



Comparison of risk perceptions and beliefs across common chronic diseases

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ABSTRACT

Objectives. Few studies have compared perceptions of risk, worry, severity and control across multiple diseases. This paper examines how these perceptions vary for heart disease, diabetes, stroke, and colon, breast, and ovarian cancers.

Methods. The data for this study came from the Family Healthware™ Impact Trial (FHITr), conducted in the United States from 2005 to 2007. Healthy adults ($N=2362$) from primary care practices recorded their perceptions at baseline for each disease. Analyses were conducted controlling for study site and personal risk factors.

Results. Perceived risk was significantly higher for cancers than for other diseases. Men worried most about getting heart disease; women worried most about getting breast cancer, followed by heart disease. Diabetes was perceived to be the least severe condition. Heart disease was perceived to be the most controllable compared to cancers, which were perceived to be the least controllable. Women had higher perceived risk and worry ratings compared to men for several diseases.

Conclusions. These data highlight how individuals comparatively view chronic diseases. Addressing prior disease perceptions when communicating multiple disease risks may facilitate an accurate understanding of risk for diseases, and help individuals to effectively identify and engage in relevant behaviors to reduce their risk.

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Introduction

Altogether, coronary heart disease, cancer, stroke, and diabetes account for approximately 60% of total deaths each year in the United States (Minino et al., 2007). Overall, these diseases represent a large portion of chronic disease morbidity and mortality suffered by adult men and women in the US. Efforts to educate the public on health behaviors to prevent chronic disease necessitate a better understanding of the attitudes and beliefs individuals hold about these conditions.

Perceptions of risk, worry, severity and control have been the foundation of health behavior theories for decades and are integral to many theories including the Health Belief Model (Becker, 1974; Janz and Becker, 1984), Theory of Planned Behavior (Ajzen, 1991), Common-Sense Model (Leventhal et al., 2003), and Extended Parallel Process Model (Witte, 1992). Although the importance of these constructs for predicting health behaviors has been well studied in

many disease contexts (Bowen et al., 2004; Dassow, 2005; Moser et al., 2007), less is known on how these perceptions vary across common diseases and correspond to actual comparative disease risks and availability of preventive measures. The perceptions that individuals have about one disease, however, not only have implications for how they view other diseases, but also the health protective actions they may (or may not) take to reduce their risks for these diseases (DiLorenzo et al., 2006; Erblich et al., 2000). Existing perceptions for one disease might also influence how individuals respond to and process new health information related to this or other diseases. As such, the knowledge of how perceptions vary across diseases will become increasingly important, especially as family health history tools and multiplex genetic tests are utilized to identify an individual's risk for multiple diseases simultaneously (Khoury et al., 2004; Yang et al., 2003; Yoon, 2005; Yoon and Scheuner, 2004).

Prior research comparing perceptions across diseases has focused primarily on perceived risk, particularly among women. Findings suggest that women often have misconceptions about the diseases for which they are at greatest risk. For example, women have heightened concerns about their risk for breast cancer even though other diseases

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such as lung cancer and heart disease have higher mortality rates (Covello and Peters, 2002). The majority of studies in this area have reported a heightened risk perception for breast cancer or cancer in general compared to heart disease (Mosca et al., 2000, 2004; Wilcox et al., 2002), although there have been exceptions (DiLorenzo et al., 2006). Little information is available comparing individual's perceptions of risk across diseases among men. One study (DiLorenzo et al., 2006) found that men perceived their risks for heart disease the greatest, followed by prostate cancer, diabetes and colorectal cancer.

The variability of other important perceptions including worry, severity, and controllability across diseases has not been well studied, with few studies providing comparative reports. In one study, women reported the highest worry for breast cancer, followed by heart disease, diabetes and colorectal cancer, whereas worry among men was highest for heart disease, followed by prostate cancer, diabetes and colorectal cancer (DiLorenzo et al., 2006). Others have also noted that women report the greatest worry for cancer in general compared to cardiovascular diseases (Mosca et al., 2000; Wilcox et al., 2002). Perceived severity has not been shown to differ between various diseases including breast cancer and heart disease (Gerend et al., 2004) or breast and colorectal cancer (Dassow, 2005). In contrast, perceived control has been shown to be significantly higher for heart disease compared to breast cancer among women Gerend et al. (2004).

