

## Trends in Public and Global Health Education among Nationally Recognized Undergraduate Liberal Arts Colleges in the United States

Patrick A. Robinson,<sup>1</sup>† Kate K. Orroth,<sup>2\*</sup>† Lauren A. Stutts,<sup>2</sup> Patrick A. Baron,<sup>2</sup> and David R. Wessner<sup>2</sup>

<sup>1</sup>Department of Public Health Sciences, College of Health and Human Services, University of North Carolina at Charlotte, Charlotte, North Carolina; <sup>2</sup>Department of Health and Human Values, Davidson College, Davidson, North Carolina

**Abstract.** The prevalence of public health and global health (PH/GH) curricular offerings appear to be increasing in terms of undergraduate curricula and in the context of liberal arts education in the United States. Liberal arts colleges (LACs) represent stand-alone institutions, which exclusively focus on undergraduate education. The objective of this study was to assess the prevalence of PH/GH study pathways and PH/GH course offerings among LACs. All LACs identified through the *US News and World Report* (USNWR) college rankings were contacted with a survey about the following: formal majors, minors, or concentrations in PH/GH; independent study (IS) pathways for PH/GH; specific PH/GH courses offered; and the number of students graduating in 2016, 2017, and 2018 with formal and IS degrees in PH/GH. Demographic characteristics of the colleges came from the USNWR database. Almost half (43%) of all LACs in our sample offer a PH/GH major, minor, concentration, or IS pathway. Almost all (90%) colleges offer at least one course in PH/GH. Approximately 2,000 students attending these LACs pursued or are pursuing graduation with majors, minors, or concentrations in PH/GH for the years 2016–2018. The number of students pursuing formal PH/GH programs has increased by 25% from 2016 to 2018. Student interest in public health is rising in U.S. LACs, with more students seeking formal curricular or IS PH degree pathways. Public health messages are prevalent even among institutions without formal programs. Colleges without programs should consider integrating public health into their curriculum.

### INTRODUCTION

Protecting public health has become critical to the twenty first century society, requiring an informed populace and educated health workforce to address the health issues we face locally, nationally, and globally.<sup>1–4</sup> Because of the importance of public health in today's society, the Institute of Medicine put out a call for public health education to become accessible to all undergraduate students.<sup>5</sup>

Public health has grown as an academic major in undergraduate institutions over the past two decades.<sup>6,7</sup> It has been ranked as 10th in the list of the fastest growing programs in undergraduate institutions from 2008 to 2012.<sup>8</sup> In the United States, 54 undergraduate institutions offered public health majors in 2013,<sup>9</sup> majors in global health have been emerging over the past decade,<sup>10</sup> and individual institutions have seen increases in the numbers of undergraduate students majoring in public health.<sup>11</sup> Public health education is of particular interest to students from underrepresented backgrounds.<sup>12,13</sup> We have also observed these trends at Davidson College, with increasing numbers of students pursuing public health degrees through our independent study (IS) pathway.

In the United States, liberal arts colleges (LACs) focus on undergraduate education based on broad general knowledge, with most of their degrees in the arts and sciences. They develop general intellectual capacities of undergraduate students, by including a wide range of academic material from the sciences and traditional humanities.<sup>14</sup> Because of the interdisciplinary nature of a liberal arts education, LACs may be among the best institutions to influence the next generation of decision makers of public health strategies and public health policy.<sup>13,15,16</sup>

Hill et al.<sup>17</sup> reported that approximately 42% of U.S. LACs offered a track, concentration, or program in public health or global health (PH/GH) and 100% of the colleges offered at least one course in public health based on websites of the 50 top-ranked LACs during the 2009–2010 academic year. However, these data are now 7 years old, included an exclusive subset of LACs, did not assess the availability of “public health message” courses or IS offerings, and depended exclusively on school website source data.

In this study, we surveyed colleges to provide a broader examination of PH/GH undergraduate education in U.S. LACs. We report on the prevalence of public health majors, minors, and concentrations, and public health message courses among U.S. LACs; describe the characteristics of institutions associated with these programs; and assess secular trends in the number of students at LACs pursuing PH/GH degrees between 2016 and 2018.

### MATERIALS AND METHODS

We measured undergraduate PH/GH-related educational offerings in nationally recognized U.S. LACs in 2016–2017. College offerings evaluated include majors, minors, or concentrations or certificates in the areas of PH/GH, and courses that typically and primarily carry PH/GH messages. Public health or global health IS pathways were also examined. Because of similarities and overlap between PH and GH educational objectives, the investigators addressed PH and GH programs together.

