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Correlates of Unrealistic Risk Beliefs in a Nationally Representative Sample

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Abstract

Unrealistically optimistic or pessimistic risk perceptions may be associated with maladaptive health behaviors. This study characterized factors associated with unrealistic optimism (UO) and unrealistic pessimism (UP) about breast cancer. Data from the 2005 National Health Interview Survey were analyzed (N=14,426 women). After accounting for objective risk status, many (43.8%) women displayed UO, 12.3% displayed UP, 34.5% had accurate risk perceptions (their perceived risk matched their calculated risk), and 9.5% indicated “don’t know/no response.” Multivariate multinomial logistic regression indicated that UO was associated with higher education and never smoking. UP was associated with lower education, lower income, being non-Hispanic Black, having ≥ 3 comorbidities, current smoking, and being overweight. UO was more likely to emerge in younger and older than in middle-aged individuals. UO and UP are associated with different demographic, health, and behavioral characteristics. Population segments that are already vulnerable to negative health outcomes displayed more UP than less vulnerable populations.

Keywords

Unrealistic optimism; unrealistic pessimism; breast cancer; health behavior

Most theories of health behavior state that engagement in health protective behaviors is determined in part by the degree to which people perceive that they are vulnerable to a

health threat (Ajzen, 1985; Edwards, 1954; Fishbein & Ajzen, 1975; Rogers, 1983; Rosenstock, 1990; Witte, 1998). There is empirical support for this assertion. For example, women who perceive that they are at high risk of developing breast cancer are more likely to undergo mammographic screening than women who believe that they are at lower risk (McCaul, Branstetter, Schroeder, & Glasgow, 1996). However, an individual's perceived risk may or may not adequately represent his or her objective risk (Fagerlin, Zikmund-Fisher, & Ubel, 2005), and it is not easy to correct such misperceptions (Senay & Kaphingst, 2009; Smerecnik, Mesters, Verweij, de Vries, & de Vries, 2009; Weinstein & Klein, 1995).

The present study examined two errors people can make when evaluating a health hazard: *unrealistic optimism*, generally defined as the inaccurate belief that one is better off regarding the chances of experiencing a particular outcome compared with an average person (Weinstein, 1980), and *unrealistic pessimism*, which is the inaccurate belief that one is *worse off* than the average person. Both errors may have negative effects on health behaviors (Kreuter & Strecher, 1995; Rogers, 1983). The present study used a large nationally representative sample to characterize the demographic, health access, health status, and behavioral correlates of unrealistic optimism and unrealistic pessimism of developing breast cancer in an effort to identify population segments for targeted health communication and behavior interventions. This study possesses several methodological strengths that add value to the existing literature (e.g., extremely large representative sample, accounting for actual risk status).

Unrealistic Optimism

Unrealistic optimism can be measured both at the group level and individual level, and using either comparative or absolute measures. This flexibility in assessment makes it possible for women to be unrealistically optimistic about their breast cancer risk while simultaneously overestimating their absolute risk (Lipkus et al., 2000). We used the comparative, individual level approach for several reasons. First, people draw meaning from comparative judgments and use them when responding affectively, formulating intentions, and engaging in behavior (Klein, 1997, 2002; Lipkus, et al., 2000). Second, comparative judgments that do not require participants to estimate or evaluate a numerical value may be less vulnerable to low numeracy than judgments that require a numerical estimate (Peters, 2008). The third reason was pragmatic; the available dataset allowed us to assess unrealistic optimism at the individual level using comparative risk judgments but not absolute risk judgments.

Unrealistic optimism has been found for a variety of negative health outcomes within several populations. Adult smokers can be unrealistically optimistic about avoiding lung cancer (Dillard, McCaul, & Klein, 2006), middle-aged women can be unrealistically optimistic about developing breast cancer (Lipkus, Klein, & Skinner, 2005), gay men, heterosexuals, and prostitutes can be unrealistically optimistic about contracting HIV/AIDS (van der Velde, van der Pligt, & Hooykaas, 1994), and college students can be unrealistically optimistic about experiencing negative alcohol-related events such as hangovers (Dillard, Midboe, & Klein, 2009). Unrealistic optimism about a variety of health problems has been found in community (Katapodi, Dodd, Lee, & Facione, 2009; Weinstein, 1987) and clinical (Strecher, Kreuter, & Koblin, 1995) study samples.

Unrealistic optimism may also be associated with less favorable health behaviors. College students who are unrealistically optimistic about their risk of experiencing negative alcohol-related events report experiencing more such events three months later (Dillard, et al., 2009). Unrealistic optimism about lung cancer is associated with less interest in quitting smoking (Dillard, et al., 2006). The literature is mixed regarding the direction of the relationship between unrealistic optimism and breast cancer screening (Facione, 2002; Katapodi, et al.,

2009). Contributing to the confusion is that many existing studies are cross-sectional, whereas prospective studies are necessary to draw definitive conclusions about the direction of the relationship between perceived risk and behavior (Brewer, Weinstein, Cuite, & Herrington Jr., 2004; Weinstein, 2007).

