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Development and validation of an instrument to assess perceived social influence on health behaviors

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Abstract

Assessment of social influence on health behavior is often approached through a situational context. The current study adapted an existing, theory-based instrument from another content domain to assess Perceived Social Influence on Health Behavior (PSI-HB) among African Americans, using an individual difference approach. The adapted instrument was found to have high internal reliability (α = .81–.84) and acceptable testretest reliability (*r* = .68–.85). A measurement model revealed a three-factor structure and supported the theoretical underpinnings. Scores were predictive of health behaviors, particularly among women. Future research using the new instrument may have applied value assessing social influence in the context of health interventions.

Keywords

social influence; health behavior; validity; reliability; measurement model

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It is undisputable that lifestyle and behavior play a significant role in many chronic diseases such as diabetes, heart disease, and cancer. Behavioral and environmental factors account for 70% of premature deaths in the US (Department of Health and Human Services, 2001). Behavior is difficult to control and predict. However it is recognized that behavior including health behavior is multi-determined (Bandura, 1986). One of the factors influencing behavior, including health behavior, is the impact of individuals in one's social network (Bandura, 1986). This may be one's friends, family, peers, coworkers, social groups or clubs, or faith-based groups. Such social influences may be positive or negative in nature.

Multidimensional theories of social influence

It has been proposed that individuals' behaviors and choices vary in the extent to which they are influenced by others (McGuire, 1968). This 'influenceability' has been proposed to be a trait or personality factor (Bearden, Netemeyer, & Teel, 1989; 1990). Such social influence has also been proposed to differ by culture and societal norms (Triandis, 1989). Social influence has been recognized as a multidimensional construct (Bearden, et al., 1989; Mourali, Laroche, & Pons, 2005). Bearden and colleagues (1989) and Mourali and colleagues (2005) conceptualized social influence as being comprised of three dimensions including utilitarian influence, value-expressive influence, and informational influence. Utilitarian influence occurs when an individual complies with others' expectations in order to receive rewards or avoid a punishment, and involves compliance processes (Bearden & Etzel, 1982; Park & Lessig, 1977). Value-expressive influence occurs when an individual wishes to enhance their self-image or self-concept by identifying with a reference group, and involves identification processes (Bearden & Etzel, 1982; Park & Lessig, 1977). Informational influence occurs when an individual looks for information from others to form their reality, and involves internalization processes (Deutch & Gerard, 1955; Bearden & Etzel, 1982). With compliance, the individual may act but may not believe in what they have done. With identification and internalization, the individual actually believes in the behavior.

Social influence and health behavior

Perceived social influence has been found to be associated with a number of health behavior outcomes including sexual experimentation (Di Noia & Schinke, 2008), age of sexual initiation (Gilliam, Berlin, Kozloski, Hernandez, & Grundy, 2007), health behavioral intentions (Finlay, Trafimow, & Jones, 1997), and health behaviors (Finlay, Trafimow, & Villareal, 2002). Other studies report relationships with smoking (Ahern, Galea, Hubbarde, & Syme, 2009), smoking intentions (Grube, Morgan, & McGree, 1986), fruit and vegetable consumption (Emmons, Barbeau, Gutheil, Stryker, & Stoddard, 2007), and mammography utilization (Allen, Stoddard, & Sorensen, 2008).

The Present Study

The present examination reports on the development and validation of an instrument to assess the perceived role of others in the health behavior decisions of individuals. An African American adult sample was employed, as part of an ongoing national survey examining the role of a variety of cultural factors in health risk and protective behaviors. Existing instruments examine perceived social norms through a Theory of Planned Behavior or Theory of Reasoned Action context. However an extensive search produced no instrument to assess perceived social influence from a trait or individual difference approach, particularly within the domain of health behaviors. Therefore, an existing, theory-based, multidimensional instrument was adapted to suit this purpose (Bearden, Netemeyer, & Teel, 1989). An instrument that assesses the perceived role of others in making health behavior decisions has broad utility, and could be used in determining the role of social

influence in health behavior decision making. Findings from such studies may have applied value for the development of more effective health promotion interventions, particularly those based on theories that incorporate the role of social influence.

