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# Risk Perception and Its Association with Cardiac Risk and Health Behaviors Among Urban, Minority Adults: The Bronx Coronary Risk Perception Study

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## Abstract

**PURPOSE—**To examine the relationship between risk perceptions, health behaviors, and a measure for actual risk of coronary heart disease (CHD).

**DESIGN—**Cross-sectional survey.

**SETTING/SUBJECTS—**Adults from three outpatient medical clinics with at least one CHD risk factor.

**MEASURES—**Perceived risk using the new Coronary Risk, Individual Perception (CRIP) scale, an index of CHD risk, and summary scores for self-reported diet and exercise.

**ANALYSIS—**Bivariate associations using Spearman Rank and Kruskil-Wallis; multiple regression models for outcomes (health behaviors).

**RESULTS—**The 16-item CRIP scale had acceptable internal consistency ($\alpha$ =0.76; inter-item total correlation=0.34 ± 0.17). The response rate was 80.3% and the mean age of 256 respondents

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**INDEXING KEY WORDS**

1. Manuscript format: research
2. Research purpose: instrument development, descriptive
3. Design: cross-sectional
4. Outcome: health behaviors
5. Setting: clinical/health care
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7. Strategy: education, behavior change
8. Target population: adults
9. Target population circumstances: geographic locale, economic/income, and race/ethnicity

was 56.6 (±9.9) years; 70% were women, 63% Hispanic, and 27% black. CRIP scores were inversely associated with low-fat/high fiber intake (r=− 0.17; p=0.007) and exercise (r=−0.19; p=0.003). Among respondents with 3 or more CHD risk factors (n=132), 44% perceived themselves to be at low risk for CHD. In multivariable models, men with high CRIP scores had higher fat intake than women (p=0.02), but men exercised more (p=0.04).

**CONCLUSIONS—**In this study, gender moderated the relationship between risk perception and health behaviors and many respondents underestimated their risk of CHD. Behavioral research aimed at reducing cardiometabolic risk in minority populations should resolve differences between perceived and actual risk of CHD to foster lifestyle changes, and examine temporal relationships between risk perception and health behaviors.

### Keywords

risk perception; coronary heart disease; health behaviors; minorities

## PURPOSE

Coronary heart disease (CHD) remains the number one killer of adult Americans. However, many persons have limited knowledge of risk factors for CHD, and misconceptions regarding perceived and actual risk of CHD remain, especially among minorities.[1] Suboptimal CHD risk prevention counseling is a potential explanation.[2] On the other hand, misconceptions could limit the ability of healthcare providers to effectively counsel or motivate individuals to become health promotion participants.

Few studies have used a scale to measure risk perception for CHD and examine its relationship to health behaviors.[3] Most reports included only female participants or were based on a single question.[1, 4] In addition to perceptions of disease risk, self-efficacy, perceived health status, and worry affect health promotion. For example, individuals with high “self-efficacy,” can overestimate their ability to maintain healthy habits, which could impede risk prevention counseling.[5] Perceived health status has been associated with heightened perception of cardiac risk, and worry can positively impact health behaviors in blacks.[6, 7]

To reduce disparities due to CHD, health providers need novel strategies for risk prevention counseling. Assessments of CHD risk perception could be used to tailor the “risk-talk” dialogue and as a platform for patient education. In this study, we used a newly developed measure of CHD risk perception to examine how the scale was related to health behaviors and an index of cardiac risk. Our main hypothesis was that high perceived risk for CHD would be associated with unhealthy behaviors.

## METHODS

### Setting and Population

Following Institutional Review Board approval, over 250 adults were recruited by trained study staff from the waiting areas of three outpatient medical clinics located in the Bronx, New York. These clinics serve a minority and publicly insured population. Eligibility

criteria were: ≥40 years of age, at least one cardiovascular risk factor (e.g. diabetes), no history of cardiovascular disease, ability to give informed consent in Spanish or English, and access to health information. Following consent, a 20-minute survey was administered. Within four weeks, respondents' clinic records were abstracted for: medical history, recent weight, blood pressure, and lipid (total cholesterol, LDL, HDL, and triglyceride) values.