Liberal arts colleges selected for the study were those listed by *U.S. News and World Report* (USNWR) as “national liberal arts colleges”; the USNWR list is limited to educational institutions in the United States.<sup>18</sup> Regional colleges, which grant fewer than 50% of their degrees in the liberal arts or which are primarily 2-year associate degree institutions, are not categorized as LACs. We accessed USNWR's database that provides data on college-specific characteristics. These data are generally reported to USNWR by the colleges.<sup>19</sup> College registrars, academic deans, and occasionally other faculty

\* Address correspondence to Kate K. Orroth, Department of Health and Human Values, Davidson College, 405 S. Main St., Davidson, NC 28035. E-mail: kate.orroth@gmail.com

† These authors contributed equally to this work.

TABLE 1  
College demographic characteristics compared with base population for e-survey colleges

	USNWR-ranked colleges	Survey respondents
Number	235	186
Number ranked*	176 (74.9)	146 (78.5)
Number unranked	59 (25.1)	40 (27.4)
Mean ranking (SD)	87.9 (51.3)	87.2 (52.9)
Enrollment*—mean (SD, range)	1,689 (851, 147–4,525)	1,654 (738, 192–4,348)
Annual tuition*†—mean (SD, range)	\$36,331 (12,238, 0–53,090)	\$38,119 (11,318, 0–53,090)
Annual cost to student (minus financial support)—mean (SD, range)	\$23,315 (3,379, 12,216–33,379)	\$23,214 (3,529, 12,216–33,379)
Coed, <i>n</i> (%)	223 (94.9)	177 (95.2)
Female only, <i>n</i> (%)	9 (3.8)	7 (3.8)
Male only, <i>n</i> (%)	3 (1.3)	2 (1.1)
Have > 32% minority student enrollment, <i>n</i> (%)	37 (15.1)	28 (15.1)
Private, <i>n</i> (%)	215 (91.5)	176 (94.6)
Public, <i>n</i> (%)	20 (8.5)	10 (5.4)
Urban, <i>n</i> (%)	48 (22.4)	40 (23.4)
Suburban, <i>n</i> (%)	91 (42.5)	69 (40.4)
Rural, <i>n</i> (%)	75 (35.1)	62 (36.3)
Region		
Northeast	77 (32.8)	66 (35.5)
Midwest	56 (23.8)	43 (23.1)
South	78 (33.2)	59 (31.7)
West	23 (9.8)	17 (9.1)
Proportion who receive grants or scholarships, mean (SD, range)	0.61 (0.15, 0.32–0.89)	0.59 (0.15, 0.32–0.89)
Proportion international students, mean (SD, range)	0.07 (0.06, 0.02–0.39)	0.07 (0.06, 0.02–0.35)
Proportion acceptance rate, mean (SD, range)	0.58 (0.21, 0.09–1)	0.57 (0.22, 0.1–1)
GPA—mean (SD, range)	3.46 (0.27, 2.7–4)	3.48 (0.24, 2.7–4)
Mid-range SAT scores, mean (SD, range)	1,145 (157, 760–1,480)	1,156 (157, 770–1,480)

SD = standard deviation; USNWR = *US News and World Report*.

\* USNWR ranking and dataset (ref).

† For public schools, out of state tuition is used.

members were contacted by e-mail to request their voluntary participation in the study, and a link to the e-survey was sent. A series of follow-up requests were made to nonresponders. The e-survey was conducted between May 30 and August 7, 2017. Colleges responding by e-mail that they lacked PH/GH offerings were included in analyses as responders. The study was reviewed and approved by the Davidson College Institutional Review Board.

Data collected in the survey included the following: name and location of the college; whether the college offered formally designated majors, minors, or concentrations in PH/GH; IS pathways for majors, minors, or concentration, including the names of these programs; and how many students had graduated with these designations in 2016, 2017, or were on track to do so in 2018. The survey inquired about courses offered during the 2016–2017 academic year, which were likely to carry PH/GH messages. Message courses included the “core” courses (considered central to PH/GH undergraduate education): Introduction to Public Health, Global Health, Epidemiology, Biostatistics or Statistics, Environmental Health, Health Policy, and Health Economics. Additional “message” courses were Bioethics, Maternal/Child/Infant Health, Food Systems/Food Security, Medical Anthropology, Sociology of Health/Medical Sociology, Community Mental Health or Community/Social Psychology, PH/GH Internships, and Capstone Projects/Theses in PH/GH. Because course titles varied from college to college, standard definitions were supplied for guidance in completing the e-survey (available on request). Finally, the investigators asked whether the college was exploring or actively pursuing establishment or expansion of PH/GH curricular offerings.