Method

Instrument development and pilot testing

The measure identification and development phase involved a series of six systematic steps (see Table 1). We used a process similar to that cited by Krause (2002), involving expert input, item revision, and iterative piloting. The process began with comprehensive literature searches conducted in nine databases (Step 1). An existing suitable instrument to assess the construct was not able to be identified. However one was identified that was close but in a different domain, that of consumer behavior (Bearden, Netemeyer, & Teel, 1989). Therefore, rather than to develop all original items, the team decided that the CONSUMER SUSCEPTIBILITY TO INTERPERSPONSAL INFLUENCE SCALE could be adapted to the health context (Step 2). The adapted instrument was subject to a full team review (Step 3) on the basis of representativeness of the construct (face validity) and cultural appropriateness.

The items were then revised based on the team review using an iterative process (Step 4) and then finalized (Step 5). The finalized instrument was administered by telephone to a national probability sample of 55 African Americans to assess test-retest reliability (Step 6). No changes were made at this point; the piloting was part of a protocol used in a larger study that was developing other instruments de novo. The instrument was then administered to another national probability sample of 1,006 African Americans to assess other psychometric properties (Step 6).

Telephone survey for psychometric data collection

The study was approved by the Institutional Review Board at the University of Alabama at Birmingham. For both the initial test-retest sample of 55 and the full sample of 1,006, professional interviewers recruited participants by telephone by calling names from a purchased list. The sample consisted of African Americans age 21 and older living in a private residence with a telephone. Telephone numbers were randomly selected from the nationally representative pool that was developed based on census tract. If interested, individuals were screened for eligibility criteria, including being an African American age 21 or over.

Test-retest sample—A gift card of $15 was mailed to each participant upon completing the initial survey. The survey was timed and took an average of 20 minutes to complete. Two weeks later, participants were contacted for a re-administration of study instruments. This survey took an average of 15 minutes and participants were mailed another gift card in the amount of $15 for its completion.

Full psychometric sample—The telephone survey took an average of 45 minutes to complete, due to administration of a full battery of instruments used in the larger study. Instruments related to the current analysis included the Perceived Social Influence on Health Behaviors (PSI-HB) instrument, additional measures for the assessment of discriminant validity, and participant demographics. Due to the increased time commitment by participants, a gift card of $25 was mailed to each participant upon completing the study procedure.

Measures

Health behaviors

Alcohol use was assessed using a module from the Behavioral Risk Factor Surveillance System (BRFSS). The instrument has demonstrated adequate test-retest reliability over a 21-day period in a sample of African Americans (Stein, Lederman, & Shea, 1993). The module includes four items (e.g., "During the past 30 days, how many days per week or per month did you have at least 1 drink of any alcoholic beverage?"). *Breast, prostate, and colorectal cancer screening* frequency were also assessed using items from the BRFSS.

The brief version of the International Physical Activity Questionnaire (IPAQ) was used to assess participants' *physical activity* in the last seven days. The instrument has been validated with African Americans (Wolin, Heil, Askew, Matthews, & Bennett, 2008). The instrument contains seven items that ask participants to report the number of days (frequency) they performed various types of physical activities (vigorous, moderate, and walking).

To assess fruit and vegetable consumption, we used an adaptation of the National Cancer Institute's Five-A-Day Survey (Block, et al., 1986). It consists of seven items that assess fruit consumption and five that assess vegetable consumption. Fifteen different fruits and 18 vegetables are assessed specifically within these items. This instrument has performed well in previous work with the study population (Kreuter, et al., 2005). The test-retest reliability over a two-week period (intraclass correlation coefficient) for the both the fruit (r=.52, p<.001) and the vegetable (r=.60, p<.001) portions were adequate.

Self-efficacy—Self-efficacy was utilized to assess discriminant validity, being a distinct construct from social influence on health behaviors. It was assessed using an eight-item scale (e.g., "I will be able to achieve most of the goals that I have set for myself") that has high internal reliability (α=.85-.88) and test-retest reliability (r=.62-.66) (Chen, Gulley & Eden, 2001).

Analyses

To evaluate the internal reliability of the instrument, Cronbach's alpha was conducted as well as item-total correlations. Pearson correlations were conducted to evaluate discriminant validity, and associations with health-related behaviors. The intraclass correlation coefficient (two-way mixed) was used to evaluate test-retest reliability. Measurement models, or confirmatory factor analyses, were conducted using Mplus 3.0 (Mplus, 2004), to evaluate the factor structure of the new instrument. The dataset was randomly split in half using a computer program; the first measurement model was run on one half of the data and then verified on the other half.