Demographic, Health Status, and Health Access Correlates of Unrealistic Optimism

Although unrealistic optimism may not vary by income (Dillard, et al., 2006), it may be more prevalent among people who are older (Dillard, et al., 2006) or who have less than a high school education (Katapodi, Lee, Facione, & Dodd, 2004). Research reporting null relationships between unrealistic optimism and education and age may have had low statistical power due to small sample sizes (Radcliffe & Klein, 2002; Weinstein, 1987). Studies reporting associations between race/ethnicity and unrealistic optimism are rare and their findings are inconclusive (Katapodi, et al., 2004). Few studies have employed a sufficient sample size to explore reliable relationships between unrealistic optimism and any of these variables (but see (Facione, 2002).

The literature is sparse and unclear regarding the relationship between unrealistic optimism and health status variables. In one study, people who were unrealistically optimistic about their heart attack risk had higher systolic blood pressure, serum cholesterol, and objective risk of heart attack than people who were not unrealistically optimistic (Radcliffe & Klein, 2002). In another study, unrealistic optimism was associated with decreased cardiovascular mortality (Gramling, Klein, Roberts, Waring, & Eaton, 2008).

Unrealistic Pessimism

Perceptions of risk can also go awry when people overestimate their likelihood of experiencing a negative health outcome. It is well-established that women overestimate their absolute risk of breast cancer (C. Lerman, 1995), and women can also overestimate how their risk compares with an average woman's risk (Lipkus, et al., 2005). Research on unrealistic pessimism is less common than research on unrealistic optimism and does not often address health-related issues (e.g., Rose, Endo, Windschitl, & Suls, 2008). Moreover, there are generally fewer unrealistic pessimists than optimists in any given sample (e.g., Radcliffe & Klein, 2002). In general, most studies employ samples that are too small to address factors that might be associated with unrealistic pessimism. Thus, it is necessary to conduct additional unrealistic pessimism research using a large sample of women representing the U.S. general population.

Unrealistic pessimism is surprisingly important. If people with unduly high risk perceptions also believe there is little they can do to reduce their risk of breast cancer, they may engage in maladaptive coping or health behaviors such as avoiding necessary healthcare (Caryn Lerman & Schwartz, 1993; Rogers, 1983), engaging in excessive cancer screening (Brain, Norman, Gray, & Mansel, 1999), or using tobacco (Kreuter & Strecher, 1995). On the other hand, unrealistic pessimism may be beneficial if women use it as an anticipatory coping strategy to buffer the impact of a cancer diagnosis (Norem & Cantor, 1986). Little is known about the characteristics of women who are unrealistically pessimistic about their breast cancer risk.

Objectives

The present study had three objectives. The first was to identify the prevalence of unrealistic optimism and unrealistic pessimism of breast cancer in the U.S. population, using

participants' objective risk status to identify these biases at the individual level. Without accounting for objective risk status, investigators cannot know whether someone believes she is at below average risk because she is unrealistically optimistic or because she really does have a favorable risk factor profile (Radcliffe & Klein, 2002). The second objective was to identify possible population segments that are especially vulnerable to unrealistic optimism/pessimism so that future research might target them for health communication and health behavior interventions. To this end, we examined a variety of demographic, health status, health access, and behavioral variables that may be related to unrealistic optimism or unrealistic pessimism of breast cancer. The final objective was to make a contribution to the unrealistic optimism/pessimism literature by addressing several methodological challenges. In particular, our study used a very large and nationally-representative sample, accounted for objective breast cancer risk status, described findings for adult women across the developmental lifespan, and investigated possible correlates from multiple domains. Previous studies have generally focused on small convenience samples in a limited developmental age range, thereby hindering the ability to draw conclusions about the prevalence and correlates of either unrealistic optimism or unrealistic pessimism. Moreover, most previous studies have not focused on unrealistic pessimism.

Methods and Materials

Data Source and Participants

Data from the 2005 iteration of the National Health Interview Survey (NHIS 2005) were analyzed. NHIS is a population-based, nationally-representative survey of the civilian non-institutionalized population of the United States. Detailed information about the survey's methodology and response rate is available online (National Center for Health Statistics, 2006). The sample for the present analyses included 16,106 women aged 18 and older who reported never being diagnosed with any cancer. Of those 16,106 women, 14,426 (89.7% weighted) provided valid responses for all of the items of interest and were included in the final analyses.

Measures

Risk perception category—To determine whether participants had unrealistically optimistic, unrealistically pessimistic, or accurate risk perceptions, we matched their perceived breast cancer risk to their objective breast cancer risk. First, perceived risk was assessed with the question, "Compared to the average woman your age, would you say that you are more likely to get breast cancer, less likely or about as likely." Next, the Gail model was used to calculate the objective risk of breast cancer for all women with no prior breast cancer diagnosis (Gail et al., 1989).^a Although the original Gail model provides absolute risk estimates (e.g., 1.66%), we used the same risk factors to calculate relative risk (RR) estimates (Freedman et al., 2004). RR estimates are inherently comparative in nature. For instance, a RR of 1.1 indicates that a woman's risk is 10% larger than the risk of the average woman in the sample. A RR of 0.9 indicates that the woman is at 10% reduced risk compared to the average woman's risk.