Data were transferred into a spreadsheet for review and quality assessment and then uploaded into Stata® (ver 14.2; Stata Corp., Austin, TX) for analyses. We conducted descriptive analyses, including demographic characteristics and PH/GH curricular offerings among LACs. We created a PH/GH-weighted course score for core and message courses for each college respondent. Core courses received 1 point. Other message courses were allocated 0.5 point. We identified college characteristics that were associated with majors, minors, concentrations, or IS pathways in PH/GH through bivariate analysis, including *t* tests for continuous variables and  $\chi^2$  tests for proportions. We assessed associations using *t* tests for normally distributed continuous variables, Mann–Whitney–Wilcoxon rank-sum test for non-normally distributed variables and prevalence relative risks for categorical variables using the presence of a formal curricular major, minor, concentration, or IS pathway versus non-pathway as the outcome of interest.

## RESULTS

The 239 colleges categorized as LACs in the 2017 USNWR served as the population base (Supplemental Figure 1).<sup>18</sup> Two colleges ceased to operate as independent institutions and two pairs of colleges operated as if they were single institutions, resulting in 235 potentially analyzable LACs. A total of 186 (79.1%) responded with usable information, 170 completed the survey, and 16 indicated by e-mail that they had no PH/GH offerings. Among the 235 LACs, 176 LACs had USNWR rankings from 1 (“best” ranked) to 174. Fifty-nine

TABLE 2

Prevalence of PH/GH offerings and PH/GH message courses	
	e-Survey (N = 186)
	N (%)
Degree program	
Major	30 (16.1)
Minor	41 (22)
Concentration	15 (8.1)
Any of above	62 (33.3)
Any + IS	80 (43.1)
Core courses*	
Intro to PH	65 (40)
Global health	68 (36.6)
Epidemiology	68 (36.6)
Statistics†	147 (79)
Environmental health	57 (30.6)
Health structures/economics	63 (33.9)
Other public health message courses	
Bioethics	111 (59.7)
Maternal/child health	24 (12.9)
Health policy	59 (31.7)
Food systems/security	53 (28.5)
Medical anthropology	62 (33.3)
Sociology of health	85 (45.7)
Social/community psychology	87 (46.8)
PH/GH capstone	58 (33)
PH/GH practicum	79 (44.6)
Public health course offerings message scores‡	
Health message score—unweighted§	6.1 (4.1, 0–15)
Health message score—weighted§	4.6 (3.1, 0–11)

IS = independent study; PH/GH = public health or global health.  
 \* Core courses are generally based on Gebo et al.<sup>11</sup> with the addition of Introduction to Public Health and Global Health; other message courses are listed in table.  
 † Including bio or medical or Introduction to statistical concepts.  
 ‡ Scores for each of the colleges were calculated based on the message courses reported in the current curriculum.  
 § Unweighted: presence of each course offering is weighted as 1; weighted: each core offering is weighted as 1, each noncore is weighted as 0.5.

LACs had no ranking because of missing information necessary for the USNWR algorithm. The two pairs of colleges that were consolidated had ranking and demographic information averaged. Those who responded to the survey were a good representation of the USNWR-listed LACs (Table 1). Sixty-two LACs (33.3%) offered formal curricular pathways to majors, minors, or concentrations in PH/GH. There were 37 LACs (19.9%) with an IS pathway to a major, minor, or concentration in PH/GH. Nineteen of these 37 (51%) were in LACs that also offered a formal curricular pathway (Table 2). Combining all categories (majors, minors, concentrations, and IS) resulted in 80 (43%) LACs with PH/GH curricular offerings (Table 2). Only one LAC was listed as having a Counsel on Education for Public Health-accredited program<sup>20</sup> and none were listed as members or associate members of Association of Schools of Public Health.<sup>21</sup>

We combined LACs that reported either a formal curricular pathway and/or an IS pathway to majors, minors, or concentrations in PH/GH as “Pathway” schools; those with neither a curricular nor IS pathway were defined as “No Pathway” schools (Table 3). Combining these groups is justifiable because the course-offering profiles were very similar among LACs that offered formal curricular majors, minors, and concentrations and IS, and dissimilar from LACs with no curricular or IS pathways (Supplemental Table 1).

