 775 observations.	Based on the suggestion, we have added the rationale. Please see lines 119-121 we excluded observations with missing values and with multiple responses selected in error (n=775) to help reduce bias and increase accuracy in our analysis.
6- Outcome variable: Can you provide a reference for the 2020-2025 Dietary Guidelines for Americans?	Based on the comment, we have added the following citation in the manuscript. USDA. Dietary Guidelines for Americans Vol. Ninth Edition. 2020. Accessed 5.4.2024. <a href="https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf">https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf</a>
7- Independent variable: Provide a little more information regarding the scoring of fatalism. What is the possible range of scores, what is a cutoff score for being considered to have "high" fatalism? It seems like you treated it as a continuous variable in Table 2, but it seems in the text that you have treated it as a dichotomous variable. It might be better to include a dichotomous variable in table 2 regarding number of participants with "high" fatalism scores vs. number of participants with "low"	For cancer Fatalism, we have treated it as a continuous variable after dichotomizing each response.  It seems like everything causes cancer (item N2a). 2) There's not much you can do to lower your chances of getting cancer (Item N2b). 3) There are so many different recommendations about preventing cancer it's hard to know which ones to follow (Item N2c).  We have added this explanation please see lines 160-165  Each statement had four response choices where 1= strongly agree; 2=somewhat agree, 3=somewhat disagree and 4= strongly disagree. We reverse-coded the responses so that 1 = strongly disagree, 2=somewhat disagree, 3=somewhat agree and 4 = strongly agree.  The overall/combined score ranges from 1 (not having fatalistic beliefs) to 4 (having fatalistic beliefs).



<p>fatalism scores. You might also consider including some information regarding the self-efficacy measurement as you do report results about self-efficacy (or moving that part in the section regarding covariates to the section about independent variables).</p>	<p>Those who reported to have somewhat agreed/strongly agreed were considered to have fatalistic beliefs. The weighted mean for the combined score was 2.61 0.02 (2.57-2.64). Those with a higher score (closer to 4) consider having fatalistic beliefs.</p> <p>To answer this comment on high and low fatalism scores, we used a cut-off score from the overall score to report participants with high fatalistic beliefs (overall score = <math>\geq 3</math>)” and low fatalistic beliefs (overall score = <math>&lt; 3</math>).</p> <p>Group 1 (<math>&lt; 3</math>) have “high” fatalistic beliefs; hence, 31.82% of study participants had fatalistic beliefs towards higher scores, and 65.19% of the sample Group 0 (1-3) had low fatalistic beliefs (please see table 2)</p> <p>We also reported on each of the questions separately in Table 2 for clarity.</p> <p>We provide details about how the self-efficacy variable was measured and specified as Health-Related Self-Efficacy to match the result section. We report the outcome in the abstract and in the results section. Please see line 241-245.</p>
<p>8- Statistical Analysis: There is an error in “sample weight provided by the.....” Can you provide one or two sentences regarding the rationale of providing weights? Readers may be unfamiliar with weights or the reason for weighting data. The last two sentences of this section seem repetitive. Consider deleted one of those sentences.</p>	<p>We have provided this rationale and edited the section . Please see lines 190-192</p> <p>These sample weights ensured valid inferences from the sample to the target population while minimizing non-response and non-coverage biases to the greatest extent possible.</p> <p>Also, we have deleted the suggested sentence.</p>
<p>9- Results: In the cancer fatalism section, you report the percentages for each of</p>	<p>Yes we have added the percentages for high and low fatalism scores. Please see table 2.</p>

<p>the 3 statements, but can you also provide a percentage for a combined fatalism score? For example, what percentage would be considered to have “high” degrees of fatalism vs. “low” degrees of fatalism. Again, are you able to report the mean cancer fatalism score if these were all scored dichotomously?</p>	
<p>10-Can you contextualize the fatalism scores for the reader? For example, you provide that the mean fatalism score of the sample is 2.61.....what does that mean? Is the fatalism score fairly high or fairly low given the possible range?</p>	<p>Our sample size is 2464. Therefore, a mean fatalism score of 2.61 indicates the average fatalism score of all our respondents (sample size=2464), with the lowest reported score of 2.57 and the highest reported score of 2.64. The range of the score was 1-4 (Please see comment 7 for method of calculation) In addition, it is worth mentioning that this fatalism score is calculated after applying the recommended sample weight.</p> <p>71.57% agreed that everything causes cancer. 28.65% agreed that there is not much you can do to lower your chances of getting cancer, and 74.70% agree that there are so many different recommendations for preventing cancer it’s hard to know which one to follow. For fatalism combined score, 34.81% of respondents reported high scores, and 65.19 reported low scores. We have added that in the description of the independent variable . Please see lines 160-165.</p> <p>we used a cut-off score from the overall score to report To create the combined score, we first reverse-coded the responses so that 1 = strongly disagree, 2 = somewhat disagree, 3 = somewhat agree, and 4 = strongly agree. The overall score ranges from 1 (not having fatalistic beliefs) to 4 (having fatalistic beliefs), with a higher number indicating higher fatalistic beliefs. participants with high fatalistic beliefs (overall score = <math>\geq 3</math>)” and low fatalistic beliefs (overall score = <math>&lt; 3</math>).</p>
<p>11-The statement, “Additionally, certain risky behaviors’, notably cigarette smoking, have been</p>	<p>We have added a reference for that line.</p> <p>Our demographic results were similar to prior studies.</p>

