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Analysis of Financial Barriers Experienced by Prospective Genetic Counseling Students

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Analysis of Financial Barriers Experienced by Prospective Genetic Counseling Students

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF SCIENCE

in Genetic Counseling

by

Dexter Lee

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ABSTRACT OF THE THESIS

Analysis of Financial Barriers Experienced by Prospective Genetic Counseling Students

by

Dexter Lee

Master of Science in Genetic Counseling

University of California, Irvine, 2021

Professor Fabiola Quintero-Rivera, Chair

Every year, applicants to genetic counseling graduate programs are burdened with the upfront cost of the application process. In addition to application fees, there are also "hidden costs" of applying, including graduate exam fees, prerequisite coursework, travel expenses for interviews, and time off from work to obtain relevant volunteer experiences. These costs can add up and become a hurdle for many applicants, especially those with fewer resources. Furthermore, the high costs of applying can become a barrier to diversifying the workforce. Because the financial barriers of the application process have not been extensively explored through empirical research, the aims of this study were to address the following: 1) What were the median application costs for prospective students applying to genetic counseling programs in the United States? 2) What aspects of the application process were most expensive? 3) Were there differences between individuals of historically underrepresented racial and ethnic backgrounds in medicine (hURM) and non-underrepresented applicants with respect to total application costs, accrued volunteer hours, parental education, and familial financial assistance? A survey was developed to capture demographic information, application history, application and preparation

expenses, time volunteering, and financial resources. A total of 383 responses were analyzed. Median total application costs for respondents who attempted one application cycle were $2,634 (n = 264, range: $202 - $25,693). For those who attempted twice, median total costs were $4,762 (n = 84, range: $909 – $24,206). Interview-related items had the highest median cost (one application cycle: $879, range: $0 - $6,007; two or more application cycles: $1,310, range: $0 - $7,307). Among those who applied to more than one cycle, hURM respondents (n=19) had higher median total costs ($6,713 versus $4,762, p = 0.03) and lower median total volunteer hours (246 versus 381 hours, p =0.03) than those of non-underrepresented individuals (n = 100). Additionally, parental education level differed (p = 0.04) between the two groups. Higher parental education level was correlated with a higher percentage of familial financial support (p = 0.0009). Stakeholders within the profession should implement strategies to reduce financial barriers and the resulting inequities in the application process, which will improve access to genetic counseling graduate programs and enhance efforts to diversify the workforce.

I. INTRODUCTION

1.1 Growth of the Genetic Counseling Profession

The genetic counseling profession has significantly evolved and expanded since the inception of its first Master's training program at Sarah Lawrence College in 1969 (Stern, 2009). The number of certified genetic counselors in North America has nearly doubled since 2010, increasing from 2,762 in 2010 to 5,172 in 2020 (American Board of Genetic Counseling, 2020). According to the 2020 National Society of Genetic Counselors (NSGC) Professional Status Survey (PSS), the workforce is expected to grow by 100% over the next ten years, with over 10,000 certified genetic counselors in the United States by 2030 (National Society of Genetic Counselors, 2020). This immense growth can be attributed to several factors, including technological advances in genetic sequencing, increasing knowledge of genetic predisposition to rare Mendelian and common complex diseases, and the vast array of genetic testing available on the market (Dobson DaVanzo & Associates, 2016). As genetics increasingly becomes an integral component of healthcare and personalized medicine, the demand for genetic counselors will continue to grow.

1.2 Diversity Gap

Despite the promising outlook, the profession continues to suffer a significant diversity gap. Out of 2,675 respondents to the 2020 PSS (about half of the estimated number of practicing genetic counselors), 90% identified as White, 5% as Asian, 2% as Hispanic, Latin-American or Latinx, and 2% as Black or African American. These proportions are in stark contrast with the United States' demographics; according to the

2019 American Community Survey, the United States is approximately 72.0% White, 5.7% Asian, 18.4% Hispanic, Latin-American or Latinx, and 12.8% Black or African American (U.S. Census Bureau, 2019). While the healthcare field at large does not reflect the racial and ethnic makeup of the country, the genetic counseling profession is less diverse than other healthcare professions such as physicians, social workers, physician assistants, registered nurses, occupational therapists, physical therapists, and clinical lab technicians (Sarmiento, 2019). In addition to the homogenous racial and ethnic landscape, genetic counseling remains a female-dominated field, with only 5% of 2020 PSS respondents identifying as male. This racial and gender imbalance reflects an ongoing concern that the profession has not kept pace with the nation's changing demographics, amplifying the disconnect between genetic counselors and the populations they serve.

1.3 Importance of a Diverse Workforce on Healthcare

It is well documented that racial and ethnic minorities in the United States have persistent and significant health disparities compared to their White counterparts (Baciu et al., 2017). This was further exacerbated by the ongoing coronavirus disease 2019 (COVID-19) pandemic, which has disproportionately infected and killed more people of color, especially within the African American, Latin-American or Latinx, and Native American communities (Kullar et al., 2020; Macias et al., 2020; Tai et al., 2021). Racial health disparities are not only detrimental to the overall well-being of a nation, but can also precipitate substantial economic loss. It is estimated that during the years 2003 - 2006, the U.S. expended in excess of $229 billion in direct medical care and lost more than $1 trillion

in illness-related lost productivity and premature death due to health inequalities (LaVeist et al., 2011).

To address the medical and economic impact of racial and ethnic health disparities, a growing body of literature underscores the importance of diversity in health professions. While the term "diversity" is often used to describe various racial and ethnic backgrounds, it can also extend to other dimensions, visible and invisible, such as gender, age, sexual orientation, health history, religious affiliation, disability, immigration status, and socioeconomic status. All of these multifaceted aspects of a patient's identity, along with their race and ethnicity, influence how patients communicate symptoms, cope with disease, and seek treatment (Betancourt et al., 2003). A diverse workforce is associated with providers who can effectively identify, understand, and navigate socio-cultural differences, thereby strengthening its cultural competence and responsiveness (Sullivan, 2004). There is evidence that also shows that providers from underrepresented backgrounds are more likely to serve in medically underserved communities and treat more patients who are under-or uninsured (Keith et al., 1985; Komaromy et al., 1996; Moy & Bartman, 1995).

In addition, the U.S. is a mosaic of over 300 spoken languages, with about 20% of Americans speaking a language other than English at home (U.S. Census Bureau, 2019). Language barriers between patient and provider can result in poor information exchange, incomplete patient education, lack of informed consent, under-utilization of healthcare, and a lower level of preventative care (Sullivan, 2004). In a systematic review, 76% (25/33) of studies found improved health outcomes for limited English proficient (LEP) patients when they received care from non-English language-concordant providers (Diamond et al.,

2019). Most notably, these LEP patients also were more likely to disclose personal health information, asked questions about their medical management, and had a better comprehension of their diagnosis, in contrast with those who received care from English-speaking providers utilizing an interpreter (Baker et al., 1998; Green et al., 2005; Villalobos et al., 2015; Baker et al., 1996). A diverse healthcare workforce that resembles the multilingual population it serves would therefore enhance its language competence and lead to better health outcomes.

Recent efforts have also emerged to better understand whether race-concordance between patient and provider can influence the health outcomes of minority patients. Some studies found that patients reported better communication, higher satisfaction with care, and increased compliance with health services when they encountered healthcare providers of the same racial background (Cooper et al., 2003; Alsan et al., 2018). Other studies observed little to no evidence supporting the proposed benefits of racial concordance (Meghani et al., 2009; Oguz, 2019). These conflicting outcomes can be attributed to several limitations, including methodological differences and a small sample size of minority providers in the studies. Furthermore, other factors besides racial concordance, such as language, trust, and site of care can influence patient-provider relationships and health outcomes of minority patients. While additional research is warranted to clarify these inconclusive findings, diversifying the healthcare workforce remains one of the leading strategies in the country to help strengthen the social-cultural and linguistic competencies of its health care workers (Sullivan, 2004; Jackson & Garcia, 2014; U.S. Department of Health and Human Services, 2011). The National Human Genome Research Institute (NHGRI) within the National Institutes of Health (NIH) also recently

announced plans to enhance the diversity of its genomics workforce by 2030 (The National Human Genome Research Institute, 2021).

1.4 Barriers to Diversity in the Genetic Counseling Profession

Several barriers hinder the effort of increasing diversity within the genetic counseling profession and impede prospective minority students from applying to genetic counseling graduate programs. Barriers that have been reported include the following: lack of awareness, as evidenced by the observation that many minority genetic counselors stated that they "stumbled upon" this career by chance (Chen et al., 2017); minimal understanding among high school counselors and college career advisors about the profession as a career option (Kumaravel et al., 2011; Carroll, 2017); lack of appeal due to concerns of low salary and respect in comparison to other health professions (Schoonveld et al., 2007); and lack of diversity within the existing population of students, mentors, and faculty, which can lead to a feeling of exclusion and isolation among minority students (Schoonveld et al., 2007).

In addition to the obstacles mentioned above, another frequently cited barrier to the genetic counseling profession is high tuition cost. Rising costs of medical education have also been cited as a barrier to diversity in other health professions (Toretsky et al., 2018; Kang & Ibrahim, 2020). Kuhl et al. (2014) reported that the median tuition for the entire genetic counseling program in the U.S. for students who graduated between 2008 - 2012 was approximately $40,000 - $49,000, with a range of less than $5,000 to $120,000 or more. Among the genetic counselors who responded to the Kuhl et al. survey, the median total debt after graduation when all expenses were taken into account was about $40,000 -

$50,000, with a range of $0 to $150,000 or more. Furthermore, the financial strain of attending graduate school, in general, did not show any signs of improvement as debt from federal student loans for graduate students nationwide increased by 7% between the 2010 - 2011 and 2017 - 2018 academic years (Miller, 2020). While entry-level compensation for genetic counselors has recently increased significantly from prior years, it still lags behind other health professions of master's degree level. The average starting salary for a full-time genetic counselor who graduated in 2019 was $75,319 (National Society of Genetic Counselors, 2020). For recently certified physician assistants and nurse practitioners of the same year, the average was $97,668 and $104,000, respectively (National Commission of Certification of Physician Assistants, 2019; American Association of Nurse Practitioners, 2019). This compensation gap could further complicate diversity recruitment by making the profession financially unappealing to prospective genetic counseling students, especially for those who may require a higher starting salary to help them pay off their high tuition debt.