This study examines individuals' perceptions of risk, worry, severity and control for 6 common chronic conditions: heart disease, diabetes, stroke, and breast, ovarian, and colon cancer. The analyses aim to identify whether individuals perceive certain diseases to be more threatening, provoke more worry, or under greater personal control.

Methods

Data for this study were obtained at baseline in the Family Healthware™ Intervention Trial (FHITr). FHITr is a cluster-randomized trial evaluating the impact of a web-based tool that gathers family history for the 6 aforementioned chronic diseases and classifies participants as having weak, moderate, or strong familial risk for each disease. Participants aged 35 to 65 years, with no prior personal history of these conditions, were recruited from primary care practices. A detailed description of the study is available elsewhere (O'Neill et al., under review).

To measure the effect of the intervention, baseline and 6 month follow-up surveys were administered online. Women rated their perceptions of all 6 diseases; men were not asked about breast and ovarian cancer. These ratings were recorded, for each disease sequentially, before family history assessment and feedback. The analyses presented are based on a subset of participants ($N=2362$) in the 23 practices of the intervention arm for whom baseline survey data and family history risk stratification were available.

Measures

Participant characteristics

Self-reported age, gender, body mass index (BMI from height and weight), and current smoking were collected on the baseline survey. Family history of each disease was classified by algorithms in Family Healthware™, based on participants' reports of affected first and second degree relatives and their ages at diagnosis.

Perceived risk

Perceived risk for each of the diseases was assessed using a single item measured on a 5-point Likert scale (1 = much lower than average to 5 = much higher than average), "Compared to most people your age and sex, what would you say your chances are for developing ____?" (Weinstein, 1980, 1982). This measure of perceived risk was selected

because it has been demonstrated to be more strongly associated with actual risk factors (Woloshin et al., 1999).

Perceived severity

Perceived severity was assessed with, "Getting/Having (a) _____ would be a very serious problem." Responses were on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

Worry

Worry about a condition was assessed by asking respondents "During the past 4 weeks, how often have you thought about your chances of getting _____?" (Andersen et al., 2003). Responses were on a 5-point Likert scale, ranging from 1 = not at all to 5 = almost all the time.

Perceived control

Perceived control over a condition was measured with a single item: "There's a lot I can do to prevent (a) _____." Responses were on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

Data analysis

Summary statistics were calculated to describe participant characteristics. Participants' ratings of each construct were compared across diseases. Simple linear regression was first conducted to identify variables with significant univariate associations with perception scores. A level of significance of $p < .005$ was used to protect against inflated type-I error probability. Age, BMI, smoking

Table 1

Characteristics of participants ($N=2362$)^a, United States, 2005–2007

	Men, $N=687$	Women, $N=1675$	Total, $N=2362$
Age (years)	50.8	50.2	50.3
Range (years)			35–65
Education ($p = .008$)			
Grades 1–8	2 (0.3%)	2 (0.1%)	4 (0.2%)
Grades 9–11	6 (0.9%)	12 (0.7%)	18 (0.8%)
Grade 12 or equivalent	40 (6%)	149 (9%)	189 (8%)
1–3 years of college	112 (16%)	340 (20%)	452 (19%)
4 or more years of college	527 (77%)	1172 (70%)	1699 (72%)
Race			
Caucasian	629 (92%)	1526 (91%)	2155 (91%)
African American	17 (3%)	74 (4%)	91 (4%)
Asian	32 (5%)	38 (2%)	70 (3%)
Hispanic or Latino	11 (2%)	47 (3%)	58 (3%)
Currently married ($p < .001$)	577 (84%)	1184 (71%)	1761 (75%)
Annual household income ($p < .001$)			
<\$25,000	22 (4%)	69 (4%)	91 (4%)
\$25,001–\$35,000	19 (3%)	83 (5%)	102 (4%)
\$35,001–\$50,000	48 (7%)	170 (10%)	218 (9%)
\$50,001–\$75,000	94 (14%)	307 (18%)	401 (17%)
>\$75,000	442 (64%)	819 (49%)	1261 (53%)
Smoking status ($p = .003$)			
Never	400 (58%)	1078 (73%)	1478 (63%)
Former	214 (31%)	485 (29%)	699 (30%)
Current	73 (11%)	112 (7%)	185 (8%)
Body mass index (BMI) ($p = .001$)	28.1	27.1	27.4
Family Healthware™ Risk Classification (moderate or strong) ^b			
Heart disease	375 (56%)	1004 (61%)	1379 (59%)
Diabetes	256 (38%)	647 (39%)	903 (39%)
Stroke	287 (43%)	827 (50%)	1114 (48%)
Colon cancer	90 (13%)	224 (14%)	314 (14%)
Breast cancer	N/A	404 (25%)	
Ovarian cancer	N/A	161 (10%)	

