Lifestyle and Cancer Prevention in Women: Knowledge, Perceptions, and Compliance with Recommended Guidelines

Jennifer Irvin Vidrine, PhD,¹ Diana W. Stewart, PhD,¹ Stephen C. Stuyck, MPH,² Jo Ann Ward, MPH,² Amanda K. Brown, BS,¹ Courtenay Smith, BS,³ and David W. Wetter, PhD¹

Abstract

Background: Most women in the United States do not meet minimum recommendations for physical activity or fruit/vegetable consumption. Thus, many are overweight/obese and are at increased risk for cancer morbidity and mortality. This study investigated women's perceptions about the importance of physical activity and a healthy diet in preventing cancer, perceptions of engaging in these behaviors, and whether or not the behaviors met cancer prevention recommendations.

Method: A cross-sectional, national, random-digit-dialed telephone survey was conducted with 800 women, ages 18 and older. The response rate was 24.5%. Measures assessed demographics, perceived health status, beliefs about the role of physical activity and diet in cancer prevention, perceived engagement in these behaviors, and actual behaviors.

Results: Only 9.9% of women who reported eating a healthy diet met minimum fruit and vegetable recommendations; 39.7% of women who reported regular physical activity met the minimum recommendation. Analyses adjusted for demographics indicated that low education was associated with reporting regular physical activity to prevent cancer, yet failing to meet the minimum recommendation (odds ratio [OR]=0.90, 95% confidence interval [CI]: 0.82–0.98, $p=0.01$). Racial/ethnic minority status was marginally significantly associated with reporting eating a healthy diet to prevent cancer, yet failing to consume sufficient fruits and vegetables (OR=2.94, 95% CI: 0.99–8.71, $p=0.05$).

Conclusions: Most women who reported eating a healthy diet and being physically active to prevent cancer failed to meet the minimum cancer prevention recommendations. Furthermore, low socioeconomic status and racial/ethnic minority women may be particularly vulnerable to discrepancies between beliefs and behavior.

Introduction

AMONG WOMEN IN THE UNITED STATES, the lifetime risk of cancer is slightly more than one in three.¹ It was estimated that in 2010, 739,940 new cases of cancer would be diagnosed among women and that 270,290 women would die from cancer.¹ Approximately one-third of these deaths were expected to be directly attributable to poor nutrition, physical inactivity, and overweight/obesity.¹ Recent data indicate that 64.1% of U.S. women are overweight or obese.² The American Cancer Society recommends that U.S. adults get at least 30 minutes of moderate physical activity 5 days per week and eat at least two servings of fruit and three servings of vegetables

per day.³ Nevertheless, 52.5% of women fail to meet the minimum recommendations for physical activity; 64.9% fail to consume the minimum recommended daily servings of fruits, and 69.1% do not consume the minimum recommended daily servings of vegetables.^{4,5} It is notable that numerous studies support the difficulty of maintaining even relatively short-term changes in physical activity.^{6,7} As most American women do not meet the minimum cancer prevention guidelines, many opportunities for cancer prevention might be missed. There is a critical need for research intended to improve the adoption and maintenance of cancer prevention behaviors related to diet and physical activity among women in the United States.

¹Department of Health Disparities Research, and ²Division of Public Affairs, The University of Texas MD Anderson Cancer Center, Houston, Texas.

³Prevention Magazine, Emmaus, Pennsylvania.

In general, research has supported positive associations among knowledge, beliefs, and behaviors relevant to cancer prevention. Knowledge of the American Cancer Society's dietary recommendations and the belief that diet influences the risk of developing cancer have been found to prospectively predict the adoption of healthy dietary changes.⁸ Other data have indicated that individuals with poor dietary behaviors who are likely to benefit from diet-related changes may not perceive a need to make such changes.⁹ These findings may reflect limited knowledge regarding the importance of change, or past failures among individuals attempting to initiate and maintain healthy dietary changes.⁷ Considerable data indicate that individuals with the lowest levels of education, income, and working or occupational status—those with low socioeconomic status (SES)—practice poorer health behaviors, have poorer health outcomes, live in poorer neighborhoods, and have more limited resources for the prevention, early detection, and treatment of cancer.^{10,11} Additionally, there are important racial/ethnic and socioeconomic disparities in the prevalence of overweight/obesity that contribute to cancer disparities among women. In the United States, rates of overweight and obesity are significantly higher among African American and Latina women compared with non-Latina white women,¹² and significantly higher among women with lower (vs. higher) SES.¹³ Elucidating how perceptions of behavior may be related to actual diet and physical activity behavior among racial/ethnic minority women and women of low SES is an important research agenda.