Prospective students also have to overcome the barrier of the admission process to a genetic counseling graduate program. As of May 2021, there were 55 accredited genetic counseling programs in North America, a significant increase from 33 programs in 2011 (Accreditation Council for Genetic Counseling, 2021), with more programs in development. Admission to a program is a competitive and stressful process for many prospective students; over 2,000 applicants registered in the 2021 National Matching Services (NMS) to fill only 553 spots across 55 programs (National Matching Services, 2021). Prospective students also need to fulfill a list of specific admission requirements. Applicants must have a bachelor's degree prior to matriculation and meet the program's minimum

undergraduate grade-point average (GPA) criterion, which varies by university. Additionally, each program has its distinct prerequisites, including personal statements, academic coursework, exposure to the genetic counseling profession, letters of recommendation, and other recommended volunteer and/or professional experiences to demonstrate an applicant's interpersonal, communication, and counseling skills. Furthermore, many applicants also have to fulfill the Graduate Record Examination (GRE) requirement; over the last few years, many programs/universities have been re-evaluating this requirement because it may limit the diversity of the applicant pool. Selected applicants are then invited to interview at individual programs; interviews are usually held from January to early April. After the interview process, programs and applicants who were interviewed by at least one program each submit a rank order list of preferred placements to the NMS, which later announces the Match results by the end of April.

Prospective students encounter another barrier during the application process: application costs. The numerous requirements and their accompanying expenses can quickly add up. Besides the standard application fees and the recently added NMS registration fee ($100), one of the common expenses involved in the application process is the GRE, which costs $205 for each exam attempt and $27 to send score reports for each additional institution after the exam (ETS, 2021). Due to the competitive nature of the application process, some applicants incur additional costs for exam preparation courses, such as Princeton Review and Kaplan, that can range between $400 - $2,500 depending on the level of student support. Another expense for the application process is coursework. Most life science degrees cover most programs' coursework prerequisites; however, applicants with non-science undergraduate tracks need to shoulder additional expenses to

complete unfulfilled prerequisite classes or, in some instances, a post-baccalaureate program. Finally, selected applicants are further burdened with the cost of interview-related items, such as airfare, transportation, and lodging. Affordable airfare and accommodation can be challenging to book, especially when applicants often receive interview invitations only a few weeks in advance.

In addition to the costs described above, there are other substantial costs that prospective students bear to become competitive applicants. For instance, obtaining relevant volunteer experience valued by programs (i.e., shadowing a genetic counselor, crisis counseling, advocacy work, caring for individuals with a disability or medical conditions) may involve expenses associated with background checks, training, meals, and transportation to the volunteer site. Some applicants may incur other expenses such as interview attire, dependent care, technology, conferences, educational workshops, and loss of income from unpaid time off needed to obtain these various experiences. These "hidden costs" along with the standard fees of the application process can become prohibitively expensive for many prospective students. Unlike tuition, for which programs can offer financial aid such as scholarships and stipends to offset the cost, there is usually no comprehensive aid for prospective students to cover the full spectrum of application costs. Applicants who do not have the financial means to pay for the upfront cost of the application process have to face a difficult decision: either limit the number of schools to which they apply and, consequently, decrease their chances of being interviewed, or not apply at all. More importantly, committed applicants who are not admitted in their initial application cycle and choose to reapply face some of these expenses more than once.

Few studies have explored the impact of the financial burden of the application process on prospective genetic counseling students. Based on a review of 43 past and ongoing projects on diversity, inclusion, cultural competency, and equity (DICE) efforts, Channaoui et al. (2020) found a small subset (n = 3/43 or 7%) that were related to the financial burden of genetic counseling training and professional opportunities, none of which were related to the application process. The authors acknowledged that there were likely other ongoing DICE efforts not captured in the study, and the 43 projects examined only represent a portion of those efforts. One recent study from Stoddard et al. (2021) found that genetic counseling students who enrolled in accredited programs in North America for the 2018 - 2019 academic year spent, on average, $1,648 for application costs in their acceptance year. While Stoddard et al. (2021) assessed overall application costs reported by participants who were ultimately accepted into a genetic counseling program, a breakdown of the various application expenses, including direct and indirect costs, has yet to be investigated. Additionally, there is a lack of data comparing application costs for individuals who were and were not admitted to a genetic counseling program, and if there is a difference in cost related to applicants' demographic characteristics.

1.5 Purpose of the Study

The 2019 Diversity and Inclusion Task Force of the NSGC encouraged further investigation of the financial burden that prospective genetic counseling students face and how to best support them with financial assistance (Channaoui et al., 2020). Therefore, our study aimed to address the following: 1) What was the median application cost for prospective students when they applied to genetic counseling programs in the U.S.? 2)

What type of expense was the highest during the application process (e.g., application fees, exam preparation, and registration fees, coursework, interviews)? 3) Were there differences between applicants of historically underrepresented racial and ethnic backgrounds in medicine (hURM) and non-underrepresented applicants in the categories of total application costs, accrued volunteer hours, percentage of total application costs covered by familial financial assistance, or parental education background?

II. METHODS

2.1 IRB Protocol

This research protocol was determined to be exempt using the Institutional Review Board of University of California, Irvine (UCI) Exempt Self-Determination form. A letter of confirmation for the self-determination process from the UCI Human Research Protections Program (HRPP) can be found in Appendix A.

2.2 Recruitment

The flyer (Appendix B) for participant recruitment was posted on six online forums from January 22, 2021 to January 31, 2021: Genetic Counseling Safe Space Discord Server, Minority Genetic Professionals Network (MGPN), Twitter, LinkedIn, and Genetic Counseling and Clinical Genetics on Reddit. A reminder was sent out to each of these online forums approximately one month after the initial flyer post. The survey remained open until March 31, 2021.

Emails with the recruitment flyer, a brief description of the study, and a link to the anonymous online survey were also sent out to principal members of the UCI and UCLA genetic counseling student interest groups (SIG) and faculty advisors on the American College of Medical Genetics and Genomics (ACMG) SIG listserv throughout February and March of 2021, requesting the leaders to distribute the study invitation to their respective SIG members. The UCI program director also emailed the Association of Genetic Counseling Program Directors (AGCPD) on February 11, 2021, asking them to distribute the study

invitation to their current students, alumni, and, if applicable, genetic counseling SIGs at their respective institutions.

2.3 Consent

Implied informed consent was obtained from respondents prior to their participation in the survey. A study information page was displayed to the respondents after clicking the anonymous online survey link, which contained the contact information for both the lead researcher and the faculty sponsor, the purpose of the study, the eligibility requirements, data storage, optional raffle entry after survey completion, and the contact information for the UCI Institutional Review Board. By clicking on the "Agree" button at the bottom of the study information page, participants indicated that they consented to participate in the study.

2.4 Survey

A 41-question anonymous online survey (Appendix C) in English was created through UCI's Qualtrics system. The survey questions included multiple-choice questions, matrix tables, sliders, and free-response text boxes. Additional instructions were given for slider-style questions; for example, if the computer or mobile device could not mark the exact numerical amount on the slider, respondents were asked to select the next highest value that their devices allowed. Eight questions were embedded with branch logic to enable participants to further elaborate on their responses, if applicable. Survey questions were divided into three sections: section 1 collected information regarding participants' history of applying to genetic counseling programs in the United States for admission from

Fall 2005 to Fall 2020; section 2 assessed participants' various expenses throughout the application process (Table 1), including a breakdown of costs associated with application fees, graduate exams, coursework, interviews, miscellaneous items, and other expenses that were not specifically addressed in the survey, along with their total hours spent in obtaining certain types of relevant volunteer experiences (e.g., shadowing/interviewing a GC, healthcare, working with individuals with disabilies/medical conditions, advocacy, counseling, other); section 3 inquired about participants' demographic information, including the age when they applied, gender identity, (lesbian, gay, bisexual, transgender, and queer (LGBTQ+)), parent/caregiver status, race, disability status, religious affiliation, education level when they applied, parents' education level, language skills, employment status when they applied, household income, and level of financial assistance from families to offset their total application costs.

Two modifications were made after the survey went live on 1/22/2021. First, the expense for transcript fees was added to the miscellaneous category on 1/23/2021. At the time this item was added, there were 84 (21.9%) respondents who had completed the survey and did not see transcript fees as part of their miscellaneous expense question. Of these 84 participants, seven (8.3%) reported transcript fees as part of their free-responses in the "other category." Second, on 2/11/2021 the text "EXAMPLE QUESTION. Click the right arrow to continue" was added to a still image of a slider-style question on the instruction page after question 7(Appendix C survey page 6). This was added after a respondent emailed the lead researcher, noting that the slider-style question on the still image did not work. It was clarified to the respondent that the still image was not an actual question but was only used to illustrate an example of a slider-style question as part of the

instruction page. The text was subsequently added for clarification to avoid similar confusion for future participants. At the time the text was added to the still image, 306 responses were recorded, of which 203 were marked as complete and 103 as incomplete.

Upon completion of the anonymous online survey, participants had the option to enter a raffle to win one of 100 $5 Starbucks gift cards by providing their email addresses. Answers to survey questions were not linked to the email addresses, which were only used to notify raffle winners.

