ORIGINAL RESEARCH

Weight Status and Perception of Colorectal Cancer Risk

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Background: **Obesity increases the risk of many cancers including colorectal cancer (CRC).**

Methods: This is secondary data analysis of the 2010 National Health Interview Survey data. A total of 9360 obese and overweight participants, aged 50 to 80 years, were analyzed according to their perception of their personal cancer risk.

Results: **Having a perception of increased risk for cancer was associated with higher CRC screening rates. However, when compared with their normal-weight counterparts, overweight and obese individuals did not perceive themselves as being at an increased risk for cancer in general or for CRC specifically. Subgroup analysis revealed one notable exception. Obese black women appeared to recognize themselves as being at higher risk for CRC.**

Conclusions: **Most obese and overweight individuals fail to recognize their increased cancer risk. Individuals who perceive themselves as being at increased risk for cancer, especially CRC, are more likely to have undergone CRC screening. Unfortunately, obese and overweight individuals do not seem to recognize the increased cancer risk conferred by their body weight. Education is needed so that obese and overweight individuals are aware that their excess body weight is a risk factor for cancer. (J Am Board Fam Med 2012;25:792–797.)**

Keywords: **Cancer Risk, Colon/Colorectal Cancer Screening, Obesity, Weight Status**

An estimated 68% of US adults are either obese or overweight.[1] Obesity is associated with an increased risk for several types of cancers, including colorectal cancer (CRC). Obesity is second only to tobacco as a modifiable risk factor for cancer.[2] It has been estimated that >41,000 cancer cases per year are due to obesity.[3] The relative risk of CRC for both men and women increases as body mass index (BMI) increases. Relative risk for CRC in men is 1 in 20 when BMI 25.0 to 29.9 kg/m^2, 1.47 when BMI is 30.0 to 34.9 kg/m^2, and 1.84 when BMI is 35.0 to 39.9 kg/m^2. Relative risk for CRC in women is 1 in 10 when BMI 25.0 to 29.9 kg/m^2, 1.33 when BMI is 30.0 to 34.9 kg/m^2, 1.36 when BMI is 35.0 to 39.9 kg/m^2, and 1.46 when BMI is ≥40.0 kg/m^2.[4]

Thus, there is increasing interest in promoting healthy weight through healthy eating and physical activity as a cancer prevention strategy. In addition, there may be a reason for increased diligence in cancer screening in the overweight and obese population. If individuals at higher weight recognize themselves as being at higher risk for cancer, they will, arguably, be more likely to screen for CRC or other cancers. Many models of behavior change suppose that perception of risk is a motivator of action related to preventive behavior, including behavior related to cancer prevention.[5–7] However, many individuals may not recognize obesity as an important and modifiable risk factor for cancer.[8]

This article was externally peer reviewed.

Submitted 19 January 2012; revised 8 August 2012; accepted 13 August 2012.

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Funding: This work was supported by the Cancer Control Career Development Award 115834-CCCDA-08-107-01-CCCDA from the American Cancer Society.

Conflict of interest: none declared.

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The purpose of this study is to determine if overweight and obese individuals recognize a higher personal risk for cancer in general and for CRC specifically. Prior research indicates that men and women perceive their weight differently[9]; likewise, nonwhite minorities also view their weight differently than whites.[10,11] Therefore, subgroup analysis is completed to see if cancer risk perception is different in women or blacks.

Methods

This was a cross-sectional study analyzing data from the 2010 National Health Interview Survey, a nationally representative survey of the civilian noninstitutionalized population of the United States. The National Health Interview Survey is a cross-sectional household interview survey. The sampling plan follows a multistage area probability design that permits the representative sampling of households and noninstitutional group quarters (eg, college dormitories) and oversamples of blacks, Hispanics, and Asians. This complex survey design allows for population estimates of the United States.[12]

Participants

The National Health Interview Survey respondents in this study were individuals aged ≥50 years old because CRC screening would be recommended for these individuals according to the American Cancer Society.[13] Individuals >80 years of age were excluded, acknowledging that there is some controversy regarding the age at which CRC screening should be discontinued. Within this participant group, the association between perception of cancer risk and a particular behavior, CRC screening, could be analyzed, therefore demonstrating an association between perception of risk and an action to mitigate that risk.

Variables

Perception of Increased Cancer Risk

Perception of cancer risk was self-reported as "more than the average person," "approximately the same as the average person," or "less than the average person" for both cancer in general and for CRC specifically. Individuals who answered "more than the average person" were classified as having a perception of increased cancer risk; individuals who answered "approximately the same as the average person" or "less than the average person" were classified as not having a perception of increased risk.

Weight Status

Obesity was defined according to BMI, which was calculated as weight in kilograms divided by the square of height in meters. BMI was categorized as underweight (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), and obese (≥30 kg/m^2).[14] Due to small sample size, underweight individuals were excluded.[15]

CRC Screening

We examined the self-reported variables related to endoscopy, stool blood testing, and test date. The outcome variable of overall CRC screening status was defined as up to date in individuals who had one of the following screening tests: colonoscopy within the last 10 years, sigmoidoscopy in the last 5 years, or fecal occult blood test within the last year.[13] To be included, an individual must have had complete answers (both test and date) to at least one of the aforementioned screening test questions.

