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Factors Affecting Breast Cancer Patients' Need for Genetic Risk Information: From Information Insufficiency to Information Need

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Abstract

Information-seeking models typically focus on information-seeking behavior, that is, an individual's interest in information because their current level is perceived to be insufficient. In the context of genetic risk information (GRI), however, information insufficiency is difficult to measure and thus can limit understanding of information behavior in the context of GRI. We propose that an individual's need for information might be a more direct and conceptually clearer alternative to predicting their information-seeking behavior. To test this hypothesis, this study investigates the extent to which previously identified factors affecting interest in GRI are also predictors of need for GRI among women diagnosed with breast cancer at the age of 40 or younger (N = 1,069). As hypothesized, there was a positive association between interest in, and need for, GRI. Furthermore, hypothesized factors of numeracy, information orientation, and genetic knowledge, were significant predictors of increased interest in, and need for, GRI. In contrast, hypothesized factors of genetic worry and genetic causal belief predicted increased interest in GRI only, while genetic self-efficacy predicted increased need for GRI only. As

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Author Contribution Statement

Soo Jung Hong developed the theoretical design of this study, drafted the manuscript, and performed the analyses. Barbara Biesecker revised the paper for important intellectual and practical content. Melody Goodman verified the analytical methods, and contributed to the interpretation of the results. Kimberly Kaphingst supervised the project. All authors including Jennifer Ivanovich discussed the results, commented on the manuscript, and contributed to the final version of the manuscript.

Conflict of interest

The authors have no conflicts of interest to declare.

Human subjects and informed consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Animal Studies

No animal studies were carried out by the authors for this article.

hypothesized, BRCA mutation status significantly moderated associations between informational norm and both interest in, and need for, GRI. Collectively, the findings support inclusion of need for GRI in theoretical information-seeking models in the context of genomic risk.

Keywords

genetic risk information; whole genome sequencing; interest in genetic information; genetic information need; genetic uncertainty; breast cancer; BRCA1/2

Introduction

Genetic Risk Information: From Information Insufficiency to Information Need

Scholars of risk communication have considered individuals to be active consumers of risk information who can understand and act on it to improve their health and wellbeing (Braun & Niederdeppe, 2012). Previous studies have investigated information-seeking as a final outcome of risk communication, and several theories have been developed to predict whether individuals will seek health information. In this domain, Kahlor's (2010) Planned Risk Information Seeking Model (PRISM) extended Griffin, Dunwoody, and Neuwirth's (1999) Risk Information Seeking and Processing (RISP) model and suggested novel relationships among constructs from several theories: Ajzen's (1991) Theory of Planned Behavior, the Health Information Acquisition Model (Freimuth, Stein, & Kean, 1989), and the Extended Parallel Processing Model (Witte, 1992). Both RISP and PRISM proposed that perceived information insufficiency is a significant predictor of an individual's intention to seek information, along with risk perceptions, attitudes, and beliefs. In these theoretical models, information insufficiency is conceptualized as perceived need for additional information, or the difference between perceived knowledge and sufficiency threshold (Kahlor, 2010).

Despite these theoretical predictions, prior evidence is inconsistent with respect to the role of information insufficiency in predicting information-seeking intentions (Kahlor, 2007; Kahlor, 2010). Unlike the positive association between information insufficiency and seeking intention found in prior studies based on RISP (e.g., Kahlor, 2007), in Kahlor's (2010) initial study to assess PRISM, no significant relationship was observed between information insufficiency and seeking intentions. Kahlor (2010) interpreted the results as reflecting that the healthy participants may have felt that they had sufficient health information. Later, Hovick and colleagues (2014a; 2014b) assessed the PRISM model in a cancer context because of its relevance to theoretical considerations and empirical outcomes in prior studies of cancer information-seeking (e.g., Hovick, et al., 2014a; Kaphingst, Lachance, & Condit, 2009; Miles, Voorwinden, Chapman, & Wardle, 2008; Rimal & Juon, 2010). Although information insufficiency and seeking intentions were significantly associated in this study, additional research is needed to clarify the role of information insufficiency in predicting information-seeking.

Individuals have various sufficiency thresholds for risk information. The threshold may depend on one's current knowledge as well as other personal and individual factors. In prior

studies framed by RISP and PRISM, information insufficiency has been operationalized by entering perceived knowledge into the structural equation model adjacent to risk knowledge needed. Although in the original PRISM model, the association between information insufficiency and perceived risk knowledge was negative, this association has been reported as positive (Hovick, Kahlor, & Liang, 2014a). This positive association suggests that as current risk knowledge increases, so does information insufficiency. Therefore, it is possible that an individual who has a high level of risk knowledge might still need more information than others.

Unlike information insufficiency, information need is conceptualized as the direct motivation to seek and search for information about known and unknown items (Cole, 2011).

Motivation can be defined as “the processes that energize, direct, and sustain behavior” (Santrock, 2004, p. 414). Information need, which focuses on individuals’ motivation regardless of unseen sufficiency thresholds, may be a more conceptually and operationally explicit variable to predict information-seeking behavior. Information studies suggest that information need is one of the most essential concepts in information science (Cole, 2011). Experts disagree about whether information need is a primary human need, and whether it needs to be studied in context (Wilson, 1981; Shen, Tan, & Zhai, 2005). Wilson’s (1981) user-oriented approach, however, suggests that information need depends upon more primary physiological, cognitive, and affective human needs based on the users’ social and work roles. In the same vein, according to Cole’s (2011) theory of information need for information retrieval, unlike other human basic needs such as food and water, individuals do not know what may satisfy their information needs. To better understand an individual’s information need, the context in which one’s information need arises should be considered (Cole, 2011).

Genetic risk information (GRI) can be defined as DNA-based profiling for disease risk (Collins, Wright, & Marteau, 2011). Need for GRI is a contextualized need for a specific type of health information. Previous studies on GRI have primarily focused on individuals’ interest in receiving results from genetic testing (e.g., Cherkas, Harris, Levinson, Spector, & Prainsack, 2010; Collins, Ryan, & Truby, 2014; Graves, Peshkin, Luta, Tuong, & Schwartz, 2011) or genetic information-seeking behaviors such as use of the internet, support groups, or medical providers to gain genetic information about individual or familial risks (e.g., Hay et al., 2012; Mills et al., 2015; Waters, Wheeler, & Hamilton., 2016). Need or preference for medical information has been investigated in past studies of cancer patients (e.g., Jenkins, Fallowfield, & Saul, 2001; Meredith et al., 1996; Pinguart & Duberstein, 2004). Based on these studies, Lillie et al. (2007) investigated breast cancer patients’ need for additional information related to a genomic recurrence risk test. Other studies (e.g., Pieterse, van Dulmen, Ausems, Beemer, & Bensing, 2005; Roshanai et al., 2012; Saleminck et al., 2013; Vos et al., 2013a) also have investigated the genetics-related informational needs of cancer patients and individuals at hereditary risk for cancer. Need for GRI, however, has been rarely investigated within information-seeking and processing models.