The mean ranking, according to USNWR, for institutions that offered formal or independent pathways for PH/GH undergraduate degrees (Pathway colleges) was lower (had a “better” ranking) than No Pathway colleges (mean ranks: 78 versus 96, respectively,  $P = 0.040$ ), but there was substantial

overlap (Table 3; Supplemental Figure 3). Pathway colleges also tended to have higher mean enrollments (1,765 versus 1,632 students, respectively,  $P = 0.054$ ), were more likely to have 32% or higher minority enrollment (relative risk = 2.0, 95% confidence interval = 1.0–4.1), had a higher proportion of international students, 0.08 compared with 0.06 ( $P = 0.029$ ), were more likely to be ranked than unranked (RR = 1.2, 95% CI = 1.1–1.4), and were less likely to be in the South than the Northeast (RR = 0.63, 95% CI = 0.40–0.97) (Table 3). There were no differences based on cost after financial support, the proportion receiving grants or scholarships, setting, acceptance rate, scholastic aptitude test scores, and high school grade point averages (Table 3).

The frequency of available core PH/GH courses and message courses in Pathway colleges’ was consistently greater than in No Pathway colleges. The mean PH/GH-weighted course scores for Pathway LACs was higher than that for No Pathway LACs, 6.8 compared with 2.9 ( $P = 0.0001$ ) (Table 3). The distribution of PH/GH-weighted course scores differed substantially between Pathway and No Pathway schools (Supplemental Figure 2). However, a substantial number of No Pathway LACs had moderate levels of message course offerings: median course score for No Pathway LACs was 3 and 25% had weighted course scores of 4.5 or above.

Among the core PH/GH courses, Introduction to Public Health, (RR = 3.6, 95% CI = 2.3–5.7), Global Health (RR = 4.2, 95% CI = 2.6–6.6), Epidemiology (RR = 3.9, 95% CI = 2.5–6.1), and Environmental Health (RR = 3.9, 95% CI = 2.3–6.5) were most strongly associated with Pathway LACs. Statistics and Bioethics were associated, but less strongly, because these courses were highly prevalent among both Pathway and No Pathway LACs (Table 3). The noncore message courses, such as Medical Anthropology, Medical Sociology, and Health Economics were generally offered less frequently than core courses by Pathway LACs but were still quite prevalent.

Among the 80 colleges offering PH/GH majors, minors, concentrations, or ISs, a total of 2,053 students pursued or were pursuing graduation with majors, minors, or concentrations in PH/GH for the years 2016–2018 (Tables 4 and 5). Based on the reported 2016–2017 enrollment, adjusted presuming 4 years of matriculation, the average annual proportion of students pursuing PH/GH pathways was estimated to be 19.5/1,000 students per year. During the 3-year reporting period, there was a 25.3% increase (from 601 to 753 students) in students pursuing PH/GH among these 80 colleges, driven primarily by the increase in students pursuing formal curricular majors (from 229 in 2016 to 368 in 2018, a 60.7% increase in this 3-year period). Among the 159 LACs responding to the question, 35% reported they were either actively pursuing or exploring PH/GH program additions. Among Pathway schools, 56% reported they were actively pursuing or expanding programs compared with 18% of No Pathway schools (Supplemental Table 2).

## DISCUSSION

We conducted this study to assess the prevalence of PH/GH curricular offerings among U.S. liberal arts institutions. Among the 186 U.S. liberal arts institutions responding to our survey, 33% of them offer formal curricular PH/GH undergraduate programs (including majors, minors, and concentrations), which increased to 43% when IS pathways are included. Approximately 90% of the responding institutions

TABLE 3  
Factors associated with majors, minors, concentrations, or ISs in PH/GH

