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Perceptions of High Achieving African American/Black 10th Graders from a Low Socioeconomic Community Regarding Health Scientists and Desired Careers

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Abstract

Measures are needed to assess youth perceptions about health science careers to facilitate research aimed at facilitating youth pursuit of health science. Although the Indiana Instrument provides an established measure of perceptions regarding nursing and ideal careers, we were interested in learning how high achieving 10th graders from relatively low socioeconomic areas who identify as Black/African American (Black) perceive health science and ideal careers. The Indiana Instrument was modified, administered to 90 youth of interest, and psychometrically analyzed. Reliable subscales were identified that may facilitate parsimonious, theoretical, and reliable study of youth decision-making regarding health science careers. Such research may help to develop and evaluate strategies for increasing the number of minority health scientists.

Non-White (minority) populations, particularly those from lower socioeconomic classes, suffer from disproportionately more health problems than Whites in the United States.¹⁻³ Furthermore, many chronic diseases are projected to dramatically increase in prevalence, disproportionately so among minorities.⁴ Research regarding reducing health differences by socioeconomic class and race/ethnicity is needed. Health scientists from lower socioeconomic and minority backgrounds may have particular familiarity with these disparities and inspire new strategies for reducing health disparities.^{5,6} Unfortunately, the health workforce does not include, and is not projected to include, an ideal number of minority professionals to address health disparities.⁷ In 2010, only 6.3% of United States permanent resident citizens earning doctorates were Black/African American (Black); of these, 36% were male and 64% were female.⁸ In 2010, Blacks made up 8% of biological scientists, 7% of medical scientists, 5% of environmental scientists, 4% of psychologists, and less than 1% of sociologists.⁹

To increase the number of health scientists from lower socioeconomic and minority backgrounds, youth from these backgrounds must be inspired to become health scientists. Measures are needed to assess youth perceptions about health science careers to facilitate research aimed at facilitating youth pursuit of health science. Although no survey instrument addresses youths' perceptions of a career in health science, the nursing literature includes a

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series of assessments of perceived attributes of nursing. Commonly used instruments in this literature assess the attributes of nurses as well as an ideal career.¹⁰ These measures are referred to as the Indiana Instrument and used repeatedly to assess youth perceptions of an ideal versus a nursing career.¹⁰

The Indiana Instrument assesses two sets of 17 items: perceptions of attributes of an ideal career as well as a nursing career.¹⁰ All of the items use a response format consisting of a 5-point Likert scale with responses ranging from strongly agree to strongly disagree. Tomey et al. (1996) used the Indiana Instrument to assess the effectiveness of a nursing presentation intervention designed for rural high school students. Individual items were compared between the intervention and control group.¹¹ Cohen et al. (2004) used the Indiana Instrument to assess middle school students' perceptions of an ideal career versus a nursing career. Item ratings were compared for an ideal versus nursing career.¹² Palumbo et al. (2008) modified the Indiana Instrument to compare and contrast young people's perceptions of six health careers (medical laboratory science, nursing, pharmacy, physical therapy, radiating technology, respiratory therapy) relative to their ideal career.¹³

Unfortunately, while the two Indiana Instrument item lists (characteristics of ideal and nursing career) have been evaluated by panels of experts and have been assessed for internal consistency for use as multi-item scales, these measures have not undergone psychometric analysis.¹⁰ Also, in all identified studies using the Indiana Instrument, the items are analyzed individually without consideration of underlying constructs or multi-item scales.¹⁰⁻¹³ Hence, the research analyses using the instrument are not parsimonious, not linked to underlying constructs or related theory, and may lack reliability.

Although the Indiana Instrument provides an established measure of perceptions regarding various health-related careers and the ideal career, we are interested in learning how high achieving high school students from relatively low socioeconomic areas who identify themselves as Black/African American (Black) perceive health science careers in general, as we ultimately want to examine how these perceptions predict pursuit of health science education and careers. This paper describes how we modified the Indiana Instrument and examined its psychometric properties in preparation for research toward this aim.

Specifically, in this study we: 1) Modify the nursing career and ideal career measures by revising existing items and developing new items to create scales that assess characteristics of health scientists (CHS) and desired career characteristics (DCC), 2) Examine youths' relative evaluations of the CHS and DCC items, 3) Examine the dimensionality of the CHS and DCC, 4) Assess the reliability of the factor subscales resulting from the factor analysis, 5) Examine the youth's relative evaluations of the factor subscales within the CHS and DCC, and 6) Test whether there are differences in the subscale scores between males and females.