Since information insufficiency can be conceptualized and self-reported only when individuals are aware of their current knowledge and sufficiency thresholds, the need for GRI is an alternative construct to investigate. Although individuals may know a certain

amount of risk information based on their family histories or family members' test results, they might not know the thresholds needed to satisfy their confidence or what they do not know and want to know. Yet current knowledge may increase individuals' interest in, and need for, GRI. Further, since need for GRI may explain individuals' direct motivations to seek unknown GRI (Cole, 2011), it may predict individuals' information-seeking behaviors (e.g., genetic testing, genetic information-seeking, communicating genetic information etc.). Patients' need for GRI is as such worth investigating since their information needs may differ from genetic counselors' or medical providers' perceptions of their needs.

In this study, we focus on interest in, and need for, GRI in the context of common disease-related (i.e., cancer, heart disease, and diabetes) GRI that can be identified by Whole Genome Sequencing (WGS) among women diagnosed with breast cancer at the age of 40 or younger. Although 77% of the participants had previously received genetic testing for *BRCA1/2*, based on technological advances, those with negative results may be invited for the testing of genetic risks using multi-gene panels. Therefore, their interest and need related to genetic risk information include the variant status as well as the short-term and/or lifetime disease risks associated with the results.

Information Need, Information Interest, and Exposure to Media Health Information

Prior studies have examined individuals' interest in genetic testing and test results (e.g., Cherkas et al., 2010; Collins et al., 2014; Graves et al., 2011). Exploring factors that underlie interest in genetic testing or information is vital in the face of emerging genetic technology (Persky, Kaphingst, Condit, & McBride et al., 2007). Persky et al.'s (2007) quantitative review regarding interest in genetic testing investigated the effect of several theoretically based factors on genetic test uptake by identifying potential predictors of interest based on the Heuristic-Systematic Model (Chaiken, 1980). In this study, we focus on psychosocial variables that may affect participants' interest in GRI. Although 'interest' in the persuasion literature has been defined as interest in an object of great perceived personal consequence (Crano, 1997), 'interest in genetic testing or information' is defined and measured in different ways across studies, depending on the population studied and on the measure used (Bowen, Patenaude, & Vernon, 1999). In this study, we define 'interest' in GRI' as breast cancer survivors' interest in learning information about a gene variation and relevant risks. According to Collins and colleagues (2014), individuals' interest in genetic testing was positively associated with their attitudes towards the provision of information about genetic testing, suggesting that individuals with more interest in GRI might have greater need for GRI.

One factor that may impact individuals' interest in and need for GRI is media exposure. Since past behaviors affect individuals' feelings of self-efficacy, risk-aversion behaviors are often the behaviors that have been performed successfully in the past (Hovick et al., 2014a; Weinstein, 2007). Similarly, past information-seeking behaviors can best explain future information-seeking (Millar & Shevlin, 2003). This is also the case for individuals' use of media for health information-seeking. Specifically, the attitudinal or affective outcomes as well as increased knowledge following media exposure may influence individuals' future information-seeking (Slater, 2007; Zhao, 2009). A study conducted in 2008 suggested that

more exposure to media health campaigns may have increased the general public's awareness and interest in personal genome testing (Cherkas et al., 2010). Angelina Jolie's decision to pursue genetic testing of the *BRCA1/2* genes is an example of how media can have a major impact on the public's interest in genetic testing and GRI (Evans et al., 2014). Therefore, we posit that exposure to media health information may influence individuals' interest as well as need for GRI.

Hypothesis 1: Individuals' interest in GRI predicts their need for GRI.

Hypothesis 2: Health information exposure through media is positively associated with interest in GRI and need for GRI.

Influences of Individual Characteristics and Norms about Health Information on Interest in, and Need for, Genetic Risk Information

Prior empirical research and theoretical frameworks suggest factors that may impact interest in and need for GRI. More specifically, demographics, sociocultural variables, and relevant experience are believed to underlie the motivation for information-seeking as well as processing (Griffin et al., 2008). Given the reported positive association between information need and information-seeking (Cole, 2011), individual characteristics that are associated with information-seeking can be considered potential predictors of information need (Wilson, 1981; Dervin & Nilan, 1986; Hewins, 1990; Pettigrew, Fidel, & Bruce, 2001). In this study, we focused on informational norms, health consciousness, and information orientation.

According to the RISP model and other theoretical frameworks (Griffin et al., 1999; Viswanath, Ramanadham, & Kontos, 2007), the effect of individual characteristics on information-seeking is considered to be indirect and mediated by other variables such as informational norms (i.e., perceptions that relevant others believe he or she should or should not seek information for sufficiency; Griffin et al., 1999) and information gathering capacity (Hovick, Freimuth, Johnson-Turbes, & Chervin, 2011). Maibach and colleagues (2006) investigated individuals' abilities for finding and using health information as well as perceptions of the importance of health information to clarify which information-related factors predict health information-seeking. Health information orientation refers to "the extent to which the individual is willing to look for health information" (Dutta-Bergman, 2004, p. 275). Although these variables were regarded as control variables in prior RISP studies (Hovick et al., 2011), the model suggests that informational norms and active information orientation predict individuals' interest in, and need for, health risk information such as GRI. Health consciousness refers to "the extent to which health concerns are integrated into a person's daily activities" (Jayanti & Burns, 1998, p. 10). Given that the level of informational norm is higher among those with more health-conscious social networks and that social capital may affect information-seeking (Dutta-Bergman, 2004; Hovick, Liang, & Kahlor, 2014b), health consciousness may also affect both interest in, and need for, GRI.