Continuous variables	Pathway	No Pathway	P values
	Mean (SD)	Mean (SD)	
Ranking	78 (52)	96 (52)	<b>0.040*</b>
Enrollment	1,772 (649)	1,554 (797)	0.054
Annual tuition (\$)	41,023 (10,050)	35,927 (11,765)	<b>0.002</b>
Annual cost to student minus financial support (\$)	23,443 (3,475)	22,934 (3,656)	0.621
Proportion who receive grants or scholarships	0.58 (0.15)	0.60 (0.15)	0.623
Proportion international students	0.08 (0.06)	0.06 (0.05)	<b>0.029</b>
Proportion acceptance rate	0.54 (0.21)	0.59 (0.22)	0.146
GPA	3.49 (0.25)	3.46 (0.23)	0.494
Mid-range SAT scores	1,180 (152)	1,137 (159)	0.066
Course scores	6.8 (2.5)	2.9 (2.3)	<b>0.0001*</b>

  

Categorical variables	Pathway	No Pathway	Relative risk
	N (%)	N (%)	(95% CI)
Minority ( $\geq 32\%$ of student enrollment)	17 (21)	11 (10)	2.0 (1.0–4.1)
Ranked (vs. unranked)	70 (88)	76 (72)	1.2 (1.1–1.4)
Private (vs. public)	75 (94)	101 (95)	1.0 (0.9–1.1)
Setting: city (vs. rural/suburban)	19 (25)	21 (22)	1.1 (0.6–1.9)
Region—Northeast is reference group			1.0
Northeast	34 (52)	32 (48)	
Midwest	20 (47)	23 (50)	0.90 (0.6–1.3)
South	19 (32)	40 (68)	0.63 (0.4–0.97)
West	7 (41)	10 (59)	0.80 (0.4–1.5)
Core PH/GH courses			
Intro to PH	47 (64)	18 (18)‡	3.6 (2.3–5.7)
Global health	51 (69)	17 (17)	4.2 (2.6–6.6)
Epidemiology	50 (68)	18 (17)	3.9 (2.5–6.1)
Statistics†	72 (97)	75 (73)	1.5 (1.2–1.8)
Environmental health	42 (57)	15 (15)	3.9 (2.3–6.5)
Other PH/GH courses			
Bioethics	57 (77)	54 (52)	1.3 (1.0–1.6)
Health economics/Institutions	39 (53)	24 (23)	2.3 (1.5–3.4)
Maternal/Child health	16 (22)	8 (8)	2.8 (1.3–6.2)
Health policy	39 (53)	20 (19)	2.7 (1.7–4.3)
Food systems/Security	31 (42)	22 (21)	2.0 (1.2–3.1)
Medical anthropology	36 (49)	26 (25)	1.9 (1.3–2.9)
Sociology of health	43 (58)	41 (40)§	1.4 (1.1–2.0)
Social/Community psychology	48 (65)	39 (38)	1.7 (1.3–2.3)
Internship	52 (70)	27 (26)	2.7 (1.9–3.8)
Capstone	48 (66)†	10 (10)	6.8 (3.7–12.4)

ISs = independent studies; PH/GH = public health or global health; SD = standard deviation. Bold type indicates statistically significant at 0.05 level.

\* The Mann–Whitney two-sample rank-sum test was used to compare these variables.

† Denominator N = 73.

‡ Denominator N = 101.

§ Denominator N = 102.

have at least one PH/GH message course in their curriculum. Although the proportion of LACs that have formal undergraduate curricular major programs in PH/GH was modest (16%), the prevalence of the one or more pathways to PH/GH education was high.

The characteristics of LACs with PH/GH offerings were quite varied, so it is difficult to typecast schools with PH/GH offerings. Pathway schools tended to be “better ranked” schools (have lower USNWR ranking numbers) than No Pathway LACs, but there was a substantial overlap among the school rankings. The correlation between ranking and

Pathway schools is interesting and may suggest a relationship between the likelihood of a LAC offering a degree pathway and some of the factors included in the USNWR ranking criteria. However, 25% of the unranked schools had PH/GH pathways, indicating diversity among LACs that offer PH/GH pathways.

TABLE 4  
Colleges offering curricular pathways for PH/GH

Curricular program	IS
Major	32
Minor	9
Concentration	5
Total	37

IS = independent study; PH/GH = public health or global health.

TABLE 5  
Number of students pursuing PH/GH pathways for graduation

Curricular study	2016	2017	2018	Total
Major	229	271	368	868
Minor	239	285	235	759
Concentration	108	121	114	343
Major/Minor/Concentration	576	677	717	1,970
IS				
Major	19	16	12	47
Minor	3	2	1	6
Concentration	3	4	23	30
Major/Minor/Concentration	25	22	36	83
Curriculum plus IS	601	699	753	2,053

IS = independent study; PH/GH = public health or global health.