Results

Participant characteristics

A total of 1,006 individuals (693 women and 313 men) completed the telephone interview (see Table 2 for participant characteristics). The response rate is calculated as the proportion of complete interviews to the total number of eligible individuals. The overall response rate was 25% as computed from: accepted/[accepted+refused before eligibility screener], 1,006/[1,006+2,992]. Another 387 individuals were screened but not eligible for various reasons: 16 were under age 21; 163 refused to provide an age for use in eligibility screening; 122 were not African American; 86 had a history of cancer. Only 17 individuals who were screened and eligible refused to participate, resulting in an upper bound response rate of

98% (1,006/1,023). A brief refusal survey was conducted to compare responders to non-responders (N=168). Non-responders were in general older than responders (M=59.98, SD=17.04, vs. M=45.98, SD=14.85, respectively), more likely to be men (41.7% vs. 31.1%, respectively), and less likely to have attended 4 or more years of college (16.1% vs. 25%, respectively).

To assess test-retest reliability, a unique pilot sample was examined including 55 African Americans sampled nationally using the aforementioned method. Fifty-three (96%) completed the two-week retest. Participants in this sample were 34 women and 21 men, from 23 states, with an average age of 50.93 (SD=16.72), and on average, with a high school diploma (12.36 years; SD=2.74). Characteristics of this sample are reported in more detail elsewhere (Holt, et al., 2009).

Reliability and validity

The Perceived Social Influence on Health Behavior scale consisted of 10 items assessed in four-point Likert-type format (strongly disagree, disagree, agree, strongly agree). Four points were used for ease of telephone administration. The instrument has a possible range of 10-40, with higher scores indicating higher levels of these beliefs. Scores in this sample ranged from 10-40, with a mean of 20.50 and standard deviation of 6.25 (median score was 20). The internal consistency of the overall instrument was $\alpha = .90$. Subscale alphas were $\alpha = .84$ for utilitarian influence, $\alpha = .85$ for value-expressive influence, and $\alpha = .81$ for informational influence. The average item-total correlation was .69 and ranged from .60 - .75 (see Table 3). Test-retest reliability was acceptable during the two-week interval ($r = .73$, $p < .001$ for utilitarian influence; $r = .62$, $p < .001$ for value-expressive influence; $r = .52$, $p < .001$ for informational influence).

Validity was evidenced through the instrument development process in terms of face validity involving the investigative team, as well as discriminant and factorial validity (see measurement model section below). Discriminant validity was evidenced by modest negative or nonsignificant correlations with the self-efficacy scale scores (Chen, Gully, & Eden, 2001) ($r = -.16$, $p < .01$ with utilitarian influence; $r = -.16$, $p < .01$ with value expressive influence; $r = -.01$, $p =$ ns with informational influence).

Measurement model

To examine the factor structure of the Perceived Social Influence on Health Behavior instrument, a measurement model was conducted using Mplus software (Mplus, 2004). As recommended by Muthén and Muthén (2008), an exploratory approach was conducted to determine the appropriate number of factors and identify potentially problematic items. A Principal Components analysis with a Varimax rotation was applied. This was followed by a confirmatory analysis on a random sample of half of the data and a subsequent confirmation on the other half of the data. The exploratory factor analysis suggested a three-factor approach, based on the eigenvalues greater than 1.00 using the Kaiser-Guttman rule (Guttman, 1954; Kaiser, 1960; 1970; Nunnally & Bernstein, 1994) and examination of the scree plot. A three-factor model is also consistent with previous research using this instrument (Mourali, Laroche, & Pons, 2005).