In addition, it is necessary to consider numeracy as a basic ability to manage one's health that may predict individuals' interest in, and need for, GRI. Health numeracy refers to "the degree to which individuals have the capacity to access, process, interpret, communicate,

and act on numerical, quantitative, graphical, biostatistical, and probabilistic health information needed to make effective health decisions” (Golbeck, Ahlers-Schmidt, Paschal, & Dismuke, 2005, p. 375). Given that GRI often includes probabilities and uncertain numeric information, the effects of numeracy on interest in, and need for, GRI need to be explored as well.

Hypothesis 3: Numeracy, health consciousness, (active) health information orientation, and informational norms are positively associated with interest in GRI and need for GRI.

Influences of Genetics-related Factors on Interest in, and Need for, Genetic Risk Information

Individual characteristics related to genetics are other potential significant factors that may impact interest in, and need for, GRI. According to Kahlor’s (2010) PRISM, the key variables predicting health information-seeking intentions include perceived risk knowledge, affective risk response (e.g., worry), and perceived information-seeking control (i.e., cognitive and physical ability to seek information; Hovick, et al., 2014a). People’s disease-specific knowledge has been positively associated with information-seeking behaviors (Shim et al., 2006). Ashida and colleagues (2011) have found important implications of genetic knowledge for the inter-generational communication of genetic information. Specifically, older age groups’ lower genetic knowledge requires additional information-seeking so that they can benefit from rapidly emerging genetic information as well as engage in health promoting behaviors. Accordingly, it seems that individuals’ knowledge about genetic risks needs to be investigated in relation to genetic information-seeking.

Genetic worry (i.e., worry about genetic impact on one’s and one’s relatives’ disease risks), as an affective risk response, may influence individuals’ interest as well as need for GRI. In the context of multiplex genetic testing, previous studies have investigated worry about genetic risks for common diseases such as diabetes, heart disease, cancer and its relationships with risk perceptions (Cameron, Sherman, Marteau, & Brown, 2009; Shiloh, Wade, Roberts, Alford, & Biesecker, 2013). The findings of these previous studies partly explain the advantage of worry over disease risks in predicting health behaviors (Shiloh et al., 2013). Breast cancer survivor’s worry about cancer has been found to relate to a greater interest in genetic testing (Cameron & Reeve, 2006). In this study, we investigated how breast cancer survivors’ worry about genetic risks for common disease predicts their interest in, and need for, GRI.

Another factor is genetic self-efficacy, which is defined as one’s perception of self-efficacy regarding genetic knowledge or confidence in one’s ability to utilize genetic information (Carere et al., 2015). Given that self-efficacy predicts an individual’s ability to perform a particular action (Bandura, 1986), genetic self-efficacy may influence interest in, and need for, GRI. Causal beliefs (i.e., beliefs about the causes of health conditions) have been shown to have a strong influence on health behavior in a variety of illnesses including cancer (Petrie, Myrtveit, Partridge, Stephens, & Stanton, 2015). The Common Sense Model of self-regulation of health and illness suggests that health risk information activates individuals’ cognitive representation of the threat which includes their causal attributions (Cameron &

Leventhal, 2003). Causal beliefs and attributions shape subsequent beliefs about disease controllability and/or the efficacy of medical interventions (Parrott, Silk, & Condit, 2003), which may affect interest in, and need for, GRI. Genetic causal beliefs about cancer development and prevention may also be an important factor predicting interest in, and need for, GRI.

Hypothesis 4: Genetic knowledge, genetic self-efficacy, genetic worry and genetic causal beliefs are positively associated with interest in, GRI and need for, GRI.

Influence of Uncertainty Embedded within *BRCA1/2* Mutation Status on Interest in, and Need for, Genetic Risk Information

In the present study, we focus on women diagnosed with breast cancer at the age of 40 or younger. For cancer patients, genetic mutation status may affect their interest in, and need for, GRI. For breast cancer patients, genetic risks have been shown to comprise a great part of the uncertainty related to their decision-making before genetic testing (Egginton et al., 2014). According to the uncertainty in illness theory, “[U]ncertainty exists in illness situations that are ambiguous, complex, unpredictable, or when information is unavailable or inconsistent” (Mishel & Clayton, 2008, p.55). Recent studies (e.g., Eccles et al., 2015; Moghadasi, Eccles, Devilee, Vreeswijk, & Asperen, 2016) have pointed out that genetic testing for the genes *BRCA1* and *BRCA2* may yield uncertain results, potentially leading to misunderstanding of test results by patients and their families. The potential for uncertain results is heightened for whole genome sequencing (WGS), which captures known genetic variation by accessing an individual’s entire genetic makeup (Sanderson et al., 2016).

The type of genetic test results for *BRCA1/2* that individuals receive may affect the associations between informational norms, and interests in and needs related to GRI. A variant of unknown significance (VUS) is defined as variation in a genetic sequence whose association with disease risk is unknown (National Cancer Institute, 2016). Misinterpreting a VUS may lead to actual clinical harms for both patients and patients’ families (Eccles et al., 2015; Vadaparampil, Scherr, Cragun, Malo, & Pal, 2015). Women with VUS results in the *BRCA1/2* tend to have higher distress and difficulty in communicating their results to family members compared to those with positive or negative outcomes (Cypowyj et al., 2009; O’Neill et al., 2006; van Dijk et al., 2006). In addition, among breast cancer patients, negative mutation status may increase perceptions of uncertainty because it suggests that there are deleterious or likely deleterious variants in genes other than *BRCA1/2* or unknown causes of disease other than genetic inheritance (Heiniger, Butow, Charles, & Price, 2015; Maxwell et al., 2015). According to the uncertainty reduction theory and anxiety-uncertainty management, information-seeking and anxiety reduction are two key functions of communication (Brashers, 2007). Individuals manage uncertainty and relevant negative emotions by seeking health information (Brashers, Neidig, Reynolds, & Haas, 1998). As uncertainty reduction theory indicates, however, experiencing too much uncertainty may not be favorable for information-seekers (Hong & You, 2016). The different levels of uncertainty between individuals with different types of *BRCA1/2* genetic test results may therefore affect their interest in as well as need for GRI by moderating the associations related to these variables. For example, the influence of informational norms on interest in, and need for, GRI might differ by mutation status because the perceived importance of genetic

information among family members and significant others may be affected by the level of uncertainty embedded in patients' *BRCA1/2* mutation status.

RQ1: Does *BRCA1/2* mutation status moderate the associations between informational norm and interest in GRI and between informational norm and need for GRI?

