

Investigating the Influence of Mentor–Mentee Race and Gender Pairs on Public Health Persistence

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Abstract

Background. Mentoring and immersive experiences through internships are important means of increasing underrepresented (UR) students' persistence in public health. However, while the positive effects of mentoring are well established, studies on the effect of race/ethnicity and gender mentor matching on persistence have produced mixed results. **Aims.** This article investigates the impact of homogeneous and heterogeneous mentor–mentee pairs on UR intern persistence for Project Imhotep, a summer internship program at Morehouse College. **Method.** The authors employ multivariable logistic regression analyses to examine the relationship between mentor and mentee race/ethnicity and gender characteristics on undergraduate intern academic persistence and career attainment. **Results.** Mentor demographics and institution type are predictors associated with intern academic and career persistence; however, the predictive importance of model attributes varied by outcome. Mentees paired with UR mentors (female or male) were more likely to attend graduate school, and mentees mentored by female mentors (UR female or White female) were more likely to pursue a graduate degree in public health. Finally, mentees mentored by UR females had the highest likelihood of either pursuing a graduate degree in public health or a public health career. **Discussion.** This article advances our understanding of how mentor–mentee race/ethnicity and gender affects the recruitment and retention of undergraduate students from racially and ethnically UR populations into public health. **Conclusions.** The findings suggest that the degree of shared racial/ethnic and/or gender identity between a public health intern and mentor influenced the likelihood of the intern pursuing further education or a public health career.

Keywords

mentoring, public health, underrepresented groups, women, logistic regression

According to the World Health Organization (2021), non-communicable diseases such as cardiovascular disease and cancer account for most deaths, disability, and health care costs in the United States. African Americans, in particular, are affected by chronic diseases (e.g., heart disease, hypertension, and type 2 diabetes; Bauer et al., 2014), all of which are preventable through improved public health awareness and education (Diem et al., 2016). Despite a continued focus on noncommunicable disease prevention, there was a predicted shortage of 250,000 public health workers in the United States, including an even greater deficit in racially and ethnically underrepresented (UR) communities. Increasing interest and encouraging the pursuit of public health careers among racially and ethnically UR college students could help address this shortage (Wheeler & Bryant, 2017), as could having more decision makers and policy makers from UR groups, who

would be expected to be better informed on the social determinants of health issues that affect access among minoritized population groups (Snyder et al., 2018). Funding agencies have responded by supporting public health training programs with increasing focus placed on professional mentorship opportunities for students and interns from ethnic and racial UR communities (Hamelin & Paradis, 2018; White et al., 2016).

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Quality mentoring can have a profound positive effect on the success of research careers (Harawa et al., 2017), academic performance (Campbell & Campbell, 1997), social integration (Allen et al., 2006), physiological health (DuBois & Silverthorn, 2005), college retention rates (Mangold et al., 2002), career development and training (Parks-Yancy, 2012), professional identity (Murdock et al., 2013), and role modeling (Ragins & Kram, 2007). Mentors provide knowledge, advice, and support the psychosocial needs of mentees (Zaniewski & Reinholz, 2016) by helping them establish a professional identity, develop networks, and acculturate within their field.

Over the years, researchers have studied gender and race/ethnicity pairing of mentors and mentees to understand their effects on the quality and the intended outcomes of mentoring relationships (Collins et al., 1997; Noe, 1988). However, these studies have produced conflicting results. Female mentees expressed greater comfort and support from outstanding female role models than outstanding male role models (Allen et al., 2006). Black summer research students with Black or female mentors reported more positive perceptions of their experience than Black students who worked with White mentors (Frierson et al., 1994). In some studies, mixed gender pairs reported better mentee psychosocial outcomes (e.g., mutual trust, respect, and reciprocal influence; Ugrin et al., 2008) and more academic persistence (DuBois & Silverthorn, 2005) than same gender pairs. Academic outcomes, however, did not differ significantly by congruence of pairs. Studies among undergraduate students whose primary focus of studies are in STEM (science, technology, engineering, and mathematics) found that the methods and outcomes of mentorship also differ based on student gender and race/ethnicity (Aikens et al., 2017).