^a The percentages sum to less than 100% due to incomplete data for some participants and exceed 100% from rounding error.

^b Estimates are valid percentages based on a $N=2323$, with the exception of heart disease ($N=2324$), owing to missing data.

Table 2
Unadjusted means and standard deviations, United States, 2005–2007

Disease	Males				Females			
	Perceived risk	Worry	Severity	Control	Perceived risk	Worry	Severity	Control
Heart disease	2.62 (1.02)	1.81 (.89)	4.78 (.68)	4.31 (.67)	2.74 (1.01)	1.87 (.96)	4.76 (.69)	4.35 (.71)
Diabetes	2.56 (.97)	1.45 (.74)	4.46 (.73)	4.00 (.83)	2.72 (1.07)	1.63 (.94)	4.59 (.69)	4.14 (.79)
Stroke	2.58 (.88)	1.46 (.73)	4.83 (.53)	4.00 (.79)	2.68 (.93)	1.57 (.83)	4.81 (.55)	4.03 (.83)
Colon cancer	2.68 (.79)	1.36 (.66)	4.72 (.55)	3.74 (.85)	2.70 (.85)	1.43 (.74)	4.76 (.54)	3.82 (.83)
Breast cancer	–	–	–	–	2.91 (.81)	1.92 (.92)	4.71 (.59)	3.31 (.95)
Ovarian cancer	–	–	–	–	2.79 (.67)	1.43 (.76)	4.78 (.53)	2.97 (.92)

status, gender, the disease-corresponding family history, and study recruitment site were significant predictors in a majority of the regression models. In subsequent mixed model analyses, each model was adjusted for these covariates, stratified by gender. Gender differences in perceptions were also examined by multiple regression models, adjusting for the same covariates. Clustering of perception scores across different diseases for the same subject was accounted for using an exchangeable correlation pattern. The pairwise comparison among different diseases was carried out in a post-hoc manner using a Tukey–Cramer adjustment for multiple comparisons.

Results

Patient characteristics

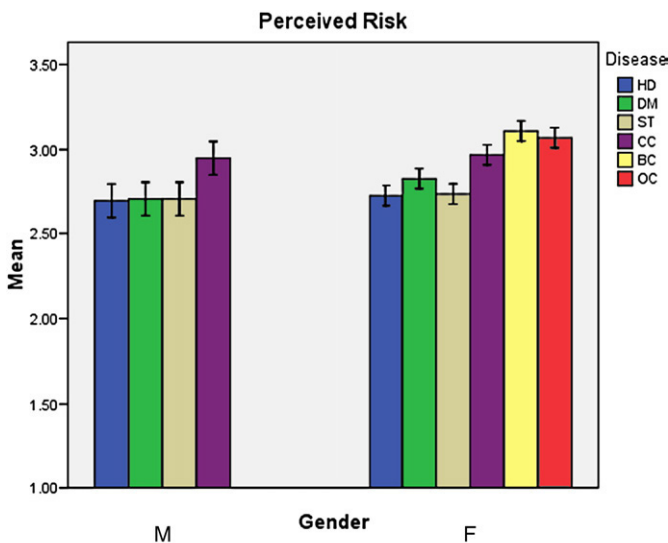
Table 1 shows the demographic and clinical characteristics of the sample. Participants ranged in age from 35 to 65, with a mean of 50 years. The study population was predominantly Caucasian, college educated, married, and had a household income over \$50,000. Compared to women, men had a higher BMI and were more likely to be college educated, married, have higher incomes, and smoke cigarettes. The majority of participants (59%) were at increased familial risk for coronary heart disease, a quarter of women for breast cancer, and a much smaller proportion (14%) for colon cancer.