We then stratified the sample by 5-year age group (described below). For each stratum we assigned participants to one of three objective risk categories according to RR quartiles.

^aThe Gail model is based on population-level data (Gail, et al., 1989) and may not adequately predict breast cancer risk at the individual level (Rockhill, 2001; Schonfeld et al., 2010), particularly for African American women (Adams-Campbell et al., 2009). However, the model was used to determine individual participant eligibility for the randomized clinical trials of tamoxifen and raloxifene (Fisher et al., 1998; Vogel et al., 2006), is mentioned in the Federal Drug Administration approval of tamoxifen for primary chemoprevention of breast cancer (Vogel, et al., 2006), and is posted on heavily-visited cancer risk assessment websites (for a review see Waters, Sullivan, Nelson, & Hesse, 2009). Thus, it is not unreasonable to use the Gail model to obtain objective risk estimates.

Participants whose overall RR of breast cancer was in the top quartile (i.e., higher than 75% of the sample) were considered at above average risk. Participants whose RR was in the bottom quartile (i.e., lower than 25% of the sample) were considered at below average risk. Those whose RR was in the middle two quartiles were considered at average risk. Women were categorized as having accurate risk perceptions if their objective RR matched their perceived risk (see Table 1). Unrealistic optimists were women whose perceived risk was lower than their objective RR category. Unrealistic pessimists were women whose perceived risk was higher than their objective RR category. There were 1,458 women (9.5% weighted) who answered either “don’t know” or did not respond to the perceived risk question. These women were included in the analyses as a distinct category within the risk perception category variable. Thus, there were four possible levels of the outcome variable: unrealistically optimistic, unrealistically pessimistic, accurate, and “don’t know/no response.”

Demographic variables—Four demographic variables were included in the analyses: age, educational attainment, income, and race/ethnicity. Age was divided into 15 groups by 5-year intervals (i.e., 20–24, 25–29...80–84). Women aged 18 to 19 and women aged 85 or older were categorized separately (i.e., 18–19 and 85+).

Health access and health status variables—Three health access variables were assessed: health insurance status, contraceptive/HRT use, and presence or absence of a usual source of healthcare. One health status variable was also assessed: the number of serious non-cancer comorbidities (i.e., hypertension, coronary heart disease, heart attack, any other heart problem, angina, stroke, emphysema, asthma, diabetes, kidney condition, liver condition).

Behavioral variables—Smoking status, alcohol use, healthy weight maintenance, and meeting physical activity recommendations (i.e., engaging in at least 150 minutes of physical activity per week) were assessed. Mammogram history was not included because questions about breast cancer screening were not asked of participants under 30 years of age and this study sought to examine unrealistic optimism and unrealistic pessimism over the entire adult lifespan.

Statistical Analyses

Data were analyzed using SUDAAN version 10.0.1 to account for the complex sampling design. Participant characteristics were examined using weighted descriptive statistics. Cross-tabulation tables and chi-square tests of association were used to test whether individuals who did (versus did not) complete all of the items of interest differed on the outcome and predictor variables. Cross-tabulations and chi-squares also examined whether there were bivariate relationships between risk perception category (i.e., unrealistic optimists, unrealistic pessimists, accurate, and don’t know/no response) and any of the predictor variables. Finally, multivariate multinomial logistic regression analyses were used to address the research questions. Risk perception category was the outcome variable, and participants who had accurate risk perceptions were assigned as the reference group. Demographic, health access, health status, and behavioral variables that were significantly related to risk perception category ($p < .05$) were entered as predictors. To take advantage of the wide age range, we made an *a priori* decision to explore whether there was a quadratic relationship between age and risk perception category. To account for multiple comparisons and reduce the possibility of Type I error, a sequential Bonferroni correction (Holm, 1979) was conducted for each of the unrealistic optimism, unrealistic pessimism, and don’t know/no response categories. This method adjusts for Type I error but is less conservative than the traditional Bonferroni adjustment. This correction yielded adjusted critical p values of .

.005 for unrealistic pessimism and .003 for unrealistic optimism and don't know/no response. All analyses were weighted to provide nationally representative population estimates of the parameters and percentages.

Results

The 1,680 individuals who did not provide complete data for all of the variables in the study differed significantly from those who did. Noncompleters were more likely to be older, $p < .001$, have a lower relative risk of breast cancer, $p < .001$, and to report never drinking, $p < .001$. Noncompleters were also less likely to report engaging in at least 150 minutes of physical activity per week, $p < .001$. However, completers and noncompleters did not differ on any of the other predictors. Women who did not respond to the perceived risk question were less likely to complete other items on the survey, $p < .001$. Table 2 describes the characteristics of the 14,426 participants with complete data.