The confirmatory factor analysis measurement model was developed based on the factor loadings from the exploratory approach. Maximum likelihood was used as the estimator. All item loadings onto their latent constructs were consistent with those found with the original instrument (Mourali, Laroche, & Pons, 2005) except for one item (“I like to know what health behaviors make good impressions on others.”) that loaded onto the first latent construct (utilitarian influence) rather than the second latent construct (value-expressive

influence). Thus, the latent construct utilitarian influence included the first four items, the value-expressive influence latent construct included the next three items, and the informational influence construct included the final three items (see Figure 1). Table 4 shows the correlation matrix between these factors. This model provided an approximate fit for the first random half of data χ^2 (32, N = 471) = 160.80, p = .001, χ^2/df = 5.03, root mean square error of approximation (RMSEA) = .09, 90% confidence interval (CI) = .08 - .11, comparative fit index (CFI) = .95, TLI (Tucker-Lewis Index) = .92, SRMR (standardized root mean square residual) = .05. Modification indices suggested adding an error covariance between two sets of items; items one and two ("Approve"; "Agree"), and items six and seven ("Be like"; "Identify"). Examining the instrument, it was determined that items one and two both reflected the concept of approval from others prior to engagement in health behaviors and these items were also in consecutive order on the instrument. Items six and seven both reflected identification with others by making the "same healthy choices that they do", using the same phrasing and also falling in consecutive order. These factors may cause the errors of these pairs of items to be correlated. As such, the errors were allowed to correlate, which improved the fit of the model, χ^2 (30, N = 471) = 87.38, p = .001, χ^2/df = 2.91, root mean square error of approximation (RMSEA) = .06, 90% confidence interval (CI) = .05 - .08, comparative fit index (CFI) = .98, TLI (Tucker-Lewis Index) = .96, SRMR = .04. Although the probability value for the chi-square statistic was significant, it is recognized that the chi-square value is sensitive to sample size (Jöreskog, 1969) and a recognized measure of model fit is χ^2/df (Wheaton, Muthén, Alwin, & Summers, 1977), with values in the 2.00 - 5.00 indicating acceptable fit (Hatcher, 1994; Bollen & Long, 1993). Each item was significantly related to the latent variable onto which it was loaded. No other residuals or modification indices provided a theoretically defensible modification for further model respecification.

This model was verified on the other random half of the study sample and provided a comparable fit: χ^2 (30, N = 512) = 76.38, p = .001, χ^2/df = 2.55, root mean square error of approximation (RMSEA) = .06, 90% confidence interval (CI) = .04 - .07, comparative fit index (CFI) = .98, TLI (Tucker-Lewis Index) = .98, SRMR = .03. Model parameters were also comparable to the first model.

Relationships with health behaviors

Because men scored significantly higher than women on the social influence subscales (utilitarian influence M=7.86 [SD=3.09], M=7.42 [2.86], $p < .05$; value expressive influence M=6.52 [SD=2.43], M=5.80 [2.16], $p < .001$; informational influence M=7.19 [SD=2.32], M=6.78 [2.06], $p < .01$), correlations with health behaviors were analyzed separately for men and women (see Table 5). In general, there were more correlations with health behaviors for utilitarian influence than for the other subscales, and more correlations with health behaviors for women than for men, though this finding is primarily driven by utilitarian influence. For men, the significant correlations between social influence and health behaviors were all positive in nature. For women, these correlations were mostly negative in nature. For men, the correlations mainly involved health screenings, while for women they involved physical activity and mixed correlations with alcohol use.

Discussion

The present study reports on the process of adapting an existing instrument to assess perceived social influence on health behavior. The result is a brief instrument with modest to acceptable reliability and validity that is appropriate for use with African American populations. Factorial validity was evidenced through the measurement modeling process and was consistent with the theory-based original instrument. There was one exception in which one of the utilitarian influence items loaded onto the value expressive influence

factor. It is possible that this item, which involves making good impressions on others, reflects more of a process of gaining others' approval than identifying with others. This would be consistent with utilitarian influence rather than value expressive influence.

The current findings are largely supportive of the three-dimensional model of interpersonal influence that Mourali and colleagues (2005) reported with the instrument. The instrument developed by Bearden and colleagues (1989) proposed a three factor solution. However their data fit a two factor solution better, in which the utilitarian influence and value expressive influence factors were combined. The correlation between the two factors in that study was r = .92 whereas it was r = .67 in the present study. The difference could be due to differences in study populations or domain differences. The Bearden study examined adult consumers (demographics not reported). One item in the current study "migrated" from the utilitarian influence factor to the value expressive factor, which was unexpected, and illustrative of the potential for conceptual overlap between these two factors.

