
Original Research

Who Are the Next Generation of Genetic Counselors? A Survey of Students

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Genetic counseling students were surveyed about their backgrounds, application process to genetic counseling programs, and career motivations and plans. Program directors from 27 accredited programs were asked to distribute 362 surveys to students. Fifty-two survey items assess demographics; sources of support for pursuing a genetic counseling career (information about genetic counseling, encouragement/discouragement from others); career motivations (reasons for applying and for becoming a genetic counselor); and career certainty. Two hundred and thirty-five usable surveys were returned (64.9% usable return rate). Most respondents were Caucasian females (mean age = 25.4 years). About 13% identified as ethnic minorities, and about one-third reported family histories of a genetic condition(s). Most respondents learned about the field in classes, and most were strongly encouraged by family and friends to pursue genetic counseling. Reasons rated as most important for becoming a genetic counselor included *helping others* and *intellectual stimulation*. Recruitment, training, and research recommendations are given.

KEY WORDS: genetic counseling students; career motives; career plans; student characteristics.

INTRODUCTION

Since the first genetic counseling student cohort graduated from Sarah Lawrence College in 1971, the profession has grown considerably. Currently there are 29 genetic counseling programs in North America accredited by the American Board of Genetic Counselors (ABGC), and they admit approximately 195 students annually. The number of applicants out-

weighs available slots in each program, and it is therefore crucial that individuals chosen for these limited openings are those most likely to complete the program and pursue a career in genetic counseling. In order to assist programs in their student recruitment, selection, and retention efforts, research is needed to assess the types of students who currently are enrolled in genetic counseling programs and to determine those who graduate and practice as genetic counselors. The purpose of the present study was to conduct the first phase of such research. Current genetic counseling graduate students were surveyed regarding their backgrounds, sources of support for pursuing a genetic counseling career, and career motivations and career certainty.

Career Motives and Characteristics of Health Care Professionals

Jenkins (1987) argues that people may select or leave a specific career because of their personality

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characteristics and/or the compatibility of their personal motives and values with working conditions and available satisfactions. Individuals in identical work environments who differ, for example, in their career motivations may vary in their work proficiency and satisfaction. Thus, it is important to assess the motives and backgrounds of students and post-degree individuals and determine the relationship of their characteristics to job performance and job satisfaction. Although no published research has examined genetic counseling graduate students' demographic backgrounds and reasons for choosing a career in genetic counseling, the results of investigations of career motives of other health care professionals may have some applicability.

Hallisey *et al.* (2000) surveyed the career motives of 121 dental students and found that their reasons for choosing a career in dentistry included: positive working conditions; the opportunity to work regular hours and to have an independent practice; student perceptions that they would have no difficulty finding work on graduation; and the opportunity to help others. Crossley and Mubarik (2002) found that many of their sample of 80 dental students placed great importance on personal financial gain, and they were more likely to be motivated by features of the job that relate to status or security rather than to patient interaction.

Crossley and Mubarik (2002) also compared the motives of their sample of dental students to those of 80 medical students and found that the medical students placed more importance on working with others and caring for patients. The opportunity for constant intellectual stimulation was another strong motivating factor for the medical students. Hyppola *et al.* (1998) compared the career motives of 1339 satisfied Finnish physicians (i.e., those who reportedly would enter the field again) to those of 386 dissatisfied physicians (those who would not enter the field if they were beginning their studies again). The satisfied physicians were more strongly motivated by two factors—an interest in people and a wide range of job opportunities. The majority of physicians in both groups reported being greatly influenced in their career choice by two factors: a belief that medicine is a *highly appreciated* profession, and their personal success in medical school.

DiCaccavo (2002) compared the backgrounds of 32 counseling psychologists to those of 32 psychologists who were not in a helping specialty. The counseling psychologists were more likely to report a history of adverse experiences including

emotional neglect and parent–child *role inversion*. Role inversion occurs when a child learns that the only way to relate to his/her parent(s) is to become a *caretaker*, anticipating and fulfilling parental needs. DeCaccavo speculated that in adulthood, many of these individuals enter helping specialties such as counseling psychology because their professional role is similar to their childhood role.

Gambles *et al.* (2003) argued that nurses possess unique personality characteristics that allow them to handle the stresses inherent in their jobs. They administered personality instruments to 178 cancer and palliative care nurses in the United Kingdom and found that they tended to be extraverted, empathic, trusting, open, expressive, insightful, and group-oriented. Since the authors did not include comparison samples of nurses from other specialties or individuals from other professions, it cannot be concluded that these characteristics are unique to cancer and palliative care nurses. Nevertheless, their findings suggest that individual difference variables such as personality characteristics may be related to career choice, job satisfaction, and job proficiency.

Recruitment and Retention of Ethnically Diverse Students

A particularly challenging aspect of student recruitment and retention concerns the need to increase diversity in the genetic counseling profession. Enrollment of ethnic minority students in science-based programs may be limited by several factors including: expense of higher education, declining availability of scholarships and low-interest loans, attractiveness of other career options, and inadequate academic preparation for the pursuit of rigorous science studies (Butler *et al.*, 1991). Taylor *et al.* (2001) described similar obstacles to increasing the number of females of under-represented ethnic groups in science-based careers, specifically gender discrepancies in standardized test scores; lack of academic preparation; not selecting *college-prep* high school courses; lack of mentors; cultural barriers; lack of encouragement; and differences in economic status, interests, and/or access to educational resources. Given such obstacles, it is important to assess the backgrounds, motivations, and career plans of genetic counseling students who identify as ethnic minorities to discern whether they are unique in certain respects.