Student outcomes can also vary dramatically by higher education institution type (i.e., minority-serving institution [MSI], predominantly White institution [PWI]). Findings suggest that the undergraduate institution climate can significantly affect student and alumni performance (McClain & Perry, 2017). While mentorship is a promising strategy for guiding students' development, published studies reported inconsistent results. Research in these areas has largely lagged behind program development (Meschitti & Lawton Smith, 2017).

This study aimed to contribute to the empirical literature on the impact of mentor matching for UR students in the public health context utilizing statistical techniques. These techniques are capable of developing relationships with greater detail and clarity using Morehouse College's Project Imhotep summer internship program as the case study. In this study, we explore the relative impact of mentor–mentee race, ethnicity, and gender combinations on the pursuit of a graduate degree and employment in public health. The two research questions are the following:

Research Question 1: Under what conditions do same (homogeneous) or different (heterogeneous) race/ethnicity and gender mentor–mentee pairs positively influence the academic and career outcomes of public health interns?

Research Question 2: How do public health academic and career outcomes of interns vary by the type of mentor–mentee pairing? Specifically, how do mentor–mentee pairs influence intern: (i) pursuit of a graduate degree in any discipline, (ii) completion of a graduate degree in public health, (iii) employment in a public health field, or (iv) commitment to the field of public health as demonstrated with either a degree or employment in a public health field?

Four analyses were conducted to answer each of the sub-questions (i–iv) in Research Question 2. This research was approved by the Institutional Review Board at Morehouse College.

Method

Program Description

Supported by the Centers for Disease Control and Prevention (CDC), the mission of Project Imhotep is to increase the knowledge and skills of UR students in public health and to promote the quality and quantity of well-trained professionals in the public health workforce. Students enter the program as interns and engage in an intensive interdisciplinary 11-week summer program that provides curricular and research training, and professional mentoring. Program eligibility includes holding the status of being a college junior, senior, or recent graduate; having a cumulative undergraduate GPA of 2.7 or higher; and having U.S. citizenship or permanent residence.

Project Imhotep recruits are from racially and ethnically underrepresented groups including African American, Hispanic/Latino, Native American, and Asian/Pacific Islander undergraduate juniors, seniors, and recent college graduates from across the United States.¹ Between 2012 and 2016, a total of 2,015 people applied to the program with 233 accepted participants for an overall acceptance rate of 11.5%. Mentors are recruited from a variety of partner sources including the CDC, institutions of higher education, nongovernmental organizations, and state and local public health organizations in the state of Georgia and out-of-state. On receipt of the mentor proposals, mentors participate in a review of the applicant database to interview candidates whose interests align with their work. Once an intern is selected, mentors are expected to participate in an orientation that gives insight of program expectations and the tools to best guide the intern throughout the summer. Interns who are placed outside of Georgia are accommodated with travel by the

Program for relocation, and they return to the Morehouse College campus for the closing program activities. Interns work with mentors at the placement site a minimum of 8 hours per day for 5 days a week. The staff conducts midterm site visits to monitor the internship to support the mentors and interns if needed.

Data Sources. Project Imhotep staff uses a computerized tracking system to maintain the most up-to-date academic and career achievement on Imhotep alumni. Intern information is updated as new interns complete intake forms and alumni respond to annual follow-up surveys. Surveys are administered online using Qualtrics. In instances where no survey feedback was received, program staff gathered career and/or academic information from third party professional sites (e.g., LinkedIn).

Data Preparation and Operationalization. In order to investigate the relationship between participant demographic characteristics and Public Health persistence among Summer 2012 to Summer 2016 Project Imhotep intern participants, the following model features are identified: (1) independent variables: participant characteristics (intern and mentor race/ethnicity and gender) and types of mentor–mentee pairs; (2) control variables: institution type, intern undergraduate major, and site location; and (3) dependent variables: academic and career outcomes of interns. Qualitative survey responses were transformed from open-ended text responses (i.e., current job role) and recoded to create a series of categorical variables prior to analysis.