## Survey Components

Coronary Risk, Individual Perception (CRIP) is a new scale that measures one's personal perception of CHD risk. The scale contains 16 items on a 6-point Likert-scale with 1=strongly disagree to 6 =strongly agree. A higher score indicates a higher perception of risk. The median score for the scale was used to divide respondents into low versus high risk perception. The CRIP scale items were based on questions used in other risk perception studies and have all been previously associated with behavioral change and motivation.[1, 5–7] We included questions that pertained to: (1)worry (I worry about having a heart attack [4 items]), (2) self-efficacy (I don't mind the effort to exercise [3 items]), (3) perceived susceptibility/vulnerability (I'm at low risk of a heart attack [5 items]), and (4) perceived health status (I'm as healthy as anybody I know [4 items]). Perceived health status items were adapted from the validated health-related quality of life SF-12 survey.[8] Content validity of the CRIP scale was evaluated by a panel of research experts. To assess construct validity, we simultaneously administered a 3-item scale previously reported to measure CHD risk perception.[3] The resultant correlation coefficient (r=0.53) suggested the CRIP scale measured the same general construct.

A simple index for risk of CHD was derived by summing up the respondents' number of cardiovascular risk factors (age ≥ 65 years, hypertension, diabetes, dyslipidemia, family history of premature CHD, smoker, and obese [BMI ≥ 30 $kg/m^2$]). BMI was calculated using the most recent clinic weight and respondents' self-reported height. We only used biometric data collected within six months. High risk for CHD was defined as having ≥3 cardiovascular risk factors.[9]

A composite score for exercise was derived based on intensity (i.e. mild, moderate, or strenuous), frequency (times per week), and duration. We stratified on a 20-minute duration since the Bronx has low physical activity levels.[10] Composite measures for fruits and vegetables were defined as the product of frequency of intake and daily serving size. Fat and fiber intake was based on a 6-point Likert scale that asked how much respondents agree or disagree that their diet was high-fiber (e.g. brown rice, oats) or low-fat (e.g. use skim milk, avoid red meat). The survey also contained demographic questions (age, gender, race/ethnicity).

## Data Analysis

Descriptive statistics included means and standard deviations for continuous normally distributed data and relative frequencies for categorical variables. Multiple imputation procedures were used to impute values for CRIP and behavioral questions with missing data (n=24 [9.4%]). We assessed the internal consistency for both components based on their respective Cronbach's alpha values. However, the behavioral questions were not a distinct

scale or construct. The main outcome variables were health behaviors (i.e. diet and physical activity). With a sample size of 250 and dichotomizing each behavior score, then for a 10% difference in CRIP scores, there was more than 95% power for alpha=0.05 for a two-tailed test. Bivariate associations with health behaviors were performed using Spearman Rank and Kruskil-Wallis. Multi-collinearity was assessed by reviewing pairwise associations. Initial regression models were derived using a monitored backwards procedure. Significant confounding factors were tested as interactions and as effect modifiers of the exposure variable (CRIP). Variables were retained in the final model if they yielded p-values < 0.05. All analyses were performed using SAS Version 9.1.2.

## RESULTS

Of the 350 patients approached, 319 were eligible for inclusion, and 256 agreed to participate (80.3% response rate). The mean age of the respondents was 56.8 years (±10.7), most were female (70.3%), Hispanic (62.1%), and unemployed (56.5%). About 45% (n=116) did not complete grade school and half (51.6% [n=132]) were deemed to be at high risk for CHD (i.e. had ≥ 3 cardiovascular risk factors). Hypertension was the most common risk factor (48%).

The CRIP scale has acceptable internal consistency (Cronbach's $\alpha$=0.76; inter-item total correlation=0.34±0.17). The overall mean summary score for the 16 items was 53.9 (±10.3) with a possible score range of 16–96. The median score was 55.0. The reliability (Cronbach's alpha) for health behavior questions was $\alpha$=0.65. Among the health risk variables (TABLE 1), respondents with diabetes, hypertension, or obesity all had significantly higher risk perception scores, compared to respondents without these co-morbidities (p values<0.05 for each comparison). There was also heightened risk perception found among respondents with low levels of physical activity, compared to those who exercised frequently (p=0.002). Respondents who visited a nutritionist had heightened risk perception, compared to those without a visit (p=0.01). Among individuals at high-risk of CHD (i.e. had ≥ 3 cardiovascular risk factors [n=132]), 46% (n=61) perceived themselves to be at lower risk (appa =0.16; 95% CI [0.05–0.29]). (TABLE 2) Having attended college was associated lower risk of CHD.