Perceptions across diseases

The unadjusted means and standard deviations for perceived risk, worry, perceived severity, and perceived control are provided in Table 2. Figs. 1–4 present the estimated mean perception ratings, adjusted for covariates in the multiple regression analyses. Overall, these were similar to the unadjusted means.

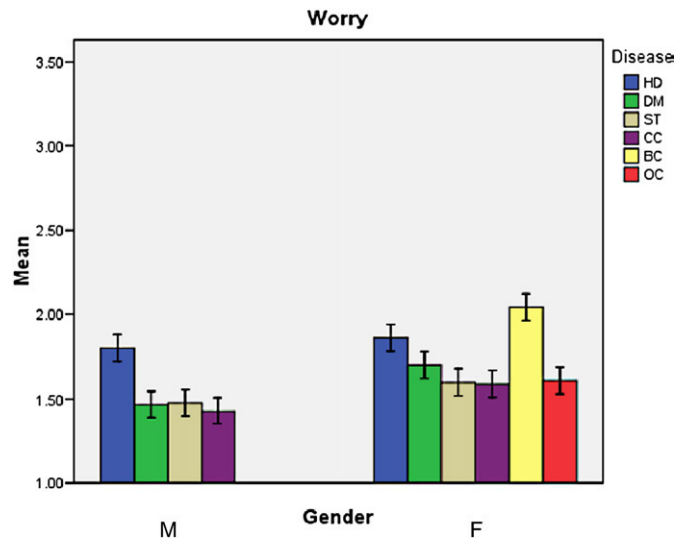
In the mixed model analysis, perceived risk is significantly higher for cancers than other diseases for both men and women (see Fig. 1). Among men, perceived risk for colon cancer is significantly higher than perceived risk for the other diseases, which did not significantly differ from each other. Women perceived themselves to be at greatest risk for breast and ovarian cancer, followed by colon cancer. Perceived risk was lowest for heart disease and stroke among women.

Study participants worried infrequently about getting these diseases. Fig. 2 shows that men thought most frequently about getting heart disease compared to diabetes, stroke and colon cancer, which did not differ in worry levels. Among women, worry was highest for getting breast cancer, followed by heart disease and diabetes. Fig. 3 demonstrates little variability in high perceived severity ratings for both men and women with only perceived severity for diabetes significantly lower compared to all the other diseases. Finally, as seen in Fig. 4, both men and women perceived heart disease to be the most controllable and cancers the least controllable.



Note: HD = Heart Disease, DM = Diabetes Mellitus, ST = Stroke, CC = Colon Cancer, BC = Breast Cancer, OC = Ovarian Cancer

Significant differences in means ($p < .05$)
 Males: CC > DB=ST=HD
 Females: BC = OC > CC > DB > ST=HD

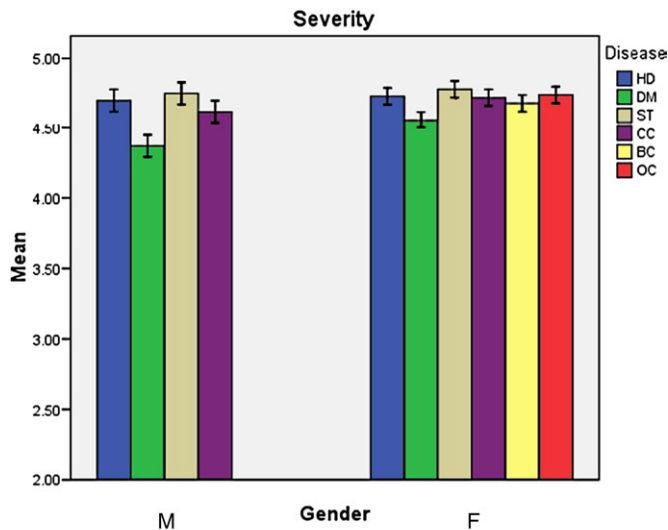


Note: HD = Heart Disease, DM = Diabetes Mellitus, ST = Stroke, CC = Colon Cancer, BC = Breast Cancer, OC = Ovarian Cancer

Significant differences in means ($p < .05$)
 Males: HD > CC=DB=ST
 Females: BC > HD > DB > ST = CC = OC

Fig. 1. Perceived risk (adjusted for age, family history, BMI, smoking status and study site), United States, 2005–2007.