Although previous findings suggest a positive relationship between knowledge, beliefs, and behaviors related to cancer prevention, no prior studies that we know of have investigated how beliefs about certain health behaviors (e.g., physical activity, healthy eating) might prevent cancer and predict the regular practice of recommended cancer prevention behaviors. Further, no studies have assessed whether those who report engaging in cancer prevention behaviors do so with sufficient frequency and duration to meet current cancer prevention guidelines. We are also unaware of research examining predictors of potential discrepancies between beliefs about engaging in behaviors to help prevent cancer and compliance with minimum recommendations. The present study sought to address these gaps in the literature.

The primary goal of this study was to investigate women's perceptions of the importance of diet (i.e., fruit and vegetable consumption) and physical activity in helping to prevent cancer, their perceptions regarding the frequency with which they engaged in these behaviors to help prevent cancer, and whether or not the frequencies with which they engaged in these behaviors were sufficient to meet the minimum recommendations for cancer prevention established by the American Cancer Society.³ Socio-demographic and racial/ethnic predictors of potential discrepancies between perceived behavior and compliance with minimum recommendations for cancer prevention were also assessed.

Materials and Methods

Design

The data were collected via a cross-sectional, national, random-digit-dialed (RDD) telephone survey of 800 women. The survey assessed general health and lifestyle issues and

was created for this study (measures and questions of interest are described below).

Sample

Inclusion criteria required that respondents be female, at least 18 years of age, and speak English. All participants were members of a convenience survey pool; however, we attempted to obtain a racially/ethnically diverse sample roughly equivalent to demographics reported in the 2000 U.S. Census (e.g., 69.1% non-Latino white; 12.5% Latino, 12.1% African American).¹⁴ Study staff attempted to contact each participant only once. A total of 3,261 surveys were attempted, and 800 interviews were completed, resulting in a response rate of 24.5%. Survey administration took approximately 20 minutes. All data were collected in May 2007 by Gelb Consulting.

Measures

Demographics assessed included gender, age, race/ethnicity, educational attainment, marital status, employment, annual household income, and insurance status.

Perceived general health was assessed using a single item from the 2006 Behavioral Risk Factor Surveillance (BRFSS) survey¹⁵ that read, "Would you say that in general your health is ____?" Response options included excellent, very good, good, fair, poor, and don't know.

Beliefs about cancer prevention behaviors were assessed by asking participants if they believed that eating a healthy diet could help prevent cancer from developing, and if they believed that engaging in regular physical activity could help prevent cancer from developing. Response options for both questions were yes, no, and don't know. These questions were created for the purposes of the present study and were therefore not previously validated.

Perceptions about the practice of behaviors intended to prevent cancer were assessed by asking participants if they regularly consumed a healthy diet, and if they engaged in regular physical activity to help prevent cancer. Response options for both questions were yes, no, and don't know. Both questions were generated for this study and were not formerly validated.

Fruit and vegetable intake was assessed using two items from the 2006 BRFSS survey.¹⁵ The following instructions were read to respondents prior to administration of the two items: "I'd like to ask about the foods you usually eat or drink. Please tell me how often you eat or drink each one, for example, twice a week, three times a month, and so forth. Remember, I am only interested in the foods *you* eat. Include all foods *you* eat, both at home and away from home." The items were: (1) "Not counting juice, how often do you eat fruit?" and (2) "How often do you eat vegetables?" Response options for each item were identical (i.e., ____ per day, ____ per week, ____ per month, ____ per year, never, and don't know/not sure).

Physical activity was assessed using three items from the 2006 BRFSS survey:¹⁵ (1) "During the past 30 days, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" The response options were yes, no, and don't know. (2) "During the past 30 days, how often have you engaged in these physical activities or exercises? Please tell me how many times a day, days a week or days during the

month.” (3) “During the past 30 days, about how long at a time did you spend each time you did these physical activities or exercises? Please tell me how many minutes or hours you usually spent.”