Methods

Participants and Procedures

The participants were recruited from an existing nationwide cohort called the Young Women's Breast Cancer Program (YWBCP), which is comprised of women diagnosed with breast cancer at the age of 40 or younger. Recruitment for this study was conducted from June to December, 2014. We mailed letters to 1,778 YWBCP members inviting them to participate in a survey online, by telephone, or by mail. We sent two follow-up e-mails with links to the survey to those who did not opt-out of further contact. If participants did not respond or opt out, they were sent a mailed paper version of the survey (Kaphingst et al., 2018). Of those contacted, 1,080 (61%) women completed the survey. The survey took about 20–30 minutes to complete, and participants received a \$10 gift card. An informed consent process was completed by all individual participants included in the study. Of the 1,080 participants, eleven participants, who didn't respond to our major variables of interest (i.e., independent variables, dependent variables, and moderator), were removed from this analysis ($N = 1,069$).

Measures

Interest in genetic risk information.—A single item was used to assess interest in GRI: How interested would you be in learning information about a gene variation that increases your risk of developing a disease that may be able to be prevented or treated (McBride et al., 2009). Response options were on a seven-point scale from *Not at all interested* to *Very interested*. For analysis, the responses were categorized into 2 groups: *Very interested* vs. others.

Need for genetic risk information.—We assessed need for GRI with a single item: If you were to learn about a gene variation that you carry, how much information would you want on the following topic: How much the gene variation affects your risk of a disease, which was adapted from Lillie et al. (2007). Response options were *None*, *Just the basics*, *A moderate amount*, *A lot*. For analysis, the responses were categorized into 2 groups: *A lot* vs. others.

Exposure to newspaper, TV, and internet.—Exposure to newspaper, TV, and internet were measured using items adapted from the Health Information National Trends Survey (Nelson et al., 2004). Specifically, the following items were asked: 1) Some newspapers or general magazines publish a special section that focuses on health. In the past 12 months, how often have you read such health sections? 2) Some local television news programs include special segments of their newscasts that focus on health issues. In the past 12 months, how often have you watched health segments on local news? 3) Some people notice

information about health on the internet, even when they are not trying to find out about a health concern they have or someone in the family has. How often have you read this sort of health information in the past 12 months? Response options for each question were 1) *Every day*, 2) *Several days per week*, 3) *2 or 3 times per month*, 4) *About once per month*, 5) *5 to 10 times per year*, and 6) *Less than 5 times per year*. We compared “2–3 times per month or more” (1–3) to “about once a month or less” (4–6) in analysis.

Numeracy.—Self-reported numeracy ability was assessed via four items ($\alpha = .90$). Specifically, the following items were included: 1) How good are you at working with fractions? 2) How good are you at working with percentages? 3) How good are you at calculating a 15% tip? 4) How good are you at figuring out how much a shirt will cost if it is 25% off? (Fagerlin et al., 2007). Participants responded on six point Likert-type scales from *Not at all good* to *Extremely good*. We used the mean score in analysis.

Informational norms.—We assessed informational norms with the following item: The people who mean the most to me think I should learn more about ways I can keep myself healthy (Hay et al., 2012). Participants responded on a seven point Likert-type scale; response options ranged from *Strongly disagree* to *Strongly agree*.

Health consciousness.—Five items were used to assess health consciousness ($\alpha = .76$). Specifically, the following items were included: 1) Living life in best possible health is very important to me; 2) Eating right, exercising, and taking preventive measures will keep me healthy for life; 3) My health depends on how well I take care of myself; 4) I actively try to prevent disease and illness; and 5) I do everything I can to stay healthy (Dutta-Bergman, 2003). Participants responded on five point Likert-type scales, with response options ranging from *Strongly disagree* to *Strongly agree*. We used the mean score in analysis.

Information orientation.—We used eight items to assess health information orientation ($\alpha = .89$). For example, the following items were asked: 1) I really enjoy learning about health issues; 2) To be and stay healthy, it's critical to be informed about health issues; and 3) It's important to me to be informed about health issues (Dutta-Bergman, 2004). Participants responded on five point Likert-type scales. Response options ranged from *Strongly disagree* to *Strongly agree*. We used the mean score in analysis.

Worry about genetic risks.—We assessed genetic worry with three items ($\alpha = .75$): 1) Your genes put you at increased risk for developing a common disease, like heart disease or diabetes; 2) You already have a health condition that was caused primarily by your genes; and 3) Your relatives could be affected with a genetic condition that you have passed on (Kaphingst et al., 2018; Shiloh, Drori, Orr-Urtreger, & Friedman, 2009). Participants responded on seven point Likert-type scales with response options ranging from *Not at all worried* to *Extremely worried*. We used the mean score in analysis.

Genetic self-efficacy.—Parrott and colleagues (2004) developed a three-item measure to assess genetic self-efficacy ($\alpha = .90$): 1) I know how to assess the role of genes for health; 2) I know how to assess my genetic risk for disease; and 3) I can explain genetic issues to

people. Participants responded on five point Likert-type scales with response options ranging from *Strongly disagree* to *Strongly agree*. We used the mean score in analysis.

Genetic causal belief.—We assessed genetic causal belief for breast cancer with one item: How much do you think genetic make-up determines whether or not a woman will get breast cancer?” (McBride et al., 2009), which we have used in previous studies (Ashida et al., 2011). Participants responded on five point Likert-type scales with response options ranged from *Not at all* to *Completely*. We used the mean score in analysis.

Genetic knowledge.—Genetic knowledge, more specifically genome sequencing knowledge, was measured by using ten questions developed by Kaphingst et al. (2012). For example, the following questions were asked: 1) A health care provider can tell a person her exact chance of developing a disease based on the results from genome sequencing; and 2) Scientists know how all variants of genes will affect a person’s chances of developing diseases. Participants responded on five point Likert-type scales from *Strongly disagree* to *Strongly agree*.

BRCA1/2 mutation status.—*BRCA1/2* mutation status was collected from the YWBCP database and characterized as positive (i.e., has a pathogenic variant in *BRCA1* and/or *BRCA2*), negative (i.e., no variant identified in either *BRCA1* or *BRCA2*), VUS, or unknown (i.e., history of genetic *BRCA 1/2* testing was unavailable). This mutation status was recoded for analysis as positive = 1 vs. negative, VUS, or unknown = 0.