Independent Variables. Participant demographic data consisted of race/ethnicity and gender. Interns and mentors self-selected their race and ethnicity from the following options: Black/African American, Hispanic/Latino, American Indian/Alaska Native, Hawaiian/Other Pacific Islander, Asian, White, and Other. Gender options consisted of male, female, and other.² Race/ethnicity categories created from participant responses included Black/African American female, Black/African American male, Other non-White female, Other non-White male. These categories were then combined to form high-level race/ethnicity categories based on the expressed focus of the Imhotep program, the number of participants in each subgroup and the study's analytical focus on UR populations. For the *Intern* variable, race/ethnicity was classified as either Black/African American or Other Non-White. For mentors (*Mentor*) race/ethnicity was classified as either race and ethnically UR (e.g., Black/African American and Other Non-White) and White.

The types of mentor–mentee matched pairs were defined using the data on mentor and intern race/ethnicity and gender. Full matches (*Full*) consist of interns and mentor pairs who shared the same gender and UR status.

Partial matches (*Partial*) consisted of interns and mentor pairs who shared either the same gender or UR status. Heterogeneous matches (*Heterogeneous match* or *No match*) consisted of interns and mentor pairs who shared neither the same gender nor UR status.

Control Variables. Project Imhotep 2012–2016 interns hailed from colleges and universities across the United States. These institutions can be represented in three primary categories: PWIs, historically Black colleges and universities, or Hispanic-serving institutions.³ For the purposes of this study, both historically Black colleges and universities and Hispanic-serving institutions were combined to form an overarching MSI category, creating a dichotomous *Institution Type* variable (*PWI* or *MSI*). An overarching dichotomous variable *Major* was created with “Public Health and Related Fields” as one class of majors and “Other” as all other majors. Open-ended responses on intern major were coded using the National Center for Education Statistics CIP code (2010) under 51.2207, Public Health Education and Promotion.⁴ In order to control for potential effects of internship location, a *Site* variable was created reflecting the location of internship (i.e., *CDC* vs. *non-CDC*).

Target Variables. The dependent variables included (1) the pursuit of a graduate degree, (2) the pursuit of a graduate degree in public health, (3) having a career in public health, and (4) either pursuing a graduate degree in public health or a career in public health. The corresponding variable names for each of these target variables are *Pursue*, *Degree*, *Career*, and *Success*. The diagram (Figure 1) shows the relationships of these target variables.

1. *Pursue*: “Yes” if a program alumnus completed or is still enrolled in a graduate degree program in any discipline. Otherwise, “No.”
2. *Degree*: “Yes” if an alumnus completed or is still enrolled in a graduate degree program in public health. Otherwise, “No.”
3. *Career*: “Yes” if an alumnus is currently employed in a public health-related field.
4. *Success*: “Yes” if an alumnus was Yes for either Degree or Career indicating a commitment to working in the field of public health.

Data Preprocessing

Due to limited samples size for mentor–mentee matches, White male ($n = 13$) and White female ($n = 18$) interns were removed from this data set prior to analysis. Each of the four models contained sufficient sample sizes: *Pursued* ($n = 191$), *Degree* ($n = 153$), *Career* ($n = 174$), and *Success* ($n = 185$). Issues of multicollinearity were investigated using the *vif* function of the *car* package in