Table 1. Breakdown of application expenses by categories

Categories	Expenses inquired in the survey
Application	Total application fees, National Matching Services registration
Exams	TOEFL/IELTS (for international students), GRE, score reports, supplementary study materials, exam prep courses (online or in-person)
Coursework	Post-baccalaureate program (for non-science degree participants), classes (taken after your last degree to fulfill specific prerequisite), textbooks, technology
Interviews	Airfare, transportation, food, lodging, attire, technology for virtual program interviews
Miscellaneous	Conferences, workshops (online or in-person), transcript
Other	Free-response text for respondents to enter additional expenses not covered by the survey

2.5 Participants

Individuals were eligible to participate in the study if they applied to at least one accredited genetic counseling program in the U.S. for admission to a Fall 2005 - Fall 2020 academic term, regardless of the outcome of their application(s). The timeframe denotes

the academic term for which participants applied to begin the genetic counseling program if admitted, not the year they submitted the application materials.

A total of 922 recorded responses were collected between January 22, 2021, and March 31, 2021, of which 218 were excluded from data analysis due to incomplete responses. Participants who did not reach the end of the survey page after 48 hours of their last survey responses were marked as incomplete. Four quality control survey questions (number 6, 7, and 9) were utilized to screen for inconsistent responses, of which a total of 321 were identified and subsequently removed after a thorough examination. Inconsistent responses included those who reported greater than $400 for NMS fee (which would not have been possible), selection of multiple application cycles with the same academic term, and discrepant entries between the number of interview offers and the number of programs applied. Out of 321 inconsistent responses, 275 were recorded from 3/19/2021 to 3/23/2021 and were suspected to be bot-generated. As a result, data analysis was conducted on the remaining 383 responses (41.5% usability rate).

2.6 Protection of participant privacy

Study participants were asked to complete an anonymous online survey. Participants accessed the online survey link through a computer or mobile device. Participants' responses to the survey questions were protected throughout the entire data collection and stored securely and confidentially.

2.7 Data analysis

Data analysis was done using JMP Pro version 15.0.0. Descriptive statistics were used for demographic information, number of programs applied and interview offers, total application costs, breakdown of application expenses, and volunteer hours. Univariate analysis of the difference between subgroups was performed using Pearson's chi-square test, Wilcoxon Rank Sums, and Kruskal-Wallis non-parametric tests. A p-value of less than 0.05 was considered statistically significant. The p-values shown are reported with no correction for multiple comparisons. Data from free response questions were categorized and grouped into themes.

Several variables were consolidated to allow for fewer categories and better statistical power. "Cycle" refers to the number of application cycle(s) that respondents previously attempted (1, 2, 3, or 4) and data were re-coded into "one cycle" and "two or more cycles." "Academic cycle" refers to the academic term for which respondents last applied to begin the genetic counseling program if admitted. Academic cycle was re-coded into four categorical variables in subsequent analysis: Fall 2020, Fall 2015-2019, Fall 2010-2014, and Fall 2005-2009. Fall 2020 was evaluated alone due to the impact that the COVID-19 pandemic had on travel during this academic cycle. Many applicants were not required to travel for some, if not all, of their program interviews, depending on when interviews were conducted relative to the timing of the COVID-19 lockdowns imposed by various states. Travel expenses would vary significantly depending on the mode of interview (in-person versus remote). "Status" denotes the respondent's current admission standing and was re-coded into three categorical variables: "admitted" encompasses respondents who graduated, were actively enrolled in a genetic counseling program in the

U.S. at the time of survey participation or declined admission after being matched or admitted; "interviewed, not admitted" denotes respondents who received at least one interview offer but were not admitted or matched to a genetic counseling program; and "not interviewed" represents respondents who applied to at least one genetic counseling program but were not offered an interview.

To account for the small numbers of individual minority groups, respondents' racial and ethnic backgrounds were re-coded into two binary categorical variables: "hURM" (historically underrepresented in medicine) and "not underrepresented." Underrepresented is defined by the National Institute of Health's (NIH) diversity statement as individuals from specific groups that are historically underrepresented in medicine and health-related sciences, such as racial and ethnic background, disability status, and socioeconomic status (Notice of NIH's Interest in Diversity, 2019). For the purpose of this study, "hURM" only encompasses historically underrepresented racial or ethnic backgrounds, which NIH defines as individuals from one of the following groups: Black or African American, Hispanic or Latino/a-American/Latinx, American Indian or Alaska Native, Native Hawaiian, and Pacific Islander. Multiracial respondents were categorized as "hURM" if one or more of their racial or ethnic identities are from the preceding list. Participants who did not identify with any of the NIH's definitions of historically underrepresented racial and ethnic groups were categorized as "not underrepresented."

Finally, household income (Appendix E) was excluded from data analysis due to a lack of clarity in the survey regarding this variable. The survey did not explicitly define household income as the sum of all earnings from every member with whom respondents

resided at the time of their last application cycle. Moreover, the survey did not include a question inquiring about the number of respondents' household members. For instance, 68 participants reported their household income as $30,000 - $39,999; it is unclear whether that amount reflects a household of only one member or the combined income of multiple household members at the time of respondents' last application cycle.

III. RESULTS

3.1 Demographic characteristics of all participants

A total of 383 completed responses were analyzed. Table 2 summarizes participants' demographic characteristics. Of these, 356 (93.0%) were female, 22 (5.7%) were male, one (0.3%) was genderqueer, and one (0.3%) was non-binary. Those who preferred to self-describe identified as gender fluid (0.3%) and gender nonconforming (0.3%). A majority of the respondents were between 20-29 years old (n = 363, 94.8%) when they last applied to genetic counseling programs. The majority of the respondents (n = 368, 96.1%) were not a parent or caretaker of dependents when they last applied to genetic counseling programs. About 16% (n = 61) of the respondents identified as LGBTQ+. Thirty (7.8%) respondents identified themselves as someone with a disability. For religion, half of all respondents had no religious affiliation (n = 192, 50.1%), followed by Christian (n = 91, 23.8%) and Catholic (n = 60, 15.7%). Within the cohort, English (n = 374, 97.7%) was the most common native language reported, followed by Spanish (n = 11, 2.9%), French (n = 7, 1.8%), Mandarin Chinese (n = 3, 0.8%), and Hindi (n = 3, 0.8%). Other than English (n=374, 97.7%), the top five proficient languages reported by the respondents were Spanish (n = 41, 10.7%), French (n = 21, 5.5%), Mandarin Chinese (n = 9, 2.4%), and German (n = 9, 2.4%). A complete list of proficient and native languages reported can be found in Appendix D.

Approximately 59% (n= 225) of the cohort had a bachelor's degree when they last applied to genetic counseling programs. About 35.0% (n = 134) were in the process of obtaining a bachelor's degree, and 6.3% (n = 24) reported having a master's degree or

higher when they last applied. The majority of participants (n = 308, 80.6%) reported having at least one parent with a bachelor's degree or higher. Approximately 63% of the mothers and 70% of the fathers of respondents had at least a bachelor's degree or higher. Five participants reported that they did not know one of the parents' educational backgrounds. Two hundred and sixty-nine respondents (70.2%) reported being employed when they last applied, of which 195 respondents (72.5%) were full-time employees (defined as≥ 35 hours/week). The top three industries in which participants were employed were healthcare (with patient interaction) (n = 69, 25.7%), genetics laboratory (n = 51, 19.0%), and retail service (n = 29, 10.8%). One hundred sixty-nine (44.1%) respondents were full-time students.

Table 2. Participant's demographic characteristics at the time of their last application cycle

		n=383	**Percent (%)**
Gender	Female	356	93.0
	Male	22	5.7
	Genderqueer	1	0.3
	Non-binary	1	0.3
	I prefer to self-describe:	2	0.5
	Gender fluid	1	0.3
	Gender nonconforming	1	0.3
	I prefer not to answer	1	0.3
Age	18-20	3	0.8
	20-29	363	94.8
	30-39	13	3.4

	40-49	4	1.0
Parent or caretaker of dependents	Yes	15	3.9
	No	368	96.1
LGBTQ+	Yes	61	15.9
	No	309	80.7
	I prefer not to answer	13	3.4
Disability	Yes	30	7.8
	No	341	89.0
	I prefer not to answer	12	3.1
Religious affiliation[1]	Agnostic	2	0.5
	Buddhist	6	1.6
	Catholic	60	15.7
	Christian	91	23.8
	Hindu	8	2.1
	Jewish	16	4.2
	Muslin	5	1.3
	No affiliation	192	50.1
	I prefer to self-describe:	8	
	Atheist	2	0.5
	Episcopalian	1	0.3
	Humanist	1	0.3
	Methodist	1	0.3

	Mormon	1	0.3
	Spiritual	1	0.3
	Unitarian Universalist	1	0.3
	I prefer not to answer	10	2.6
Native languages[1] (Top 5)	English	374	97.6
	Spanish	11	2.9
	French	7	1.8
	Mandarin	3	0.8
	Hindi	3	0.8
Proficient languages[1] (Top 5)	English	374	97.7
	Spanish	41	10.7
	French	21	5.5
	Mandarin	9	2.3
	German	9	2.3
Highest Education Level	Bachelor's degree in process	134	35.0
	Bachelor's degree	225	58.7
	Master's degree	19	5.0
	Doctorate degree (i.e., PhD, EdD)	5	1.3
Mother's Highest Education	Did not finish high school	8	2.1
	High school diploma	78	20.4
	Associate degree	53	13.8
	Bachelor's degree	139	36.3

	Master's degree	80	20.9
	Doctorate	14	3.7
	Applied or professional doctorate	10	2.6
	Unknown	1	0.3
Father's Highest Education	Did not finish high school	13	3.4
	High school diploma	67	17.5
	Associate degree	33	8.6
	Bachelor's degree	124	32.4
	Master's degree	92	24.0
	Doctorate	37	9.7
	Applied or professional doctorate	13	3.4
	Unknown	4	1.0
Employment status when last applied[1]	Employed:	269	70.2
	Part-time (< 35 hours/week)	74	
	Full-time (≥ 35 hours/week)	195	
	Full-time student	169	44.1
	Half-time student	19	5.0
	Less than half-time student	25	6.5
	Unemployed	16	4.2
Industry of employment	Retail Service	29	10.8
	Education (science or healthcare related)	14	5.2
	Education (non-science or healthcare-related)	17	6.3