Family history of breast cancer.—Family history of breast cancer was scored by an experienced genetic counselor based on the degree of affected relatives (i.e., first-degree: parents, full siblings, or children; and second-degree: grandparents, grandchildren, aunts, uncles, nephews, nieces, or half-siblings) and used as a covariate. This was classified as strong (i.e., one first- or second-degree female relative diagnosed younger than age 50, two relatives diagnosed at any age, or male relative diagnosed), moderate (i.e., one first- or second-degree female relative diagnosed age 50 or older), low (i.e., no first- or second-degree female relatives diagnosed), or unknown. This family history was recorded for analysis as moderate or strong = 1 vs. low or unknown = 0.

Data Analysis

SPSS Version 24 was used for data analysis. For the analysis, covariates (i.e., age, race, income, marital status, employment, and family history of breast cancer) were selected based on prior empirical studies. To investigate hypotheses 1, 2, 3, 4 and research question 1, logistic regression was employed. To further investigate RQ1 regarding the interaction effects of *BRCA1/2* mutation status, SPSS Macro for Probing Interactions in OLS and Logistic Regression (Hayes & Matthes, 2009) was employed.

Results

Demographic variables (i.e., age, race, income, marital status, and employment) were entered in each model as covariates. Descriptive statistics related to these variables are in

Table I. Most (92%; $n = 983$) of the participants were Non-Hispanic White. Bivariate correlations among variables are in Table II.

Factors Affecting Participants' Interest in Genetic Risk Information

Table III reports the results of the logistic regression analysis related to interest in GRI. In all three models the variables together explained a significant amount of the variance in interest in GRI. The variance explained by the final model (Model 3) is as follows: Nagelkerke $R^2 = .143$, $\chi^2(19) = 105.870$, $p < .001$. In the final model (Model 3), income (OR= 1.452, $p = .029$; 95% CI = 1.04, 2.03) and *BRCA1/2* mutation status (OR= 4.920, $p = .020$; 95% CI = 1.29, 18.74) were found to significantly predict high interest in GRI. That is, participants with higher income and who carried a known deleterious mutation in *BRCA1/2* were more likely to be very interested in GRI. Those with higher numeracy (OR= 1.167, $p = .027$; 95% CI = 1.02, 1.34) and information orientation (OR= 1.502, $p = .003$; 95% CI = 1.15, 1.96) were more likely to report being very interested in GRI (H3). Genetic worry (OR= 1.151, $p = .005$; 95% CI = 1.04, 1.27), genetic causal belief (OR= 1.272, $p = .04$; 95% CI = 1.01, 1.60), and genetic knowledge (OR= 2.110, $p < .001$; 95% CI = 1.52, 2.92) were positively associated with interest in GRI (H4).

This model shows that the interaction effect of *BRCA1/2* mutation status on the association between informational norm and interest in GRI was significant (OR= .732, $p = .029$; 95% CI = .55, .97) (RQ1). Participants with negative/VUS/unknown mutation status have a significantly higher interest in GRI than participants with known *BRCA1/2* mutations when they believe their significant others think they should seek information to be healthy.

Factors Affecting Participants' Need for Genetic Risk Information

Table IV reports the results of the logistic regression analysis related to need for GRI, showing that in all four models, the variables together explained a significant amount of the variance in need for GRI. The variance explained by the final model (Model 4) is as follows: Nagelkerke $R^2 = .311$, $\chi^2(20) = 238.274$, $p < .001$. In the final model (Model 4), age (OR= 1.589, $p = .011$; 95% CI = 1.10, 2.28), marital status (OR= .542, $p = .010$; 95% CI = .34, .86), and *BRCA1/2* mutation status (OR= 10.472, $p = .018$; 95% CI = 1.50, 72.84) were found to significantly predict need for GRI. That is, older participants, those who were not married, and those who carry *BRCA1/2* mutations were more likely to have a high need for GRI.

Those with higher numeracy (OR= 1.298, $p = .001$; 95% CI = 1.12, 1.50) and information orientation (OR= 1.684, $p = .001$; 95% CI = 1.24, 2.28) were more likely to have a high need for GRI (H3). Those with higher genetic self-efficacy (OR= 1.353, $p < .001$; 95% CI = 1.14, 1.60) and genetic knowledge (OR= 1.549, $p = .020$; 95% CI = 1.07, 2.24) were more likely to have a high need for GRI (H4). Interest in GRI significantly and positively predicted need for GRI (OR= 5.849, $p < .001$; 95% CI = 4.08, 8.39) (H1).

This model reveals that the interaction effect of *BRCA1/2* mutation status on the association between informational norm and need for GRI was significant (OR= .655, $p < .05$; 95% CI = .45, .96) (RQ1). More specifically, participants who carry mutations in *BRCA1/2* status have a significantly lower need for GRI than participants with negative/VUS/unknown

mutation status when they believe their significant others think they should seek information to be healthy.

Discussion

This study investigated factors affecting need for GRI among women diagnosed with breast cancer at the age of 40 or younger in the context of WGS. Specifically, this study focused on health information exposure through media, individual characteristics regarding health information and genetics, and interest in, GRI by applying existing information-seeking models (i.e., RISP and PRISM) to the context of genetic risk communication. According to the Nagelkerke R^2 , the final models of this study accounted for 14.3% (interest in GRI) and 31.1% (need for GRI) of the variability in the outcomes. The extent of the variance explained in this study is similar to the models of health information-seeking in other studies (e.g. Hovick et al., 2011; Hovick et al., 2014b). Below we will discuss the implications of the findings for future studies on interest in, and need for, GRI among cancer patients and survivors as well as the influences of individual characteristics on the interest and need.

First, as hypothesized, participants' interest in GRI was positively associated with their need for GRI. This study was conducted based on the premise that compared to information insufficiency, information need might be a more direct and conceptually clearer alternative to predicting information-seeking behavior, especially in the context of genetic risk information. In the prior literature on GRI (e.g., Cherkas et al., 2010; Collins et al., 2014; Graves et al., 2011), a clear association between interest in, and need for, GRI has not yet been established. According to the result, those with higher interest in "the information about a gene variant that increases disease risks" are more likely to want "information on how much the gene variant affects disease risks." This result suggests a positive relationship between interest in, and need for, GRI. Further, given that information insufficiency is hard to measure and apply to the context of GRI, this finding suggests that information need might be a useful alternative for future studies of information behavior in this context. At the same time, however, this suggestion should be further clarified in future studies via empirical testing in other patient populations that are more diverse in terms of race, education, and income.

