The Role of Intrinsic Motivation in the Pursuit of Health Science-Related Careers among Youth from Underrepresented Low Socioeconomic Populations

Bradley O. Boekeloo, Chandria Jones, Krishna Bhagat,
Junaed Siddiqui, and Min Qi Wang

ABSTRACT *A more diverse health science-related workforce including more underrepresented race/ethnic minorities, especially from low socioeconomic backgrounds, is needed to address health disparities in the USA. To increase such diversity, programs must facilitate youth interest in pursuing a health science-related career (HSRC). Minority youth from low socioeconomic families may focus on the secondary gains of careers, such as high income and status, given their low socioeconomic backgrounds. On the other hand, self-determination theory suggests that it is the intrinsic characteristics of careers which are most likely to sustain pursuit of an HSRC and lead to job satisfaction. Intrinsic and extrinsic motivation for pursuing an HSRC (defined in this study as health professional, health scientist, and medical doctor) was examined in a cohort of youth from the 10th to 12th grade from 2011 to 2013. The sample was from low-income area high schools, had a B- or above grade point average at baseline, and was predominantly: African American (65.7 %) or Hispanic (22.9 %), female (70.1 %), and children of foreign-born parents (64.7 %). In longitudinal general estimating equations, intrinsic motivation (but not extrinsic motivation) consistently predicted intention to pursue an HSRC. This finding provides guidance as to which youth and which qualities of HSRCs might deserve particular attention in efforts to increase diversity in the health science-related workforce.*

KEYWORDS *African American and Hispanic youth career decision-making, Achieving diversity in the health science workforce, Motivation for health science among youth, Workforce to address health disparities, Biomedical and health science career choice*

INTRODUCTION

Some populations are underrepresented in the USA health science-related workforce spanning careers in basic health research through clinical and public health science applications. For example, racial and ethnic minorities, especially African Americans and Latinos, tend to be underrepresented in health science-related careers (HSRCs).^{1,2} Comprising 33 % of the U.S. population, racial and ethnic minorities constitute less than 15 % of most health science professions.³ Underrepresented minority individuals and those from low-income communities who become health

Boekeloo, Jones, Bhagat, Siddiqui, and Wang are with the Department of Behavioral and Community Health, University of Maryland School of Public Health, 255 Valley Drive, Room 2360, College Park, MD 20742, USA.

Correspondence: Bradley O. Boekeloo, Department of Behavioral and Community Health, University of Maryland School of Public Health, 255 Valley Drive, Room 2360, College Park, MD 20742, USA. (E-mail: Boekeloo@umd.edu)

science professionals provide an invaluable resource to combating the health disparities that disproportionately burden minorities and lower-socioeconomic persons within the USA.⁴ One strategy for increasing underrepresented minority participation in HSRCs is to identify barriers and facilitators to promoting youth interest in health sciences as career paths given that such career paths often begin in adolescence.^{5–7}

Health Science-Related Career Choice

While nurturing interest in HSRCs among underrepresented minority high school students is warranted, expecting high school students to specify a specific HSRC choice is not. The health science-related workforce is extremely varied, spanning basic, and applied sciences, as well as public and clinical services. Across health service professions, the landscape is sometimes unclear or competitive as in such fields as advanced practice nursing and physician assistants. Further, evolutions in healthcare systems are requiring a vast array of new types of health professionals from community health workers to health coaches and an increase in the number of some professionals such as physicians.⁸ The US health research workforce is currently under great pressure due to a prior expansion of the biomedical research enterprise followed by the current contraction leading to a hypercompetitive environment for upcoming as well as entrenched scientists.⁹ In this environment, upcoming health scientists even at the graduate level must continue to identify viable career choices. Hence, for many reasons, youth cannot be expected to understand the health science landscape and different HSRC options enough to have a clear idea of exactly which to pursue.