Analysis

Frequencies were examined to determine the percentage of women surveyed who (1) believed that eating a healthy diet and engaging in regular physical activity could help prevent cancer, (2) reported actually eating a healthy diet and engaging in regular physical activity to prevent cancer, and (3) reported behaviors compliant with current minimum cancer prevention guidelines regarding fruit and vegetable consumption and physical activity (i.e., eating at least two servings of fruits and three servings of vegetables daily and getting at least 150 minutes of moderate to vigorous physical activity weekly). Potential demographic differences based on fruit and vegetable consumption and self-reported physical activity were assessed using Chi-square analyses and *t*-tests for categorical and continuous variables, respectively. Next, Chi-square analyses and *t*-tests were performed to evaluate potential discrepancies between perceptions of regularly eating a healthy diet and engaging in physical activity to help prevent cancer and meeting the current minimum levels of those behaviors recommended by the American Cancer Society for cancer prevention.

Univariate logistic regression analyses were performed to examine predictors of discrepancies between (1) perceptions of eating a healthy diet to prevent cancer and meeting the minimum recommendation for fruit and vegetable consumption, and (2) perceptions of engaging in regular physical activity to prevent cancer and meeting the minimum recommendation for physical activity. Discrepancies were defined as significant differences, assessed via Chi-square tests, between self-reported consumption of a healthy diet and regular physical activity to help prevent cancer, and actually meeting the minimum recommendations for fruit and vegetable consumption and physical activity. In the logistic regression analyses, the presence of a discrepancy for each participant was coded as 1, and the absence of a discrepancy for each participant was coded as 0. Predictors examined included demographic variables (i.e., age, race/ethnicity, years of education, household income, marital status), and perceived general health. Finally, predictors that were significant in the univariate models were evaluated in multivariate logistic regression models. All multivariate analyses controlled for or included age, race/ethnicity, education, income, and marital status. Race/ethnicity was dichotomized as white versus non-white, and marital status was dichotomized into married/living with partner versus not married/living with partner. All other demographic variables were continuous. Analyses were conducted using IBM SPSS version 19.

Results

Participant characteristics

Participants ($n=800$) were female and had an average age of 53.7 years (standard deviation [SD]=17.39). Most (75.5%) were non-Latino white, married, or living with a significant other (77.3%), and had an annual household income of less than \$60,000 (65.6%). The majority had completed high school

(66.6%; mean years of education=13.96; SD=2.63). See Table 1 for further details. Results from Chi-squares and *t*-tests revealed no significant differences (p values>0.05) in fruit or vegetable consumption and physical activity based on participant characteristics (e.g., age, gender, race/ethnicity).

Beliefs, perceptions, and compliance with cancer prevention guidelines

The percentage of women surveyed who (1) believed that eating a healthy diet and engaging in regular physical activity could help prevent cancer, (2) reported actually eating a healthy diet and engaging in regular physical activity to prevent cancer, and (3) reported behaviors compliant with current minimum cancer prevention guidelines regarding fruit and vegetable consumption and physical activity are presented in Table 1.

Discrepancies between behaviors perceived to help prevent cancer and compliance with minimum recommended guidelines for cancer prevention

Differences between self-reported, regular consumption of a healthy diet and regular physical activity to help prevent

TABLE 1. PARTICIPANT CHARACTERISTICS

Variable	Total sample n=800
Female (%)	100%
Age (mean, SD)	53.7 (17.39)
Married/living with partner (%)	77.3%
Race/ethnicity (%)	
Non-Latino white	75.5%
African American	9.9%
Latino	6.6%
Other	8%
≤HS education (%)	33.4%
Income <\$60,000 per year (%)	65.6%
Working full- or part-time (%)	48.8%
Privately insured (%)	79.3%
Very good or excellent perceived general health (%)	44.1%
<150 minutes of physical activity/week (%)	68.5%
<2 fruit servings/day (%)	68.6%
<3 vegetable servings/day (%)	87.9%
Believes eating a healthy diet can help prevent cancer (%)	83.4%
Believes regular physical activity can help prevent cancer (%)	77.8%
Reports eating a healthy diet to prevent cancer (%)	81.0%
Reports engaging in regular physical activity to prevent cancer (%)	73.1%
Current fruit/vegetable consumption meets minimum recommendation for cancer prevention (%)	8.5%
Current level of physical activity meets minimum recommendation for cancer prevention (%)	31.5%