Purpose of the Present Study

To date, no published research has studied the types of individuals who are enrolled in genetic counseling programs and why they have chosen this field. Therefore, we surveyed first- and second year genetic counseling graduate students enrolled in accredited programs in the United States and Canada. We investigated five major research questions: (1) What are the demographic characteristics of students who are enrolled in accredited genetic counseling programs? (2) What type of support did students receive for pursuing a career in genetic counseling? (3) What are student career motivations, that is, what are their reasons for applying to genetic counseling programs and for becoming genetic counselors? (4) How certain are students regarding their career choice? (5) Do students who identify as ethnic minorities differ from Caucasian students with respect to demographics, support, career motivations, and career certainty?

METHODS

Participants and Procedures

On approval of our university Institutional Review Board in winter 2004, program directors from 27 of 28 genetic counseling graduate programs in North America that were certified by the American Board of Genetic Counselors (ABGC) at the time of data collection, were mailed a packet of research materials. The program in which the first author, ML, was enrolled was excluded because anonymity could not be ensured. Each packet contained a cover letter describing the study as an investigation of student demographics and decision-making processes regarding a career in genetic counseling and requesting the program directors' assistance in distributing the enclosed surveys and return envelopes to every student enrolled in their program. Based on program websites and/or information provided by program directors, the estimated number of students enrolled in these programs during the 2003–2004 academic year was 362.

Potential respondents were asked to return the survey within 5 weeks of its receipt, even if they chose not to participate. Program directors from all 27 schools were sent an e-mail 1 week after that date, thanking them for their assistance and asking them to remind students who had not already done so to return the survey. Of 238 returned surveys, 235 were

completed and 3 were blank (a 65.7% return rate; and a usable rate of 64.9%). Postal codes on return envelopes indicated that at least 25 of the 27 programs were represented.

Instrumentation

We developed a 52-item survey to elicit descriptive information about students enrolled in genetic counseling programs. Questions were developed to assess demographic characteristics, how students first became interested in the field of genetic counseling, what appealed to them about a genetic counseling career, and whether they planned to practice as a genetic counselor on graduation. After several iterations, the survey was piloted on two genetic counseling graduate students in ML's program, and minor revisions were made based on their feedback.

The first portion of the survey contains 17 items that elicit demographic information about student age, gender, race, religious affiliation, relationship/marital status, community size, and annual household income; and educational background (undergraduate major, undergraduate grade point average [GPA], and whether or not the student had obtained another graduate degree). The educational/career background of the students' parents also is elicited (i.e., highest education level, current occupation, and annual income).

The second portion of the survey contains 15 items assessing the students' process of applying to graduate programs in genetic counseling. Respondents are asked how long they had considered a career in genetic counseling before applying to a program, whether they were a student and/or employed part- or full time when they applied, the number of times they applied, to how many programs, and how many times they applied before being accepted. Next, respondents are asked to indicate any other types of graduate programs to which they had applied and whether or not they were accepted by these other programs.

The third portion of the survey contains 12 items assessing reasons for applying to genetic counseling programs. Respondents are asked to indicate on a checklist all individuals and resources from which they first obtained information about a genetic counseling career. They also are asked to list any genetic conditions present in their family and to rate the extent to which their family's genetic history influenced their decision to pursue a career in this field

(Likert-type scale: 1 = *Little or no influence*; 4 = *A great deal of influence*). Next, respondents are asked to indicate from a list those individuals who offered them encouragement to pursue a genetic counseling career and to rate the amount of encouragement they received (Likert-type scale: 1 = *Little or none*; 4 = *A great deal*). Using the same checklist of individuals, they are asked whether they received any discouragement (Yes/No) and from whom.

Respondents then are asked to specify the number of times they shadowed a genetic counselor prior to applying to a genetic counseling program and to list other careers they have considered in the past 5 years. Finally, they are asked to rate the extent to which each of four reasons influenced their decision to apply to a genetic counseling program(s) (Likert-type scale: 1 = *Little or no influence*; 4 = *A great deal of influence*): using a genetic counseling program as a stepping stone before applying for an additional advanced degree; to become a genetic counselor; uncertainty of what other field to pursue; and *other reasons*.

In the next portion of the survey, respondents are asked whether or not they plan to practice as a genetic counselor on graduation and, if not, to describe their career plans. Respondents who indicate that they plan to practice as a genetic counselor are then asked to rate the importance of each of the 10 reasons for becoming a genetic counselor (Likert-type scale: 1 = *Not at all important*; 10 = *Very important*): to help others; for intellectual stimulation; I believe I will make a good genetic counselor; prestigious field; I can work part time; I enjoy science/genetics; it is a 2-year program; I was pressured into it; attractive income level; and *other*.

Next, respondents are asked to rate their certainty that their decision to pursue a master's degree in genetic counseling is the best choice (Likert-type scale: 1 = *Not at all sure*; 4 = *Very sure*). Two final items ask whether respondents would be willing to provide a copy of their personal statement, and whether they would be willing to be contacted about participation in future phases of this research.

