Perceptions of the roles of behavior and genetics in disease risk: Are they associated with behavioral change?

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The number of Americans with chronic conditions is rapidly rising (number in millions)

Proportion of U.S. adults meeting both aerobic and muscle-strengthening physical activity guidelines by state

Source: Behavioral Risk Factor Surveillance System, United States, 2011
Behavioral Theories

Rosenstock et al. (1988)

- Individual Perceptions
  - Perceived susceptibility of disease X
  - Perceived seriousness (Severity) of disease X

- Modifying factors
  - Demographic Variables (age, sex)
  - Sociopsychological (personality, social class)

- Likelihood of Action
  - Perceived benefits of preventive action minus perceived barriers to preventive action

- Cues to action
  - Mass media campaigns
  - Advice from others
  - Illness of family member
  - Health visitor’s/physician’s explanation

- Perceived threat of disease X

Ajzen (1999)

Theory of Planned Behavior

- Behavioral beliefs (importance of the health issue & whether the behavior will be effective)
- Normative beliefs: how do others view the behaviors?
- Control beliefs: self-efficacy
- Subjective norms: felt social pressures to act
- Perceived behavioral control

- Intention to act (or not)
- Behavior

Bandura (2001)

Social Cognitive Theory

- Behavior
  - Personal factors
    - (Cognitive, affective, and biological events)
  - Environmental factors

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Causal beliefs about Chronic Conditions

**Behavioral** causal beliefs vs. **Genetic** causal beliefs?

Study from Multiplex Initiative: causal beliefs for chronic conditions (i.e., diabetes, osteoporosis, heart disease, high cholesterol, hypertension, lung, colon, and skin cancer)

- participants placed emphasis on the role of both health behaviors and genetics in influencing disease outcomes (O’Neill et al., 2010).

2007 HINTS respondents endorsed both causal attributions for behaviors and genetics to obesity (Wang et al., 2010)
Genetic Causal Beliefs and Prevention

Do beliefs about genetic factors of illness reduce prevention behaviors?

Genetic causal beliefs for heart disease reduced the perceived effectiveness of non-pharmacological treatments but had no effect on perceived medication effectiveness (Wright et al., 2012) -- genetic causal beliefs for obesity did not appear to influence pharma nor non-pharma treatment.
The Study's Aims

The aims of the present study are to:

(1) examine the prevalence of perceived behavioral and genetic causal beliefs for chronic conditions (i.e., obesity, heart disease, diabetes, and cancer);

(2) examine the association between these causal beliefs and attempts at behavior change (i.e., physical activity, weight management, fruit and vegetable intake and soda intake).
Methods

Health Information National Trends Survey (HINTS)
• nationally representative survey of the U.S. non-institutionalized adult population, aged 18 +
• health-related information and communication and health-related behaviors, perceptions, and knowledge
• HINTS 2003, -2005, -2007 with ongoing fourth iteration (HINTS 4)
• HINTS 4 is comprised of four separate data collection cycles that began in 2011 and will extend into 2014, using self-administered mail questionnaires

All analyses are conducted on the HINTS 4 (Cycle 2) data which were collected from July 2012 to October 2012.
• response rate: 39.97%
**Outcome variables: Behavioral change**

“At any time in the past year, have you intentionally tried to...”

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Health Promotion</th>
<th>Health Maintenance</th>
<th>Didn’t Pay Attention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Exercise</strong></td>
<td>Increase amt of exercise in typical week</td>
<td>Maintain amt of exercise in typical week</td>
<td>Haven’t really paid attention</td>
</tr>
<tr>
<td><strong>2. Weight</strong></td>
<td>Lose weight</td>
<td>Maintain weight</td>
<td>Haven’t really paid attention</td>
</tr>
<tr>
<td><strong>3. Vegetable intake</strong></td>
<td>Increase amt of veg. you eat or drink</td>
<td>Maintain amt of veg. you eat or drink</td>
<td>Haven’t really paid attention</td>
</tr>
<tr>
<td><strong>4. Fruit intake</strong></td>
<td>Increase amt of fruit you eat or drink</td>
<td>Maintain amt of fruit you eat or drink</td>
<td>Haven’t really paid attention</td>
</tr>
<tr>
<td><strong>5. Soda intake</strong></td>
<td>Decrease amt of regular soda you drink</td>
<td>Maintain amt of soda you drink</td>
<td>Haven’t really paid attention</td>
</tr>
</tbody>
</table>
Measures: **Covariates**

- **age** (measured in years)
- **body mass index** (BMI)
- **gender** (1 = male, 0 = female)
- **race/ethnicity** (1 = non-Hispanic White, 2 = Black, 3 = Asian and Pacific Islander, 4 = Native American, and 5 = Hispanic)
- **Current moderate-intensity weekly exercise** (in minutes)
- **educational attainment** (1 = less than a high school diploma, 2 = high school diploma or GED equivalent, 3 = some college, and 4 = college graduate and beyond)
- **Daily fruit and vegetable intake:**
  “About how many cups of fruit/vegetables (including 100% pure fruit/vegetable juice) do you eat or drink each day?”
- **Weekly soda intake**
Causal Beliefs for Behaviors

“How much do you think health behaviors like diet, exercise and smoking determine whether or not a person will develop each of the following conditions?”