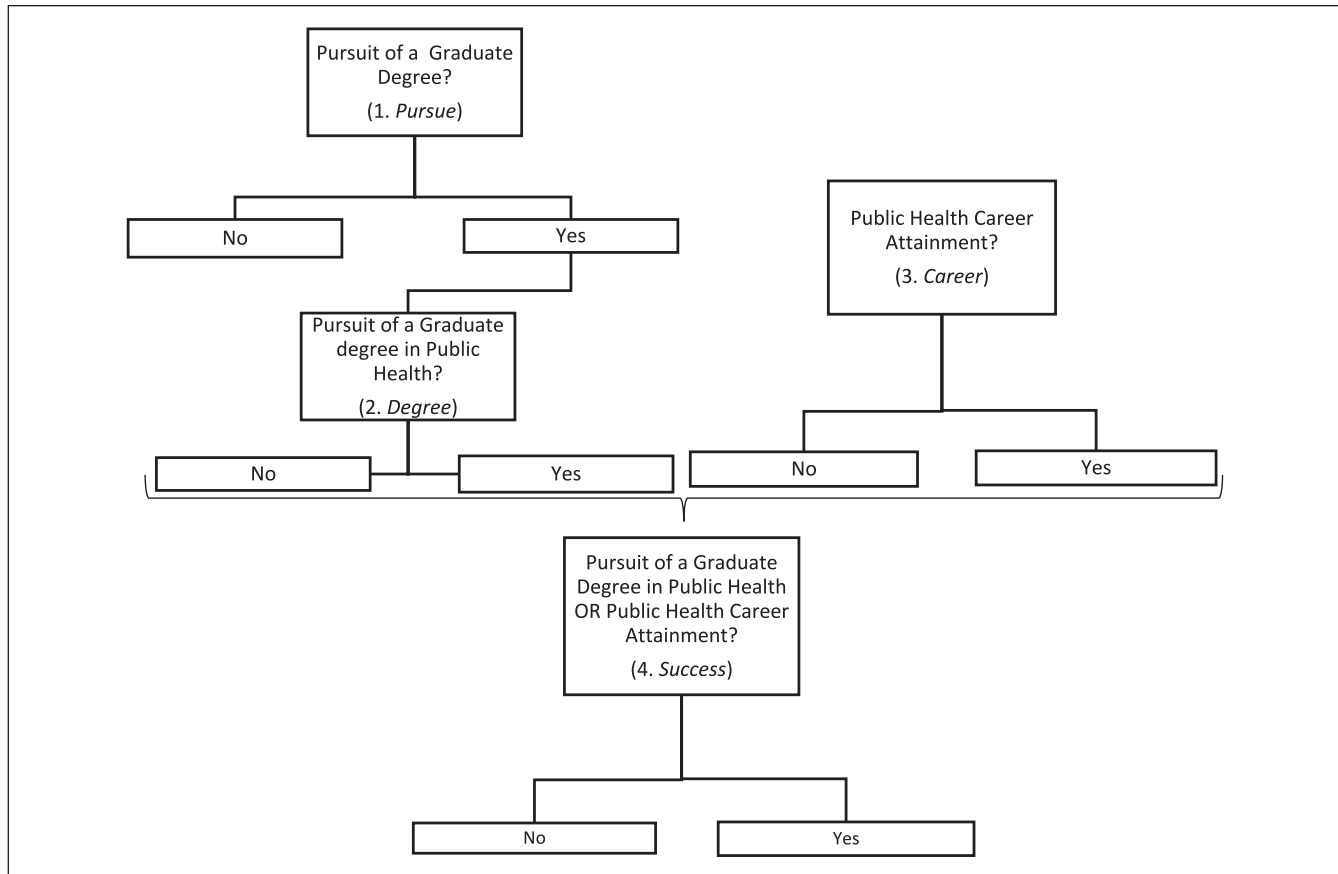


Figure 1. Target variables and their relationships to one another.

R (R Core Team, 2013), VIFs ranged from 1.08 to 3.45, indicating that there were no issues of multicollinearity.

Analyses

A logistic regression analysis was used to investigate differences between alumni who pursued graduate degrees and careers in public health and those that did not. Regression identifies global patterns and relationships among variables (i.e., those that are true across the entire data set; Hand, 2007). The logistic regression model allows one to identify the variables that have the greatest impact with regard to mentoring UR interns. This analysis was created using the R statistical software package.