Youth, particularly those from underserved backgrounds, may lack information about HSRCs. Without science, technology, engineering, and mathematics (STEM) career information, students not only lack clarity about their science career goals but they also lack clarity about how their high school science might relate to, and what they must do to reach, science career goals.^{10–12}

Intrinsic and Extrinsic Motivations for Career Choices

Given that high school youth need, but do not have, enough intimate understanding of health science occupations to make educated choices regarding pursuit of a specific HSRC, they must make decisions about their educational path based on more general cues arising from their own basic interests and desires related to health science (intrinsic motivation) and/or their perceptions of secondary aspects of a desired career such as a good salary and comfortable work conditions (external motivation). Career decision-making may be influenced by youths' past experiences¹³ and influences of adults and role models.¹⁴ Even broad cultural trends may influence youth's motivations related to career choice as seen in studies of generational differences. For example, "GenMe" individuals born between 1980 and 1999 may favor extrinsic factors (e.g., money) and "GenX" individuals born between 1960 and 1980 may favor intrinsic factors (e.g., self-actualization) in their career decision-making^{15,16}. When coupled with the disparity in pay between some STEM fields and some non-STEM fields, more individuals, including minorities in GenMe, may favor more lucrative careers and professions that provide more extrinsic reward and focus less on their innate satisfaction from the career.¹⁷

HSRCs themselves may present varied opportunities in regard to intrinsic and extrinsic motivations. Some HSRCs, such as scientific researcher and clinical physician, may typically provide higher salaries than other lower-level HSRCs, such

as research assistant and medical technician, but they also involve a greater number of years of post-secondary education; and such HSRCs may require more years of education than other potentially more lucrative careers in business, for example. Non-STEM careers often require less extensive education and come with a higher salary at the bachelor and doctoral levels than compared to some STEM fields.^{18,19} As extra years of education have additional costs both financially and psychosocially, expenditures are high to obtain higher level HSRCs.

When faced with career paths that either postpone or have relatively low potential extrinsic reward, it might be expected that youth from low socioeconomic status families may focus on extrinsic rewards of educational and occupational options; but prior studies suggest that demographics influence career motivations in varied ways. It has been observed that student debt causes students to be less likely to take low-paid “public interest” jobs than high salary jobs.²⁰ Among academically able adolescents from different ethnic and socioeconomic backgrounds in England, those from lower socioeconomic groups saw medicine as having extrinsic rewards, such as money, but requiring prohibitive personal sacrifices. In contrast, students from affluent backgrounds saw medicine as one of many challenging career options with intrinsic rewards, like fulfillment and achievement.²¹ High school first-generation students and Hispanic students reported a higher level of intrinsic motivation than their counterparts in college.²² Individuals from lower socioeconomic status, and especially boys, talked more about the extrinsic rewards of medical careers than intrinsic ones.²¹ Among university students in Ontario, women scored higher than males on intrinsic motivation but males and females did not score differently on extrinsic motivation.²³ Other studies examining the motivations of females versus males tend to indicate that females’ subjective values are often different than males.^{24–26}

Studies of intrinsic motivation appear from the 1960s.^{27–30} Three of the early prominent sources of intrinsic motivation proposed were challenge, curiosity, and control.³¹ An additional form of intrinsic motivation, self-determination, was later added. Self-determination theory³² addresses how social and cultural factors facilitate or undermine people’s preferences, initiative, and assessment of their performance. Applications of self-determination theory suggest intrinsic motivation (engaging in an activity for its own sake) versus extrinsic motivation (engaging in an activity as a means to an end) leads to better engagement.^{33,34} Comparisons between people whose motivation is authentic (or self-authored) and those whose motivation is externally controlled reveal that the former have more interest, excitement, and confidence.^{35,36}

Aims of this Study

Our previous research suggests that among predominantly African American and Hispanic high school students from a low socioeconomic area, health professionals, research scientists, and medical doctors are not strongly differentiated. Also, intention to pursue these HSRCs is related to having experienced health-related problems in oneself or others.¹³ This suggests that experiencing health problems may increase youth’s motivation to pursue HSRCs. We also previously examined measures of the youths’ desired career qualities. A face validity assessment of the items suggested that students desired both intrinsic and extrinsic career qualities.³⁷

This study examines whether intrinsic and extrinsic motivation predicts intention to pursue an HSRC among high achieving, predominantly African American and Hispanic minority, youth from a low socioeconomic community. Informed by our

prior studies, we hypothesize that intrinsic and extrinsic motivation will be associated with three HSRC intentions: to become a health professional, to become a research scientist, and to become a medical doctor. This study could help clarify the youth's pathways to HSRCs that deserve more attention in the research and education of youth.