Response options: not at all, a little, somewhat, and a lot

four chronic conditions:
• obesity
• heart disease
• diabetes
• cancer
Causal Beliefs for Genetics

“How much do you think genetics, that is characteristics passed from one generation to the next, determine whether or not a person will develop each of the following conditions?”

Response options: not at all, a little, somewhat, and a lot.

four chronic conditions:
• obesity
• heart disease
• diabetes
• cancer
Analyses

SAS 9.3 and SAS-callable SUDAAN 10.0 statistical software

Survey weights were used to obtain population-level point estimates and accurate variance estimates

Weighted multinomial logistic regression models were conducted to examine whether perceptions surrounding the roles of behaviors and genetics for obesity, heart disease, diabetes, and cancer were associated with behavioral change

-“haven’t paid attention...” = REF group
# HINTS 4 Cycle 2 Adult Sample

<table>
<thead>
<tr>
<th>Trait</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1384 (50.16%)</td>
</tr>
<tr>
<td>Female</td>
<td>2023 (49.83%)</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>NH White</td>
<td>2183 (68.42%)</td>
</tr>
<tr>
<td>NH Black</td>
<td>614 (12.75%)</td>
</tr>
<tr>
<td>Asian</td>
<td>132 (5.40%)</td>
</tr>
<tr>
<td>AI/AN</td>
<td>27 (1.02%)</td>
</tr>
<tr>
<td>Hispanics</td>
<td>456 (12.4%)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;HS</td>
<td>329 (13.51%)</td>
</tr>
<tr>
<td>HS / GED</td>
<td>775 (20.29%)</td>
</tr>
<tr>
<td>Some college</td>
<td>1057 (37.57%)</td>
</tr>
<tr>
<td>College degree +</td>
<td>1380 (28.64%)</td>
</tr>
</tbody>
</table>
# HINTS 4 Cycle 2 Adult Sample

<table>
<thead>
<tr>
<th>Trait</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>105 (12.91%)</td>
</tr>
<tr>
<td>25-34</td>
<td>424 (17.63%)</td>
</tr>
<tr>
<td>35-39</td>
<td>845 (26.44%)</td>
</tr>
<tr>
<td>50+</td>
<td>2138 (43.01%)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
</tr>
<tr>
<td>Married/Living with partner</td>
<td>1857 (57.2%)</td>
</tr>
<tr>
<td>Divorced/separated/widowed</td>
<td>1043 (15.7%)</td>
</tr>
<tr>
<td>Never married/single</td>
<td>628 (27.2%)</td>
</tr>
<tr>
<td><strong>Annual Household Income</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;$15,000</td>
<td>536 (16.38%)</td>
</tr>
<tr>
<td>$15,000-34,999</td>
<td>705 (20.39%)</td>
</tr>
<tr>
<td>$35,000 – 74,999</td>
<td>983 (32.25%)</td>
</tr>
<tr>
<td>$75,000-99,999</td>
<td>376 (12.13%)</td>
</tr>
<tr>
<td>$100,000-199,999</td>
<td>427 (15%)</td>
</tr>
<tr>
<td>$200,000+</td>
<td>123 (3.84%)</td>
</tr>
</tbody>
</table>
Research Aim 1

To examine the prevalence of perceived behavioral and genetic causal beliefs for chronic conditions (i.e., obesity, heart disease, diabetes, and cancer)
Causal Beliefs for Diabetes

<table>
<thead>
<tr>
<th></th>
<th>Behaviors</th>
<th>Genetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A little</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A lot</td>
<td>60%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Mean:
- Behavior: 3.58
- Genetics: 3.26
Causal Beliefs for Heart Disease

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior</td>
<td>3.53</td>
</tr>
<tr>
<td>Genetics</td>
<td>3.28</td>
</tr>
</tbody>
</table>
Causal Beliefs for Cancer

% that endorse cause beliefs

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Genetics</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior</td>
<td>3.18</td>
<td></td>
</tr>
<tr>
<td>Genetics</td>
<td>3.18</td>
<td></td>
</tr>
</tbody>
</table>
Causal Beliefs for Obesity

% that endorse cause beliefs

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior</td>
<td>3.68</td>
</tr>
<tr>
<td>Genetics</td>
<td>2.92</td>
</tr>
</tbody>
</table>
Research Aim 2