Second, we did not find a significant effect of media exposure on interest in and need for GRI. There are a number of possible explanations for this finding that could be explored in future research. For example, since the participants of this study are breast cancer survivors, their direct experience of disease may have a larger effect on their interest in, and need for, GRI than other indirect information such as stories in the media. Although Angelina Jolie's decision to pursue genetic testing has been shown to have an impact on the public's interest in genetic testing and GRI (Evans et al., 2014), this might not be the case for cancer survivors. Moreover, the majority of participants (77.2%) already know their BRCA1/2 mutation status. For breast cancer survivors, health information from interpersonal sources such as patient support groups, medical providers, or family members may matter more than media-based health information. While researchers have argued that exposure to media health campaigns may increase public awareness and interest in genetic testing (Cherkas et al., 2010), the effect of exposure to cancer patients or survivors has been rarely explored. To

better explain the effects of media exposure, future studies should investigate the associations among exposure to and use of different media, interest in, and need for, GRI in different patient populations and the general public.

Third, we found that individual characteristics that predicted information-seeking in previous studies are also significant predictors of interest in, and need for, GRI. This study was conducted based on the premise that health information-seeking is predicted by information need (Wilson, 1981; Dervin & Nilan 1986; Hewins 1990; Pettigrew et al. 2001). Therefore, factors affecting health information-seeking including information orientation and informational norms were regarded as potential predictors of information need (Griffin et al., 1999; Hovick et al., 2011; Maibach et al., 2006). Moreover, numeracy was examined as basic abilities to manage one's health and health information (Hovick et al., 2014b). Although hypothesis three was partially supported, the findings are consistent with several previous studies of health information-seeking. In particular, as hypothesized, participants' numeracy and active information orientation were significant predictors of individuals' interest in, and need for, GRI. This suggests that the predictors of information-seeking in previous studies can function as significant predictors of information interest and need in the context of genomic risk communication.

Fourth, the results showed that individual characteristics related to genetics were significantly associated with interest in, and need for, GRI. This study investigated key variables predicting seeking intentions in Kahlor's (2010) PRISM model, such as perceived risk knowledge, worry, and perceived information-seeking control. Since this study was conducted in the context of GRI, these variables were genetics-related variables such as genetic knowledge, genetic worry, genetic self-efficacy, and genetic causal belief. Overall, as hypothesized, the genetics-related variables were significant predictors of interest in, and need for, GRI. More specifically, genetic knowledge was significantly and positively associated with both interest in GRI and need for GRI. In addition, genetic worry and genetic causal belief significantly and positively predicted interest in GRI, and genetic self-efficacy significantly increased need for GRI. These results therefore indicate that several individual characteristics that have been hypothesized to predict seeking intentions in this study positively influenced individuals' interest and need for GRI. Previous studies have assessed the PRISM model in the cancer context. The results of this study reveal these that this model can be successfully applied to the context of genetic risk information.

Fifth, *BRCA1/2* mutation status significantly moderated the associations between informational norm and interest in GRI and between informational norm and need for GRI. We focused on the uncertainty existing in different types of results from genetic testing of *BRCA1/2* because these results can be ambiguous, complex, and unpredictable (Mishel & Clayton, 2008). According to Vos et al. (2013b), cancer patients differ in need for certainty as well as perceived certainty depending on the test results. Uncertainty reduction theory and anxiety-uncertainty management suggest that people attempt to reduce anxiety embedded in uncertain situations through information-seeking (Brashers, 2007; Brashers et al., 1998). Therefore, it makes sense that cancer patients diagnosed at a young age who do not carry a known deleterious mutation in the *BRCA1/2* genes have a higher interest in GRI when they believe their significant others think they should seek information to be healthy. These

participants' perceived uncertainty might be high because their genetic test results have not identified a probable genetic cause for their disease. Similarly, participants with known *BRCA1/2* mutations have a significantly lower need for GRI than participants with negative/VUS/unknown mutation status when they believe their significant others think they should seek information to be healthy.

Sixth, the results show that several demographic variables significantly predict participants' interest in, and/or need for, GRI. Although the participants represent a high income population, income still matters in predicting their interest in GRI. Interestingly, marital status and age were significant predictors of need for GRI as well. More specifically, older and/or unmarried participants are more likely to have a high need for genetic information. These people might be more concerned or worried about their health due to their higher risk situations (e.g., aging, economic instability, etc.). Family history of breast cancer was not significantly associated with interest in GRI or need for GRI in this study. This finding is not consistent with prior research among general population samples (e.g., data from the U.S. Health Information National Trends Survey) indicating that participants' understanding that cancer has multifactorial causes was associated with a family history of cancer (e.g. Waters et al., 2016). This is a group of survivors, and their young age of onset may have been a greater motivator for interest in, and need for, genetic risk information than other factors. Moreover, other demographics (e.g., parental status) and unmeasured personality traits related to uncertainty (e.g., need for certainty/closure and uncertainty tolerance) may have affected the results of this study. In a recently published study based on this dataset, having biological children was generally not related to participants' preferences for different types of genetic risk information (Kaphingst et al., 2018). Given the participants' relatively young age compared to other breast cancer patients or survivors, however, it is possible that a different effect on interest in GRI would be seen for those who have older or adult children because children's age affects when parents believe that it is important to share genetic risk information. Future studies can further investigate whether these demographic/medical variables and individual characteristics have moderating and/or mediating roles in the associations between individual characteristics and information need in different populations.

Lastly, genetic risk information is key because patients desire genetic information when they seek genetic counseling services (Veach, Bartels, & LeRoy, 2007). Our findings about individuals' need of GRI and its psychosocial predictors suggest theoretical as well as practical implications to be applied to the process of genetic counseling. According to the Reciprocal Engagement Model of genetic counseling that supports a patient-centered genetic counseling process (Veach et al., 2007), a mutual process occurs when the genetic counselor and counselee participate in an educational exchange of genetic and biomedical information that is affected by their identities. This model incorporates the patients' values, knowledge, experiences, and beliefs, allowing for building a mutual relationship (Schmidlen et al., 2018). The findings of this study will be able to contribute to this mutual process by helping genetic counselors understand patients' needs based on their unique psychosocial factors. More specifically, the findings suggest that participants' beliefs, knowledge and experiences relevant to health information and genetics altogether influence their need for genetic risk information. This also suggests that the genetic counseling process needs to assess and

reflect these predictors so that counselors can satisfy their patients' needs based on their psychosocial characteristics. The predictors of interest can contribute to developing evidence-based decision aids as well as communication materials to support the process of genetic counseling (Persky et al., 2007).