METHODS

The current research is part of a larger study, Climbing Up and Reaching Back (CURB), conducted at the University of Maryland and uses the data collected from 2011 to 2013. Institutional Review Board (IRB) approval was obtained for this research from both the collaborating university and public school system.

Participants for the CURB study were recruited from six high schools in "inner beltway" Prince George's County, Maryland—an area bordering Washington, D.C. with a high racial and ethnic minority composition and predominantly low socioeconomic status. The study sample consisted of students who participated in the CURB 10th through 12th-grade longitudinal demonstration of an intervention aimed at increasing interest in HSRCs among underrepresented minority high school students from low socioeconomic backgrounds. Students eligible for recruitment met the following requirements: 10th grade students, B- or above cumulative grade point average and no developmental or learning disabilities requiring special classroom teaching assistance. Based on a sample frame of eligible students produced by the school system administration, school staff selected by principals offered students CURB participation. Of those who were offered participation, students who completed assent forms and obtained signed consent forms from their parents by the study initiation deadline ($n=173$) were offered participation in the CURB baseline survey. The students' offered participation were provided transportation from their respective high schools to the researchers' university, which was located in the same county, in order to complete the survey. The paper-and-pencil survey was administered in a large lecture hall and took approximately 25 min to complete. The same survey was administered four times: at the beginning of the 10th grade spring semester ($n=134$) and at the end of the 10th ($n=134$), 11th ($n=121$), and 12th ($n=116$) grades using the same methods. All survey participants received \$10 for their participation in the baseline survey, and \$15, \$20, and \$25, respectively, for the surveys at the end of the 10th, 11th, and 12th grades. Students in the three schools received health science mentoring from School of Public Health students and researchers plus educational materials about college preparation and health science programs distributed by mail and email (mentoring study condition). Students in another three schools received only the educational materials (educational study condition). The impact of the intervention has been thoroughly examined previously, and no differences between study conditions have been identified. Hence, study group is included in this study simply as a covariate in the analyses.

Measures

The baseline survey instrument was designed by a team of researchers including behavioral scientists, university students, and community members, using existing items whenever possible as described below. The survey was pretested with high school students not involved in the main study in order to assess ease of completion, comprehension, and acceptability. Revisions were made, and a second round of

review and pretesting was conducted before the baseline survey was administered for this study.

Demographic and Other Covariate Variables. Demographic variables included in this study were gender coded as male or female; birth place of the respondent's parents were coded as born in USA or not born in USA; highest educational attainment of the mother was coded as "less than college" (high school or less, trade/vocational school, and associate's degree), "more than college" (college degree, master's degree, and doctorate degree), or "don't know"; and race/ethnicity coded as African American excluding Hispanics, Hispanics, and other race ethnicities including Asian, Caucasian, Native American, and combinations of non-Hispanic race/ethnicities. Study conditions were coded as mentoring and educational. As the survey was administered four times, time was coded as baseline, 10th, 11th, and 12th grade.

Intrinsic and Extrinsic Motivation. Students responded to a series of 25 questions addressing desired qualities of a health science career. These items included questions originally developed by May and colleagues³⁸ and revised by Palumbo et al.³⁹ We used the Palumbo items as well as several new items developed by the research team to address cultural relevance. Responses to the 25 questions were on a seven-point scale with 1 corresponding to "I don't want this" and 7 corresponding to "I want this very much." The intrinsic and extrinsic motivation scales were based on our psychometric analysis of the items. The psychometric analysis included a factor analysis, correlation matrix, item-total correlations, and alpha coefficients to assess the reliability of the intrinsic and extrinsic motivation scales. The exploratory factor analysis with varimax rotation identified the following six items which grouped together and we labeled "intrinsic motivation" for a career in the health sciences: develop ways of improving people's health, answer questions about health, my racial/ethnic group makes valuable contributions to society, care for people, collect information about people's health, and analyze information about people's health. The multi-item scale demonstrated good internal consistency ($\alpha=.88$). The factor analysis also identified twelve items which grouped together to comprise the factor that we labeled "extrinsic motivation" for a career in health. Four of these items were removed because, based on face validity, they were not consistent with the construct. The final extrinsic motivation scale included the following eight items: be very powerful, have high status in my racial/ethnic culture, know a lot, be a leader, work in a safe place, make a lot of money, have respect, and always have a job. This scale demonstrated acceptable internal consistency ($\alpha=.78$).⁴⁰