Results

Descriptive Statistics

From 2012 to 2016, nearly half (49%) of all interns were Black/African American females (Table 1). Forty-seven percent of the mentors in the data set were females from racially and ethnically UR populations (African Americans, Hispanics, Asians, and Pacific Islanders). The

majority of interns attended PWI institutions (58%) and were not public health majors (55%). An equal percentage of students interned at CDC (50%) and non-CDC sites of internship placement (50%). The majority of interns went on to pursue graduate degrees (81%) and degrees in public health⁵ in particular (70%); nearly three fourths (74%) have pursued careers in public health and 158 out of 215 (78%) either pursued a graduate degree or attained employment in public health. Additionally, 35 of 82 (43%) UR female interns and 17 of 62 (27%) UR male interns who pursued graduate degrees shared neither the same gender nor UR status with their mentor.

Results of Logistic Regression Analysis

Multivariate logistic regression results on the Four “Public Health Persistence” target variables are presented in Table 2.

Pursuit of a Graduate Degree (Pursue). Interns who had UR female (odds ratio [OR] = 6.135) or UR male (OR = 5.510) mentors, and, paradoxically, interns who matched neither gender or UR status with their mentors (OR = 9.752) were more likely to pursue a graduate degree in any field compared with other types of mentor/mentee

Table 1. Descriptive Characteristics of Project Imhotep Interns, 2012–2016 (N = 215).

Characteristic	n (%)
Interns	
Black/African American female	105 (49)
Black/African American male	82 (38)
Other non-Whites	28 (13)
Mentors (missing, n = 10)	
UR female	97 (47)
UR male	45 (22)
White female	37 (18)
White male	26 (13)
Match (missing, n = 10)	
Full	72 (35)
Partial	96 (47)
No match	37 (18)
Institution	
PWI	125 (58)
MSI	90 (42)
Undergraduate major	
Public health	96 (45)
Other	119 (55)
Internship site (missing, n = 1)	
CDC	107 (50)
Non-CDC	107 (50)
Pursue (missing, n = 6)	
Pursuit of a graduate degree	
Yes	170 (81)
No	39 (19)
Degree (missing, n = 49)	
Pursued a graduate degree in public health	
Yes	116 (70)
No	50 (30)
Career (missing, n = 24)	
Public health career attainment	
Yes	141 (74)
No	50 (26)
Success (missing, n = 13)	
Pursued a graduate degree in public health or a public health career	
Yes	158 (78)
No	44 (22)

Note. Data in this table characterize the population of Project Imhotep interns with regard to the number and percentage in different categories. Full matches (*Full*) consist of interns and mentor pairs who shared the same gender and UR status. Partial matches (*Partial*) consisted of interns and mentor pairs who shared either the same gender or UR status. No match (*No Match*) consisted of interns and mentor pairs who shared neither the same gender nor UR status. UR = underrepresented; PWI = predominantly White institution; MSI = minority-serving institution; CDC = Centers for Disease Control and Prevention.

pairs. Interns who had public health as their undergraduate major were 56% less likely than students who were non-public health majors to pursue a graduate degree.

Pursued a Graduate Degree in Public Health (Degree). The odds of pursuing a graduate degree in public health for interns attending PWI institutions is about two times higher than interns from MSIs (OR = 2.150; 95% confidence interval [CI; 1.001, 4.616]). When compared with interns who were mentored by White males, those mentored by either a UR female (OR = 5.084; 95% CI [1.126, 22.953]) or White female (OR = 5.378; 95% CI [1.220, 23.703]) also had increased odds in pursuing a graduate degree in public health.

Public Health Career Attainment (Career). The odds of pursuing a career in public health for interns attending PWI institutions is two and a half times higher than interns from MSIs (OR = 2.524; 95% CI [1.168, 5.455]). Interns from MSIs were 69% less likely than interns from PWI to pursue a career in public health (OR = 0.363; 95% CI [0.136, 0.968]).

Pursued a Graduate Degree in Public Health or a Public Health Career (Success). The odds of an intern pursuing a graduate degree in public health and/or having a career in public health was approximately two and a half times higher for interns attending PWIs versus those from MSIs (OR = 2.556; 95% CI [1.160, 5.675]) and approximately five times higher for interns paired with UR female mentors than White male mentors (OR = 5.036; 95% CI [1.406, 18.039]).