HS, high school; SD, standard deviation.

cancer and actually meeting the minimum recommendations for fruit and vegetable consumption and physical activity were examined using Chi-square tests. Results indicated that the percentage of women who reported eating a healthy diet to help prevent cancer was significantly higher than the percentage who reported consuming at least the minimum number of daily fruit and vegetable servings recommended for cancer prevention ($p=0.004$). Specifically, 90.1% of women who reported eating a healthy diet to help prevent cancer failed to meet the minimum fruit and vegetable consumption recommendations for cancer prevention. Similarly, the percentage of women who reported engaging in regular physical activity to help prevent cancer was significantly higher than the percentage who actually engaged in physical activity with sufficient frequency and duration to meet the minimum recommendation for cancer prevention ($p<0.001$). That is, 60.3% of women who reported engaging in regular physical activity to help prevent cancer failed to meet the minimum physical activity recommendation for cancer prevention.

Predictors of discrepancies between behaviors perceived to help prevent cancer and compliance with minimum recommendations for cancer prevention

Fruit and vegetable consumption. Only one of the six predictor variables examined—race/ethnicity—was significantly associated with a discrepancy for fruit and vegetable consumption in a univariate analysis (OR=3.10, 95% CI: 1.22–7.91, $p=0.018$). Specifically, women who identified as African American, Latino, Asian/Hawaiian/Pacific Islander, Native American/Alaska Native, multi-racial, or other were 3.10 times more likely than non-Latino white women to have a discrepancy between reporting regular consumption of a healthy diet and actually meeting the minimum recommendations for fruit and vegetable consumption. This association remained marginally significant after controlling for the effects of age, education, income, and marital status in a multivariate model (OR=2.94, 95% CI: 0.99–8.71, $p=0.052$). (See Table 2.)

Physical activity. Two of the six predictor variables examined were significantly associated with a discrepancy for physical activity in univariate analyses. Specifically, education (OR=0.91, 95% CI: 0.86–0.97, $p=0.005$) and perceived general health (OR=0.83, 95% CI: 0.07–0.98, $p=0.024$) each independently predicted the discrepancy. That is, for each year of education completed, women were 0.91 times less likely to have a discrepancy between reporting engagement in regular physical activity and actually meeting the minimum physical activity recommendations for cancer prevention. For each level of increase in perceived general health, women were 0.83 times less likely to report a discrepancy for physical activity. Both predictors were entered into adjusted multivariate logistic regression models predicting the discrepancy. While education (OR=0.90, 95% CI: 0.82–0.98, $p=0.011$) remained significant, perceived general health (OR=0.71, 95% CI: 0.47–1.57, $p=0.103$) was no longer significant after adjusting for the effects of age, income and marital status in a multivariate model (see Table 2).

Discussion

Considerable evidence indicates that lifestyle factors including regular physical activity and consuming a diet high in

TABLE 2. SIGNIFICANT PREDICTORS OF DISCREPANCIES BETWEEN BEHAVIORS PERCEIVED TO HELP PREVENT CANCER AND COMPLIANCE WITH MINIMUM RECOMMENDATIONS FOR CANCER PREVENTION (N=800)

	Odds ratio	95% Confidence interval	p value
<i>Significant predictors of fruit/vegetable discrepancy</i>			
Univariate logistic regressions			
Race/ethnicity	3.10	1.22–7.91	0.018
Multivariate logistic regression			
Race/ethnicity	2.94	0.99–8.71	0.052
<i>Significant predictors of physical activity discrepancy</i>			
Univariate logistic regressions			
Education	0.91	0.86–0.97	0.005
Perceived general health	0.83	0.07–0.98	0.024
Multivariate logistic regression			
Education	0.90	0.82–0.98	0.011
Perceived general health	0.71	0.47–1.57	ns

fruits and vegetables can attenuate lifetime risk of cancer.^{9,16} Unfortunately, cancer prevention opportunities related to physical activity and consuming a healthy diet are frequently missed. Population data indicate that the majority of women in the United States fail to meet the minimum cancer prevention recommendations for physical activity and fruit and vegetable consumption.^{4,5} To our knowledge, the current study is the first to compare women's perceptions of the importance of a healthy diet (i.e., fruit and vegetable consumption) and regular physical activity in helping to prevent cancer, their perceptions regarding whether or not they regularly engaged in these behaviors to help prevent cancer, and whether or not the frequencies with which they engaged in these behaviors were sufficient to meet the current minimum recommendations for cancer prevention.