Data Analysis

Descriptive statistics (means, standard deviations, medians, ranges, and percentages) were calculated. Responses to open-ended items were content analyzed by ML and independently verified by PMV, a licensed psychologist. Exploratory correlational analyses, chi-square analyses and analyses of

variance were conducted to examine possible relationships between selected survey items.

RESULTS

Demographic Characteristics of Genetic Counseling Students

Student Characteristics

Student characteristics are summarized in Table I. As shown, the vast majority were female (97.4%) and identified themselves as Caucasian (86.8%). Their mean age was 25 (range: 21–55; median = 25), and the majority were either single (55.3%) or married (26.8%). Only nine individuals had children. The size of the community in which students grew up varied (range: <500 to >5000,000), with the largest percentage (24.3%) coming from towns of greater than 500,000 individuals. Eighty percent reported a religious affiliation, and Catholicism was the largest single denomination endorsed (24.2%). Slightly over half of the students reported that they were not currently practicing a religion.

Students listed their undergraduate majors, and these were classified into 1 of 20 categories (about 16% listed two majors). The great majority of students had majors either in general biology/biological science (47.5%) or genetics (22.5%). The remaining students had various majors such as psychology, chemistry, neuroscience, language, health studies, pre-med, sociology, or philosophy. Mean undergraduate GPA for the sample was 3.52 ($SD = 0.27$; range: 2.70–4.0; median = 3.51). Nineteen students (8.1%) reported having a graduate degree, most frequently a masters in Biological Science.

Median annual income for the sample was <\$20,000 (range: <\$20,000 to >160,000). Data obtained for this item are suspect, however, because it appears that at least some students misinterpreted this question and reported their parent's combined income level instead of their own income.

Parent Characteristics

Parent education and income are summarized in Table II. About one-third of the students reported that their mother's highest level of education was a bachelor's degree, and about 27% reported that their father's highest level of education was a bachelor's degree. A larger percentage of fathers (36%)

Table I. Demographic Characteristics of Genetic Counseling Students (*N* = 235)

Variable	<i>n</i>	%	Mean	<i>SD</i>
Gender				
Female	229	97.4		
Male	6	2.6		
Ethnicity				
Caucasian, White	204	86.8		
Asian/Pacific Islander	8	3.4		
Bi-racial	8	3.4		
Chicano/Hispanic/Latino	5	2.1		
African-American/Black	2	0.9		
Alaskan Native/American Native	0	0.0		
Other: Ancient Persian; East Indian; SE Asian	8	3.4		
Age (years)			25.42	3.99
Religious affiliation				
Protestant: Lutheran; Episcopal; Presbyterian; Baptist	65	27.6		
Catholic	57	24.2		
None	54	23.0		
Christian	21	8.9		
Jewish	15	6.4		
Hindu	5	2.1		
Mormon	2	0.9		
Evangelical	1	0.4		
Islamic	1	0.4		
Other: Agnostic; Congregational; Protestant; Eastern Catholic; Unitarian; Zoroastrian	14	6.0		
Practice religion				
Yes	112	47.7		
No	123	52.3		
Relationship Status				
Single	130	55.3		
Married	63	26.8		
Engaged	18	7.7		
Domestic partner	10	4.3		
Separated/divorced	2	0.9		
Other: Long-term relation	12	5.1		
Children				
Yes	9	3.8		
No	226	96.2		
Genetic condition in family				
Yes	73	31.1		
No	160	68.1		

Note. *ns* vary slightly because some students did not respond to every item.

than mothers (26%) held some type of advanced degree. Parents' occupations were classified into one of 10 categories. The largest percentage of mothers had careers in education (27.2%), business/office settings (17.9%), or homemaking (13.2%). The greatest percentage of fathers had careers in business (26.8%) or worked as laborers (14.9%). Combined annual income of parents appears to be fairly evenly distributed. Median income was \$100,001–120,000 (range: <\$20,000 to >160,000).

Table II. Parent Characteristics

Variable	<i>n</i>	%
Mother's highest education		
Some high school	5	2.1
High school degree	33	14.0
Technical school	8	3.4
Some junior college	9	3.8
Some college	19	8.1
Junior college degree	8	3.4
College degree	77	32.8
Some graduate school	12	5.1
Master's degree	55	23.4
PhD	3	1.3
MD	1	0.4
Other: nursing school; DVM; business school; teaching college; typing/secretary	6	2.6
Father's highest education		
Some high school	3	1.3
High school degree	21	8.9
Technical school	13	5.5
Some junior college	8	3.4
Some college	23	9.8
Junior college degree	4	1.7
College degree	63	26.8
Some graduate school	7	3.0
Master's degree	55	23.4
PhD	12	5.1
MD	13	5.5
Other: law school; dental school; CPA; optometry; doctorate of pharmacy; MBA; grade 8; don't know	17	7.2
Parents' annual income (\$)		
<20,000	4	1.7
20,001–40,000	10	4.3
40,001–60,000	30	12.8
60,001–80,000	24	10.2
80,001–100,000	31	13.2
100,001–120,000	29	12.3
120,001–140,000	19	8.1
140,001–160,000	14	6.0
≥160,000	39	16.6