<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33</p> <p>You have provided a thorough discussion regarding your finding about fatalism and its link to risky behaviors. You also report results about self efficacy and demographic variables that relate to risky behaviors. Could you provide some discussion about those findings?</p>	<p>We have added a discussion on Self-efficacy findings. Please see line 290-304.</p> <p>Our study findings also showed that, those who expressed little or no confidence in their ability to maintain good health were less likely to report engaging in one or more risky health behaviors than those who felt confident in their health management skills. This suggests a protective effect of not feeling fully satisfied with one's ability to care for oneself, leading to a more cautious approach towards risky health behaviors. Although health-related self-efficacy is generally known to positively influence health-related behaviors <sup>39</sup>, previous research has also highlighted conflicting results. For example, a study using HINTS data found that overweight or obese non-Hispanic Black individuals holding fatalistic beliefs and high self-efficacy have less tendency to order food (fewer food items of less calorie food at a fast food or sit-down restaurant) than their healthy non-Hispanic Black Counterparts. However, in the same study, high self-reported self-efficacy negatively impacted weight management in individuals with obesity, potentially due to overestimating their knowledge about physical activity when higher fatalistic beliefs were present <sup>40</sup>. Therefore, further research is required to explore the relationship between self-reported health-related self-efficacy and actual health behaviors when fatalistic beliefs are present.</p>
<p>34 35 36 37 38 39 40 41 42 43 44 45 46 47</p> <p>12- It may be important to note to highlight for readers you finding that 43.02% of the sample engage in at least one or more risky health behaviors. If nearly half of the population engages in risky health behaviors, that seems like an important point for your discussion section.</p>	<p>Yes we have added that to our discussion as part of our first paragraph as follows . Please see lines 262-266</p> <p>In this nationally representative sample, 43.02% of individuals reported engaging in one of the risky health behaviors. Future studies are critically needed to better understand the role of cancer fatalism in the prevention of these risky health behaviors that have detrimental effects on an individual's chances of prevention against certain cancers.</p>
<p>48 49 50 51 52 53 54 55 56</p> <p>13-Educational attainment: You note in the findings that “participants with higher educational attainment had significantly lower odds of reporting at least one risky</p>	<p>In our study people who reported having attained a college degree or more were 33.6% less likely to report one or more risky health behaviors. Education has already been shown to mitigate risky health behaviors<sup>31</sup>. We have added that into the discussion section. Please see line 284</p>

<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27</p> <p>health behavior than those with high school or lower level of educational attainment.” However, you do not provide discussion about this point in your discussion section. You might consider providing discussion about this finding for your readers. Page 11, second paragraph...you do not include educational attainment as one of the variables, but you did find that educational attainment was related to risky health behaviors. Can you provide some context for this finding in the existing literature?</p>	<p>Viinikainen J, Bryson A, Böckerman P, et al. Does better education mitigate risky health behavior? A mendelian randomization study. <i>Econ Hum Biol.</i> Aug 2022;46:101134. doi:10.1016/j.ehb.2022.101134</p> <p>However, none of the sociodemographic variables we included demonstrated novel trends. Thus, our results contribute to the existing literature on these variables.</p>
<p>28 29 30 31 32 33 34 35 36 37 38 39</p> <p>14-Page 11, the statement, “Research shows that people from under-resourced financial and educational circumstances often hold more fatalistic beliefs.....” requires a supporting reference.</p>	<p>Yes we have added the references. Please see line 271</p> <p>Vrinten C, Wardle J, Marlow LA. Cancer fear and fatalism among ethnic minority women in the United Kingdom. <i>Br J Cancer.</i> Mar 1 2016;114(5):597-604. doi:10.1038/bjc.2016.15</p> <p>Emanuel AS, Godinho CA, Steinman C, Updegraff JA. Education differences in cancer fatalism: The role of information-seeking experiences. <i>J Health Psychol.</i> Oct 2018;23(12):1533-1544. doi:10.1177/1359105316664129</p>
<p>40 41 42 43 44 45</p> <p>15-Page 11, the statement “Faith or spiritual practices may also impact cancer fatalism beliefs.” requires a supporting reference.</p>	<p>Yes we have added a supporting reference. Please see line 273</p> <p>Brevik TB, Saether KW. Approaching religious fatalism in cancer screening education. <i>J Eval Clin Pract.</i> 2024 Jan 8. doi: 10.1111/jep.13957. Epub ahead of print. PMID: 38192090.</p>
<p>46 47 48 49 50 51 52 53 54 55 56</p> <p>16-Page 13, the statement, “They initiate the process by evaluating a patient’s tobacco usage history.....while assessing nicotine dependence and readiness to quit,” requires a supporting reference.</p>	<p>We have revised the statement as follows. Please see lines 332-334</p> <p>Based on prior research, the United States Preventive Services Task Force report includes advice from nurses to participants about smoking cessation as an evidence-based tool for quitting smoking And added this reference.</p>

	<p>USPSTF. Interventions for Tobacco Smoking Cessation in Adults, Including Pregnant Persons: US Preventive Services Task Force Recommendation Statement. JAMA. 2021;325(3):265-279. doi:10.1001/jama.2020.25019</p>
<p>17-Page 13, the statement, “Nurses can provide information about various NRT options....” Requires a supporting reference (perhaps the systematic review by Rice and colleagues titled “Nursing interventions for smoking cessation”)</p>	<p>Thank you for pointing that out. We have added that. Please see line 340.</p> <p>Rice VH, Heath L, Livingstone-Banks J, Hartmann-Boyce J. Nursing interventions for smoking cessation. Cochrane Database Syst Rev. Dec 15 2017;12(12):Cd001188. doi:10.1002/14651858.CD001188.pub5</p>