Few previous studies have examined the role of perceived social influence among African Americans specifically. A previous study found that African Americans did not report being motivated by social influence to engage in dietary change (Satia & Galanko, 2007). This finding is comparable to that in the present study, as evidenced by means on the PSI-HB scales near the middle of the possible range (see Table 4), and nonsignificant or negative correlations with fruit and vegetable consumption (see Table 5). These findings have implications for health promotion, namely that when promotion dietary change, social norms may not be the most promising target for intervention.

It is proposed that both individuals and behaviors can be subject to normative control (Johnston, White, & Norman, 2004). This supports the individual-difference view of social influence, but also suggests that some health behaviors are more or less susceptible to influence than others. This pattern was evidenced in the current data, where the PSI-HB subscales were correlated positively, negatively, or not at all, with different health behaviors (see Table 5). These findings also have implications for interventions in which health behaviors may vary in their suitability for a social influence-based intervention.

The patterns of correlations of the PSI-HB subscales with health behaviors for men and women were notable. Men scored higher than women on each of the subscales, suggesting that they tend to follow the indications of others when making health behavior decisions to a greater extent than do women. Particularly among women, utilitarian influence seemed to carry more correlation with health behaviors than did the other types of influence, reflecting compliance with others' expectations in order to receive rewards or avoid a punishment. This process was negatively associated with performance of health-related behaviors, perhaps reflecting the negative role of social networks or peer influences. Interestingly, for men, the correlations with health behaviors were positive. It is possible that this process reflects a supportive role of family or friends for men. These data are preliminary and warrant further study with more complex modeling, including multi-group measurement models (Bingenheimer, Raudenbush, Leventhal, & Brooks-Gunn, 2005; Stark, Chernyshenko, & Drasgow, 2006).

Limitations

The findings of this study should be interpreted in the context of several limitations. First, as with most research in instrument development, we are relying on self-report data. Second, the data may not generalize beyond an African American sample. However, much of the instrument development research relies heavily on European American samples, including college students, resulting in instruments that may not be valid for a mature, beyond-collegiate African American population. Third, the current sample included selection bias

due to nonresponse. However, through use of the brief refusal survey, we were able to characterize non-responders as older, more likely to be men, and less well educated than responders. Finally, for retention purposes, there was a brief interval between the test and re-test reliability administrations. Due to the characterization of perceived social influence on health behavior as an individual difference variable, it is not likely that this construct would vary significantly if a longer interval had been utilized.

Conclusion

The availability of a valid and reliable instrument to assess the role of perceived social influence in health behaviors will help answer some of the questions posed by theorists interested in the role of social networks and social influence processes on health behaviors and outcomes. In the context of social networks such as faith-based or secular networks, more needs to be learned about the specific nature of their impacts on health behaviors and outcomes. This work can inform the development of interventions, particularly those targeting such social networks.

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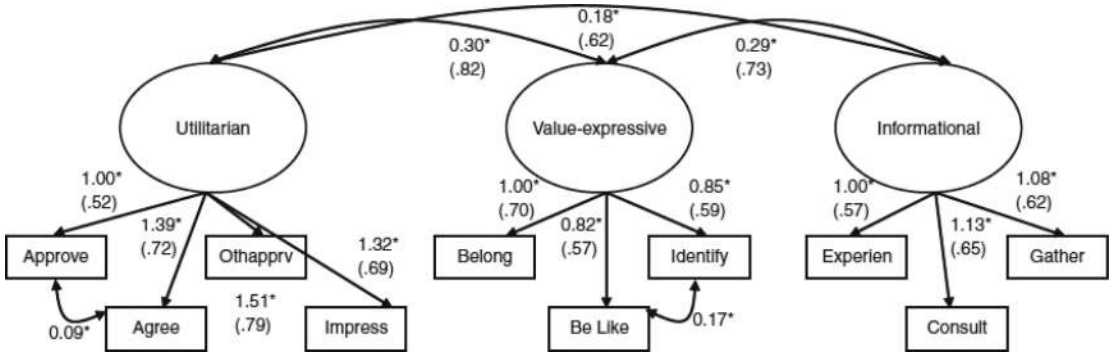

Figure 1.
Measurement model for Perceived Social Influence on Health Behaviors (PSI-HB) instrument.