Students' Application Process

Information concerning the students' application process is summarized in Table III. As shown in this table, students had considered a career in genetic counseling for an average of 2.68 years (range: 0–10; median = 2.00) before first applying to a genetic counseling graduate program. At the time of application, approximately 41% of the sample were students, 56% were employed full- or part time, and 3% were both students and employed full time. Students had been out of school an average of 1.45 years (range: 0–25; median = 0.50) prior to applying the first time. The most common occupations at the time of application were laboratory technician/assistant or

Table III. Student Application Process ($N = 235$)

Variable	<i>n</i>	%	Mean	<i>SD</i>
Years considered field	225		2.68	2.13
Status at application ^a				
Student	110	41.4		
Employed full time	116	43.6		
Employed part time	33	12.4		
Other: volunteer; traveling; homemaker; laid-off	7	2.6		
Years since enrolled in school	231		1.45	2.72
Accepted first time				
Yes	189	80.4		
No	36	19.6		
No. of times applied	235		1.22	0.51

^aThree percent of respondents reported simultaneously being a student and working full time.

research technician/fellow (29.8%), and employment in the healthcare field (12.3%).

Overall, students applied an average of 1.22 times (range: 1–4; mode = 1.00) before being accepted by a program. They applied to an average of 4.78 genetic counseling programs the first time that they applied (range: 1–13; median = 5.00), and they were accepted by an average of 1.77 programs (range: 0–10; mode = 1.00). The vast majority of students (80.4%) were accepted by a genetic counseling graduate program the first time that they applied, and they all accepted an offer on first application. Students who were not accepted the first time applied to a greater number of programs in their subsequent attempts (mean = 6.17; $SD = 4.48$; range: 1–22; median = 5.00). These students subsequently were accepted by an average of 2.28 programs ($SD = 1.91$; range: 1–9; median = 1.50).

About 16% of the sample ($n = 38$) also applied to other types of graduate programs, most commonly: biology, environmental biology, molecular biology, medical school, physicians assistant programs, mental health counseling, and genetics doctoral programs. Over three-fourth of these students ($n = 30$) were accepted to an average of 1.29 other types of programs ($SD = 1.06$; range: 0–4; mode = 1.00).

Support for Pursuing a Career in Genetic Counseling

Information Sources

Table IV contains a summary of sources of information about genetic counseling. The students provided 363 responses regarding how they first learned

about genetic counseling. The most common source was high school or college classes (21.8%), followed by being informed by a professor (15.7%).

Although the majority of students reported shadowing a genetic counselor at least once before applying to a program ($n = 179$; 76.2%), almost one-fourth did not do so. Of those who shadowed a counselor, close to half (41.9%) did so several times, and a number of students shadowed a genetic counselor for a semester or longer (38.5%).

Social Support

As shown in Table IV, most students reportedly received either a great or a fair amount of encouragement to pursue a degree in genetic counseling. The mean rating for encouragement received was 3.31 ($SD = 0.85$; range: 1–4; mode = 4.00). The most prevalent sources of encouragement were their family (21.6%) and a friend (17.6%). About one-fourth of the sample ($n = 60$) reported receiving discouragement from at least one person. The source of this discouragement was varied, with the most prevalent being their family (24%), followed by a professor (18.8%).

Career Motivations

Consideration of Other Careers

A great majority of students ($n = 199$; 84.7%) reported considering a wide variety of careers other than genetic counseling within the past 5 years, and most generally listed several alternative careers. Only 17 students stated that they had not considered any careers besides genetic counseling, and 19 students did not respond to this question. A total of 332 careers were listed and they were grouped into nine categories. In the descending order of frequency, they include medicine ($n = 139$; e.g., physician, physician's assistant, nursing); research ($n = 102$; e.g., ranging from laboratory technician to PhD in genetics, forensics, biology, and other science and non-science areas); teaching ($n = 52$; ranging from high school to university level genetics, biology, other sciences, and social sciences); mental health ($n = 32$; e.g., psychology, social work, special education); business/business administration ($n = 24$; e.g., pharmaceutical sales, marketing, public relations, hospital administration); allied health ($n = 20$; e.g., physical therapy, speech pathology and

Table IV. Student Support for Pursuing a Career in Genetic Counseling ($N = 235$)

Variable	<i>n</i>	%	Mean	<i>SD</i>
Source of genetic counseling information				
Class	79	21.8		
Professor	57	15.7		
NSGC website	45	12.4		
Friend	44	12.1		
Co-worker	16	4.4		
Media	16	4.4		
Family member	13	3.6		
Academic advisor	12	3.3		
Job/career fair	10	2.8		
Career counselor	9	2.5		
Respondent was genetic counseling patient	6	1.7		
Family member was genetic counseling patient	4	1.1		
<i>Journal of Genetic Counseling</i>	0	0.0		
Other: genetic counselor; intern-ship; internet search for biology/genetics careers; program websites; during medical school; guest speaker	52	14.3		
Amount of encouragement received ^a	231		3.31	0.85
Received discouragement?				
Yes	60	25.5		
No	173	73.6		
			Sources of encouragement ^b	Sources of discouragement ^c
			<i>n</i>	%
			<i>n</i>	%
Family	209	21.6	23	24.0
Friend	170	17.6	8	8.3
Genetic counselor	120	12.4	4	4.2
Partner	101	10.5	1	1.0
Professor	100	10.4	18	18.8
Employer/boss	73	7.6	12	12.5
Co-worker	69	7.1	5	5.2
Academic advisor	57	5.9	9	9.4
Genetic college graduate student	48	5.0	0	0.0
Career counselor	14	1.4	9	9.4
Other: GC program director; boyfriend; self; supervisor; MD/PhD; geneticist; self; religious individual	5	0.5	7	7.3

^aAmount of encouragement was rated on a Likert-type scale (1 = *Little or none*; 2 = *Some*; 3 = *A fair amount*; 4 = *a great deal*).