METHODS

Recruitment, Data Collection, and Study Sample

Data collection for this study was approved by the Institutional Review Boards of both the collaborating university and public school system. The study data were from the baseline survey of the “Climbing Up and Reaching Back (CURB)” project, a three-year longitudinal demonstration of an intervention aimed at increasing interest in health research careers among high achieving students from the 10th through completion of the 12th grade from relatively low income areas. The sample frame for student recruitment was 689 10th graders with a B- or above cumulative grade point average as of November 2009 from six high schools in the lowest socioeconomic, and predominantly minority, area of Prince George’s County, Maryland. A school staff person chosen by the school principal at each school was provided with the lists of eligible students by the central system administration. Using a convenience sampling approach, the staff confidentially offered CURB participation to students, without developmental disabilities requiring special classroom teaching assistance, when face-to-face with them in high school classrooms and activities. The goal was to obtain a completed parent consent form and a student-signed assent form from 150 students, and ultimately 167 students provided these forms. The 167 students were invited to complete the baseline survey administered at the researchers’ university, located in the same community as the high schools. Surveys were confidentially self-administered by 134 student participants in university classrooms. Students received \$10 cash incentives for completing the baseline survey. Of the students who completed the baseline survey, 90 stated they were Black/African American. Because of the large Black representation and concern that there could be race/ethnicity differences relative to the aims of this study, this study sample was confined to the Black baseline survey participants.

Measure Development

A research team was constituted by the CURB Principal Investigator, a White male behavioral sciences professor, from his research colleagues to include Black health science student and scientist representation for perspective about the research. It included a Black male doctoral student with prior experience administering empowerment programs for Black youth from underserved areas, a female Black emeritus professor with experience mentoring Black youth of all ages, a female Black assistant professor with experience administering youth college preparation programs and mentoring Black youth, and a female Black research assistant. The team also included an Asian male professor biostatistician. The research team modified the Palumbo et al. (2008) version of the Indiana Instruments.¹³ This version used 18 items to assess perceptions of six health careers and, using a second list of 18 parallel items, characteristics of an ideal career. The research team made slight modifications to assess perceptions of characteristics of health scientists. The team then created three new items to assess perceptions about one’s racial/ethnic group. Additionally, the team added four items to assess potential roles of health scientists. Finally, the team changed the response formats from the 5-point scales (Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree). The response format was changed to a 7-point semantic differential scale from Not Likely to Very Likely for the Characteristics of Health Scientists (CHS) measure, and for the Desired Career Characteristics (DCC) measure from I Don’t Want This

to I Want This Very Much to increase measure sensitivity and to more clearly differentiate CHS and DCC measurements. The modified 25-item instruments were administered with probed questioning about comprehension and ease of completion to 10 high school students, and then administered to another 10 high school students followed by focus-group questioning about comprehension, ease of completion, and appropriateness. The students involved in this pretesting were students of Black race/ethnicity from a local area health school not participating in the CURB study. No further revisions to the survey were warranted based on this pretesting before the CURB baseline survey administration.

Data Analysis

All data were double entered into Microsoft Excel, checked for accuracy, and converted to PASW (SPSS version 19) for analysis. The demographic and item frequencies and distributions were examined. Principal component factor analysis with varimax rotation was conducted on all potential scale items to assess dimensionality and item strength within dimensions. An eigen value of 1.25 was used to extract factors. Items were deleted if they did not meet minimum criteria of having a primary factor loading of .5 or above and the factor analysis was repeated until all items met this criteria.

For each set of items loading on a factor, Cronbach alpha was conducted to assess internal consistency based on standards established by Nunnally.¹⁴ Subscale scores were then calculated as means across all subscale items, and statistical characteristics of the subscale distributions were assessed. Finally, differences in means between males and females were examined for each subscale using Student T-tests.

RESULTS

Of the 90 Black participants, 74.4% were female, 28.9% were born outside of the United States, 55.6% had a parent born out of the United States, 18.9% declared that English was not their first language, 90% said they intended to go to college, 46% strongly agreed that they plan to pursue a doctoral degree in a science-related field, and 46% strongly agreed that they plan to become a medical doctor.

In regard to the CHS measured characteristics of health scientists, students rated as least likely: status and valuable contributions made by those from their own racial/ethnic group, making decisions for themselves, and being very powerful. They rated as most likely: use their brain a lot, work very hard, have a college degree, work with technology, improve people's health, as well as collect and analyze information, and answer questions about health (Table 1).