Risk perception was inversely associated with health eating behaviors and exercise (r=−0.17; p=0.007 and r=−0.19; p=0.003, respectively). This implies that respondents who engaged in healthy habits (i.e. physically active, low-fat/high-fiber diet) perceived themselves to be at lower risk for CHD. Also, risk perception and actual risk of CHD were significantly associated (r=0.22; p<0.001). After controlling for demographics and risk perception, being male (t=−2.7; p=0.008) and college educated (t=2.0; p=0.04) were associated with physical activity. There was a significant risk perception*gender interaction for physical activity (t=2.1; p=0.04) and fat/fiber (t=2.3; p=0.02). Stratified analyses revealed that men exercised more than women, but men with the lower risk perception scores exercised the most. Men with higher risk perception scores had diets higher in fat or lower in fiber, compared to all others.

# DISCUSSION

## Summary

This study used a new scale to measure perceived risk of developing CHD and examined its relationship to health behaviors among inner-city black and Hispanic patients. The risk perception scale had acceptable internal consistency and was inversely related with self-reported health behaviors and directly related to an index for actual risk of developing CHD. Gender moderated the relationship between risk perception and health behaviors. Men with heightened perception of their CHD risk had less healthy diets than all others. Regardless of risk perception scores, men reportedly exercised more than women. Furthermore, many respondents at high risk of CHD (≥ 3 cardiovascular risk factors) perceived themselves to be at lower risk. Based on these findings, any CHD risk prevention strategy should begin with conversations regarding its severity and an individual's susceptibility. This includes personalized messages regarding perceived and actual risk of CHD to clear up misconceptions, enhance the "risk-talk" dialogue, and stress "tangible benefits" of healthy living (e.g. lower blood pressure).

## Limitations

This study has limitations. Our findings are descriptive since we cannot determine if the relationship between risk perception and health behaviors was due to recent changes in health habits. For that, a prospective study is required. Self-reported health behaviors, such as exercise, are often overestimated. We revised questions with socially desirable answers during the pilot testing phase of this study. Our findings might also have limited generalizability since we surveyed a convenience sample. However, population surveys from the Bronx have reported a similar preponderance of obesity and limited physical activity.[10] Furthermore, other studies have also shown inverse associations between risk perception and health behaviors, as well as misconceptions regarding CHD risk.[1, 3, 4] We used the median summary score to define high versus low risk perception. This arbitrary cut point might vary in larger studies. Since we were unable to collect standardized blood pressure measurements, the CHD risk index was not based on a Framingham equation. Nonetheless, population data demonstrate that having multiple cardiovascular risk factors increases the incidence of cardiac events.[9]

## Significance

Our respondents felt that their self-reported diet and exercise were sufficient to lower their CHD risk although many were obese and had low levels of physical activity. Disease prevention can only occur if self-assessment of health status is accurate and realistic. Furthermore, effective communication of CHD risk in underserved communities requires knowledge of and sensitivity to potential group differences in risk perception. Thus, our results have important implications for risk reduction counseling. For example, during the medical encounter, healthcare providers could approximate CHD risk based on the number of traditional risk factors (e.g. diabetes, smoker) or anthropometric indices (e.g. waist-hip ratio or BMI)[2], ask simple questions pertaining to CHD risk perception, and use brief counseling to clear up any misconceptions. Although our risk perception survey will require further refinement before its clinical implementation, we have attempted to raise the

awareness of healthcare providers that misconceptions regarding patients' risk of CHD exist and propose strategies to tailor the risk-talk dialogue.