	Healthcare (patient interaction)	69	25.7
	Healthcare (no patient interaction)	18	6.7
	Laboratory (genetics)	51	19.0
	Laboratory (healthcare, nongenetic)	16	5.9
	Laboratory (non-healthcare related)	24	8.9
	Multiple employment	7	2.6
	Other Industry:	24	
	Caregiver	6	1.6
	Consulting	2	0.5
	Finance	2	0.5
	Military	1	0.3
	Nonprofit	4	1.0
	Office support	2	0.5
	Performing art	1	0.3
	Self-employed	1	0.3
	Social services	5	1.3

[1] Respondents could select more than one option, so the total exceeds 100%

Table 3 summarizes the cohort's reported racial and ethnic backgrounds, which is further broken down by the number of responses (one versus two or more) selected by participants. The cohort was predominately White (n = 308, 80.4%), with 59 (11.5%) reported as Asian, 24 (6.3%) as Hispanic/Latin-American/LatinX, 12 (3.1%) as Black/African American/African, five (1.3%) as Middle Eastern or North African, and three

(0.8%) as American Indian or Alaska Native. Three (0.8%) participants preferred to self-describe, and another three (0.8%) preferred not to answer. Three hundred and forty-five respondents (90.1%) selected one response for their racial and ethnic backgrounds; thirty-two (8.4%) selected two or more responses. Respondents who were hURM collectively composed 9.9% (n = 38) of the cohort.

Table 3. Respondents' Racial/Ethnic Backgrounds

Overall[1]	n = 383	Percent (%)
American Indian, Alaska Native	3	0.8
Asian	59	15.4
Black, African American, African	12	3.1
Hispanic/Latin(a/o)/Latinx	24	6.3
Middle Eastern, North African	5	1.3
White	308	80.4
I prefer to self-describe	3	0.8
I prefer not to answer	3	0.8
Single background selected	345	90.1
American Indian, Alaska Native	1	0.3
Asian	44	11.6
Black, African American, African	4	1.0
Hispanic/Latin(a/o)/Latinx	15	3.9
Middle Eastern, North African	3	0.8

White	278	73.2
I prefer to self-describe:	3	
Filipino	1	0.3
Indian	1	0.3
Jewish	1	0.3
Multiple backgrounds selected (2 or more)	32	8.4
Two responses:	29	7.6
Asian; Black, African American, African	2	0.5
Asian; White	12	3.1
Black, African American, African; White	4	1.0
Hispanic/Latin(a/o)/Latinx; White	9	2.3
Middle Eastern or North African; White	2	0.5
Three responses:	3	0.8
Asian; American Indian or Alaska Native; White	1	0.3
American Indian or Alaska Native; Black, African American or African; White	1	0.3
Black, African American or African; Middle Eastern, North African; White	1	0.3
hURM[2]	38	9.9
Not underrepresented[2]	342	89.3

[1]Respondents could select more than one background/choice, so the total exceeds 100%
[2] Historically underrepresented in medicine (hURM) encompasses only underrepresented racial and ethnic backgrounds, which NIH defines as individuals from one of the following groups: Black or African American, Hispanic/Latin(a/o)/Latinx, American Indian or Alaska Native, Native Hawaiian, Pacific Islander (Notice of NIH's Interest in Diversity, 2019). Multiracial participants were categorized as hURM if one or more of their racial or ethnic

backgrounds are from the preceding list. Otherwise, they were categorized as "not underrepresented."

3.2 Participants' application history and outcomes

Table 4 summarizes the respondents' application history. Out of 383 respondents, 45% (n=174) were current students at an accredited genetic counseling program in the U.S. at the time of the survey participation. Respondents who graduated from an accredited genetic counseling program composed 36% (n = 138) of the cohort, 32 (8.4%) respondents applied and received at least one interview offer but were not admitted or matched to a program, and 37 (9.7%) reported that they applied but were not offered an interview from a program. Two respondents (0.5%) were admitted to a genetic counseling program but declined their admission offers. One respondent declined because of the following reasons: relocating to attend the program would mean not being able to live with their spouse, and unsure if the returns (salary) would justify the high tuition cost. The second respondent indicated timing conflicts between their current employment and study for the program.

The majority of the cohort (n = 264, 68.9%) indicated that they applied to only one application cycle, 84 respondents (21.9%) reported that they applied to two application cycles, and less than 10% (n = 35) applied to three or more application cycles. Fall 2020 (n = 130, 33.9%) and Fall 2019 (n = 138, 36.0%) were the most reported academic cycles applied for, followed by Fall 2018 (n = 81, 21.1%), Fall 2017 (n = 45, 11.7%), and Fall 2015 (n = 28, 7.3%). Figure 1 shows the distribution of the number of respondents stratified by the number of genetic counseling graduate programs applied per application cycle. On average, respondents applied to 6.15 programs per application cycle (SD = 3.1; median = 6;

range: 1 – 20). Figure 2 summarizes the average number of interview offers stratified by the number of programs applied per application cycle. On average, respondents who applied to six programs received approximately three interview offers (SD = 2.1). The average number of interview offers increased slightly as respondents applied to more programs per cycle.

Table 4. Respondents' application history and outcomes

		n	Percent (%)
Admission status	Current Student	174	45.4
	Graduated	138	36.0
	Interviewed, not admitted	32	8.4
	Not interviewed	37	9.7
	Declined admission	2	0.5
Number of application cycle attempts	1	264	68.9
	2	84	21.9
	3	23	6.0
	4 or more	12	3.1
Academic cycle(s) applied[1,2]	Fall 2020	130	33.9
	Fall 2019	138	36.0
	Fall 2018	81	21.1
	Fall 2017	45	11.7
	Fall 2016	20	5.2
	Fall 2015	28	7.3
	Fall 2014	22	5.7
	Fall 2013	20	5.2

	Fall 2012	8	2.1
	Fall 2011	3	0.8
	Fall 2010	3	0.8
	Fall 2009	3	0.8
	Fall 2008	5	1.3
	Fall 2007	4	1.0
	Fall 2006	3	0.8
	Fall 2005	2	0.5

[1] Fall 20XX denotes the academic term for which respondent applied to begin the program, not the year they submitted the application materials

[2] Respondents could select more than one academic cycle

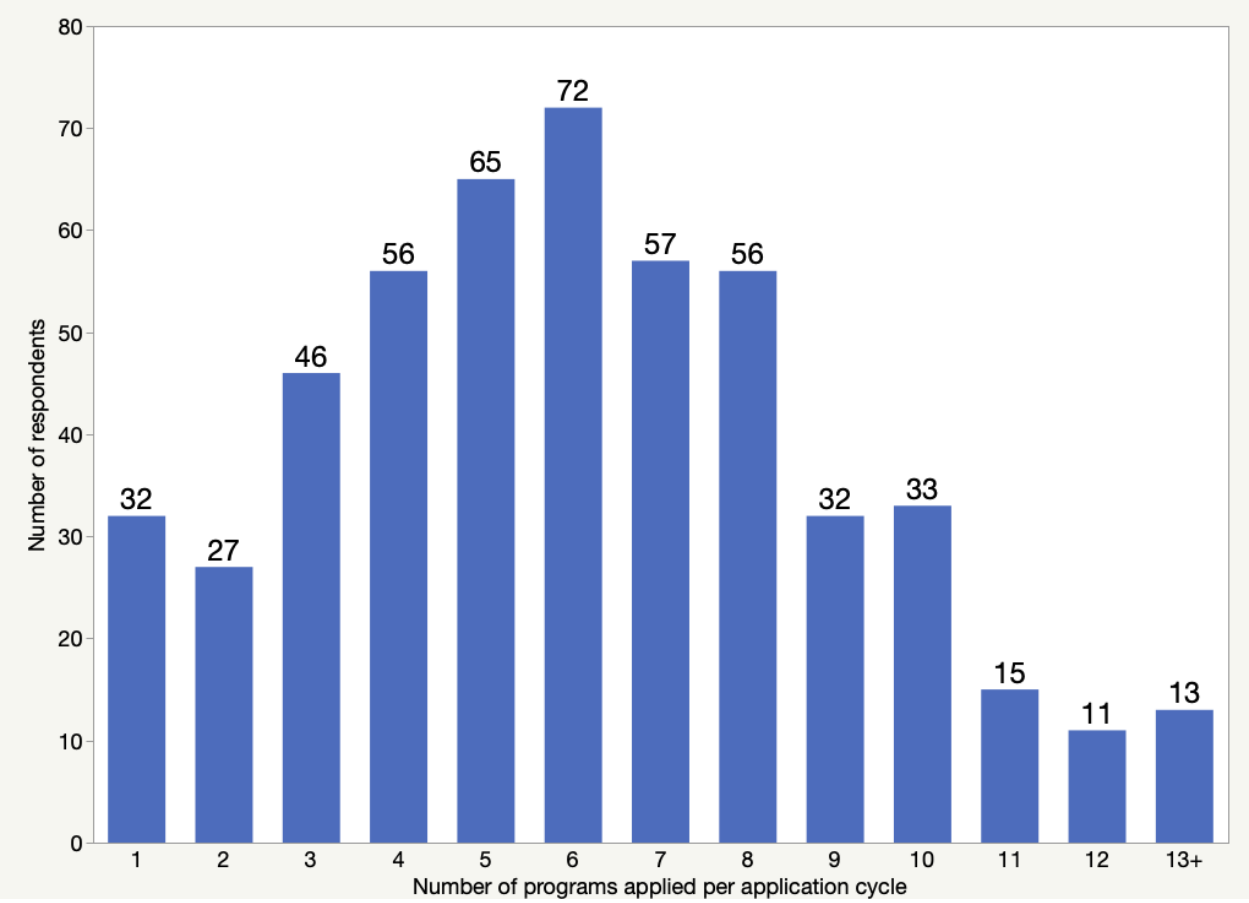

Figure 1. On average, respondents applied to approximately six genetic counseling graduate programs per application cycle.