Results revealed striking discrepancies between what women reported doing in their daily lives to help prevent cancer and actually engaging in such behaviors at sufficient levels to meet current minimum recommendations for cancer prevention. That is, the vast majority of women in the current study reported (1) knowing that eating a healthy diet and engaging in regular physical activity were important for cancer prevention and (2) that they regularly engaged in these behaviors to help prevent cancer. Nevertheless, the amount of fruits and vegetables regularly consumed and the frequency and duration of regular physical activity that they reported engaging in failed to meet the current minimum guidelines for cancer prevention recommended by the American Cancer Society.³ Results indicated that women reported knowing what to do and believed they were doing what they could to prevent cancer. Unfortunately, examination of the frequency and

duration with which they reported engaging in the behaviors of interest revealed that the vast majority of women were ultimately failing to put into practice what numerous studies have found to be effective in preventing cancer. In other words, the data revealed a substantial disconnect between what women *believed* they were doing to help prevent cancer and what they reported *actually* doing to help prevent cancer.

This finding has important public health implications. The first implication is that women in the current study reported understanding that engaging in regular physical activity and eating a healthy diet are important behaviors for cancer prevention. Thus, media campaigns and targeted public health messages should focus on the importance of specific frequencies and durations of recommended behaviors (i.e., 5 a Day for Better Health), and place less emphasis on the general importance of health behaviors.^{17,18} This may help attenuate the “underdosing” observed in the current study. Current public health efforts are focusing on making community-wide changes to reduce obesity and improve health.¹⁹ These efforts may be enhanced by promoting awareness of potential discrepancies between perceptions of behavior and actual behavior and by highlighting practical ways to integrate specific cancer prevention behaviors into daily life at adequate levels. Furthermore, they should consider the imbalance between educational resources for healthy eating and physical activity and barriers to these behaviors (i.e., society encourages the overconsumption of unhealthy food; low access to fresh produce and places to exercise safely sometimes exists).^{17,18} Given that women often serve as “gatekeepers” of health behavior within their families,^{20–22} efforts to address these discrepancies among women may ultimately have a positive downstream effect on men and children. Because dietary habits are often solidified in childhood, the discrepancies observed in this study could potentially set children up for a lifetime of poor health behaviors. These findings add to the body of existing literature indicating that although health-relevant knowledge and attitudes are generally positively associated with the practice health behaviors, the associations are only modest.⁸

Results further indicated that the observed discrepancies for diet and physical activity were significantly more common among women with less education and among members of racial/ethnic minority groups. This is consistent with a large body of research supporting a social gradient in health (i.e., lower socioeconomic position and minority status are associated with poorer health behaviors and poorer health outcomes).^{23,24} One explanation for this is differential exposure to obesogenic environments.^{25,26} That is, individuals with low socioeconomic status and racial/ethnic minorities have less access to healthier foods such as fruits and vegetables due to higher cost and lower access to grocery stores that carry fresh produce.²⁷ They also have fewer safe places to engage in physical activity.^{25,28} These women may be particularly vulnerable to perceiving that they are engaging in specific diet and physical activity behaviors to help prevent cancer. However, they may lack the opportunity to fully engage in preventive behaviors, thus failing to engage in such behaviors with sufficient frequency and duration to reduce their cancer risk. Such women may need to be specifically targeted for intervention and may benefit from tailored messages and interventions regarding diet and physical activity.