Overall, 6,036 (41.8% unweighted, 43.8% weighted) participants were unrealistically optimistic about their breast cancer risk, 1,927 (13.4% unweighted, 12.3% weighted) were unrealistically pessimistic, and 5,005 (34.7% unweighted, 34.5% weighted) were accurate. An additional 1,458 women (10.1% unweighted, 9.5% weighted) either did not respond to the perceived risk question or indicated that they did not know the answer. The range of objective relative risks for each category of perceived risk were: 1.0–8.7 (Less likely); 1.0–8.2 (About as likely); 1.0–19.6 (More likely); and 1.0–6.4 (Don't know/No response). Bivariate chi-square analysis indicated that all the predictors were significantly associated with risk perception category except for usual source of health care and contraceptive/HRT use (data not shown). Consequently, the main analysis excluded these two variables.^b The omnibus Wald F tests for the multinomial logistic regression analyses indicated that age, $p < .0001$, age² (i.e., age as a quadratic function), $p < .0001$, race/ethnicity, $p < .0001$, educational attainment, $p < .0001$, income, $p = .004$, health insurance status, $p = .004$, number of comorbidities, $p = .006$, smoking status, $p < .0001$, and BMI, $p = .001$ were significantly associated with risk perception category. Physical activity, $p = .11$ and alcohol use, $p = .44$ were not related to risk perception category.

More detailed examination revealed that being unrealistically optimistic (versus accurate) was significantly associated with educational attainment and smoking status. In particular, compared with women who had accurate risk perceptions, those who were unrealistically optimistic had significantly higher odds of being more highly educated and never smoking (see Table 3). Unrealistic optimism was also significantly less frequent among older women (see Table 3). A quadratic trend for age, $p < .0001$ took the form of a U-shaped curve in which unrealistic optimism was highest at younger ages, fell over the lifetime, and increased again at older ages (see Figure 1). Unrealistic optimism was not related to ethnicity, income, health insurance status, number of comorbidities, alcohol use, or physical activity.

Unrealistic pessimism was related to educational attainment, income, race/ethnicity, number of comorbidities, smoking status, and maintaining a healthy weight. In particular, compared with women with accurate risk perceptions, those who were unrealistically pessimistic were slightly more likely to be non-Hispanic Black (rather than Caucasian), and significantly more likely to have three or more comorbidities and to be overweight (see Table 3).

^bWe also examined unrealistic optimism on the group level. In accordance with established practice (Weinstein, 1987), the comparative perceived risk variable was recoded as: -1 (less likely), 0 (about as likely), and +1 (more likely). The mean comparative risk for the entire sample was -0.24 (SE=0.01), which was significantly different from zero ($p < .0001$). This demonstrates that, as a group, women perceived their breast cancer risk as lower than the average woman's risk (i.e., unrealistically optimistic). Readers who are interested in the correlations between the raw comparative risk perception measure and the outcome variables should contact the corresponding author.

Unrealistic pessimism was less frequent among women with more education, higher income, and who were never or former smokers (see Table 3). There was no significant relationship between unrealistic pessimism and health insurance status, age, alcohol use, or physical activity.

Compared to women with accurate risk perceptions, women who did not know their risk or did not respond to the risk question were more often members of racial/ethnic minority groups and to have less education (see Table 3). There was also a quadratic relationship between age and not knowing/responding (see Figure 1). None of the other predictors was associated with not knowing/responding.

Discussion

This is the first study to use a population based, nationally representative survey to estimate the ubiquity of unrealistic optimism and unrealistic pessimism in the U.S. with respect to a specific disease. Consequently, its findings are more generalizable than other research sampling from universities (Dillard, et al., 2009), medical centers (Strecher, et al., 1995), or local communities (Weinstein, 1987).

Although 35% of U.S. women evaluated their risk of breast cancer accurately, two-thirds (65%) had inaccurate breast cancer risk perceptions. Most of these errors (67%) were in the direction of unrealistic optimism, but a sizable minority was either pessimistic (19%) or reported not knowing their risk or refused to answer the question (14%). These percentages are consistent with research examining early-stage breast cancer patients (Liu et al., 2010) and with the assertion that unrealistic optimism is highly prevalent (Weinstein, 1987). The lack of association between unrealistic optimism and many demographic, health status, health access, and behavioral variables speaks to its ubiquity across population segments (see Table 4).^c

The higher prevalence of unrealistic optimism among young people reported elsewhere (Strecher, et al., 1995) was qualified in the present study. Younger *and* older women displayed more unrealistic optimism than middle-aged women. In contrast to research involving community-based or clinical samples (Facione, 2002; Liu, et al., 2010; Strecher, et al., 1995; Weinstein, 1987), this study found that higher educational attainment was associated with greater odds of being an unrealistic optimist and decreased odds of being an unrealistic pessimist. Because increased education is actually associated with increased breast cancer incidence and with decreased breast cancer mortality, it is possible that this result is due to participants' conflating incidence and mortality. Additional research should explore this possibility.