Limitations and Conclusion

Although this study provides several novel findings, it is important to acknowledge its limitations. First, since most of the participants were Caucasian women, of higher socioeconomic status, diagnosed at a young age, and had previously agreed to participate in a research cohort, the results might not be generalizable to other populations of women diagnosed with breast cancer. As such, demographics such as parental status may have significant effects in other groups of older breast cancer survivors. Second, the majority of participants were a number of years past their cancer diagnosis and most had already received genetic testing for *BRCA1/2*. This may have affected their interest as well as need for GRI compared with a newly diagnosed cancer patient population. Third, we also acknowledge that there is a limitation due to the use of single item measures for two key variables (i.e., interest in GRI and need for GRI) and the possibility of overlapping. In practice, however, information about a gene variant increasing disease risks (interest in GRI) and information on how the gene variant impacts risk (need for GRI) overlap. In addition, both measurements reflect the need for and interest in "genetic risk information" (i.e., DNA-based profiling for disease risk) defined by Collins et al. (2011). At the same time, however, future studies will need to develop and validate multiple item scales to assess interest in and need for GRI, and determine differences between the constructs (e.g., path analysis).

Despite the limitations, our findings provide grounds for including need for GRI rather than information insufficiency in the theoretical models in the context of cancer survivors and WGS. More specifically, these findings highlight the role of cancer survivors' interest in predicting their information need, as well as potential intentions to seek genetic information. Moreover, the interaction effects based on participants' *BRCA1/2* mutation status suggest important clinical and practical implications related to cancer patients' uncertainty management and genetic information-seeking to be further investigated in future studies.

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Table I.**Sociodemographic and Clinical Characteristics of Participants**

		n (%)
Current age	Less than 35	97 (9.1)
	36–45	521 (48.7)
	46–55	298 (27.9)
	56–65	106 (9.9)
	66 or more	47 (4.4)
Race	Non-Hispanic White	983 (92)
	Non-White ^a	86 (8)
Income	Less than \$25,000	36 (3.4)
	\$25,000–\$49,999	117 (10.)
	\$50,000–\$74,999	155 (14.5)
	\$75,000–\$99,999	157 (14.7)
	\$100,000 and over	473 (44.2)
	Missing	131 (12.3)
Marital status	Married	778 (72.8)
	Living as married	51 (4.8)
	Widowed	16 (1.5)
	Divorced	95 (8.9)
	Separated	21 (2.0)
	Never been married or not answered	108 (10.1)
Employment	Full-time	618 (57.8)
	Part-time	205 (19.2)
	Other ^b	246 (23.0)
Family history of breast cancer	Unknown or not answered	61 (5.7)
	Low	503 (47.1)
	Moderate	205 (19.2)
	Strong	200 (28.1)
BRCA mutation status	Positive	117 (10.9)
	Negative or variant	708 (66.2)
	Unknown	244 (22.8)
Newspaper use for health information seeking	Every day or several days a week	209 (19.6)
	1–3 times a month	459 (42.9)
	10 times a year or less	401 (37.5)
TV use for health information seeking	Every day or several days a week	170 (15.9)
	1–3 times a month	418 (39.1)
	10 times a year or less	481 (45.0)
Internet use for health information seeking	Every day or several days a week	268 (25.1)
	1–3 times a month	476 (44.5)
	10 times a year or less	325 (30.4)

Note: $N = 1,080$.

^{a.} other includes African Americans, Asian Americans, American Indian or Alaska Natives, and Hispanic

^{b.} other includes; student, retired, unemployed, maintaining the home, and disabled.

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Table II.

Bivariate Correlations among Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Newspaper use	1												
2. TV use	.35***	1											
3. Internet use	.41***	.33***	1										
4. Numeracy	.06	.02	.03	1									
5. Informational norm	-.01	.03	.03	-.06*	1								
6. Health consciousness	.10**	.08*	.02	.04	-.03	1							
7. Informational orientation	.34***	.23***	.30***	.09**	.02	.48***	1						
8. Genetic worry	.07*	.05	.11**	-.03	.23***	.05	.15***	1					
9. Genetic self-efficacy	.11***	.01	.12***	.17***	.02	.08*	.18***	-.01	1				
10. Genetic determinism	.02	.01	.01	-.04	.12***	.04	.07*	.24***	.02	1			
11. Genetic knowledge	.09**	-.03	.05	.18***	-.10**	.04	.15***	-.05	.23***	-.05	1		
12. Interest in GRI	.09**	.08*	.05	.11***	.04	.12***	.19***	.14***	.02	.09**	.16***	1	
13. Need for GRI	.13***	.06*	.07*	.18***	.02	.08**	.23***	.11***	.16***	.04	.17***	.38***	1

Note: $N = 1,069$.

*

$p < .05$

**

$p < .01$

$p < .001$

GRI = genetic risk information

Table III.