The graph shows the number of respondents stratified by the number of programs applied per application cycle. Applicants who attempted multiple application cycles are counted more than once in this figure. (For example, an applicant who applied to two programs in the first cycle and five in the second cycle would be counted in both column 2 and column 5). The number above each bar denotes the frequency of respondents.

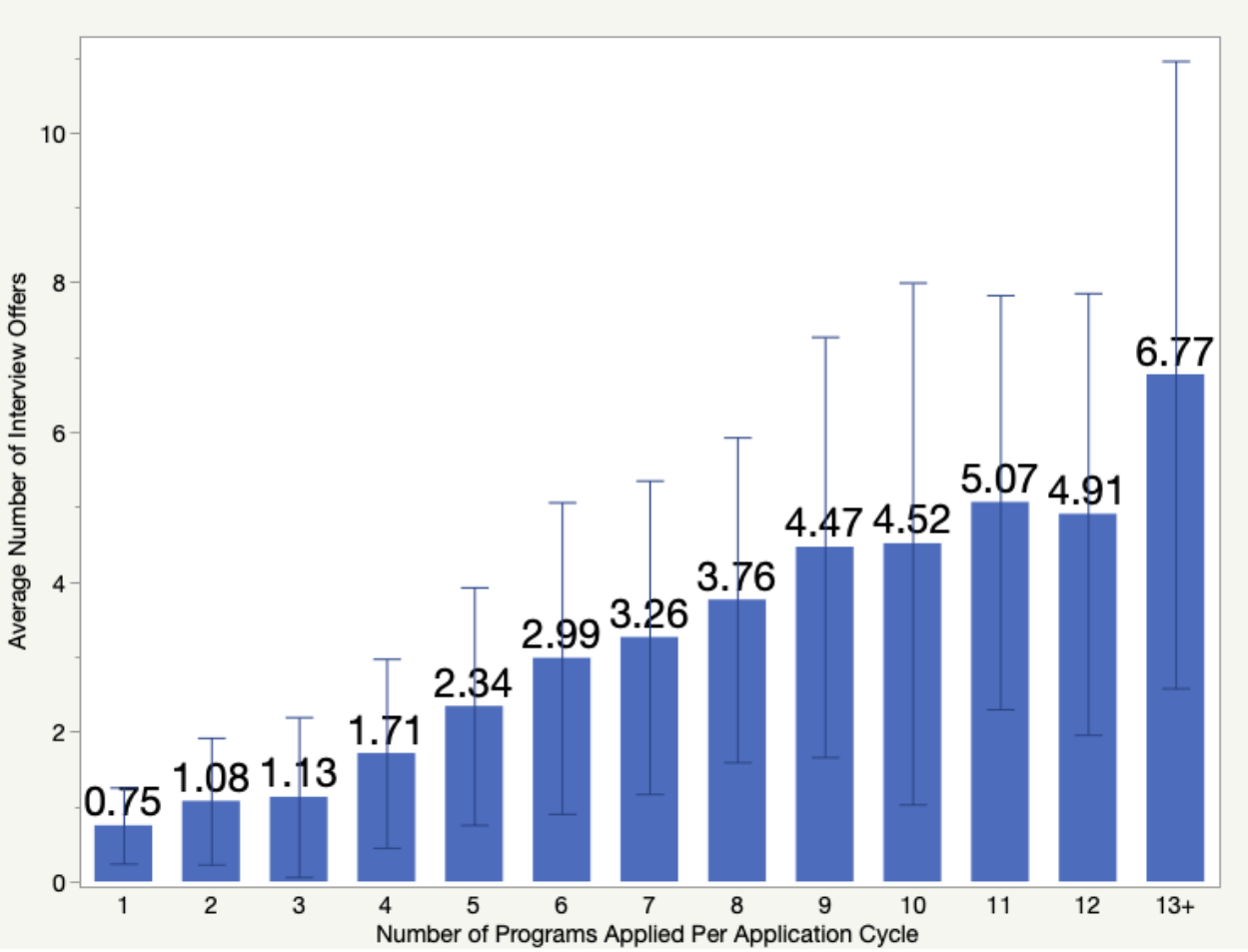

Figure 2. Average number of interview offers increased slightly as respondents applied to more genetic counseling graduate programs per application cycle.

The average (mean) number of interview offers, shown above each bar, stratified by the number of genetic counseling graduate programs applied per application cycle. The mean is calculated by averaging the number of interview offers reported by all respondents who applied to the same number of programs in at least one of their application cycle attempts. For example, 72 respondents reported applying to six programs in one or more of their application cycle attempts, and in total, received 215 interview offers in these cycles (i.e., an average of 2.99 interview offers in that cycle out of six applications submitted). Error bars represent one standard deviation above and below the mean.

3.3 Median total costs stratified by number of application cycle attempts

Figure 3 and Table 5 contain summaries of respondents' median total application costs by the number of cycle(s) attempts. Respondents' total application costs were calculated by summing up the six different categories of expenses (application, exams, coursework, interview, miscellaneous, and other) across all the application cycle(s) in which they participated. Total application costs ranged from $202 to $25,693. The median total costs for respondents who applied to one application cycle were $2,634 (n = 264, range: $202 - $25,693). For respondents who applied to two application cycles, the median total costs were $4,762 (n = 84, range: $909 – $24,206). For three or more application cycles, median total costs were $5,607 (n = 35, range: $883 - $25,242). There was a statistically significant difference in median total application costs across the three categories of application cycle attempts ($p < 0.0001$, Table 5).

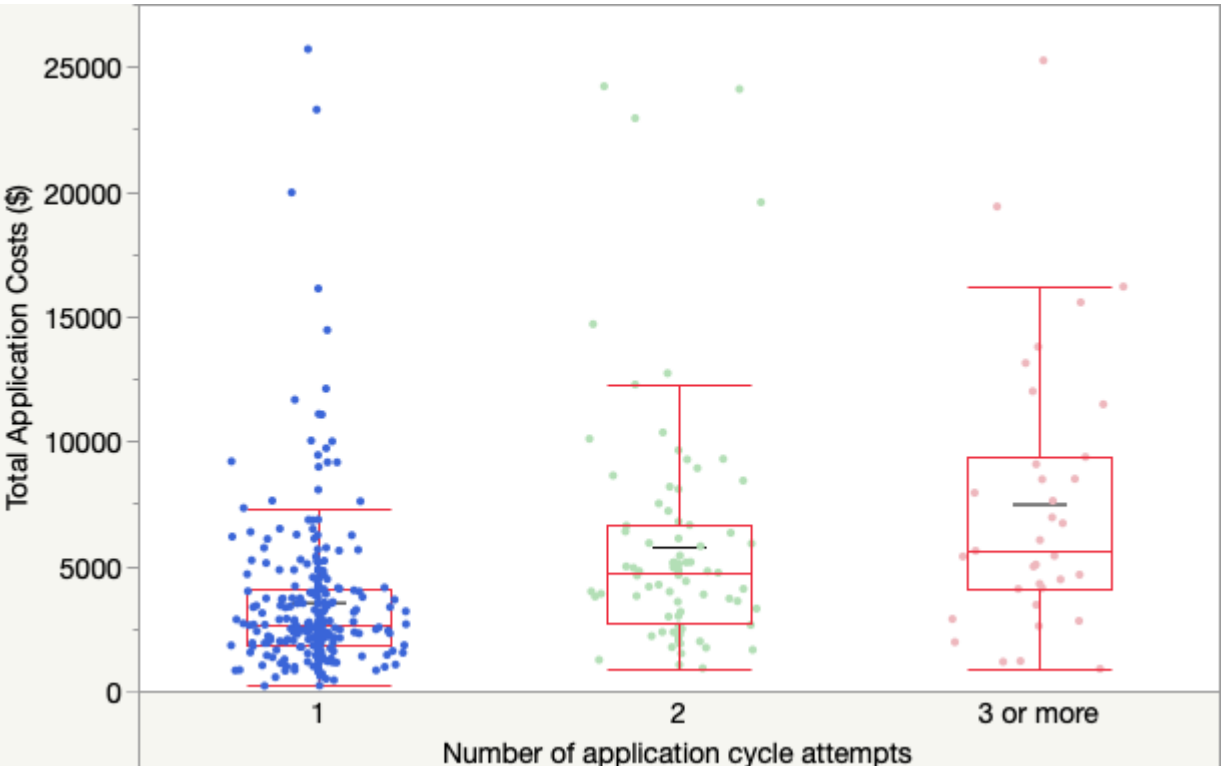

Figure 3. Total application costs increased with application cycle attempts.

Total application costs stratified by number of application cycle attempts. Data points are overlaid on each of the box and whisker plots shown. Color denotes number of application cycle attempts (blue, one attempt; green, two attempts; red, three or more attempts). From bottom to top, the five horizontal lines of each box plot represent the five-number summary: the minimum non-outlier value, 25th percentile (Q1), median, 75th percentile (Q3), and maximum non-outlier value (e.g., less than Q3 + 1.5*IQR). While data points outside the top horizontal line are "outliers" by box and whisker plot standards, they are notable because they reflect the few respondents who had significantly high total application costs. IQR: interquartile range.