The associations of increased likelihood of PH/GH degree offerings in institutions with higher levels of minority and international student enrollments is consistent with previous findings that underrepresented students are interested in PH/GH.<sup>12,13</sup> Much of PH/GH education focuses on issues of international and U.S. domestic health disparities, which may increase the relatability of and interest in PH/GH degree programs and offerings among these students. Although insight into these possible associations are limited by a lack of data on the specific students enrolled in these PH/GH degree programs, the institutional numbers on student enrollment support a possible association with student interest in these degree pathways. In addition, setting and measures of academic rigor (e.g., student SAT scores and student acceptance rates) were similar between Pathway and No Pathway schools.

Unsurprisingly, LACs with PH/GH pathways offered a greater number and variety of PH/GH course offerings than No Pathway schools. The most frequently observed core or noncore messages PH/GH courses offered at Pathway LACs were epidemiology, environmental health, (bio)statistics, behavioral health/social psychology, bioethics and health policy. Statistics and bioethics were offered frequently, often as part of non-PH/GH degree programs. Course offerings for No Pathway schools were fewer than Pathway schools, but a quarter of the non-pathway schools had a moderate number of message courses (weighted course scores of 4.5 or higher). Thus, many of the No Pathway schools still offer PH/GH messages through noncore courses. Public health or global health internships and capstone courses were reported for 26% and 10% of pathway and non-pathway schools, respectively.

Notably, there is rapidly growing student interest in public health, as reflected in the 25% growth in student engagement in curricular and IS pathways reported between 2016 and 2018. This was primarily driven by increased student enrollment in PH/GH majors. Moreover, LACs are interested in adding or expanding PH/GH programs—56% of Pathway schools and 18% of No Pathway schools reported that they were discussing or pursuing such additions.

This study has several important limitations. First, it was limited to undergraduate nationally recognized LACs in the United States and does not address other types of institutions. The relatively high response rate of 79% is representative of the overall study population, but the potential for responder bias remains. We did not collect the demographic and academic characteristics of the individual students matriculating in PH/GH. We examined institutional and average student characteristics. Although useful in characterizing the schools, these data do not describe directly the PH/GH student population and we cannot assume that they serve as surrogate measures. Finally, our study was cross-sectional, representing the curriculum year 2016–2017, and so we can say little about trends in PH/GH courses, with the exception of increasing student enrollment in PH/GH pathways over the years 2016–2018.

The study of public and global health has been on the rise in undergraduate institutions for multiple reasons.<sup>7</sup> There is an increased awareness of public and global health problems, such as the recent Ebola and Zika epidemics, and increased awareness of the social context of public health issues, including gender, socioeconomic, and racial inequalities.<sup>22</sup> There is also an expanding public health job market and evolution of public health as a field that includes a wide variety of disciplines and professions.<sup>23</sup> Liberal arts colleges are

uniquely equipped to provide the interdisciplinary lens required to address these problems as students are taught modes of thinking to address scientific and humanitarian questions. Our study indicates student interest and participation in PH/GH programs and messages is growing in the context of a liberal arts education.

Further investigation into the demographics of students who enroll in LAC PH/GH programs would offer additional valuable insights into which students are interested. Post-graduate follow-up with LAC students in PH/GH programs would aid in understanding how these individuals proceed with their education and move through the PH workforce. Finally, it would be useful to learn if the PH/GH messages built into LAC educational programs have an impact on the future promotion of public health concerns.

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Authors' addresses: Patrick A. Robinson, Department of Public Health Sciences, College of Health and Human Services, University of North Carolina at Charlotte, Charlotte, NC 28223, E-mail: [probinsonid2@gmail.com](mailto:probinsonid2@gmail.com). Kate K. Orroth, Lauren A. Stutts, and Patrick A. Baron, Department of Health and Human Values, Davidson College, Davidson, NC 28036, E-mails: [kate.orroth@gmail.com](mailto:kate.orroth@gmail.com), [lastutts@ davidson.edu](mailto:lastutts@ davidson.edu), and [pabaroon@davidson.edu](mailto:pabaroon@davidson.edu). David R. Wessner, Biology Department, Davidson College, Davidson, NC, E-mail: [dawessner@davidson.edu](mailto:dawessner@davidson.edu).

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