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## TABLE 1

RISK FACTOR CHARACTERISTICS AND CHD RISK PERCEPTION

| | CHD RISK PERCEPTION mean (±SD) | |
|---|---|---|
| **Characteristic** | | |
| **Total (n=256)** | **53.9 (±10.3)** | |
| **Sex** | | |
| Female n=180 (70%) | 54.7 (10.4) | |
| Male n= 76 (30%) | 52.1 (9.9) | p=0.06 |
| **Race** | | |
| Hispanic n= 159 (62%) | 54.2 (9.7) | |
| Black/African American n= 63 (25%) | 53.1 (11.0) | |
| White/Other n= 34 (13%) | 54.4 (11.6) | p=0.73 |
| **Some college or advanced degree** | | |
| Yes n= 77 (30%) | 53.0 (10.9) | |
| No n= 179 (70%) | 54.4 (10.0) | p=0.33 |
| **Married or marriage like relationship** | | |
| Yes n= 118 (46%) | 53.8 (9.5) | |
| No n= 138 (54%) | 54.1 (10.9) | p=0.85 |
| **Diabetes** | | |
| Yes n= 67 (29%) | 57.5 (9.8) | |
| No n= 165 (71%) | 52.7 (9.7) | p<0.001 |
| **Hypertension** | | |
| Yes n= 125 (50%) | 55.7 (10.7) | |
| No n= 127 (50%) | 52.6 (9.3) | p= 0.01 |
| **Hypercholesterolemia** | | |
| Yes n= 97 (38%) | 53.7 (10.3) | |
| No n= 159 (62%) | 54.1 (10.3) | p= 0.79 |
| **Obese (BMI≥30)** | | |
| Yes n= 121 (47%) | 55.9 (10.6) | |
| No n= 135 (53%) | 52.2 (9.7) | p=0.003 |
| **Current smoker** | | |
| Yes n= 43 (18%) | 55.2 (9.6) | |
| No n= 202 (82%) | 53.7 (10.2) | p=0.38 |
| **Risk of CHD*** | | |
| High n= 132 (52%) | 55.9 (10.9) | |
| Low n= 124 (48%) | 51.9 (9.2) | p=0.002 |
| **MD discussed lowering CHD risk** | | |
| Yes n= 106 (42%) | 55.0 (10.3) | |
| No n= 149 (58%) | 53.3 (10.1) | p=0.19 |
| **Nutrition visit about CHD risk** | | |
| Yes n= 76 (30%) | 56.4 (10.2) | |

| CHD RISK PERCEPTION | | |
|---|---|---|
| | **mean (±SD)** | |
| No n= 178 (70%) | 52.8 (10.1) | p=0.01 |
| **Moderate-strenuous physical activity, 3–5 days/week** | | |
| Yes n= 156 (61%) | 52.4 (9.9) | |
| No n= 100 (39%) | 56.4 (10.4) | p=0.002 |

Risk factors were: age> 65 years, BMI≥ 30 kg/$m^2$, dyslipidemia (i.e. diagnosis of hypercholesterolemia (or most recent cholesterol ≥200 mg/dl or triglycerides≥150 mg/dl), hypertension, diabetes, or family history of premature CHD.
BMI based on self-report of height and medical record review for weight.
CHD= coronary heart disease
Whites/Others include: 25 whites, 2 Asians and 7 others.

## TABLE 2

CHARACTERISTICS OF RESPONDENTS AT HIGH RISK OF CORONARY HEART DISEASE (CHD)*

| CHARACTERISTIC | AT HIGH RISK OF CHD | |
|---|---|---|
| TOTAL: n=132 | | |
| | ---------*percent*---------- | |
| **Sex** | | |
| Female | 53.3 | |
| Male | 47.4 | p= 0.38 |
| **Race/ethnicity** | | |
| Hispanic | 51.6 | |
| African American | 50.8 | |
| White/Others | 52.9 | p= 0.98 |
| **Married** | | |
| Yes | 50.0 | |
| No | 53.3 | p= 0.60 |
| **Some college** | | |
| Yes | 35.1 | |
| No | 54.2 | p= 0.03 |
| **Moderate-strenuous physical activity, 3–5 days/week** | | |
| Yes | 51.3 | |
| No | 52.0 | p= 0.91 |
| | **RESPONDENTS AT HIGH RISK OF CHD** | |
| | ---------*percent*---------- | p value |
| †**Risk Perception of CHD** | | |
| High | 60.7 | |
| Low | 43.9 | p= 0.007 |

*CHD risk index based on having ≥ 3 of the following cardiovascular risk factors: age> 65 years, BMI≥ 30 kg/$m^2$, dyslipidemia (i.e. diagnosis of hypercholesterolemia (or most recent cholesterol ≥200 mg/dl or triglycerides≥150 mg/dl), hypertension, diabetes, family history of premature CHD, or current smoker.

†High or heightened perceived risk based on having a risk perception summary score above the median value (55.0).

Whites/Others includes: 25 whites, 2 Asians and 7 others.
All total vary due to some missing data.