Fig. 2. Worry (adjusted for age, family history, BMI, smoking status and study site), United States, 2005–2007.



Note: HD = Heart Disease, DM = Diabetes Mellitus, ST = Stroke, CC = Colon Cancer, BC = Breast Cancer, OC = Ovarian Cancer

Significant differences in means ($p < .05$)

Males: ST = HD > CC > DB

Females: ST > HD = CC = OC > BC > DB

Fig. 3. Perceived severity (adjusted for age, family history, BMI, smoking status and study site), United States, 2005–2007.

Gender differences were observed in perception ratings. Perceived risk and worry for heart disease, diabetes and stroke were significantly greater for women (all $ps < .001$). Women also worried more about getting colorectal cancer ($p < .05$). Perceived severity and perceived control for diabetes were also significantly higher for women compared to men ($ps < .001$).

Discussion

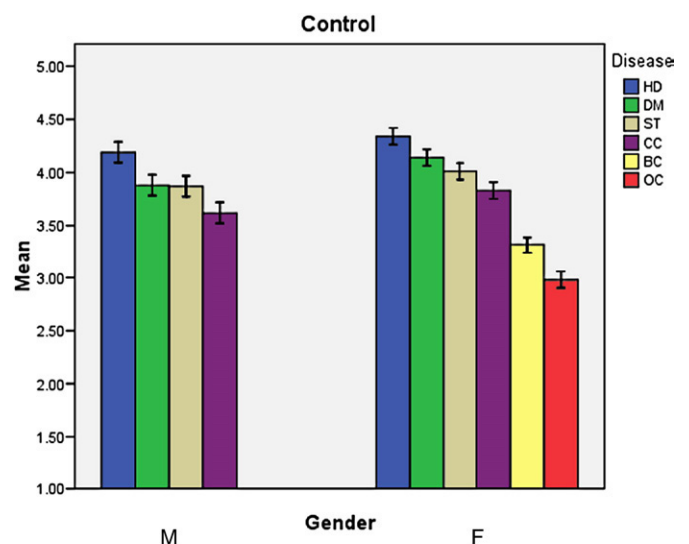
This study is unique in its ability to examine perceptions of risk, worry, severity, and control across six common chronic conditions. Findings suggest that primary care patients have misconceptions about the diseases for which they are at greatest risk. Heart disease has the greatest impact on morbidity and mortality in the US, yet both men and women perceived their chances of developing cancers to be the greatest. Our data support prior research that has documented the heightened perceived risk among women for breast cancer compared to other diseases (Covello and Peters, 2002; Dassow, 2005; Mosca et al., 2000, 2004). However, these findings are not consistent with findings from DiLorenzo et al. (2006) who reported highest perceived risk ratings for heart disease, followed by breast cancer for women and prostate cancer for men. That study did not comparatively analyze risk perceptions across disease, thus, it is unclear whether the perceived risk ratings significantly differed from one another. Our findings suggest that prior findings in the literature of higher perceived risk for breast cancer compared to heart disease may be fueled more by women's conceptualization of cancer in general and not breast cancer specifically (McQueen et al., 2008; Mosca et al., 2000). The data also provide evidence that the greater risk perceptions for cancer compared to other diseases observed previously for women may exist for men as well. Notably, this sample of relatively healthy individuals did not demonstrate exaggerated risk perceptions on average.

Comparative ratings of worry were more consistent with population prevalence of disease. Consistent with other studies documenting low worry ratings for cancer (see Hay et al., 2006), participants reported thinking between “not at all” and “rarely” about these

diseases in spite of acknowledging that having any one would be a very serious problem. Nonetheless, worry about getting heart disease was higher across both genders, although women worried significantly more about getting breast cancer (DiLorenzo et al., 2006). Our findings suggest that worry may be explained by factors other than perceived risk and personal risk factors (e.g., family history, smoking, BMI). For example, the greater worry ratings for breast cancer compared to other diseases may reflect the media attention focused on the former (Blanchard et al., 2002; Covello and Peters, 2002; Gerlach et al., 1997). Studies examining the association between perceived risk and worry have noted that these variables operate independently in predicting cancer screening behaviors (McQueen et al., 2008; Moser et al., 2007).