^bPercentages were calculated for total number of responses ($N = 966$).

^cPercentages calculated for total responses ($N = 96$).

audiology, occupational therapy, nutrition); public health ($n = 15$; e.g., masters of public health, epidemiology); law ($n = 9$; lawyer, paralegal); bioethics ($n = 4$); and miscellaneous ($n = 35$; e.g., architect, chef/cook, journalist, fitness trainer).

Reasons for Applying to Genetic Counseling Programs

Students rated the influence of four reasons for applying to genetic counseling programs (scale: 1 = *Little or no influence*; 4 = *A great deal of influence*). Almost the whole sample (95.7%) reported that *becoming a genetic counselor* greatly influenced their decision to apply (mean = 3.96; $SD = 0.22$).

The vast majority rated two reasons as having little or no influence: *using a genetic counseling program as a stepping stone before applying to medical school, law school, or another advanced degree* (mean = 1.13; $SD = 0.45$), and *uncertainty of what field to pursue* (mean = 1.30; $SD = 0.61$). About 25% listed *other reasons* that varied in their influence (e.g., right fit; enjoy working with patients; work with people and science; and, to have more career choices and options).

Approximately one-third of the sample ($n = 73$) reported a total of 75 genetic conditions in their families. The specific conditions varied (e.g., cancers, Crohn's disease, diabetes, cystic fibrosis, Ehlers–Danlos, epilepsy, Huntington's disease, Klinefelter's

Table V. Reasons for Becoming a Genetic Counselor ($N = 235$)

Variable	Mean	SD
Reasons ^a		
Enjoy science/genetics	9.31	1.00
Help others	9.26	0.97
Intellectual stimulation	8.96	1.25
Believe I will be a good genetic counselor	8.74	1.10
Prestigious field	5.47	2.25
Two-year program	5.20	2.71
Can work part time	5.18	2.63
Attractive income level	3.60	1.87
Pressured into it	1.15	0.58
Other: patient interaction; good fit for personality; variety in job; clinical work; ability to work from home; combines research and work with people; ability to educate people; policy development opportunities		

^aReasons were rated on a 10-point, Likert-type scale (1 = *Not at all important*, 5–6 = *Somewhat important*; 9–10 = *Very important*).

syndrome, mental retardation, multiple sclerosis, Prader–Willi, sickle cell disease, Tay Sachs, and Turner syndrome). The majority of these students (61.6%) stated that the presence of the condition had little or no influence on their decision to become a genetic counselor (mean = 1.76; $SD = 1.10$; range: 1–4; mode = 1.00).

Reasons for Becoming a Genetic Counselor

Students rated the importance of each of 10 different reasons for becoming a genetic counselor. As shown in Table V, four of these items received strong importance ratings (mean > 8): *I enjoy science/genetics; to help others; intellectual stimulation; and I believe I will make a good genetic counselor*. Reasons that received mean ratings suggesting moderate importance (mean 5–6) include: *prestige of the field of genetic counseling; genetic counseling programs require 2 years to complete; and being able to work part time*.

About two-third of the sample stated that *being pressured into entering the field of genetic counseling* was not at all important in their decision and many commented that they were not pressured. About one-fifth rated *an attractive income level* as not at all important in their decision-making process. Indeed, several wrote comments stating that they did not believe that there was an attractive income level associated with the field. Twenty-five students endorsed *other* reasons that varied in their importance.

Certainty of Career Choice

An overwhelming majority of students (96.6%) stated that they planned on practicing as a genetic counselor on graduation. One individual reportedly did not plan to practice after graduating; another six individuals stated that they were unsure as to whether they would practice; and one individual did not respond to this question. These latter individuals listed alternate plans, including: raising a family; pursuing a non-traditional role; becoming involved in public policy and/or public health genetics; uncertainty as to whether a position would be available in the surrounding community; and pursuing further education. Over 92% of the sample indicated that they were either very sure or fairly sure that pursuing a degree in genetic counseling was the best choice (mean = 3.52; $SD = 0.71$; range: 1–4; mode = 4.00).

Ethnically Diverse Students

The small number of students who identified as ethnic minorities ($n = 31$) relative to Caucasian students ($n = 204$) precluded statistical analyses of between-group differences. However, a visual examination of descriptive statistics suggests that both groups were similar on most variables. Possible exceptions are as follows: All 31 ethnic minority students were female; a greater percentage were currently practicing a religion (73.9% vs. 43% for Caucasian students); most were accepted the first time they applied to a genetic counseling program (91.3% vs. 79.9%); and a smaller percentage reported receiving discouragement for pursuing a genetic counseling degree (17.4% vs. 27%).