Intention to Pursue a Health Science-Related Career. Students were asked to respond to three questions with their level of agreement. The questions included "I now plan to become a health professional," "I now plan to become a medical doctor," and "I now plan to become a research scientist." Responses were evaluated on a seven-point scale with 1 corresponding to "Strongly Disagree" and 7 corresponding to "Strongly Agree." All three variables were highly correlated indicating that the participating students did not strongly differentiate between these careers. Pearson correlations of the three variables with each other varied from 0.61 to .77 ($p<.0001$).

Analysis

Data were analyzed using Statistical Analysis System (SAS Institute Inc., Cary, NC), version 9.3. First, we conducted a descriptive analysis including the cell size and frequency of all demographic variables including gender, race, parents born in the

USA, and mother's education level. We computed the means and standard deviations of continuous variables including intrinsic and extrinsic motivation scales, and the three HSRC intention variables. In addition, we conducted a correlational analysis between intrinsic and extrinsic motivation variables and the three HSRC intention variables to assess for possible co-linearity. Using the GENMOD procedure of SAS, generalized estimating equations (GEE) was implemented within the generalized linear model (GLM) framework. Generalized linear models examining predictor variables (intrinsic motivation and extrinsic motivation) with each outcome variable (three HSRC intention variables) and all covariates of interest were constructed using GEE to account for the multiple time points of each subject.⁴¹⁻⁴³ This approach used all available data regardless of whether subjects completed every questionnaire, and as the time data were correlated longitudinally for each subject, the standard errors of the regression coefficient were empirically adjusted. Interactions between significant independent variables and covariates when predicting the outcomes variables were examined, and as all interactions were not significant, they were dropped from the model. All statistical tests were set at a significance level of $p < .05$.

RESULTS

Descriptive statistics were computed for the research measures and are summarized in Table 1. The baseline sample ($n=134$) was 29.9 % male, 65.7 % African American/Black, 22.4 % Hispanic, 64.7 % children of parents who were foreign-born, and 45.1 % children who knew their mothers had less than a college education. On most characteristics, except mother's education, the sample was relatively stable over time although 18 participants were lost to follow-up from baseline to the end of the 12th grade. The percentage of students who knew their mother's had less than a college education increased over time leaving a smaller percentage of those who did not know their mother's education.

Of note were the mean levels of intrinsic and extrinsic motivation at baseline among students in the sample which were well above the 3.5 mid-point of the scale (5.3, $s.d.=1.0$ and 6.2, $s.d.=.07$ on a seven-point scale, respectively). The mean levels of intention to pursue a health careers (health professional=4.9, $s.d.=2.0$; research scientist=4.3, $s.d.=1.9$; medical doctor=4.8, $s.d.=2.2$) were also above the 3.5 mid-point of the seven-point scales.

Intention to Become a Health Professional. The unadjusted analysis between intrinsic motivation and extrinsic motivation with intention to become a health professional using the GEE model are presented in model 1 (Table 2). Students with stronger intrinsic motivation were more likely to express intention to become a health professional, coefficient=0.31, (95 % CI, 0.09 to 0.53). However, extrinsic motivation was not significantly related to intention to become a health professional, $p > .05$.

The adjusted GEE model analysis between intrinsic motivation and extrinsic motivation as independent variables with the outcome intention to become a health professional, controlling for all covariates, are presented in model 2 (Table 2). Intrinsic motivation was again positively related to intention to become a health professional, coefficient=0.32, (95 % CI, 0.10 to 0.55). Extrinsic motivation was not significantly related to intention to become a health professional, $p > .05$. Of the covariates, time was negatively related to the intention to become a health