Perceived control ratings were highly variable across diseases with participants perceiving greater control over non-cancer conditions compared to cancers (Walter et al., 2004). In part, perceived control ratings were the inverse of perceived risk ratings. This may suggest that study participants perceived their risks as greater for conditions they do not perceive they can control (Walter and Emery, 2005; Walter et al., 2004). Conversely, conditions with higher perceived control (non-cancers) had lower perceived risk. The latter may reflect a discounting of perceived risk by individuals who engage in behaviors believed to reduce one's risk (Walter and Emery, 2005). In contrast, perceived severity ratings demonstrated little variability and were high for all the diseases. Moreover, although diabetes was perceived to be the least severe condition (see also Walter and Emery, 2006), this finding cannot necessarily be explained by perceptions of disease controllability since heart disease was perceived as more controllable. Overall, the findings for perceived control suggest that public health communication efforts for cancer prevention and early detection may not have been as successful as the programs for heart disease, stroke and diabetes. Cancer prevention and control messages need to highlight behaviors that individuals can engage in to help reduce the risk of cancer.

Compared to men, women had higher perceived risk and worry for several diseases including heart disease, diabetes, and stroke. These findings add to the scant literature on gender differences in perceived risk and worry for common diseases. Past studies examining cancer



Note: HD = Heart Disease, DM = Diabetes Mellitus, ST = Stroke, CC = Colon Cancer, BC = Breast Cancer, OC = Ovarian Cancer

Significant differences in means ($p < .05$)

Males: HD > DB = ST > CC

Females: HD > DB > ST > CC > BC > OC

Fig. 4. Perceived control (adjusted for age, family history, BMI, smoking status and study site), United States, 2005–2007.

perceptions have also reported higher perceived risk (DiLorenzo et al., 2006; Helzlsouer et al., 1994; Robb et al., 2004) and cancer worry (DiLorenzo et al., 2006; McQueen et al., 2008) for women compared to men. Future work is needed to clarify reasons for the observed gender differences and potential impact on the health behaviors of men and women.

The present study had several limitations. Specifically, comparisons were made only among the 6 diseases included in the Family Healthware™ tool. In addition, single-item measures for the constructs were utilized in efforts to minimize response burden when assessing perceptions for multiple diseases. The item used to assess worry pertained to frequency of thoughts about risk and may reflect the degree of conscious attention rather than cognitive appraisal or affective response. The order in which participants were asked about each disease was not varied randomly so this study cannot establish the effect of item order on the comparative validity of the perceptions. Additionally, the study participants were predominantly Caucasian; few were recruited from minority or underserved populations in spite of efforts to do so. Moreover, the sample is above average in terms of education and income thus potentially limiting the generalizability of these findings to other populations. Future research should examine differences in the perceptions across racial/ethnic and underserved groups (Mosca et al., 2000; Wilcox et al., 2002). Although the study analyses controlled for demographic and behavioral risk factors, it is possible that individuals' perceptions vary as a function of other factors that were not assessed in the larger study trial and therefore not controlled for in the present analyses. Finally, although statistical differences are noted across disease perceptions, there was a relative consistency across disease perceptions as a whole, especially for severity, risk, and worry.

Prior studies have demonstrated that elevated perceptions of risk for one disease correspond to lower worry about other diseases (DiLorenzo et al., 2006), thereby potentially compromising the likelihood that individuals will engage in protective actions to reduce their risk for these other diseases. Future studies are needed to examine the interrelationships among individuals' perceptions for various conditions as well as the implications of modifying these perceptions on both behavioral and health outcomes. Efforts to compare individuals' perceptions across diseases may identify which conditions people underestimate their likelihood of developing or preventing, thus highlighting areas in need of greater public education. As genome-based disease risk information becomes available, individuals' disease perceptions could be influenced by a multitude of tests. Knowledge of how these perceptions vary across multiple diseases will help to gauge the effect of multiplex genomic tests on their perceptions and behaviors.

Conclusions

This study highlights how individuals comparatively view common chronic diseases and suggests the need to consider these varying perceptions when attempting to convey disease risk and preventive health information. Future efforts to communicate multiple disease risks may benefit from addressing prior disease perceptions to facilitate accurate understanding of risk for various diseases, and help individuals to effectively identify and engage in relevant screening and lifestyle behaviors to reduce their risk.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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