Statistical Analyses

A series of analyses were conducted to examine relationships between demographic variables for which there were adequate sample sizes and response variability. Only three analyses yielded statistically significant results. First, GPA was negatively correlated with the number of schools to which a student had applied ($r = -0.18$, $p < .012$), such that as GPA increased, students tended to apply to fewer programs. Second, the amount of encouragement students received was positively correlated with certainty that they had made the right choice to pursue a career in genetic counseling ($r = 0.31$, $p < .001$). Third, students who reported

receiving discouragement had significantly lower mean certainty scores than those who did not receive discouragement, $F(1, 230) = 4.74$, $p = .03$ (mean = 3.35 vs. mean = 3.58).

In order to determine the sample size necessary for a study in which there is an expected effect size, power analysis tables are consulted a priori. Because this was an exploratory study based on a new questionnaire developed specifically for this investigation, there were no directional hypotheses or expected effect sizes and therefore, this initial step was omitted. However, the small number of statistically significant findings prompted a post hoc review of a power table (Wahlstein, 1991) calculated for a power of .80 (as suggested by Cohen, 1992). Information was obtained regarding the necessary sample size to obtain significance for the various statistical tests. The reported sample size for an analysis for a medium effect size with an alpha level of .05 is $n = 85$ (for a small effect size, $n = 783$). The sample size for the present analyses was approximately 235 (n s varied slightly due to withheld responses for some items), suggesting that a significant finding would have been detected had there been a medium effect size, but not a small one.

DISCUSSION

This study was an investigation of the backgrounds and career motivations and plans of individuals enrolled in genetic counseling programs. Two hundred and thirty-five first- and second year genetic counseling students from ABGC accredited graduate programs in North America completed a 52-item survey that assessed their demographic characteristics, the type of support received for pursuing a career in genetic counseling, and their career motivations and career certainty.

Demographic Characteristics of Genetic Counseling Students

Demographics

The majority of students were single, Caucasian females in their mid- to late 20s. A recent Professional Status Survey of full members of the National Society of Genetic Counselors (NSGC) (Parrott *et al.*, 2002) revealed that a majority of respondents were Caucasian women. In the present study, a larger percentage of students identified as non-Caucasian

(13.4%) compared to respondents to the NSGC survey (6%), indicating that ethnic diversity within the field may be increasing. However, a number of ethnic groups were absent from the present sample (e.g., Alaskan Native/American Native), and others were under-represented (e.g., African-American; Hispanic). Additionally, males continue to be under-represented in genetic counseling. Graduate programs must continue their efforts to recruit and retain diverse students and to foster a learning environment that is sensitive to their needs and concerns.

Interestingly, less than half of the sample reported currently practicing a religion. This percentage is lower than those reported in surveys of the general US population. For instance, Gallup polls indicate that 69% of Americans are members of a church or synagogue and 40% regularly attend, while 60% report religion to be very important in their lives (Gallup and Lindsay, 1999). One possible explanation is that strongly religious individuals would experience greater value conflicts about certain patient options (e.g., pregnancy termination) and therefore would be less likely to apply to and/or be accepted into genetic counseling programs. However, it is noteworthy that the most prevalent single denomination reported by students currently practicing a religion was Catholicism. This religion is known for its views regarding a number of genetic tests and technologies. Additional research is needed to assess how religiosity impacts student career motivation and clinical practice. For instance, studies could be done to test the hypothesis that religiously affiliated individuals are more ethically aware/reflective regarding challenges raised by various genetic testing and technology options. Investigations also are needed to assess the influence of religiosity on clinical practice relative to other factors such as personal moral stance, knowledge/understanding of the genetic condition in question, and perceived impact on patient and family functioning.

The findings suggest that students are academically strong and accomplished, as evidenced by their high undergraduate GPAs and the relatively large percentage who had two undergraduate majors and/or graduate degrees. Not surprisingly, the majority of respondents majored in some type of science as undergraduates.

Almost two-thirds of the present sample had one or both parents whose highest degree was either a bachelor's or post-baccalaureate/graduate degree. This percentage is much higher than for the adult US population of which only slightly more

than 25% hold a bachelor's degree (DeLeon, 2003). Across the sample, parents' educational backgrounds ranged from completion of the eight grade to attainment of an advanced degree. These results indicate that a number of students are *first generation* undergraduate and/or graduate students. First generation students may lack *insider information* regarding higher education as compared with students whose parents hold advanced degrees. For example, students who have parents with advanced degrees may have clearer expectations regarding academic and clinical demands, the importance of mentorship and networking, how to balance increased academic responsibilities with one's personal life, etc.

Across the sample, parental occupations were quite diverse. Therefore, possible relationships between parents' occupations and student choice of a career in genetic counseling could not be discerned. Further research is needed to determine whether and how parental educational background affects career choice, satisfaction, and proficiency of genetic counseling students.

Over half of the sample reported parental annual household incomes of at least \$80,000. However, 5% had parents whose annual income was less than \$40,000. Given the expense of graduate education and the limited availability of fellowships and assistantships for genetic counseling students, it is not surprising that many of the students came from affluent backgrounds. Since students were not asked how they were financing their education, this question should be investigated in future studies.

Application Process

The sample appears to approximate a bi-modal distribution with respect to employment prior to applying to genetic counseling programs, that is, about half of the students had previous job experience, and the other half enrolled in a graduate program immediately on graduation from college. The almost equal numbers suggest that neither factor takes precedence in admissions committee decisions.