TABLE 1 CURB participant demographic characteristics

	Baseline	10th grade	11th grade	12th grade
Characteristic	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Gender				
Male	40 (29.9)	37 (27.8)	32 (26.7)	31 (27.0)
Female	94 (70.1)	96 (72.2)	88 (73.3)	84 (73.0)
Race				
Black/African American (excluding Hispanics)	88 (65.7)	95 (72.0)	89 (74.2)	84 (72.4)
Hispanic	30 (22.9)	28 (21.2)	23 (19.2)	24 (20.7)
Other	16 (11.4)	9 (6.8)	8 (6.7)	8 (6.9)
Parents born in the USA				
No	86 (64.7)	88 (66.2)	82 (68.3)	79 (68.7)
Yes	47 (35.4)	45 (33.8)	38 (31.7)	36 (31.3)
Mother's educational level				
Less than college	60 (45.1)	50 (37.6)	61 (51.3)	73 (63.5)
College or higher	34 (25.6)	29 (21.8)	28 (23.5)	27 (23.5)
Don't know	39 (29.3)	53 (39.9)	30 (25.2)	15 (13.0)
	<i>n</i> (Mean±sd)	<i>n</i> (Mean±sd)	<i>n</i> (Mean±sd)	<i>n</i> (Mean±sd)
Extrinsic motivation ^a	133 (6.2±0.7)	134 (6.2±0.8)	121 (6.4±0.6)	116 (6.4±0.7)
Intrinsic motivation ^a	134 (5.3±1.0)	134 (5.4±0.9)	121 (5.3±1.0)	116 (5.6±1.0)
I now plan to become a health professional ^b	133 (4.9±2.0)	134 (5.0±1.8)	121 (4.4±2.2)	116 (4.2±2.4)
I now plan to become a research scientist ^b	133 (4.3±1.9)	134 (4.5±1.7)	121 (3.9±1.9)	116 (3.5±2.0)
I now plan to become a medical doctor ^b	132 (4.8±2.2)	134 (5.1±2.0)	121 (4.5±2.4)	116 (4.0±2.5)

^aSeven-point scale from 1 = "I don't want this" to 7 = "I want this very much"

^bSeven-point scale from 1 = "Strongly disagree" to 7 = "Strongly agree"

professional, $p<.001$, which indicated that over the 3-year span, the participants' intention to become a health professional decreased. Students in the mentoring group showed higher intention to become a health professional than those in the educational group, $p<.05$. Students whose parents were born in the USA showed lower intention to become a health professional than students whose parents were not born in the USA, $p<.01$. Hispanic students showed lower intention to become a health professional than students reported as "Other" race, $p<.01$. Students whose mothers had college or higher education were associated with lower intention to become a health professional than those students whose mothers' education was "Unknown," $p<.05$.

Intention to Become a Health Scientist. The unadjusted analysis between intrinsic motivation and extrinsic motivation with intention to become a health scientist using the GEE model are presented in model 1 (Table 3). Students with stronger intrinsic motivation were more likely to express intention to become a health scientist, coefficient=0.31 (95 % CI, 0.06 to 0.46). However, extrinsic motivation was not significantly related to intention to become a health scientist, $p>.05$.

The adjusted GEE analysis between intrinsic motivation and extrinsic motivation as independent variables with the outcome intention to become a health scientist,

TABLE 2 Unadjusted and adjusted GEE predictors of intention to become a health professional

Parameter	Estimate	Standard error	95 % Confidence limits		Z	P
Unadjusted model						
Intercept	2.48	0.85	0.82	4.14	2.93	0.003
Intrinsic motivation	0.31	0.11	0.10	0.53	2.76	0.005
Extrinsic motivation	0.07	0.14	−0.21	0.34	0.48	0.63
Adjusted model						
Intercept	3.23	1.03	1.22	5.25	3.14	0.0017
Time	−0.31	0.06	−0.43	−0.19	−5.09	<.0001
Group mentoring	0.62	0.30	0.03	1.21	2.07	0.04
Group education	0.00	0.00	0.00	0.00	−	−
Female	0.57	0.34	−0.10	1.23	1.69	0.09
Male	0.00	0.00	0.00	0.00	−	−
Parents were born in the USA	−0.91	0.32	−1.53	−0.28	−2.85	0.004
Parents were not born in the USA	0.00	0.00	0.00	0.00	−	−
Race: Black	−0.38	0.43	−1.22	0.47	−0.87	0.39
Race: Hispanic	−1.47	0.49	−2.43	−0.51	−2.99	0.003
Race: Other	0.00	0.00	0.00	0.00	−	−
Mother's education less than college	−0.45	0.30	−1.03	0.13	−1.52	0.13
Mother's education college or higher	−0.80	0.38	−1.55	−0.04	−2.07	0.04
Mother's education not known to child	0.00	0.00	0.00	0.00	−	−
Intrinsic motivation	0.32	0.12	0.10	0.55	2.77	0.006
Extrinsic motivation	0.15	0.14	−0.13	0.43	1.04	0.30