Table 1

Instrument development and testing procedure

Step	Description
1.	Literature search to identity existing scales
2.	Existing instrument items modified
3.	Item review for face validity and cultural appropriateness
4.	Item revision based on review
5.	Instrument finalized based on team review and feedback, discussions
6.	Psychometric testing of final instrument:
	• Sample 1: Test-retest reliability ($N = 55$)
	• Sample 2: Item-total correlations, internal consistency, discriminant validity, factorial validity ($N = 1006$)

Table 2

Participant demographic characteristics

	N = 1006
Sex	
Male	313 (31%)
Female	693 (69%)
Age mean (SD)	54.98 (14.85)
Age median	55
Relationship status	
Never married	14.3%
Single	16.1%
Married or living w/partner	33.8%
Separated or Divorced	20.6%
Widowed	15.0%
Education	
Grades 1–8	2.8%
Grades 9–11	11.3%
Grade 12 or GED*	32.2%
1-3 yrs college	28.1%
4+ yrs college	25.0%
Income	
< 5k	8.5%
5–10k	12.3%
10–20k	15.1%
20–30k	10.5%
30–40k	8.8%
40–50k	7.5%
50–60k	6.5%
> 60k	17.4%

Notes: Numbers may not sum to 1006 or 100% due to missing data

*GED = General Equivalency Diploma

Table 3

Items comprising instruments and item-total correlations

	N	Item-total correlation
For the next few items, I am going to refer to 'health behaviors'. What I mean by 'health behaviors' is anything that you do that impacts your health, like going to the doctor, your eating habits, or physical activity.		
Please respond to the following statements with Strongly Agree, Agree, Disagree, or Strongly Disagree.		
Utilitarian influence		
I rarely engage in health behaviors until I am sure my friends approve of them.	1000	.60
It's important that others agree with my health lifestyle [before I act].	1002	.74
When engaging in health behaviors, I generally do things that I think others will approve of.	1003	.74
I like to know what health behaviors make good impressions on others.	995	.65
Value-expressive influence		
I achieve a sense of belonging by making the same healthy choices that others do.	1002	.66
If I want to be like someone. I often try to make the same healthy choices that they do.	1001	.74
I often identify with other people by making the same healthy choices that they do.	1002	.75
Informational influence		
If I have little experience with a health behavior, I often ask my friends about it.	1003	.63
I often consult other people to help choose the best alternative available for a health behavior.	1002	.71
I frequently gather information from friends and family before I engage in a health behavior.	1003	.64

Table 4

Correlations between factors, and subscale means and standard deviations

	Utilitarian influence M = 7.56/16 (SD = 2.94)	Value-expressive influence M = 6.03/12 (SD = 2.27)	Informational influence M = 6.91/12 (SD = 2.15)
Utilitarian influence	1.00	—	—
Value-expressive Influence	.67**	1.00	—
Informational Influence	.51**	.57**	1.00

** $p < .01$

Table 5

Bivariate correlations between social influence subscales and health behaviors among men and women

	Utilitarian influence		Value-expressive influence		Informational influence	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
Days per week vigorous physical activity	–.02	–.09 *	.01	–.05	.05	.05
Days per week moderate physical activity	–.09	–.03	–.08	–.02	.05	.07
Days per week walked for 10 minutes at a time	–.07	–.09 *	–.01	–.03	.08	.06
Had at least one alcoholic beverage in last month	.03	–.09 *	–.02	–.07	–.04	–.01
Days in last month had at least one alcoholic beverage	.02	–.14	–.16	–.11	–.03	.06
Days in last month had [5 or 4] or more alcoholic beverages ^	.12	.03	.02	–.03	.04	–.14 *
Largest number of drinks on one occasion, in last month	.12	.20 **	.05	.06	.05	.06
Heard of fecal occult blood test	.14 *	–.02	.12	–.03	.17 *	–.05
Heard of flexible sigmoidoscopy	.03	–.05	–.04	–.10 *	.01	–.14 *
Heard of colonoscopy	–.05	.04	.03	.03	–.03	.07
Ever had digital rectal examination	.09	—	.11	—	.15 *	—
Ever had prostate specific antigen test	–.08	—	–.05	—	.01	—
Ever had mammogram	—	–.06	—	–.01	—	–.03
Vegetable servings per day	–.06	–.02	–.07	.02	–.03	.02
Fruit servings per day	–.00	–.13 *	–.03	–.04	–.02	.00

Notes:

^ 5 for men, 4 for women

* $p < .05$

** $p < .01$

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