Employment may help to increase one's career certainty. For instance, most of the individuals who were employed previously held jobs as laboratory technicians or research assistants. Experiences provided by these types of jobs may have influenced their decision to enter genetic counseling which, as some reported, is a field that combines their love of science with the opportunity to work with people. In

contrast, individuals who enter a genetic counseling program directly after completing an undergraduate degree may have limited opportunities to explore alternative career paths. Researchers should investigate whether attrition is higher for students who enroll immediately after obtaining their undergraduate degree versus those who work for a period of time. It is also important that program faculty recognize and accommodate these student differences in their curricula (e.g., some students can draw on *real life work experience*, while others may be more attuned to *text-book knowledge*).

Most students (about 80%) were accepted to a genetic counseling graduate program the first time they applied. However, 20% applied more than once, and to a larger number of programs on subsequent application attempts. Although it makes sense that applying to a greater number of programs may increase an individual's chances of being accepted, further studies are needed to determine whether students make other efforts to improve their applications.

Undergraduate GPA was significantly associated with being accepted the first time an individual applied to a genetic counseling program, suggesting that programs heavily weigh GPA when considering applicants for admission. Although a high GPA may be a necessary criterion, it is not sufficient in a field that also requires strong interpersonal skills and other qualities. Additional factors need to be assessed to determine their relative importance in admissions committees' decisions. For instance, almost one-third of the sample reported a history of a genetic condition in their family. Perhaps admissions committees prefer applicants who have personal experience with a genetic condition. Researchers should investigate this possibility.

Support for Pursuing a Genetic Counseling Career

Information

The most prevalent source of information about genetic counseling was high school or college classes. The NSGC website was also a source for a number of students. In contrast, very few students reported learning about genetic counseling from career counselors. This could mean that students who enroll in genetic counseling programs do not seek career counseling services. Alternatively, career counselors may lack familiarity with genetic counseling and, if

so, program faculty should attempt to educate them about the genetic counseling field.

Almost one-fourth of the sample did not shadow a genetic counselor before applying to a genetic counseling program. This might be due to unavailability of a counselor and/or increased restrictions on patient contact due to recent HIPAA legislation. Studies are needed to determine why applicants do not shadow counselors as well as to discern the importance that admissions committees place on this activity.

Social Support and Career Certainty

The majority of students reported receiving at least a fair amount of encouragement to pursue a degree in genetic counseling, and amount of encouragement was positively correlated with their career certainty. Discouragement was significantly associated with lack of certainty of career choice. One-quarter of students reported receiving discouragement from at least one source, most commonly family members. Some students commented that individuals who discouraged them wanted them to pursue an advanced degree in another field, such as medicine. These findings suggest that social support plays an important role in an individual's career decision and career certainty. Since admission to genetic counseling programs is highly competitive and the programs of study are quite demanding, social support may remain an important factor from the initial application process through completion of the degree.

Career Motivations

Most students rated love of science, helping others, intellectual stimulation, and a belief that they would make a good genetic counselor as very important reasons for their career choice. Few rated an attractive income level as important when deciding on this field. Indeed, many students reported that the income level was not attractive. While these results suggest that, at least initially, intrinsic factors such as helping others are more important than extrinsic factors, long-range effects of low salaries on job performance, satisfaction, and attrition from the profession should be investigated.

Slightly over one-fifth of the sample rated two motives as fairly important—being able to work part time (post-degree), and genetic counseling programs require 2 years to complete. Depending on their

salience for a given individual, these reasons may be insufficient for sustaining career satisfaction. These reasons might also compromise the profession's status and stability (e.g., if significant numbers of individuals participate sporadically in the workforce and in leadership positions). Finally, these motives may indicate that some students perceive genetic counseling as a *convenient* career. Such perceptions likely will be challenged by a rigorous graduate program and by the ever increasing demands to attain and maintain professional proficiency.

The present findings suggest that genetic counseling students have fairly unique career motives. For instance, they differ from dental students who reported being motivated primarily by financial gain (Hallisey *et al.*, 2000). Although similar to medical students who also reported that working with others and caring for patients were important motivating factors (Crossley and Mubarik, 2002), the present sample differs in other ways. For instance, they rated prestige of the field as only somewhat important in their decision to become a genetic counselor, while Hyppola *et al.* (1998) found that physicians rated prestige as greatly influencing their career decision.

DiCaccavo (2002) found a high prevalence of adverse childhood experiences and emotional neglect in her sample of counseling psychologists and concluded that family history influenced their career decisions. In the present study, the proportion of students reporting a family history of some type of genetic condition(s) (almost one-third) likely is greater than for the general population. Surprisingly, however, almost two-thirds of these students reported that the condition had little or no influence on their decision to become a genetic counselor. Perhaps students do not realize the impact of their family history. Alternatively, if the genetic condition occurred in a distant relative and/or was a relatively less severe condition, it might have less impact. Regardless, we believe that these students eventually will need to address the effects of their family history on their clinical practice, for instance, when they encounter a patient or family with the same condition found in their own family. Indeed, such patient encounters may provoke difficult or painful countertransference reactions (cf. Peters *et al.*, 2004). We recommend research to investigate the impact of family history on student and post-graduate performance, and genetic counseling curricula that addresses the potential effects of personal or family histories on clinical practice.