controlling for all covariates, are presented in model 2 (Table 3). Intrinsic motivation was again positively related to intention to become a health scientist, coefficient=0.31 (95 % CI, 0.09 to 0.52). Extrinsic motivation was not significantly related to intention to become a health scientist, $p>.05$. Of the covariates, time was negatively related to the intention to become a health scientist, $p<.001$, which indicated that over the 3-year span, the participants' intention to become a health scientist decreased. Students whose parents were born in the USA showed lower intention to become a health scientist than students whose parents were not born in the USA, $p<.02$. No other covariates were significant.

Intention to Become a Medical Doctor. The unadjusted analysis between intrinsic motivation and extrinsic motivation with intention to become a medical doctor using the GEE model are presented in model 1 (Table 4). Students with stronger intrinsic motivation were more likely to express intention to become a medical doctor, coefficient=0.28 (95 % CI, 0.06 to 0.50). However, extrinsic motivation was not significantly related to intention to become a medical doctor, $p>.05$.

The adjusted GEE analysis between intrinsic motivation and extrinsic motivation as independent variables with the outcome intention to become a medical doctor, controlling for all covariates, are presented in model 2 (Table 4).

TABLE 3 Unadjusted and adjusted GEE predictors of intention to become a health scientist

Parameter	Estimate	Standard error	95 % Confidence limits	Z	p
Unadjusted model					
Intercept	2.19	0.74	0.74	3.64	2.96 0.003
Intrinsic motivation	0.26	0.10	0.06	0.47	2.50 0.01
Extrinsic motivation	0.07	0.11	-0.14	0.27	0.63 0.53
Adjusted model					
Intercept	2.74	0.89	0.99	4.50	3.06 0.002
Time	-0.34	0.07	-0.48	-0.20	-4.74 <.0001
Group mentoring	0.41	0.25	-0.09	0.90	1.61 0.11
Group education	0.00	0.00	0.00	0.00	- -
Female	0.03	0.30	-0.56	0.63	0.11 0.91
Male	0.00	0.00	0.00	0.00	- -
Parents were born in the USA	-0.70	0.28	-1.25	-0.15	-2.49 0.01
Parents were not born in the USA	0.00	0.00	0.00	0.00	- -
Race: Black	-0.39	0.39	-1.16	0.39	-0.98 0.33
Race: Hispanic	-0.67	0.44	-1.53	0.18	-1.55 0.12
Race: Other	0.00	0.00	0.00	0.00	- -
Mother's education less than college	0.08	0.29	-0.48	0.64	0.28 0.78
Mother's education college or higher	-0.15	0.35	-0.84	0.53	-0.44 0.66
Mother's education not known to child	0.00	0.00	0.00	0.00	- -
Intrinsic motivation	0.31	0.11	0.09	0.52	2.74 0.006
Extrinsic motivation	0.14	0.11	-0.08	0.36	1.24 0.22

Intrinsic motivation was again positively related to intention to become a medical doctor, coefficient=0.33 (95 % CI, 0.10 to 0.55). Extrinsic motivation was not significantly related to intention to become a medical doctor, $p>.05$. Of the covariates, time was negatively related to the intention to become a medical doctor, $p<.001$, which indicated that over the 3-year span, the participants' intention to become a medical doctor decreased. Students in the mentoring group showed higher intention to become a medical doctor than those in the educational group, $p<.05$. Students whose parents were born in the USA showed lower intention to become a medical doctor than students whose parents were not born in the USA, $p<.01$. Hispanic students showed lower intention to become a medical doctor than students reported as "Other" race, $p<.01$. Students whose mothers had college or higher education were associated with lower intention to become a medical doctor than those students whose mothers' education was "Unknown," $p<.05$. No other covariates were significant.