Table 5. Median total costs stratified by number of application cycle attempts

Number of Cycle Attempts	n	Average Number of Programs Applied to per Application Cycle	Median Total Application Costs ($)	Range ($)	p-value[1]
1	264	6.2 ± 2.8	2,634	202 – 25,693	< 0.0001
2	84	6.2 ± 2.9	4,762	909 – 24,206	
3 or more	35	5.8 ± 3.7	5,607	883 – 25,242	

[1]The non-parametric Kruskal-Wallis test was used to analyze the relationship between number of cycle attempts and total application costs.

3.3.1 One application cycle only: median total costs stratified by academic cycle(s) and admission status

Table 6 summarizes median total costs to respondents who applied to only one application cycle, stratified by academic cycle and admission status. The majority of respondents (n = 136, 51.5%) within this sub-cohort applied to Fall 2015 – 2019, followed by Fall 2020 (n = 77, 29.2%), Fall 2010-2014 (n = 36, 13.6%) , and Fall 2005- 2009 (n = 15, 5.7%). Median total application costs for Fall 2020 and Fall 2015 – 2019 were

approximately $2,424 and $2,654, respectively. In addition, respondents who were admitted for Fall 2020 (n = 52) and Fall 2015 – 2019 (n = 121) reported similar median total costs, between $2,600 - $2,700. Those who interviewed but were not offered admission (n = 10) and those who were not offered interviews (n = 15) for Fall 2020 had lower median total costs of $2,338 and $2,036, respectively, than those who were admitted ($2,611). In contrast, those who interviewed but were not offered admission for Fall 2015 – 2019 (n = 6) had higher median total costs of $3,385 than respondents who were admitted ($2,688) in the same time period, while those who were not offered interviews (n=9) had lower median total costs of $1,830.

Table 6. One application cycle only: median total costs stratified by academic cycle and admission status

Academic Cycle	n	Median Total Application Cost ($)	Average Number of Programs Applied per Application Cycle	Status	n	Median Total Application Cost ($)	Range ($)
Fall 2020	77	2,424	6.5 ± 2.7	Admitted	52	2,611	550 – 9,190
				Interviewed, not admitted	10	2,338	805 – 11,657
				Not interviewed	15	2,036	202 – 6,366
Fall 2015 – 2019	136	2,654	6.0 ± 2.8	Admitted	121	2,688	433 – 25,693
				Interviewed, not admitted	6	3,385	1,420 – 11,084
				Not interviewed	9	1,830	216 – 4,087

Fall 2010 – 2014	36	3,415	6.5 ± 3.0	Admitted	34	3,394	1,053 – 12,100
				Interviewed, not admitted	1	4,811	-
				Not interviewed	1	12,100	-
Fall 2005 – 2009	15	1,853	5.8 ± 3.1	Admitted	15	1,853	481 - 6,241
				Interviewed, not admitted	0	-	
				Not interviewed	0	-	-

3.3.2 Two or more application cycles: median total costs stratified by most recent academic cycle and admission status

Table 7 summarizes the median total costs to respondents who applied to two or more application cycles, stratified by academic cycles and admission status. These respondents were categorized based on their last applied academic cycle and median total costs represent the sum of all expenses from previous application attempts up through the last applied academic term. The majority of respondents (n = 63, 52.9%) within this sub-cohort last applied to Fall 2015 – 2019, followed by Fall 2020 (n = 53, 44.5%), Fall 2010-2014 (n = 2, 1.7%) , and Fall 2005- 2009 (n = 1, 0.8%). The median total application costs for respondents who last applied to Fall 2020 and Fall 2015 – 2019 were approximately $4,251 and $5,415, respectively. Respondents admitted to Fall 2015 – 2019 (n = 59) had higher median total costs of $5,409 than those admitted for Fall 2020 ($4,724). Respondents who interviewed but were not offered admission (n = 13) and those who were not offered interviews (n = 10) for Fall 2020 had lower median total costs of $3,446

and $2,342, respectively, than those who were admitted ($4,724) in the same academic cycle.

Figure 4 shows the median total application costs, stratified by academic cycles and application cycle attempts. Median total costs were 1.8 and 2 times higher for respondents who applied multiple cycles and had their last attempt in Fall 2020 and Fall 2015 – 2019, respectively, than those who applied only once in the respective academic cycle(s).

Table 7. Two or more application cycles: median total costs stratified by most recent academic cycle and admission status

Academic Cycle[1]	n	Median Total Application Costs[2] ($)	Average Number of Programs Applied per Application Cycle	Status	n	Median Total Application Costs[2] ($)	Range ($)
Fall 2020	53	4,251	5.9 ± 3.0	Admitted	30	4,724	909 – 19,563
				Interviewed, not admitted	13	3,446	1,195 – 8,916
				Not interviewed	10	2,342	883 – 22,928
Fall 2015 – 2019	63	5,415	6.2 ± 3.6	Admitted	59	5,409	1,877 – 25,242
				Interviewed, not admitted	2	7,622	5,607 – 9,637
				Not interviewed	2	6,173	4,173 – 8,173
Fall 2010 – 2014	2	7,780	6.0 ± 1.2	Admitted	2	7,780	3,295 – 12,264
				Interviewed, not admitted	0	-	-
				Not interviewed	0	-	-
Fall 2005 – 2009	1	2,352	5.5 ± 0.7	Admitted	1	2,352	-
				Interviewed, not admitted	0	-	-
				Not interviewed	0	-	-

[1] Respondents who attempted two or more application cycles were categorized based on their most recent academic cycle.
[2] Total application costs represent the sum of all of their expenses from all application cycle attempts.

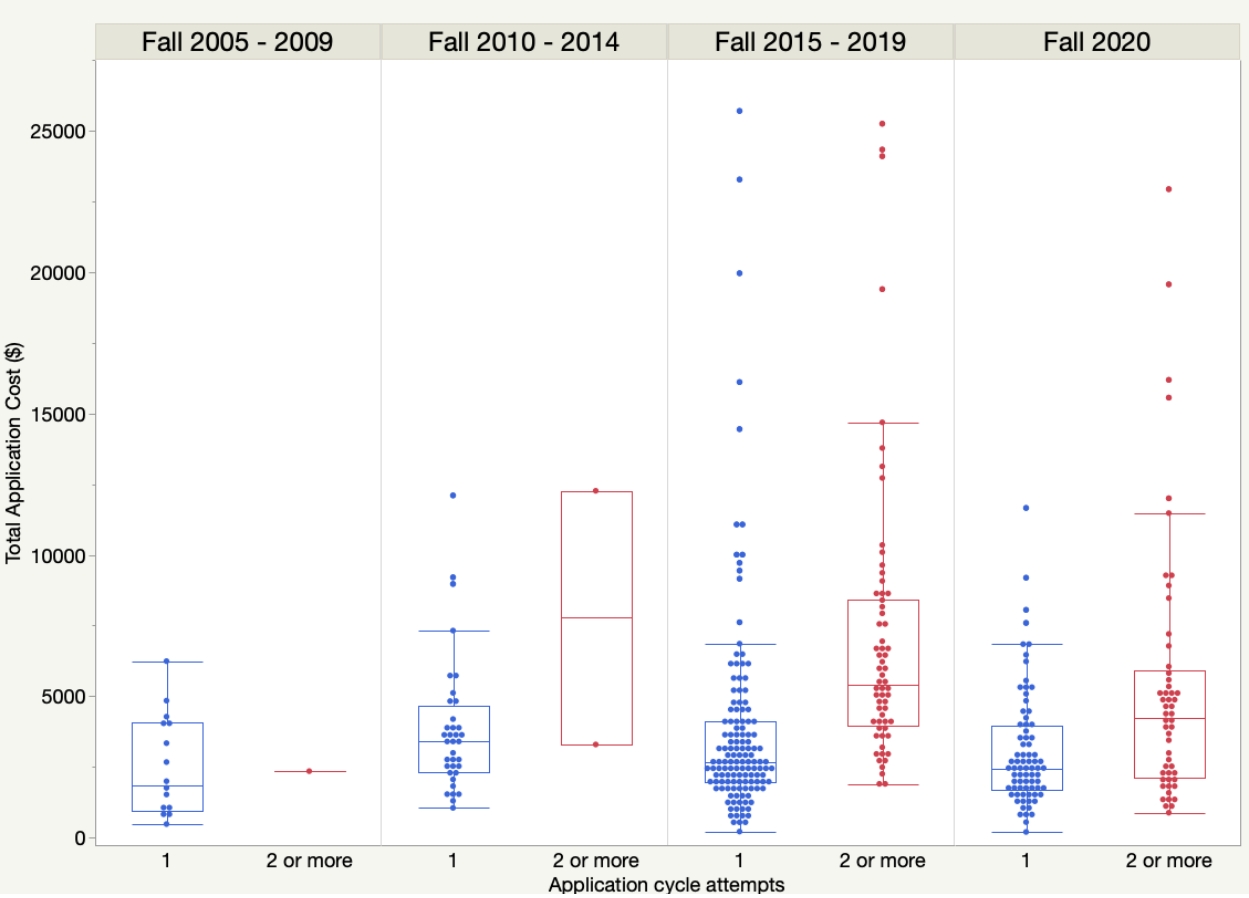

Figure 4. Respondents with multiple application cycle attempts had higher median total application costs than those who applied to only one application cycle.

Total application costs stratified by academic cycle(s) and number of application cycle attempts. Data points are overlaid on each of the box and whisker plots shown. Color indicates application cycle attempts (blue, one attempt; red, two or more attempts). From bottom to top, the five horizontal lines of each box plot represent the five-number summary: minimum non-outlier value, 25th percentile (Q1), median, 75th percentile (Q3), and maximum non-outlier values (e.g., values less than Q3 + 1.5*IQR). Data points outside the top horizontal line are "outliers" by box and whisker plot standards but are notable because they reflect the few respondents who had significantly high total application costs. For two or more cycle attempts in Fall 2005 - 2009, the line denotes the total application costs of one respondent. IQR: interquartile range.