Covariates

We examined the potential confounding variables of age (50–59, 60–69, 70–79 years); education (<12 years, high school graduate, some college, college graduate); marital status (married, unmarried); race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black); health status (fair/poor, excellent/good); income (<$20,000, $20,000–$25,000, $35,000–$55,000, $55,000–$75,000, $75,000+); insurance status (yes/no); office visits in the last year (none, one, 2–5, ≥6); regular source of medical care (yes/no); smoking status (current, former, never); physician recommendation (yes/no); alcohol use (none, light to moderate, heavy); number of comorbidities (zero, one, 2–3, 4–5, ≥6); family history defined as any primary relative with a cancer diagnosis (yes/no); personal history of cancer (yes/no); and physician recommendation (yes/no).

Results

Selection criteria for this study included the following: age between 50 and 79 and nonmissing data for BMI, colorectal screening, perceived risk of cancer, and perceived risk of colon cancer. Using this selection criteria, there were 9360 eligible participants with "nonmissing" data. We assumed that

Table 1. Demographic Characteristics of Participants According to Weight Status (n = 9360)

	Weight Status (n = 9360)		
	Normal (n = 2787)	Overweight (n = 3600)	Obese (n = 2973)
Age (years)			
50–59	48.3%	48.2%	52.0%
60–69	28.5%	31.6%	31.6%
70–79	23.2%	20.2%	16.4%
Educational status			
Less than 12 years	14.2%	15.8%	18.0%
High school graduate	27.6%	30.1%	32.2%
Some college	23.1%	25.7%	29.3%
College or more	35.1%	28.4%	20.5%
Marital status			
Married	66.5%	73.2%	69.2%
Not married	33.5%	26.8%	30.8%
Race/ethnicity			
Hispanic	5.9%	8.6%	8.3%
Non-Hispanic white	86.8%	81.6%	80.3%
Non-Hispanic black	7.3%	9.8%	11.4%
Reported health status			
Excellent/good	84.5%	83.8%	74.5%
Fair/poor	15.5%	16.2%	25.5%
Household income			
<$20,000	27.2%	25.0%	26.9%
$20,000–35,000	18.3%	22.4%	21.4%
$35,000–55,000	22.8%	22.7%	25.3%
$55,000–75,000	14.0%	14.7%	13.7%
$75,000+	17.7%	15.2%	12.7%
Insurance coverage			
None	8.7%	7.8%	8.0%
Covered	91.3%	92.2%	92.2%
Past year medical visits			
0	12.7%	11.5%	8.0%
1	15.1%	15.2%	10.7%
2–5	43.0%	43.4%	42.3%
6+	29.2%	29.9%	39.0%
Regular source of medical care	90.3%	91.5%	93.2%
Smoking status			
Never	50.1%	47.6%	50.9%
Former	29.0%	36.5%	35.3%
Current	20.9%	15.9%	13.8%
Alcohol use			
None	40.2%	40.2%	48.4%
Light to moderate	53.7%	55.2%	48.3%
Heavy	6.1%	4.6%	3.3%
Comorbidities			
0	35.0%	28.3%	16.7%
1	31.3%	30.6%	24.5%
2–3	27.2%	31.8%	42.2%
4–5	5.3%	7.8%	13.9%
≥6	1.2%	1.5%	2.7%

Continued

Table 1. Continued

	Weight Status (n = 9360)		
	Normal (n = 2787)	Overweight (n = 3600)	Obese (n = 2973)
Family history of cancer			
Yes	84.4%	82.6%	83.9%
No	15.6%	17.4%	16.1%
Personal history of cancer			
Yes	14.0%	13.4%	13.6%
No	86.0%	86.6%	86.4%
Physician recommendation			
Yes	54.6%	54.1%	55.3%
No	45.4%	45.9%	44.7%

missing data were missing at random and therefore would not affect the subsequent analyses.

Table 1 demonstrates the demographics of our population according to weight status and according to several known predictors of CRC screening. In the adjusted analysis (not shown), only family history and smoking status were significant predictors for perception of cancer risk. These variables were incorporated in the adjusted analysis of the outcome CRC screening examined in Table 2. Table 2 examines the outcome of CRC screening according to perception of risk. Having a perception of increased cancer risk in general is associated with increased CRC screening (OR, 1.66; 95% CI, 1.47–1.87). Likewise, having a perception of increased cancer risk, specifically for CRC, is strongly associated with increased CRC screening (OR, 2.71; 95% CI, 2.33–3.15). Table 3 shows perception of cancer risk according to weight status. There is no association between weight status, being overweight or obese, with having a perception of increased cancer risk in general or for CRC specifically. Table 4 stratifies the outcome of perception of increased cancer risk according to race and sex. With the exception of obese black females, there are no significant associations between weight status and perception of increased cancer risk. We did not include those who self-identify as Hispanic in Table 4 due to a small sample size.