Nearly all of the students reportedly planned to become a genetic counselor after completing their

program. However, only two-thirds reported being very sure that they had made the best career choice. This inconsistency may reflect their recognition that practicing as a genetic counselor is a logical next step after program completion, but not all students were certain that taking this next step constituted the best personal choice.

Most students reported considering several other careers in the past 5 years. In some cases their career considerations appeared to lack coherence with respect to content area, educational requirements, and occupational status. Developmental theory may offer a partial explanation for these inconsistencies. Jensen-Arnett (2000) describes individuals in their late teens and early 20s as being in a period of *emerging adulthood*, a time of exploration in love, work, and worldviews. Rather than settling into adult roles, individuals in this developmental period display change, experimentation, and lack of commitment. To the extent that genetic counseling students are *emerging adults* they may fluctuate greatly in their career certainty and commitment. The impact of these fluctuations on their performance and satisfaction may be challenging for training programs. Perhaps equally challenging are students who reported considering no other careers in the past 5 years. Having entertained no other options, they might experience a great deal of distress should they decide that genetic counseling is no longer viable. They might continue to pursue genetic counseling despite it being a *poor fit*.

Differences Due to Ethnic Background

Responses by students who identified as ethnic minorities seem to be fairly similar to those of the Caucasian students, suggesting that the two groups were comparable with respect to most variables investigated in this study. However, the small number of ethnic minority students limits conclusions that can be drawn from the present findings, and clearly, classifying all ethnic minority individuals into one group ignores unique cultural factors. Ethnic minority students, especially males, continue to be underrepresented and should be targeted in recruitment efforts. Butler *et al.* (1991) describe numerous programs created by Baylor College of Medicine to attract ethnic minority students to careers in medicine and biomedical research. These programs range from elementary school through the post-graduate years and include: supplementary science materials in elementary schools; middle school curricula that in-

tegrates biology, chemistry, physics, and earth and space science instruction; specialized high schools that foster students' interest in health professions and sciences; and summer enhancement programs for undergraduate and graduate students. Similar programs may prove to be effective in cultivating ethnic minority students' interest in genetic counseling. However, it is our contention that the profession must devote continued effort to increasing its visibility and prestige in order to attract greater numbers of ethnic minority applicants. We have found that both males and ethnic minority individuals often are encouraged by their families to pursue high status, well-publicized occupations (e.g., physician, lawyer).

Training programs might enter into partnerships with employers to offer a flexible genetic counseling curriculum to full- and part-time employees (e.g., social workers in IVF counseling, transplant coordinators, research nurses). Genetic counseling has standards that have served the profession well. Those standards should be maintained; therefore, we recommend that full curriculum be required. Evening and weekend courses could be offered and some portion of the students' cases might be obtained at their work sites (using genetic counselors from other centers as supervisors if none are available on-site). Employers would be asked to subsidize student tuition and some of the instructional costs. These types of programs would increase certain types of diversity within the profession as the students likely would be older and more experienced.

Study Limitations

Despite a high response rate (64.9%) by students from at least 25 programs, there are several limitations. Survey data lack the rich detail yielded by a qualitative design. The small number of students who identified as ethnic minorities and the small number of males limits the types of analyses that could be performed. Respondents were not asked whether they were first- or second-year students and therefore any influences due to this factor could not be ascertained. Student motivations and career certainty were assessed only once. Their responses might change over time and with additional experience.

Research Recommendations

In addition to research suggestions made earlier in this paper, follow-up phone interviews with a

subset of the present sample are recommended. Respondents could be invited to elaborate on their personal motives for becoming a genetic counselor, reasons they believe they will be successful in this field, the qualities they believe led to their acceptance to a genetic counseling program(s), and personal and situational factors that might hinder their career success. They also should be asked to describe factors that led to their choice of genetic counseling over other careers and the extent to which they are satisfied with their decision.

Longitudinal studies should be done to investigate whether students' expectations change as they progress in their graduate program and enter the field. Investigations also are needed to determine why certain students do not complete their programs and why some genetic counselors leave the profession. Two possible factors suggested by the present findings are stability of career choice and social support.

Gambles *et al.* (2003) found that palliative and cancer nurses tend to share similar personality characteristics, and concluded that personality profiling may be a useful strategy for predicting job performance and satisfaction. Personality assessments of genetic counselors and students should be done in order to determine the extent to which successful individuals possess similar characteristics. This, in turn, might assist program directors in selecting those applicants that are most likely to become competent, satisfied genetic counseling professionals. Finally, replication and extension of this study to include samples of genetic counselors from other countries would help to identify "universal" counselor characteristics, motives, and backgrounds and those that are unique due to different educational and historical factors.

CONCLUSIONS

It is encouraging that ethnic diversity appears to be increasing among genetic counseling students, albeit with notable absences of individuals from certain cultural groups and males. Also encouraging is the high level of student academic achievement. Students generally receive strong encouragement to pursue a genetic counseling career, their career certainty is strong, and their major career motives—love of science, intellectual stimulation, and helping

others—seem realistic. Based on the present findings, we predict that the next generation of genetic counselors will add to the vitality of the profession.

ACKNOWLEDGMENTS

This study was completed in partial fulfillment of the requirements for the first author's Master of Science degree from the University of Minnesota. The authors would like to thank the genetic counseling graduate students who made this study possible by their participation.

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