DISCUSSION

This study was conducted in a sample of high achieving 10th graders in a low socioeconomic area, including a predominance of African American or Hispanic, female youth of foreign-born parents. In this sample, the overall level of extrinsic

TABLE 4 Unadjusted and adjusted GEE predictors of intention to become a medical doctor

Parameter	Estimate	Standard error	95 % Confidence limits		Z	p
Unadjusted model						
Intercept	2.64	0.86	0.96	4.31	3.08	0.002
Intrinsic motivation	0.28	0.11	0.06	0.50	2.47	0.01
Extrinsic motivation	0.07	0.14	−0.20	0.33	0.51	0.61
Adjusted model						
Intercept	3.78	1.04	1.74	5.81	3.64	0.0003
Time	−0.33	0.07	−0.46	−0.20	−4.95	<.0001
Group mentoring	0.73	0.32	0.11	1.35	2.32	0.02
Group education	0.00	0.00	0.00	0.00	−	−
Female	0.50	0.35	−0.19	1.19	1.41	0.16
Male	0.00	0.00	0.00	0.00	−	−
Parents were born in the USA	−1.09	0.35	−1.77	−0.40	−3.10	0.002
Parents were not born in the USA	0.00	0.00	0.00	0.00	−	−
Race: Black	−0.64	0.50	−1.61	0.33	−1.29	0.20
Race: Hispanic	−1.74	0.53	−2.78	−0.69	−3.25	0.001
Race: Other	0.00	0.00	0.00	0.00	−	−
Mother's education less than college	−0.21	0.33	−0.85	0.43	−0.65	0.52
Mother's education college or higher	−0.97	0.42	−1.81	−0.14	−2.30	0.02
Mother's education not known to child	0.00	0.00	0.00	0.00	−	−
Intrinsic motivation	0.33	0.12	0.10	0.55	2.86	0.004
Extrinsic motivation	0.09	0.13	−0.17	0.36	0.69	0.49

motivation was somewhat higher than the overall level of intrinsic motivation; and the average scores of both types of motivation were on the high end of the measure. Nevertheless, intrinsic motivation, but not extrinsic motivation, predicted intention to pursue an HSRC from the 10th to the 12th grade. The study outcome, intent to pursue an HSRC, was defined three ways: plan to become a health professional, plan to become a research scientist, and plan to become a medical doctor. The findings reported here were consistent across all three outcome definitions. Hence, high school students from low socioeconomic areas who desire the potential intrinsic characteristics of HSRCs may be more likely to pursue an HSRC. Those who desire the potential extrinsic characteristics of HSRCs may be no more likely to pursue an HSRC than other students.

The desired intrinsic characteristics studied here include wanting to: develop ways of improving people's health, answer questions about health, help one's racial/ethnic group make valuable contributions to society, care for people, collect information about people's health, and analyze information about people's health. There are heartening implications of the finding that intrinsic motivation predicts pursuit of an HSRC. Self-determination theory and prior empirical research would posit that students with intrinsic desire for the HSRC may continue to pursue the career when faced with the challenges of time and costs related to the education needed for the career.^{33-36,44} Also, people with

intrinsic HSRC motivations may persevere in an HSRC career with limited extrinsic reinforcement.^{45–48} Hence, an emphasis on intrinsic motivation in the health science and related career education of low-income area high school youth may be effective in facilitating pursuit of HSRCs.

In addition to the consistent finding that intrinsic motivation is associated with intent to pursue an HSRC, there were other consistent findings. First, all outcome measures of intention to pursue an HSRC decreased from the 10th to 12th grades. These findings are consistent with previous findings about interest in medicine but counter to findings about interest in health.^{49,50} Secondly, students whose parents were foreign born in the USA were more likely to intend to pursue an HSRC. This finding deserves attention. With the percentage of the foreign-born persons in the USA rising, representation of persons from families with foreign born members is needed in HSRCs. These families have often experienced relatively high levels of loss, stress, and acculturation challenges.⁵¹ Finally, the study groups differed in their career intentions; this difference was consistent across study time points and does not indicate a study intervention effect so it is of little practical interest.