To examine the association between these causal beliefs and attempts at behavior change (i.e., physical activity, weight management, fruit and vegetable intake and soda intake).
Role of Behavior in Determining Obesity: Exercise

PMs for Increasing Exercise in past year

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Odds Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at All</td>
<td>1.33</td>
</tr>
<tr>
<td>A Little</td>
<td>.18*</td>
</tr>
<tr>
<td>Somewhat</td>
<td>.47*</td>
</tr>
<tr>
<td>A Lot (REF)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*significantly lower odds than REF at .05
Role of Behavior in Determining Obesity: Vegetable Consumption

PMs for Increasing Veg. Intake in past year

Odds ratios

Role of Behavior in Determining Obesity

*significantly lower odds than REF at .05
Role of Behavior in Determining Heart Disease: Exercise

Odds ratios

*significantly lower odds than REF at .05
Role of Behavior in Determining Heart Disease: Vegetable Consumption

*significantly lower odds than REF at .05
Role of Behavior in Determining Diabetes: Weight Change

<table>
<thead>
<tr>
<th>PMs for Decreasing Weight in past year</th>
<th>Odds ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at All</td>
<td>.44</td>
</tr>
<tr>
<td>A Little</td>
<td>.42</td>
</tr>
<tr>
<td>Somewhat</td>
<td>.50*</td>
</tr>
<tr>
<td>A Lot (REF)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*significantly lower odds than REF at .05
Role of Behavior in Determining Diabetes:
Exercise

<table>
<thead>
<tr>
<th>Behavior Level</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at All</td>
<td>.70</td>
</tr>
<tr>
<td>A Little</td>
<td>.36*</td>
</tr>
<tr>
<td>Somewhat</td>
<td>.72*</td>
</tr>
<tr>
<td>A Lot (REF)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*significantly lower odds than REF at .05

PMs for Increasing Exercise in past year

Odds ratios
Role of Behavior in Determining Diabetes: Vegetable Consumption

Role of Behavior in Determining Diabetes

*significantly lower odds than REF at .05
Role of Genetics in Determining Cancer: Weight Change

Role of Genetics in Determining Cancer

*significantly lower odds than REF at .05
Behavioral and genetic causal beliefs were not significantly associated with behaviors involving fruit or soda intake.
Discussion

Aims of the study:

(1) examining the prevalence of perceived behavioral and genetic causal beliefs across different chronic conditions (i.e., obesity, heart disease, diabetes, and cancer)

(2) studying the association between these causal beliefs and attempts at behavior change in across multiple domains (i.e., physical activity, weight management, fruit and vegetable intake and soda intake)

Aim 1 Findings
Respondents placed high emphasis on both the role of behaviors and genetics for chronic diseases

Findings suggest that behavioral and genetic causal beliefs are orthogonal
Aim 2 Findings:

Behavioral causal beliefs are associated with attempts at behavioral change

* e.g., behavioral causal beliefs for obesity, heart disease, and diabetes were related to behavioral changes in exercise and vegetable intake

Failure to reproduce the same association for behavioral causal beliefs for cancer

Emphasizes importance of specificity in the measurement of health cognitions and risk perception!
Behavioral causal beliefs for obesity, heart disease, and diabetes were related to some behavioral domains (i.e., exercise and vegetable intake) but not others (i.e., fruit or soda consumption).

-suggest that causal beliefs are important to consider when communicating messages about disease risk factors as causal beliefs appear to vary across diseases.

Causal attributions about behavioral and genetic factors are disease-specific

-important implications for how individuals process and react to the behavioral/genetic risk information.
Our findings indicated that genetic causal beliefs for cancer were significantly associated with attempts to maintain weight but not to lose weight.

Exercise caution in over-interpreting these results.

Cancer = heterogeneous disease.

The existence of various cancer subtypes may be masking differences.

Future research should follow up disaggregated analyses for specific cancer subtypes.
Limitations

The HINTS is cross-sectional

Reliance on single-item measures for both behavior and genetic causal beliefs for chronic conditions

Self-report measures
Future research

Findings indicate that behavioral and genetic causal attributions are orthogonal, future research should investigate their potential interaction effects on preventive behaviors.

--unclear whether individuals who endorse both behavioral and genetic causal beliefs are more or less likely to engage in preventive behaviors

Future research should examine the role of causal beliefs on other types of prevention behaviors (e.g., sun protection or smoking cessation)

Future studies should examine the role of other health cognitions such as the perceived risk or fatalism as effect modifiers on the relationship between causal beliefs and health behaviors
Conclusions

The public possesses a multi-factorial understanding of the etiology of chronic illness.

Behavioral causal beliefs are associated with behavioral change; however, measurement must capture disease-specific behavioral causal beliefs as they are associated with different health behaviors.

Additional research is needed to examine the potential interaction between behavioral and genetic causal beliefs for chronic diseases and how they may impact preventive behaviors.
Acknowledgements

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Questions? Comments?