^cSensitivity analyses indicate that these findings are reasonably robust whether the RR cutoffs for determining whether participants' objective risk is average, above average, or below average are based on tertiles, quartiles, or quintiles, even after the sequential Bonferroni correction for multiple comparisons is conducted (i.e., $p < .003$ or $p < .004$ for unrealistic optimism and unrealistic pessimism, respectively). Analyses based on tertiles differed slightly from the quartile analyses. In particular, age² had an inverted U-shaped relationship for unrealistic pessimism (OR = 0.99, 95% CI [0.98, 1.00], $p = .0003$), such that younger and older women were less pessimistic than women in their middle years. Analyses based on quintiles also differed slightly. In contrast to the reported (quartile) analysis, people without a high school degree were not less likely to be unrealistically optimistic than people with a degree (OR = 0.88, 95% CI [0.76, 1.02], $p = .10$), having more than a 4-year degree was not associated with reduced unrealistic pessimism (OR = 0.70, 95% CI [0.50, 0.98], $p = .04$), and being non-Hispanic Black was not associated with increased unrealistic pessimism (OR = 1.25, 95% CI [1.04, 1.49], $p = .015$). It should be noted that all of the OR reported in this footnote either fall within or nearly within the confidence intervals reported in Table 3. For instance, the nonsignificant OR of 0.70 for the tertile-based relationship between having more than a 4-year degree and unrealistic pessimism is within 0.01 points of the CI for the same relationship using quartiles (i.e., 0.35–0.69; see Table 3). This suggests that, although the significance levels changed very slightly based upon the objective relative risk cutoffs, the sizes of the relationships—and hence the overall message—are consistent.

Contrary to clinic-based research (Strecher, et al., 1995), never smoking was also associated with higher odds of being an unrealistic optimist and decreased odds of being an unrealistic pessimist. It could be that never smokers use their smoking status to evaluate their risk, but because tobacco use is not a risk factor for breast cancer, they do so to an undue degree.

With a few exceptions, women from segments of the population who experience higher breast cancer mortality (but not incidence) were more pessimistic about developing breast cancer than women from population segments who experience less breast cancer mortality (Table 4). Odds of being unrealistically pessimistic (rather than accurate) were higher among non-Hispanic Blacks, and women with lower educational attainment, lower income, and three or more comorbidities. Unrealistic pessimism was also more common among current smokers than never and former. Thus, these women's perceptions were somewhat correct, only in relation to mortality instead of incidence. Ethnic minorities and people with lower educational attainment also had disproportionately higher odds of making "don't know" responses than people who were non-Hispanic White and had higher educational attainment. Research is ongoing to explore this phenomenon further (Hay, Orom, & Waters, in progress).

Mechanisms

NHIS is a powerful resource for health-related research, but it does not provide any information about the psychological and cognitive processes that drive breast cancer risk perceptions. Consequently, we can only speculate about the possible mechanisms that underlie our findings. One possibility might be a lack of knowledge (Katapodi, Dodd, Facione, Humphreys, & Lee, 2010). However, because NHIS did not assess knowledge of breast cancer risk factors, direct evidence of this mechanism is unavailable.

Nevertheless, it is unlikely that the results of this study are attributable solely to lack of knowledge of breast cancer risk factors among vulnerable groups. If that were the case, vulnerable women would have displayed unrealistic optimism in addition to unrealistic pessimism, not only unrealistic pessimism (i.e., some women with less knowledge would underestimate their risk, but others would overestimate their risk). Another possibility is that affective variables such as breast cancer worry influenced how women compared their risk to the average woman's risk (Katapodi, et al., 2010; Lipkus, et al., 2005).

To some extent, the pattern of findings described in Table 4 suggests that women may have conflated breast cancer incidence with breast cancer mortality when they completed the survey. To speculate, women from vulnerable groups may have recognized that accessing breast cancer treatments could be difficult, and consequently overestimated their risk to avoid "tempting fate" by saying that their risk was lower than average (Risen & Gilovich, 2008). Women from vulnerable groups may have also engaged in a form of defensive pessimism as an anticipatory coping mechanism in the event of a cancer diagnosis (Norem & Cantor, 1986).

Unlike prior studies using much smaller samples (e.g., Facione, 2002; Weinstein, 1987), we found that women at higher and lower ages were more unrealistically optimistic (but not unrealistically pessimistic) than women in their middle years. This suggests that years of public health messages may have reached women who are in the age range most targeted to such messaging (i.e., approximately 35 to 74 years of age). However, the factors that produce unrealistic optimism may differ between the youngest and oldest age categories. Younger women who have not begun their childbearing would have larger Gail model estimates, which would decline upon the birth of their first child. Thus, unrealistic optimism in the younger ages may reflect life stage. In contrast, older women may believe that, if they

have not yet developed breast cancer, they will not do so in the future (Gerend, Aiken, West, & Erchull, 2004).