Factors Predicting Interest in Genetic Risk Information

	Interest in Genetic Risk Information					
	Model 1 (N = 1,069)		Model 2 (N = 1,069)		Model 3 (N = 1,069)	
	OR (p-value)	95% CI	OR (p-value)	95% CI	OR (p-value)	95% CI
Age ^a	.899 (.498)	.66–1.22	.976 (.881)	.71–1.34	.960 (.802)	.70–1.32
Race ^b	.796 (.435)	.45–1.41	.793 (.435)	.44–1.42	.779 (.400)	.44–1.39
Income ^c	1.520 (.012) *	1.10–2.11	1.449 (.030) *	1.04–2.03	1.452 (.029) *	1.04–2.03
Marital status ^d	1.056 (.774)	.73–1.53	1.028 (.886)	.70–1.50	1.027 (.891)	.70–1.50
Employment ^e	.780 (.115)	.57–1.06	.819 (.213)	.60–1.12	.814 (.202)	.59–1.12
FHH ^f of breast cancer ^g	.998 (.990)	.74–1.35	.968 (.832)	.71–1.31	.960 (.796)	.71–1.30
BRCA status ^h	1.697 (.052)	.99–2.89	1.392 (.241)	.80–2.42	4.920 (.020) *	1.29–18.74
Newspaper	1.140 (.461)	.80–1.62	1.114 (.553)	.78–1.59	1.101 (.598)	.77–1.57
TV	1.298 (.140)	.92–1.84	1.328 (.114)	.93–1.89	1.344 (.099)	.95–1.91
Internet	.868 (.423)	.62–1.23	.872 (.446)	.61–1.24	.875 (.460)	.62–1.25
Numeracy	1.179 (.014) *	1.03–1.34	1.169 (.025) *	1.02–1.34	1.167 (.027) *	1.02–1.34
Informational norm	1.069 (.095)	.99–1.16	1.057 (.193)	.97–1.15	1.086 (.061)	.99–1.19
Health consciousness	1.202 (.219)	.90–1.61	1.242 (.156)	.92–1.68	1.252 (.142)	.93–1.69
Informational orientation	1.636 (< .001) ***	1.27–2.11	1.503 (.002) ***	1.15–1.96	1.502 (.003) ***	1.15–1.96
Genetic worry			1.150 (.006) **	1.04–1.27	1.151 (.005) **	1.04–1.27
Genetic self-efficacy			.876 (.083)	.75–1.02	.875 (.081)	.75–1.02
Genetic causal beliefs			1.262 (.048) *	1.00–1.59	1.272 (.042) *	1.01–1.60
Genetic knowledge			2.107 (< .001) ***	1.52–2.92	2.110 (< .001) ***	1.52–2.92
BRCA status [*] Health info-norm					.732 (.029) *	.55–.97
Nagelkerke R ²	.092 ***		.136 ***		.143 ***	

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Note:
a. 45 or more = 1, less than 45 = 0
b. non-Hispanic White = 1, others = 0
c. 75K or over = 1, others = 0
d. Married = 1, others = 0
e. full-time = 1, others = 0
f. family health history
g. moderate or strong = 1, low or unknown = 0
h. positive = 1, negative, variant, or unknown = 0
* p < .05
** p < .01
*** p < .001

Table IV.

Factors Predicting Need for Genetic Risk Information

	Need for Genetic Risk Information								
	Model 1 (N = 1,069)			Model 2 (N = 1,069)			Model 3 (N = 1,069)		
	OR (p-value)	95% CI		OR (p-value)	95% CI		OR (p-value)	95% CI	
Age ^a	1.350 (.070)	.98–1.87		1.526 (.013) *	1.09–2.13		1.601 (.010) *	1.12–2.29	1.589 (.011) *
Race ^b	.774 (.412)	.42–1.43		.785 (.446)	.42–1.46		.816 (.547)	.42–1.58	.791 (.490)
Income ^c	1.570 (.010) *	1.11–2.21		1.468 (.033) *	1.03–2.09		1.292 (.184)	.89–1.88	1.302 (.172)
Marital status ^d	.632 (.031) *	.42–.96		.613 (.025) *	.40–.94		.551 (.012) *	.35–.88	.542 (.010) *
Employment ^e	.813 (.213)	.59–1.13		.854 (.352)	.61–1.19		.898 (.552)	.63–1.28	.891 (.523)
FHH ^f of breast cancer ^g	1.120 (.43)	.82–1.54		1.064 (.707)	.77–1.47		1.118 (.524)	.79–1.58	1.099 (.590)
BRCA status ^h	2.245 (.009) **	1.23–4.11		1.671 (.105)	.90–3.11		1.585 (.169)	.82–3.06	10.427 (.018) *
Newspaper	1.297 (.172)	.89–1.88		1.245 (.257)	.85–1.82		1.228 (.314)	.82–1.83	1.211 (.350)
TV	.992 (.964)	.69–1.43		1.043 (.825)	.72–1.51		.925 (.696)	.62–1.37	.931 (.719)
Internet	.951 (.789)	.66–1.37		.892 (.548)	.61–1.30		.879 (.526)	.59–1.31	.879 (.528)
Numeracy	1.385 (< .001) ***	1.21–1.59		1.319 (< .001) ***	1.15–1.52		1.297 (.001) **	1.12–1.50	1.298 (.001) **
Informational norm	1.052 (.237)	.97–1.14		1.040 (.376)	.95–1.14		1.015 (.751)	.92–1.12	1.046 (.368)
Health consciousness	.894 (.484)	.64–1.22		.922 (.621)	.67–1.27		.801 (.205)	.57–1.13	.808 (.223)
Informational orientation	2.039 (< .001) ***	1.56–2.67		1.784 (< .001) ***	1.35–2.36		1.679 (.001) **	1.24–2.28	1.684 (.001) **
Genetic worry				1.146 (.008) **	1.04–1.27		1.111 (.061)	.99–1.24	1.111 (.067)
Genetic self-efficacy				1.246 (.006) **	1.07–1.46		1.352 (< .001) ***	1.14–1.60	1.353 (< .001) ***
Genetic causal beliefs				1.083 (.517)	.85–1.38		.992 (.950)	.77–1.28	1.001 (.993)
Genetic knowledge				1.902 (< .001) ***	1.35–2.68		1.549 (.019) *	1.07–2.24	1.549 (.020) *
Interest in GRI							5.916 (< .001) ***	4.13–8.48	5.849 (< .001) ***
BRCA status [*] Health info-norm									.655 (.028) *
									.45–.96

Need for Genetic Risk Information							
Model 1 (N = 1,069)		Model 2 (N = 1,069)		Model 3 (N = 1,069)		Model 4 (N = 1,069)	
OR (p-value)	95% CI	OR (p-value)	95% CI	OR (p-value)	95% CI	OR (p-value)	95% CI
<hr/>							
Nagelkerke R^2		.146***	.186***	.305***		.311***	
<hr/>							
Note:							
$a.$ 45 or more = 1, less than 45 = 0							
$b.$ non-Hispanic White = 1, others = 0							
$c.$ 75K or over = 1, others = 0							
$d.$ Married = 1, others = 0							
$e.$ full-time = 1, others = 0							
$f.$ family health history							
$g.$ moderate or strong = 1, low or unknown = 0							
$h.$ positive = 1, negative, variant, or unknown = 0							
* $p < .05$							
** $p < .01$							
*** $p < .001$							