Some of the other covariates entered into the models examining the association between motivation and intention to pursue HSRCs provided interesting findings that may warrant further investigation. For example, Hispanic participants were less likely to intend to pursue an HSRC than participants of other non-Black race/ethnicities in two of the models. Further research might clarify whether Hispanic youth in general have lower intention to pursue HSRCs than youth of other race/ethnicities. Also in two of the models, participants whose mothers had a college or higher education were less likely to intend to pursue an HSRC than participants who did not know their mother's education level. Further research might clarify whether youth who do not know their mother's education level have higher intention to pursue HSRCs than other youth. Given the small subsamples for comparison in this study, these inconsistent covariate findings cannot be clearly interpreted.

It is not surprising that the sample of 10th grade health science study volunteers are predominantly female as more high school females are observed to have an interest in medicine and health ("people-oriented") careers than males, while males are more likely than females to have an interest in basic STEM disciplines such as engineering.⁴⁹ The high rate of study participation by students of parents born outside of the USA reflects the high proportion of new immigrant families in the high school study recruitment sites, and also suggests that the educators in the high school study recruitment sites and the students' parents facilitated the involvement of these students in this health science study.⁵²

That intrinsic motivation predicts intention to pursue a health career suggests that the intention is due more to authentic interest in such a career than to interest in potential secondary gains of the career. The importance of authentic interest in career choice is consistent with what would be posited by self-determination theory.^{33,34} The findings of the present study suggest that students who seek perceived intrinsic qualities of an HSRC, such as the application of science and service to others, are more interested in pursuing the career than students who seek perceived extrinsic secondary gains from a career, such as accumulation of wealth and prestige. Previous research on pursuit of health careers has often focused on individual perceptions of an ideal career without any particular underlying conceptual framework.³⁹ This study suggests that self-determination theory may

provide a useful framework for understanding and facilitating youth interest in HSRCs.

The practical implication of these findings is that career counseling and career development interventions aimed at increasing the number of underrepresented racial/ethnic minorities and persons from low-income areas, particularly children of foreign-born parents, in health careers may be more efficacious if focused on the intrinsic qualities of HSRCs rather than potential secondary gains of its pursuit. Students with intrinsic motivation for the career may be the most likely to benefit from education and assistance related to these type of careers. Furthermore, education about the intrinsic rewards of this type of career may be more effective than education about the extrinsic rewards of the career. In order to increase intrinsic motivation to pursue a health career, educators might focus on the ability to develop ways of improving people's health, answering questions about health, making valuable contributions to society, caring for people, collecting information about people's health, and analyzing information about people's health. This may be accomplished through engaging students in classroom discussions, exposing them to literature that highlights how certain populations are disproportionately affected by health disparities and how underrepresented minorities are crucial to resolving these disparities, inviting health scientists and clinicians from the community who have been able to impact the above constructs, and encouraging students to work with or shadow health scientists and clinicians in the community.

Limitations and Strengths

The results of this study must be examined in light of some limitations. First, the sample was comprised of high achieving youth (those with B-, average, or better) from a selection of predominantly African American/Hispanic schools in a low-income area of one mid-Atlantic county. This may limit the generalization of these results to populations outside of this geographic area who are not high achieving, and who are not minorities. Furthermore, the sample was about two thirds female and children of foreign born parents. Hence, males and children of USA-born parents may not be well represented by this study. Second, the scales used to measure intrinsic and extrinsic motivation were developed through psychometric analyses for this study and confirmation of their validity awaits other studies. There is no widely used term that encompasses both scientific research and applied health professions, there is a large number of professional roles that could be included in this career domain, and we observed that study participants did not strongly differentiate between the different career options in this domain. Thus, although we used three outcome variables to measure careers in this domain, these variables may be limited in their representation of the domain.

The study also has several strengths to be considered. It uses an array of three health science-career pursuits to assess the outcome thus providing a method for confirming the construct validity of the outcome findings. A longitudinal study design is used which increases confidence that the findings are stable over the 10th–12th grades. Multiple item, rather than single item, scales with acceptable internal consistency are used to measure intrinsic and extrinsic motivation increasing confidence in the reliability of these measures. The analyses control for potential confounding variables in regard to the relationship of motivation with career intent.

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