In regard to DCC measured desires from a career, students rated as least desired: have high status and make valuable contributions among those from their own racial/ethnic group, work with my hands, be very busy, and be very powerful. They rated as most desired: being appreciated, working very hard, going to college, making good grades, having respect, and being excited about work (Table 1).

To reduce the number of items for more parsimonious analysis, examine the possibility of multiple dimensionality across all items, and to increase the reliability of the measures, factor analysis was used to analyze the CHS and DCC items. Initial factor analysis of all 25 CHS items indicated that five items had item loadings less than five. Furthermore, the highest loadings of four of these five items also were similar on more than one factor suggesting that these items had decreased stability and usefulness in distinguishing factors. These items were eliminated from further analysis. After eliminating these items, a second factor analysis was conducted and led to the elimination of three more items for the same reasons as the first factor analysis. The remaining 17 CHS items created a three-factor structure that met all empirical criteria (Table 2). The first factor explained 29.2% of the variance and had nine items. The research team called this factor “Respected Leaders”. The second factor explained 24.4% of the variance and had six items. The research team called this factor “Health Knowledge Seekers”. The third factor explained 9.8% of the variance and had two items. The research team called this factor “High Status”. In total, the three CHS factors explained 63.4% of the variance.

The internal consistency of all three factors was found to be acceptable: Both Respected Leaders and Health Knowledge Seekers had a Cronbach alpha of .90. while High Status had a Cronbach alpha of .73. Descriptive statistics for the three CHS factors suggested they had broad distributions with varying degrees of positive skew (Table 3).

Based on the 17 items included in the final three-factor structure of what the students believed were characteristics of health scientists (CHS), the 17 parallel items in the DCC were identified and factor analyzed. Factor analysis of the 17 DCC items created a four-factor structure that met all empirical criteria (Table 2), although one item had a factor loading that was slightly less than 5; “Know a lot”. The first factor explained 21.2% of the variance and had four items. The research team called this factor “Seek Health Knowledge”. The second factor explained 19.6% of the variance and had six items. The research team called this factor “Be an Achiever”. The third factor explained 14.2% of the variance and had five items. The research team called this factor “Be a Leader”. The fourth factor explained 13.1% of the variance and had two items. The research team called this factor “Have High Status”. In total, the four DCC factors explained 67.9% of the variance.

The internal consistency of all three DCC factors was found to be acceptable: Seek Health Knowledge had a Cronbach alpha of .95, Be an Achiever had a Cronbach alpha of .85, Be a Leader had a Cronbach alpha of .75, and Have High Status had a Cronbach alpha of .88. Descriptive statistics for the four DCC factors suggested they had broad distributions with varying degrees of positive skew (Table 3).

In regard to the CHS measured characteristics of health scientists, students rated as least likely High Status. They rated the most likely characteristic of health scientists as being Health Knowledge Seekers (Table 3).

Among DCC measured desires from a career, students wanted to Have High Status the least although this average factor score still indicated that they had a relatively high desire for this. The most desired characteristic of a career was to Be an Achiever (Table 3).

Differences in CHS and DCC factor scores were examined by gender. The desire to be a Health Knowledge Seeker on the DCC scale was lower among males (mean=5.11, s.d.=1.60) than females (mean=5.86, s.d.=1.38) ($p=.03$).

DISCUSSION

The overall goal of this study was to develop reliable measures for further research to better understand the perceptions of high achieving Black/African American (Black) youth from low socioeconomic backgrounds regarding characteristics of health scientists and desires for their career. This goal was reached and the use of these measures in future research may provide new approaches to increasing the number of such youth who pursue a career as a health scientist. The study findings indicated that the study modifications of earlier Indiana instruments specifically to address characteristics of a health science career and a desired career resulted in reliable subscales among high achieving underserved Black students. These subscale measures may be used to further research regarding increasing the number of underrepresented minorities in health science.

This research furthered prior research methods with the two Indiana instruments in two major ways. First, this research adapted the Indiana instrument to address a health science career and cultural relevance. Second, this research used psychometric analyses to create reliable construct measures in a Black 10th grade, lower socioeconomic population.

Revised Indiana instruments measuring youth perceptions of the characteristics of health scientists (CHS) and desired career characteristics (DCC) from a low socio-economic area. Like all previous studies using versions of the measures, we examined the frequencies of the items.¹⁰ Examination of the frequencies indicated the relative positivity of the ratings for each item but the analysis of the long list of items was unwieldy and single item ratings were potentially inherently unreliable. To create more parsimonious and reliable measurements, we examined the dimensionality of the CHS and DCC.