Women may have also internalized some public health messaging. In general, women who were unrealistically optimistic were more likely to report never smoking (which is not a validated risk factor for breast cancer), and women who were unrealistically pessimistic were more likely to be current smokers. Thus, an overgeneralization of the adage “smoking is bad for your health” could have produced unrealistic optimism in never smokers and unrealistic pessimism among current smokers. However, this study was cross-sectional, so we cannot say whether behavior influenced perceived risk or perceived risk influenced behavior (Brewer, et al., 2004). Because the actual relationships between unrealistic optimism/unrealistic pessimism and behavior may have been obscured by the cross-sectional nature of the dataset, the findings related to behavior should be interpreted with caution.

Strengths, Limitations and Future Directions

This study had several strengths. First, we accounted for participants’ objective risk of breast cancer. Without this information, it is impossible to determine whether a given individual is unrealistically optimistic or pessimistic, or if she said that she was at below average risk because she actually had a more favorable risk factor profile than the average woman her age (Radcliffe & Klein, 2002; Weinstein, 1980). In addition, the study examined data from an extremely large, population-based and nationally-representative sample. To the best of our knowledge, this is the largest single study of unrealistic optimism and unrealistic pessimism ever conducted. This permitted us to examine the phenomenon across the lifespan, rather than recruiting several smaller samples composed of individuals of varying ages. It also allowed us to examine a large number of possible correlates, including demographic and health-related variables that had not been examined previously. Finally, this is the first large-scale study to investigate unrealistic pessimism of breast cancer in a systematic way. These findings demonstrate that unrealistic optimism and unrealistic pessimism are not polar opposites, resonating with similar conclusions drawn in the dispositional optimism/pessimism literature (Herzberg, Glaesmer, & Hoyer, 2006). In addition, the moderate correlation between the original comparative risk question and risk perception category ($r = .60$) adds evidence to the argument that comparative risk perceptions and unrealistic optimism are related—yet unique—constructs (Radcliffe & Klein, 2002).

One of the limitations of this study is that it is based on cross-sectional data, making it impossible to determine the directionality and causality of the relationships. Another complication is that women who did not provide complete data were at lower risk of breast cancer than women who did provide complete data. Consequently, the number of unrealistic optimists in the population may have been underestimated. The tendency for nonrespondents to have lower objective risk than respondents should be examined in future studies that seek to understand the nature of non-response bias. This study did not focus on how mammography use might be related to unrealistic optimism/pessimism because the breast cancer screening questions were asked only of women aged 30 and older. By sacrificing the mammography data for the extraordinarily wide age range, we were able to detect the U-shaped relationship between unrealistic optimism and age. Future research should use prospective studies to examine these issues and investigate possible mechanisms.^d

Implications

A large proportion of U.S. women are unrealistically optimistic about their breast cancer risk, and a considerable minority is unrealistically pessimistic. Either error may lead to maladaptive health behaviors, care-seeking, and outcomes (e.g., (Cameron, 2003; Dillard, et

al., 2009). Unfortunately, correcting risk perceptions is difficult (Weinstein & Klein, 1995). It is important to learn more about why the variables in this study were associated with unrealistic optimism and pessimism, how unrealistic optimism and pessimism are related to mammography utilization and other health behaviors prospectively, and whether and how to incorporate this knowledge into health communication interventions. This is especially important as public health agencies update screening recommendations, because unrealistic optimism and unrealistic pessimism might affect women's responses to these recommendations differently.

This study demonstrated that unrealistic pessimists were more likely to belong to population segments that are vulnerable to negative health outcomes. Because these population segments may already be targets for interventions to reduce disparities in cancer incidence and mortality, it seems reasonable to address risk overestimation within the context of larger health behavior and disparities interventions. However, it is first necessary for researchers to better understand the errors people make when evaluating their vulnerability to health threats. To the extent that those efforts are successful, researchers will be more able to help individuals make better lifestyle and screening decisions—a key goal of any effort to enhance public health outcomes.

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^dAlthough the paper is focused primarily on unrealistic optimism and unrealistic pessimism across the lifespan, exploratory analyses examined their relationships with appropriate mammogram use. The dataset was restricted to women aged 42 to 74 without any cancer history, and women were classified according to whether or not they had obtained a mammogram within the previous two years (National Cancer Institute, 2010). The omnibus *F*-test indicated that mammography use in the past two years was not related to risk perception category overall, $p = .81$. Readers who wish to obtain additional details about this sub-analysis should contact the corresponding author.

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Figure 1.

Age-stratified differences in breast cancer risk beliefs. Percentages based on predicted marginals, adjusted for all variables in model. Error bars describe the 99% confidence intervals. Quadratic relationship between age and UP is nonsignificant after the sequential Bonferroni correction, $p_{\text{critical}} = .005$. UO=unrealistic optimism, UP=unrealistic pessimism, DK=don't know/nonresponse.