Discussion

Our work demonstrates that perception of cancer risk is associated with higher CRC screening rates, supporting the theoretical link between perceived risk and an individual's likelihood to take action to prevent cancer. However, overweight and obese individuals, in this study, do not perceive themselves to be at higher risk for cancer in general nor for CRC specifically. This finding may illustrate an important gap in public health knowledge. If individuals recognize increased weight as a modifiable risk factor for cancer, they may be motivated to make lifestyle changes or at least be more diligent regarding screening. Obese and overweight individuals who fail to recognize an increase in their own personal risk for cancer may be less likely to engage in cancer prevention behavior and less likely to be positively influenced by cancer prevention messages.

Of interest, Finkelstein et al[16] found that obese persons do perceive their life expectancy to be

Table 2. Perception of Increased Cancer Risk Is Associated with CRC Screening (n = 8334)

Perception of Increased Risk for Cancer	n	Up-to-Date for CRC Screening	OR (95% CI)
Yes	1221	58.2% (711)	1.66 (1.47–1.87)
No	8179	45.7% (3470)	1.00*
Perception of Increased Risk for CRC	n	Up-to-Date for CRC Screening	OR (95% CI)
Yes	878	69.0% (606)	2.71 (2.33–3.15)
No	8522	45.1%(3845)	1.00*

*Reference.
CRC, colorectal cancer; OR, odds ratio; CI, confidence interval.

Table 3. Perception of Cancer Risk According to Weight Status (n = 9360)

Weight Status	Perception of Increased Risk for Cancer in General	Perception of Increased Risk of CRC
Normal (n = 353)	1.00*	1.00*
Overweight (n = 455)	1.00 (0.85–1.18)	1.03 (0.85–1.25)
Obese (n = 413)	1.05 (0.88–1.25)	1.15 (0.94–1.40)

>*Reference.
CRC, colorectal cancer.

shorter because of their weight status. They also found that obese persons regard themselves at a higher risk for cancer than normal-weight individuals. However, this study did not control for family history or smoking history. We found these factors to be significant predictors of risk perception as did Honda and Neugut in 2004.[17] This is an important distinction because weight is modifiable unlike family history or a history of smoking.

These data show one notable exception. Obese black women do appear to see themselves as being at higher risk for CRC. This is somewhat consistent with the literature, which shows that women were more likely than men to see their weight as a health risk.[10] Likewise, the literature supports that obese individuals are more likely to see their weight as a problem compared with overweight individuals.[18] However, it is unclear why black and not white women perceive this risk when, ironically, some data indicate that the link between obesity and cancer risk is weakest in black women.[19] Perhaps black women perceive a higher CRC risk because they more often see the diagnosis made in family members. Kim et al[20] found that family history was a predictor of perceived risk for CRC among a group of diverse women. The opposite trend, although not statistically significant, is seen in black men, in which obese black men see themselves as at decreased risk for cancer compared with nonobese black men. Black men have the highest incidence of colon cancer irrespective of weight status with 62.0 of 100,000 black men diagnosed in 2007.[21] This is especially concerning given that an increased risk of colon cancer with obesity has been shown more consistently in men than women.[22–24] Unfortunately, small sample size precluded our ability to examine the subgroup of Hispanic individuals.

Public health education needs to incorporate cancer risk into education programs for weight loss and obesity prevention and more research needs to be done on cancer risk perception in obese individuals. Educating the public of their increased cancer risk with obesity should be a priority, because obese persons may not fully comprehend this health risk. Current attempts at lowering obesity are not working. If fear of a cancer diagnosis is motivational,

Table 4. Association between Perception of Cancer Risk and Weight Status According to Sex and Race (n = 9360, Subdivided into Groups)

		Increased Perception of Risk for Any Cancer; OR (95% CI)	Increased Perception of Risk for CRC; OR (95% CI)
White males	Normal (n = 786)	1.00 (reference)	1.00 (reference)
	Overweight (n = 1480)	1.05 (0.76–1.45)	1.02 (0.70–1.50)
	Obese (n = 893)	1.19 (0.84–1.68)	1.48 (1.0–2.19)
Black males	Normal (n = 149)	1.00 (reference)	1.00 (reference)
	Overweight (n = 218)	0.83 (0.40–1.72)	0.91 (0.40–2.07)
	Obese (n = 141)	0.73 (0.33–1.63)	0.37 (0.12–1.11)
White females	Normal (n = 1476)	1.00 (reference)	1.00 (reference)
	Overweight (n = 1224)	1.16 (0.91–1.48)	1.23 (0.93–1.61)
	Obese (n = 1271)	1.14 (0.90–1.44)	1.07 (0.81–1.42)
Black females	Normal (n = 136)	1.00 (reference)	1.00 (reference)
	Overweight (n = 238)	1.31 (0.58–2.99)	2.72 (0.74–10.02)
	Obese (n = 322)	1.19 (0.54–2.64)	3.90 (1.12–13.52)

*Those who self-identify as Hispanic are not included in the data set.
CRC, colorectal cancer; OR, odds ratio; CI, confidence interval.

then by making more people aware of the increased cancer risk with obesity may encourage behavior changes conducive to decreasing cancer risk.

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