The CHS and DCC measures were multi-dimensional. Upon assessment of the reliability of the factor subscales within each measure, the subscales had adequate to excellent reliability. The CHS subscales addressed three constructs referenced by the youth in regard to health scientists which we named: Respected Leaders, Health Knowledge Seekers, and High Status. The absolute means of these subscales suggest that all but High Status characterized health scientists in the minds of the students. Prior research has suggested that under-served minority youth may want to emulate respected leaders, such as mentors, particularly in regard to health science.¹⁵ The Respected Leaders construct measure may be used to better understand how role models and mentors increase interest in health science. As the quest for health knowledge is pivotal in health science, the Health Knowledge Seekers measure may evaluate youth understanding of health researchers. Finally, as Black youth from low socioeconomic backgrounds may feel stigmatized due to the predominance of Whites among health scientists,⁹ the High Status measure may address Black youth's perceptions about the status of health scientists in their own cultural milieu.

The DCC subscales addressed four constructs which we named: “Seek Health Knowledge”, “Be an Achiever”, “Be a Leader”, and “Have High Status.” The absolute means, which were relatively high on the scale range for all factors, suggest that all factors were desired career factors among this sample of students. Higher scores on the Seek Health Knowledge may identify youth who are particularly interested in health science and this measure may predict pursuit of health science among Black youth. The Be an Achiever subscale may identify students who are highly motivated to achieve academically and in their career, and the scores may increase if achievement through health science is emphasized. Higher scores on the To Be a Leader subscale may also predict students who want to be health scientists as this was also a factor which students used to characterize health scientists. As High Status is another factor regarded by students as important for their career, promotion of Black health scientists may also increase student interest in health science.

One way to use the CHS and DCC within a theoretical framework is to interpret them using the attitude construct in the Theory of Reasoned Action (TRA).^{16,17} According to this theory, attitudes predict intentions which predict behavior. Attitudes are the product of beliefs about a behavior and evaluation of those beliefs. The three dimensions derived from the CHS might be considered the attitudinal domains of beliefs about health scientists and the parallel DCC items represent the evaluation of these beliefs. To elucidate, CHS items which rate health scientist characteristics (“Health Scientists will always have a job”) on a scale from “Not Likely” to “Very Likely” can be considered measures of beliefs about health scientists. DCC items which rate what you want from a career in health sciences (“Always have a job”) on a scale from “I Don’t Want This” to “I Want This Very Much” can be considered measures that evaluate the beliefs. According to the TRA, the more beliefs about health scientists are considered highly likely and also evaluated as desirable, the more positive the attitude about health scientist careers. Furthermore, according to the TRA, higher attitude scores would be expected to lead to higher intention to pursue a health science career. This application of TRA to the CHS and DCC could be examined in future research.

That only difference by gender among subscale scores was that males were less likely to endorse the DCC construct Health Knowledge Seeking as important to them in their career. This finding suggests that the Health Knowledge Seeking measure may be used to differentiate subgroups of students who find this domain significant to their career choice.

This research was limited in the following ways. The sample of youth consisted of volunteers who may not be representative of all Black high achieving 10th graders. The research warrants replication in other samples to verify its generalizability. The names of the instrument domains identified in the study were not based on any particular method of item interpretation. Rather, they were the research team’s face-valid interpretation of the construct underlying the items in each domain. Hence, the validity of the factor names as providing a true representation of the underlying constructs should be questioned and examined in further research and by other researchers.

In summary, this research may advance initiatives to increase the number of high achieving Black youth who pursue careers in health sciences. It identifies reliable measures of

cognitive domains that may represent important constructs to such youth in their career decision-making. Further research may use the subscales constructed in this research to better understand youth decision-making regarding health science careers, identify strategies for facilitating youth interest in health science careers, and evaluating educational interventions to increase youth interest in health science careers.