3.3.3 Application cost breakdown

Participants were asked to provide specific expenses across six different categories of the application process, including application fees, exams, prerequisite coursework (taken after their last degree), interview, miscellaneous, and other expenses entered by respondents. Table 8 contains the breakdown of application costs by expense category and number of application cycle(s) attempted. For respondents who applied to only one application cycle, the highest median expense was for interview related items (median: $879, range: $0 - $6,007), followed by application fees (median: $655, range: $80 - $3,576), and exam related items (median: $405, range: $0 - $3,109). While 47.8% of respondents (n = 183) did not spend any money on prerequisite coursework, this category had the largest range of $0 - 21,700. The main contributor to the large expense range was post-baccalaureate programs for individuals with a non-science degree background. In the "other category," common themes among items reported include dependent care (n = 4), internship expenses (n = 2), interview prep services (n = 1), loss of income (n = 2), printing fees (n = 1), and thank you gifts for accommodation's host (n = 1). Dependent care (median = $3,250, range: $3000 - $5,000) was the most significant expense in the "other category." One respondent's free-text response of $70,000 for loss of income was excluded from data analysis.

For participants who applied to two or more application cycles, their highest median expense in the application process was also interview-related items (median: $1,310, range: $0 - $7,307), followed by prerequisite coursework (median: $1,031, range: $0 - $22,806), application fees (median: $1,201, range: $290 - $5,959), and exams (median: $552, range: $0 - $2,900). Similar to the one application cycle only cohort, the coursework

category had the largest range of $0 - $22,806 due to the cost of post-baccalaureate programs. Common themes among items reported in the "other category" were dependent care (n = 6), internship expenses (n = 2), interview prep services (n = 1), loss of income (n = 1), thank you gifts for letters of recommendation (n = 1), and non-interview related travel expenses to meet with program directors for feedback (n = 1). Dependent care (n = 6, median: $1,250, range: $200 - $5,000) was also one of the significant expenses in the "other category". Figure 5 shows the cost breakdown by application categories and number of cycle(s) attempted. Data points higher than $12,500 (n = 8) were omitted in Figure 5 to optimize the y-axis range for better graph display. See Appendix F for the entire graph with all data points included.

Table 8. Application costs stratified by expense categories and number of cycles applied

	One cycle (n = 264)		Two or more cycles (n = 119)	
	Median ($)	Range ($)	Median ($)	Range ($)
Application Fees	655	80 – 3,576	1,201	290 – 5,959
Exams	405	0 – 3,109	552	0 – 2,900
Coursework	0	0 – 21,700	1,031	0 – 22,806
Interview	879	0 – 6,007	1,310	0 – 7,307
Miscellaneous[1]	0	0 – 1,256	0	0 – 1,101
Other[2,3]	0	0 – 5,000	0	0 – 5,000

[1] Conferences and workshops
[2] Optional free text-response for participants to enter other expenses not inquired by the survey
[3] Themes of other items listed: dependent care, internship expenses, interview prep services, loss of income, thank you gifts for accommodation's host and letters of recommendation, printing fees, non-interview related travel expenses to meet with program directors for feedback

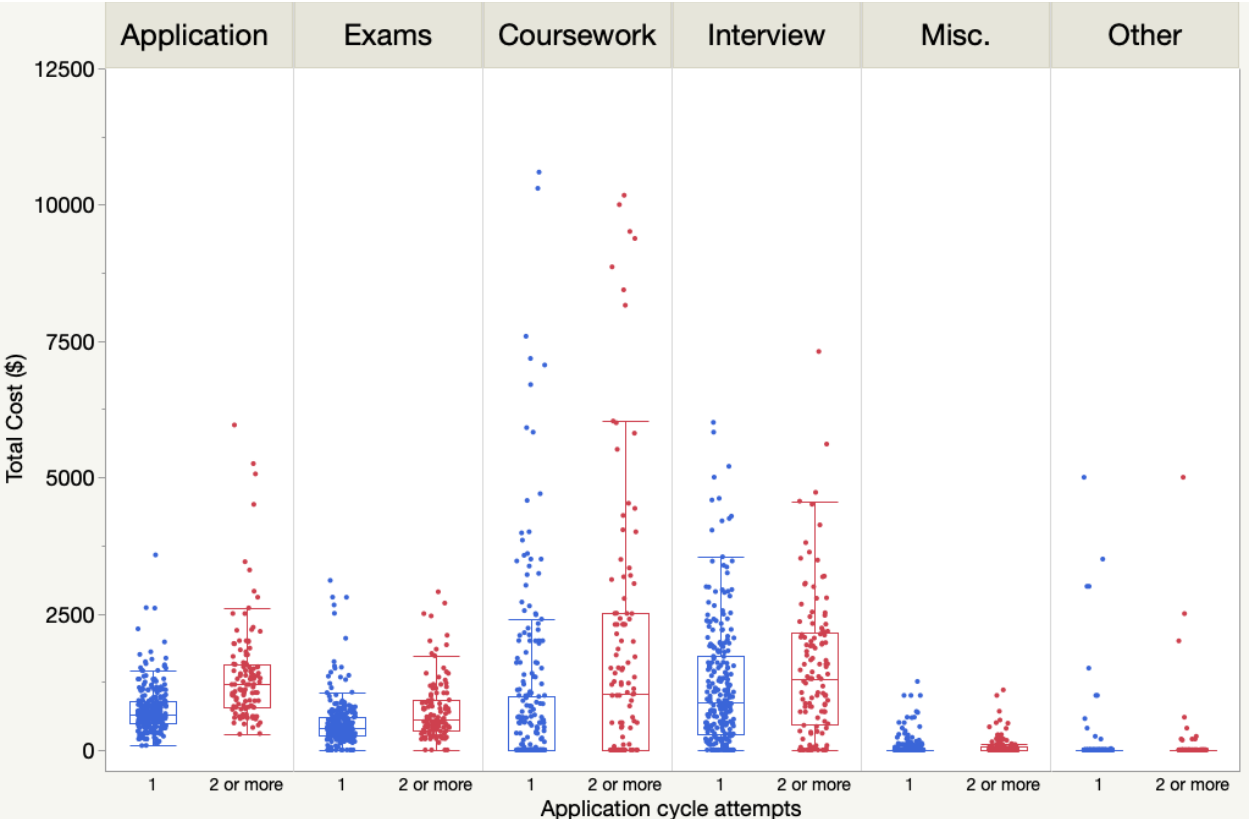

Figure 5. Highest median expense in the application process was for interview-related items but coursework had the largest range.

Cost breakdown by expense categories and number of application attempts. Data points are overlaid on each of the box and whisker plots shown. Color indicates application cycle attempts (blue, one attempt; red, two or more attempts). From bottom to top, the five horizontal lines of each box plot represent the five-number summary: minimum non-outlier value, 25th percentile (Q1), median, 75th percentile (Q3), and maximum non-outlier values (e.g., values less than Q3 + 1.5*IQR). Data points outside the top horizontal line are "outliers" by box and whisker plots standards but are notable because they reflect the few respondents who had significantly high total application costs. Eight data points in the coursework category had values greater than $12,500 and were omitted from the graph above to optimize the y-axis range. See Appendix F for a graph with all data points included.

3.3.4 Interview expenses prior to COVID-19 pandemic

The median interview expense for participants who applied only once was $879 and was $1,310 for those who applied to two or more application cycles. Both of these groups included applicants for Fall 2020 when the COVID-19 pandemic disrupted many applicants'

interview travel plans. Applicants for Fall 2020 interviewed in-person and/or virtually depending on when their interviews were conducted relative to the timing of the COVID-19 lockdowns imposed by various states. Because travel expenses would vary significantly depending on the mode of interview (in-person versus remote), a separate analysis was performed to reflect travel expenses prior to COVID-19, as shown in Table 9.

Excluding respondents who applied for Fall 2020, the median interview expense for individuals who applied to only one application cycle was $1,101 (n = 177) and $1,888 (n = 66) for those who applied to two or more cycles. Table 9 also shows median interview expense by application status. While only a few participants reported interviewing with no admission offers, they incurred significant interview-related expenses (one cycle: $1,028, two or more cycles: $2,998) prior to the COVID-19 pandemic.

Table 9. Interview-related expenses prior to the COVID-19 pandemic

Application Cycles	n	Median ($)	Status	n	Median ($)	Range ($)
One	177	$1,101	Admitted	170	1,099	0 – 6,007
			Interviewed, not admitted	7	1,028	405 – 1,603
Two or more	66	$1,888	Admitted	64	1,821	49 – 5,609
			Interviewed, not admitted	2	2,998	1,868 – 4,127

3.3.5 Financial impact of COVID-19 on interview expenses

Due to the impact of travel restrictions imposed by various states in early 2020, some applicants had to change the format of their interviews from in-person to remote.

Hence, some travel expenses were also affected in terms of financial losses (e.g., non-refundable deposits) and/or savings (e.g., airfare/lodging refunds). Out of 130 respondents who applied for Fall 2020, 59.2% (n = 77) reported that their travel plans were impacted by the pandemic, while the remaining 40.8% (n = 53) were not affected (Table 10). For the 77 respondents whose travel plans were impacted, median financial losses and savings due to the COVID-19 pandemic were $0 (range: $0 - $2,000) and $400 (range: $0 - $2,000), respectively (Table 11 and Figure 6).