Discussion

The majority of Project Imhotep interns found success in their pursuit of a graduate degree in public health or a public health career (see Table 1). Differences in and exceptions to intern success are notable with respect to some independent variables within our study (see Table 2). The factors associated with public health persistence across the models were *Mentor* race/ethnicity and gender and the type of undergraduate institution that the mentee attended. Overall, UR interns who are paired with White female or UR mentors were more likely to pursue graduate degrees in public health. White female mentors were significantly more likely to have UR interns who went on to pursue a graduate degree in public health than UR mentors (*Degree*), and UR female mentors were significantly more likely than White male mentors to have UR interns who either went on to pursue degrees or careers in public health (*Success*). However, matched mentor-mentee status did not correlate with having a public health career (*Career*). The data indicate that predicting success based on mentor characteristics is very much dependent on the outcome under consideration.

Based on the analysis in this study, mentees from predominantly White institutions are more likely to pursue

Table 2. Adjusted Odds of Public Health Persistence Among Project Imhotep Interns, 2012–2016.

Features	Pursue [AOR, 95% CI], n = 199	Degree [AOR, 95% CI], n = 160	Career [AOR, 95% CI], n = 182	Success [AOR, 95% CI], n = 193
Match				
No match	9.752 [1.425, 66.752]	3.241 [0.738, 14.237]	0.994 [0.254, 3.886]	2.961 [0.679, 12.909]
Partial	0.734 [0.267, 2.024]	1.482 [0.580, 3.786]	0.363 [0.136, 0.968]	0.704 [0.256, 1.939]
Full (ref)	1.000	1.000	1.000	1.000
Major				
Public health	0.442 [0.197, 0.992]	0.999 [0.464, 2.153]	0.935 [0.447, 1.956]	0.758 [0.352, 1.634]
Other (ref)	1.000	1.000	1.000	1.000
Intern				
AAM	0.267 [0.050, 1.424]	0.518 [0.153, 1.753]	0.279 [0.070, 1.102]	0.366 [0.089, 1.514]
AAF	0.266 [0.052, 1.354]	1.169 [0.347, 3.939]	0.459 [0.115, 1.830]	0.482 [0.119, 1.958]
Other (ref)	1.000	1.000	1.000	1.000
Institution				
PWI	1.299 [0.563, 2.998]	2.150 [1.001, 4.616]	2.524 [1.168, 5.455]	2.566 [1.160, 5.675]
MSI (ref)	1.000	1.000	1.000	1.000
Site				
CDC	0.950 [0.415, 2.176]	1.089 [0.495, 2.397]	1.553 [0.721, 3.347]	0.728 [0.331, 1.601]
Other (ref)	1.000	1.000	1.000	1.000
Mentor				
URF	6.135 [1.482, 25.400]	5.084 [1.126, 22.953]	2.623 [0.789, 8.727]	5.036 [1.406, 18.039]
URM	5.510 [1.149, 26.417]	2.946 [0.525, 16.513]	1.469 [0.371, 5.813]	3.228 [0.751, 13.870]
WF	3.513 [0.735, 16.793]	5.378 [1.220, 23.703]	1.805 [0.512, 6.357]	2.035 [0.586, 7.072]
WM (ref)	1.000	1.000	1.000	1.000

Note. Significant values ($p < .001$, $p < .01$, or $p < .05$) are highlighted in bold. This table examines the relationship between public health persistence and various mentee characteristics. Full matches (*Full*) consist of interns and mentor pairs who shared the same gender and UR status. Partial matches (*Partial*) consisted of interns and mentor pairs who shared either the same gender or UR status. No match (*No Match*) consisted of interns and mentor pairs who shared neither the same gender nor UR status. Public Health Persistence: (completion of a graduate degree in public health, employment in a public health field, or commitment to the field of public health as demonstrated with either a degree or employment in a public health field). AOR = adjusted odds ratio; CI = confidence interval; AAM = African American male; AAF = African American female; PWI = predominately White institution; MSI = minority-serving institution; URF = underrepresented female; URM = underrepresented male; WF = White female; WM = White male; CDC = Centers for Disease Control and Prevention.

public health careers than mentees from MSIs. This may be due to in part to PWIs providing more access to resources such as career services, alumni relations, and other tools particularly in public health. However, MSIs may also provide a broader view of the health needs of UR and underserved people of color, expanding mentee's career options in both health and non-health careers.