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Table 110th graders perceived characteristics of health science and desired careers (n=90)

Characteristic	Characteristics of Health Scientists		Desired Career Characteristics	
	Mean*	Std.Dev.	Mean**	Std.Dev.
Have higher status in society than others from my racial/ethnic group	3.76	1.56	5.12	1.65
Have high status in my racial/ethnic culture	4.21	1.42	5.31	1.58
Make valuable contributions to society	4.70	1.63	5.45	1.41
Always have a job	5.61	1.58	6.37	1.18
Use their brain a lot	6.24	1.20	6.09	1.17
Caring people	5.61	1.45	6.47	.94
Appreciated	5.63	1.39	6.57	.75
Know a lot	5.69	1.29	6.23	1.21
Work very hard	6.23	1.14	6.50	.82
Make a lot of money	5.67	1.31	6.48	1.16
Have a college degree	6.50	1.00	6.81	.616
Work with their hands	5.32	1.51	5.73	1.26
Work in a safe place	5.10	1.63	6.39	1.013
Leader	5.22	1.48	6.44	1.07
Make autonomous decisions	4.76	1.55	6.47	.89
Very busy	5.78	1.25	5.09	1.43
Very powerful	4.63	1.70	5.88	1.46
Good grades in school	5.22	1.67	6.76	.64
Respected	5.37	1.49	6.78	.63
Work with technology	6.05	.96	6.14	1.10
Excited about their work	5.14	1.40	6.58	.92
Develop ways of improving people's health	4.53	1.44	6.23	1.42
Collect information about people's health	6.37	1.04	5.32	1.62
Analyze information about people's health	6.33	1.09	5.58	1.59
Answer questions about health	6.42	.99	5.53	1.68

*
“Not Likely” (1) to “Very Likely” (7)

**
“I Don’t Want This” (1) to “I Want This Very Much” (7)

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Table 2

Factor analysis of perceived characteristics of health scientists and desired career characteristics among 10th grade students (n=90)

Factor Analysis 1: Characteristics of Health Scientists (CHS)			
Named Factors and Items Loading on the Factors	Factor Loadings		
<u>Respected Leaders</u>			
Health scientists are appreciated	.576		
Health scientists know a lot	.587		
Health scientists are leaders	.739		
Health scientists make decisions for themselves	.641		
Health scientists are very busy	.740		
Health scientists are very powerful	.779		
Health scientists earned good grades in school	.759		
Health scientists are respected	.860		
Health scientists are excited about their work	.649		
<u>Health Knowledge Seekers</u>			
Health scientists use their brain a lot		.656	
Health scientists have a college degree		.733	
Health scientists develop ways of improving peoples' health		.772	
Health scientists collect information about peoples' health		.872	
Health scientists analyze information about peoples' health		.847	
Health scientists answer questions about health		.778	
<u>High Status</u>			
Health scientists from my racial/ethnic group have high status in my racial/ethnic culture			.916
Health scientists from my racial/ethnic group have higher status in society than others from my racial/ethnic group			.789

Factor Analysis 2: Desired Career Characteristics (DCC)			
Named Factors and Items Loading on the Factors	Factor Loadings		
<u>Seek Health Knowledge</u>			
Develop ways of improving peoples' health	.807		
Collect information about peoples' health	.939		
Analyze information about peoples' health	.939		
Answer questions about health	.928		
<u>Be an Achiever</u>			
Use my brain a lot		.528	
Know a lot		.477	
Go to college		.745	
Make good grades		.807	
Have respect		.746	
Be very excited about my work		.786	
<u>Be a Leader</u>			

Factor Analysis 2: Desired Career Characteristics (DCC)	
Named Factors and Items Loading on the Factors	Factor Loadings
Be appreciated	.516
Be a leader	.687
Make decisions for myself	.589
Be very busy	.665
Be very powerful	.802
<u>Have High Status</u>	
Have high status in my racial/ethnic culture	.893
Have status in society than others from my racial/ethnic group	.896

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Table 3
Descriptive statistics of Characteristics of Health Scientists (CHS) and Desired Career Characteristics (DCC) subscales.

Subscale	No. of Items	Cronbach Alpha	Range	Mean	Std.D ev.	Median	Mode
CHS-Respected Leaders	9	.90	1.33–7.00	5.27	1.09	5.39	*
CHS-Health Knowledge Seekers	6	.90	1.17–7.00	6.38	.84	6.67	7.00
CHS-High Status	2	.73	1.00–7.00	3.98	1.32	4.00	4.00
DCC-Seek Health Knowledge	4	.95	1.00–7.00	5.67	1.47	6.00	7.00
DCC-Be an Achiever	6	.85	3.83–7.00	6.54	.66	6.83	7.00
DCC-Be a Leader	5	.75	3.80–7.00	6.09	.80	6.30	7.00
DCC-Have High Status	2	.88	1.00–7.00	5.22	1.53	5.50	7.00

* Multiple Modes