Table 1

Risk Perception Category (Internal Cells) is Based on Perceived Risk of Breast Cancer (Rows) and Objective Relative Risk Category (Columns)

Perceived risk	Objective relative risk category			Total (N=14,426) n (column %) ²
	Below average n (column %) ¹	Average n (column %)	Above average n (column %)	
Less likely	Accurate 934 (28.6)	Unrealistically optimistic 2438 (36.9)	Unrealistically optimistic 1371 (29.2)	4743 (32.5)
About as likely	Unrealistically pessimistic 1281 (38.5)	Accurate 3266 (50.4)	Unrealistically optimistic 2227 (49.3)	6774 (47.6)
More likely	Unrealistically pessimistic 209 (6.4)	Unrealistically pessimistic 437 (6.9)	Accurate 805 (17.5)	1451 (10.5)
Don't know/No response	836 (26.6)	395 (5.8)	227 (4.0)	1458 (9.5)

Note. All percentages are weighted. The range of objective relative risks for each category of perceived risk were: 1.0–8.7 (Less likely); 1.0–8.2 (About as likely); 1.0–9.6 (More likely); and 1.0–6.4 (Don't know/No response).

^{1, 2}Total does not sum to 100% due to rounding.

Table 2

Demographic, Health Access, Health Status, and Behavioral Characteristics for 14,426 Participants Included in the Final Multivariable Analysis

Variable	n (unweighted)	% (weighted) ¹
Race/Ethnicity		
Non-Hispanic White	8964	70.1
Non-Hispanic Black	2269	12.6
Hispanic	2663	12.7
Non-Hispanic all others	530	4.6
Educational attainment		
Less than high school	2737	16.2
High school/GED	4112	29.1
Some college	4201	29.7
College graduate	2223	16.8
Postbaccalaureate	1153	8.2
Income (USD per year)		
Less than \$20,000	4208	21.0
\$20,000 to \$34,999	3063	19.0
\$35,000 to \$54,999	2606	18.6
\$55,000 to \$74,999	1621	13.5
\$75,000 or more	2928	28.0
Health insurance status		
Covered	12098	85.0
Not covered	2328	15.0
Number of comorbidities		
None	8306	60.0
1	3795	25.7
2	1362	8.7
3 or more	963	5.6
Smoking status		
Never	9256	64.3
Former	2526	17.6
Current	2644	18.1
Drinking status		
Never	4577	30.1
Light	8220	58.4
Moderate/Heavy	1629	11.6
Maintain healthy weight (BMI)		
Underweight	349	2.7
Normal weight	6135	44.7
Overweight	4132	28.0
Obese	3810	24.6

Variable	n (unweighted)	% (weighted) ^I
Physical activity		
At least 150 minutes/week	4633	34.1
Less than 150 minutes/week	9793	65.9
Age (Weighted mean, SE)	45.0, 0.17	

^ITotals may not sum to 100% due to rounding.

Table 3

Correlates of Unrealistic Risk Beliefs (N = 14,426)

Variable	Unrealistic Optimism (UO)		Unrealistic Pessimism (UP)		Don't Know/No Response (DK/NR)		Accurate
	%	OR, 95% CI	%	OR, 95% CI	%	OR, 95% CI	
Race/Ethnicity							
Non-Hispanic White	44.6	1.00 (ref)	12.0	1.00 (ref)	8.1	1.00 (ref)	35.3
Non-Hispanic Black	40.0	0.93, 0.80–1.09	14.3	1.27, 1.08–1.50*	12.2	1.59, 1.31–1.94*	33.6
Hispanic	41.6	0.97, 0.83–1.12	12.8	1.12, 0.93–1.36	11.9	1.54, 1.25–1.89*	33.8
Non-Hispanic all others	45.8	1.29, 0.99–1.67	9.2	0.95, 0.64–1.39	16.6	2.60, 1.85–3.65*	28.4
Educational attainment							
Less than high school	32.6	0.79, 0.67–0.92*	20.5	1.41, 1.17–1.70*	11.3	0.98, 0.79, 1.21	35.9
High school/GED	39.7	1.00 (ref)	14.4	1.00 (ref)	10.9	1.00 (ref)	35.0
Some college	45.5	1.12, 1.00–1.26	9.8	0.65, 0.55–0.76*	8.7	0.77, 0.64–0.94	36.0
College graduate	53.3	1.43, 1.23–1.65*	6.5	0.46, 0.36–0.59*	6.7	0.65, 0.50–0.84*	33.5
Postbaccalaureate	54.8	1.62, 1.36–1.94*	6.3	0.49, 0.35–0.69*	8.6	0.91, 0.66–1.27	30.4
Income (USD per year)							
Less than \$20,000	40.9	1.00 (ref)	14.3	1.00 (ref)	10.5	1.00 (ref)	34.4
\$20,000 to \$34,999	42.2	1.02, 0.89–1.18	12.8	0.88, 0.74–1.05	10.0	0.94, 0.77–1.16	34.9
\$35,000 to \$54,999	45.3	1.11, 0.95–1.29	12.0	0.82, 0.67–1.00	8.1	0.76, 0.60–0.96	34.6
\$55,000 to \$74,999	43.3	1.03, 0.84–1.25	12.8	0.85, 0.66–1.09	8.2	0.75, 0.52–1.07	35.7
\$75,000 or more	46.3	1.15, 0.99–1.34	9.8	0.67, 0.53–0.84*	9.7	0.93, 0.72–1.20	34.2
Health insurance status							
Covered	44.5	1.00 (ref)	11.8	1.00 (ref)	9.3	1.00 (ref)	34.4
Not covered	39.7	0.86, 0.75–0.99	14.5	1.23, 1.04–1.45	10.5	1.10, 0.89–1.36	35.3
Number of comorbidities							
None	44.6	1.00 (ref)	11.6	1.00 (ref)	9.9	1.00 (ref)	33.9
1	42.6	0.90, 0.80–1.01	12.0	0.97, 0.83–1.15	9.4	0.89, 0.74–1.07	36.0
2	43.3	0.96, 0.80–1.16	15.0	1.31, 1.02–1.68	7.7	0.78, 0.59–1.02	34.0
3 or more	39.8	0.89, 0.70–1.12	17.6	1.59, 1.19–2.10*	9.0	0.92, 0.69–1.23	33.6