There are several limitations of this study that should be considered. First, knowledge of the specific minimum daily

fruit and vegetable servings and minimum levels of physical activity recommended for cancer prevention were not assessed. Women might have fallen short of the recommended guidelines because of a lack of guideline knowledge. That is, women who perceived that they were already engaging in health behaviors at adequate levels may not have seen a need to change their behavior. A basic knowledge of the discrepancy between a woman's²⁵ current level of a behavior and levels of that behavior required to reduce her risk of cancer may be required to facilitate behavior change. Further, knowledge of specific guidelines (rather than general knowledge that a high level of fruit and vegetable consumption and regular physical activity helps to prevent cancer) may improve adherence to cancer prevention recommendations. This possibility is consistent with previous research indicating that knowledge of fruit and vegetable recommendations predicts fruit and vegetable consumption.²⁹ An important caveat is that although consuming at least two servings of fruit and three servings of vegetables per day is recommended as a cancer prevention strategy by the American Cancer Society,³ the scientific evidence behind this recommendation is relatively weak and inconsistent.^{30–36} The evidence base for the role of physical activity in helping to prevent cancer is much stronger.^{37–39}

A second limitation is that this study sample was selected based on a national, random-digit-dialed telephone survey. We strived to obtain a racially/ethnically diverse sample roughly equivalent to the racial/ethnic breakdown of the 2000 U.S. Census (e.g., 69.1% non-Latina white; 12.5% Latino, 12.1% African American).¹⁴ Participants in this study were 75.5% non-Latino white, 6.6% Latino (due to the fact that interviews were conducted only in English), and 9.9% African American, which is similar to results from the census. It is important to note that because participants were members of a convenience survey pool, the sample may not be representative of the U.S. population at large. Participants were of fairly high SES, and a very large proportion of the women were non-Latino white. Thus, it is unclear whether or not the results will generalize to the larger populations of women with low SES, members of racial/ethnic minority groups, and/or the general U.S. population of women. Third, our response rate was quite low; however, several recent studies have indicated that low response rates do not result in nonresponse bias.^{40–42} Furthermore, responders do not appear to differ from non-responders regarding behaviors and attitudes.¹⁷ Over the last 15 years, RDD contact and cooperation rates have steadily decreased due to an increase in unsolicited telephone calls and the use of caller ID. Keeter and colleagues⁴² reported that a RDD response rate of 25% poses no threat to the quality of findings. Such a response rate yields results equivalent to those obtained from a survey that employed a more rigorous sampling approach that achieved a much higher response rate of 50%. Notably, prior findings suggest that non-whites and those with lower educational attainment and income have a lower response rate.⁴⁰ Thus, the generalizability of the present findings to underserved populations is unclear.

A fourth limitation of this study is its reliance upon self-report measures, which can be biased and unreliable. Fifth, questions pertaining to beliefs about cancer prevention behaviors and perceptions about the practice of behaviors intended to prevent cancer were created solely for the purpose of the present study and not previously validated. Thus, results should be interpreted with caution. Finally, the data are

cross-sectional, so self-reported attitudes and behaviors reflect a single point in time. The cancer prevention behaviors examined may have changed over time in response to social or environmental stressors and events, and such potential change was not captured in this study.

Conclusions

In summary, the current study revealed that women reported regularly engaging in specific healthy behaviors in an effort to help prevent cancer, yet failed to engage in these behaviors with sufficient frequency and duration to meet current minimum recommendations for cancer prevention. Women with less education and racial/ethnic minorities had greater discrepancies. Public health messages should emphasize the importance of specific “doses” of recommended behaviors and promote awareness of discrepancies between perceptions of and actual behavior. As women often serve as gatekeepers of health behavior within their families, such efforts may have a positive downstream effect on men and children. Future studies should more thoroughly evaluate these associations, and should evaluate the efficacy of interventions intended to enhance congruence between perceptions and behavior, particularly among women with less education and racial/ethnic minority women. Compliance with at least the minimum diet and physical activity recommendations for cancer prevention has the potential to reduce the lifetime risk of cancer among women. As elucidated by Salovey and colleagues, health behavior change may ultimately have greater potential than medical innovation to attenuate the morbidity and mortality of cancer.⁴³

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Address correspondence to:

Jennifer Irvin Vidrine, PhD

Department of Health Disparities Research

The University of Texas MD Anderson Cancer Center

1400 Pressler St., Unit 1440

Houston, TX 77030

E-mail: jirvinvidrine@mdanderson.org