Limitations

Due to the small sample size of UR subgroups, we were not able to assess all combinations of mentor–mentee interactions by gender, race, and ethnicity in subgroups. While we recognize that there are differences between various racial and ethnic groups (e.g., cultural), this study did not distinguish between subgroups of Black/African American, Latino, or Pacific Islander interns. In line with other research in this area, this study uses broad categories to define mentee and mentor racial/ethnic identifiers (Aikens et al., 2017). Restrictions made to our data set, such as combining Black/African American and Other-non-White mentors into one overarching UR mentor category in order to mitigate biases

associated with small samples could be avoided with more data and complete demographic information on pre-2012 participating mentors. In addition to increasing the size and completeness of the existing data set, future research could be done to further our understanding of why nonmatch mentor–mentee pairs yield larger number of students pursuing graduate degree. Furthermore, future studies could incorporate psychosocial variables (e.g., intern and mentor self-reported satisfaction scores) as well as intern performance data (e.g., Project Imhotep course grades) into the models (see Allen et al., 2006) in order to better interpret the data. Last, this research does not address the ways in which mentoring relationships might affect nonacademic and noncareer outcomes, such as helping mentees develop emotional competence, self-knowledge, confidence, and other skills related to personal growth.

Conclusion

As calls for a well-trained and diverse workforce of health care professionals continue to mount (Felder et al., 2018; Jean-Louis et al., 2016; Loue, 2010), it is recommended

that policy makers pay close attention to factors that support public health persistence among students of various demographic backgrounds in the design of their interventions. The results from this study indicate that the pathway to public health success can be influenced by the provision of mentors from racially and ethnically diverse backgrounds and having more female mentors. Mentees who had UR mentors (either a female or a male) were more likely to attend graduate school, and mentees who were mentored by female mentors (either a UR female or a White female) were more likely to pursue a graduate degree in public health. Finally, mentees who were mentored by UR females had the highest likelihood of either pursuing a graduate degree in public health or a public health career.

From this study, we have also observed some interesting differences between UR female and male mentees that may inform program practice. Among those interns who pursued graduate degree, a larger proportion of UR female mentees did not match in gender and race/ethnicity with their mentor compared with UR male mentees. One possible strategy to achieve greater success with UR male mentees is to preferentially pair them with female mentors. This work reinforces calls from science and health policy experts for the disaggregation of results on mentoring by race/ethnicity and gender (Alegria & Branch, 2015; Leggon, 2010).

The findings suggest that an intersectional view (i.e., considerations of gender and race) of UR students and mentors may be appropriate for public health training programs such as Project Imhotep (Crenshaw, 1989, 1991; Saw et al., 2018) and that one size fits all models will not work for all UR students of color.

Declaration of Conflicting Interests

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Notes

1. Eighteen interns self-identified as White and were excluded from these analyses.
2. No participants selected "other" as a gender in our sample.
3. According to the National Center for Education Statistics, historically Black colleges and universities are those that

were established prior to 1964 and have the principal mission of educating Black Americans. Hispanic-serving institutions are institutions in which Hispanics represent 25% or more of the full-time-equivalent undergraduate enrollment. "Predominantly White institutions" is the term used to describe institutions of higher learning in which Whites account for 50% or greater of the student population (Lomotey, 2009).

4. Overarching majors were created from four high-level categories: (1) Public Health, (2) STEM (science, technology, engineering, and math) including biological Sciences (neurobiology, microbiology, and molecular biology, etc.), Computer Sciences and Natural Sciences (physics, chemistry, etc.), (3) Health Professions (nursing, medical laboratory technology, etc.), and (4) Other.
5. Calculated as a percentage of interns who pursued a graduate degree ($n = 161$).

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