Variable	Unrealistic Optimism (UO)		Unrealistic Pessimism (UP)		Don't Know/No Response (DK/NR)		Accurate	
	%	OR, 95% CI	%	OR, 95% CI	%	OR, 95% CI	%	%
Smoking status								
Never	45.7	1.34, 1.17–1.53*	11.0	0.66, 0.56–0.78*	9.4	0.97, 0.79–1.20	33.9	
Former	43.5	1.20, 1.02–1.40	11.5	0.65, 0.53–0.81*	9.2	0.90, 0.70–1.17	35.8	
Current	37.0	1.00 (ref)	17.0	1.00 (ref)	10.2	1.00 (ref)	35.8	
Drinking status								
Never	44.2	1.00 (ref)	12.4	1.00 (ref)	9.6	1.00 (ref)	33.8	
Light	43.6	0.97, 0.86–1.08	12.7	1.00, 0.86–1.16	9.3	0.95, 0.80–1.12	34.5	
Moderate/Heavy	43.8	0.93, 0.79–1.09	10.3	0.76, 0.59–0.98	9.6	0.93, 0.71–1.21	36.3	
Maintain healthy weight (BMI)								
Underweight	48.2	1.17, 0.86–1.58	9.6	0.96, 0.61–1.51	10.8	1.20, 0.77–1.87	31.5	
Normal weight	45.2	1.00 (ref)	10.7	1.00 (ref)	9.8	1.00 (ref)	34.3	
Overweight	42.9	0.96, 0.86–1.07	13.8	1.34, 1.14–1.57*	9.7	1.02, 0.86–1.20	33.6	
Obese	41.6	0.85, 0.76–0.97	13.4	1.19, 1.00–1.43	8.5	0.81, 0.68–0.97	36.5	
Physical activity								
At least 150 mins/wk	45.0	1.00 (ref)	11.6	1.00 (ref)	8.7	1.00 (ref)	34.7	
Less than 150 mins/wk	43.1	0.96, 0.87–1.07	12.7	1.11, 0.96–1.28	9.8	1.15, 0.97–1.36	34.4	
Age category	--	0.71, 0.67–0.75*	--	0.99, 0.91–1.07	--	0.89, 0.81–0.97	--	
Age category squared	--	1.02, 1.02–1.03*	--	1.00, 0.99–1.00	--	1.01, 1.01–1.02*	--	

Note. All percentages are weighted. A sequential Bonferroni correction (Holm, 1979) was conducted for each of the UO, UP, and DK/NR categories. This method adjusts for Type 1 error but is less conservative than the traditional Bonferroni adjustment. This correction yielded adjusted critical p values of .005 for UP and .003 for UO and DK/NR.

The symbol * denotes comparisons that had p values that met or exceeded these values (i.e., $p \leq .005$ or $p \leq .003$, as appropriate).

Table 4

Summary of Findings

Variable	Unrealistic optimism	Unrealistic pessimism
Ethnicity	ns	Non-Hispanic Black ↑
Educational attainment	Higher education ↑	Higher education ↓
Age	Younger and older ↑	ns
Income	ns	Higher income ↓
Health insurance status	ns	ns
Number of comorbidities	ns	3 or more ↑
Smoking status	Never smoker ↑	Never or former smoker ↓
Maintain healthy weight	ns	Overweight ↑
Alcohol use	ns	ns
Engage in physical activity	ns	ns

Note. Arrows pointing up (↑) indicate that the error was more common among women in the group identified. Arrows pointing down (↓) indicate that the error was less common in the group identified. *ns* denotes a non-significant finding. (m) denotes a finding of marginal statistical significance.