Table 10. COVID-19 pandemic impact on travel plans for Fall 2020 program interviews

Travel plans impacted by COVID-19	n	Percent (%)
Yes	77	59.2
No	53	40.8
Total	130	100

Table 11. Financial impact of COVID-19 pandemic on travel plans for Fall 2020 program interviews (n = 77)

	Median ($)	Range ($)
COVID-19 Losses	0	0 – 2,000
COVID-19 Savings	400	0 – 2,000

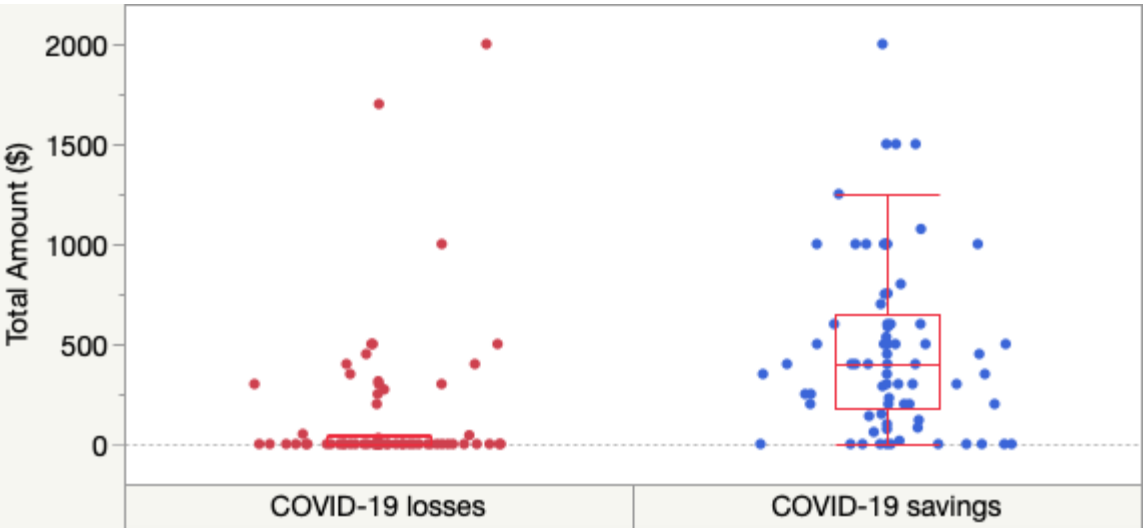

Figure 6. Most respondents reported no financial loss and some form of savings on travel expenses due to the COVID-19 pandemic.

Data points are overlaid on each of the box and whisker plots shown. Color denotes financial loss (red) and financial savings (blue) on travel expenses. From bottom to top, the five horizontal lines of each box and whisker plot represent the five-number summary: the minimum non-outlier value, 25th percentile (Q1), median, 75th percentile (Q3), and maximum non-outlier value (e.g., less than Q3 + 1.5*IQR).

3.4 Accrued volunteer hours stratified by experience type and number of cycle attempts

Table 12 summarizes the breakdown of accrued volunteer hours, stratified by experience type and the number of application cycle attempts. Two respondents were removed from this analysis due to a report of greater than 15,000 total volunteer hours, which would correspond to more than 1,800 eight-hour days of volunteer work or approximately seven years of full-time volunteer work. For participants who applied to only one application cycle, the median total accrued volunteer hours were 271 hours (range: 0 – 5,030 hours). The volunteer work with the highest median hours accrued was in counseling-related experiences (median: 100 hours, range: 0 – 3,000 hours), followed by shadowing and/or interviewing a GC (median: 20 hours, range: 0 – 1000 hours), and advocacy (median: 16, range: 0 – 2,400 hours). In the "other category," where respondents

had the option to enter other types of volunteer experiences, common themes that were reported include education (n = 4), international volunteer experiences (n = 1), and research (n = 1).

For respondents who applied to two or more application cycles, the median total accrued volunteer hours were 350 hours (range: 51 – 2,628 hours). Counseling-related experiences also had the highest median volunteer hours accrued (median: 100 hours, range: 0 – 2,500 hours) in this sub-cohort, followed by shadowing and/or interviewing a GC (median: 46 hours, range: 0 – 780 hours), advocacy (median: 30 hours, range: 0 – 650 hours), healthcare (median: 25 hours, range: 0 – 400 hours), and working with individuals with disabilities/medical conditions (median: 12 hours, range: 0 – 1,000 hours). For the "other category," one respondent reported education (n = 1), and another respondent listed "miscellaneous" (n = 1).

Table 12. Volunteer hours stratified by experience type and number of application cycle attempts

Volunteering Categories	One cycle (n = 262[1])		Two or more cycles (n = 119)	
	Median (hrs)	Range	Median (hrs)	Range
Shadowing/Interviewing a GC	20	0 – 1,000	46	0 – 780
Healthcare	0	0 – 4,000	25	0 – 400
Disabilities/Medical Conditions	0	0 – 1,600	12	0 – 1,000
Advocacy	16	0 – 2,400	30	0 – 650
Counseling	100	0 – 3,000	100	0 – 2,500
Other[2,3]	0	0 – 5,000	0	0 – 1,200
Total accrued hours	271	0 – 5,030	350	51 – 2,628

[1] Two responses were removed from this analysis due to reported values of 15,000 total volunteer hours
[2] Free text-response for respondents to enter other volunteer experiences
[3] Themes of other volunteer experiences: education, international volunteer experiences, research, and "miscellaneous"

3.5 Parental education level and financial assistance from family to total application costs

Respondents' parental education levels were analyzed and recorded into the following groups, as shown in Figure 7: neither parent with a high school diploma; highest degree attained by at least one parent was a high school diploma or associate's degree, denoted as "HS/Associate"; highest degree attained by at least one parent was a bachelor's degree, denoted as "BA/BS"; highest degree attained by one of the parents was a master's degree or higher, denoted as "Master's or higher"; and both parents with at least a master's degree or higher. One respondent was excluded due to insufficient information regarding parental education level. The majority of participants (n = 308, 80.6%) reported having at least one parent with a bachelor's degree or higher. Three respondents (0.08%) reported that neither of their parents had a high school diploma, and 71 (18.6%) respondents indicated the highest degree attained by at least one parent was a high school diploma or associate's degree.

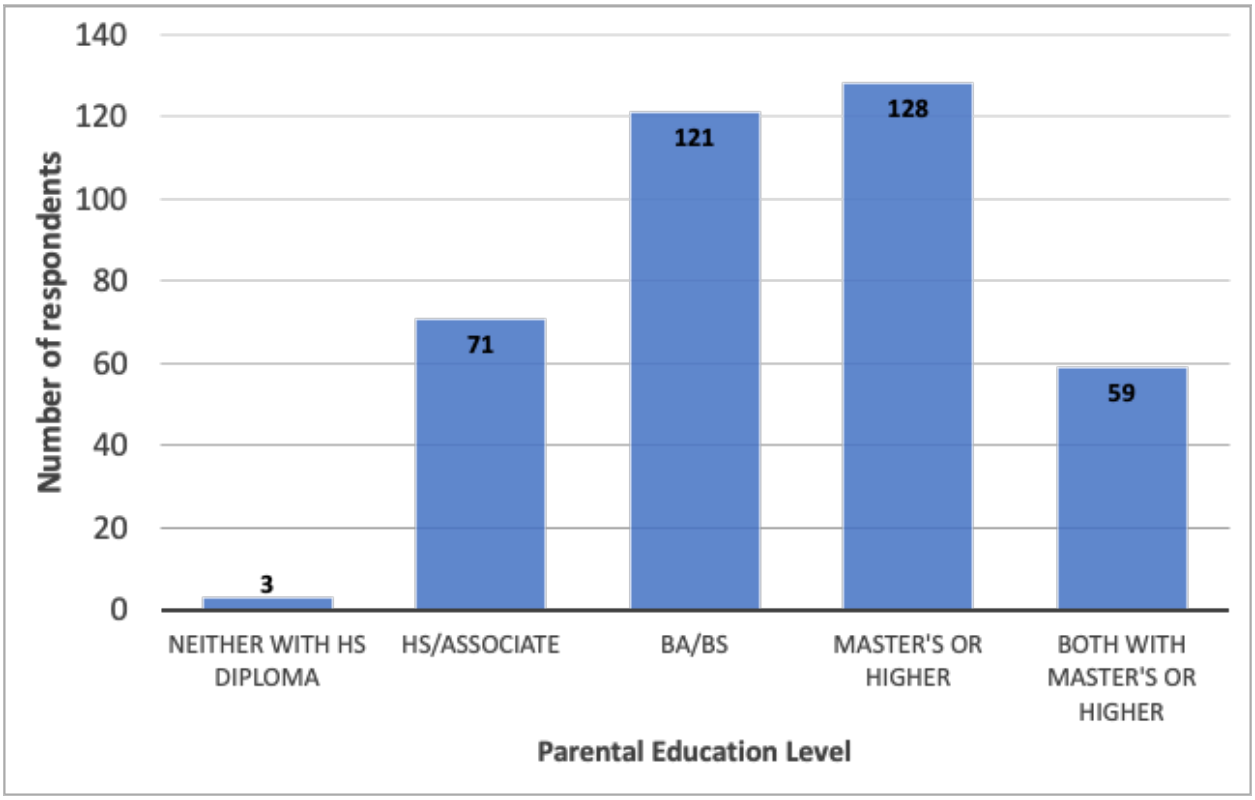

Figure 7. The majority of respondents had at least one parent with a bachelor's degree or higher.

The graph shows the distribution of parental education level, which was classified into the following five groups: neither with a HS (high school) diploma; highest degree attained by at least one parent was a high school diploma or associate's degree, denoted as "HS/Associate"; highest degree attained by at least one parent was a bachelor's degree, denoted as "BA/BS"; highest degree attained by one of the parents was a master's degree or higher, denoted as "Master's or higher"; and both parents with at least a master's degree or higher.

At the end of the survey, participants were given an estimate of their total application costs based on the sum of the expenses they provided across the six categories of the application process. They were then asked what percentage of the total application costs were covered by financial assistance from their families (Figure 8). About 42% (n = 161) of the cohort did not receive any financial assistance from their families, while 36.3%

(n = 139) reported that at least half of their total application costs were covered with the help from their families. The remaining cohort (n = 83) received some financial support from families that covered less than 50% of the total application costs.

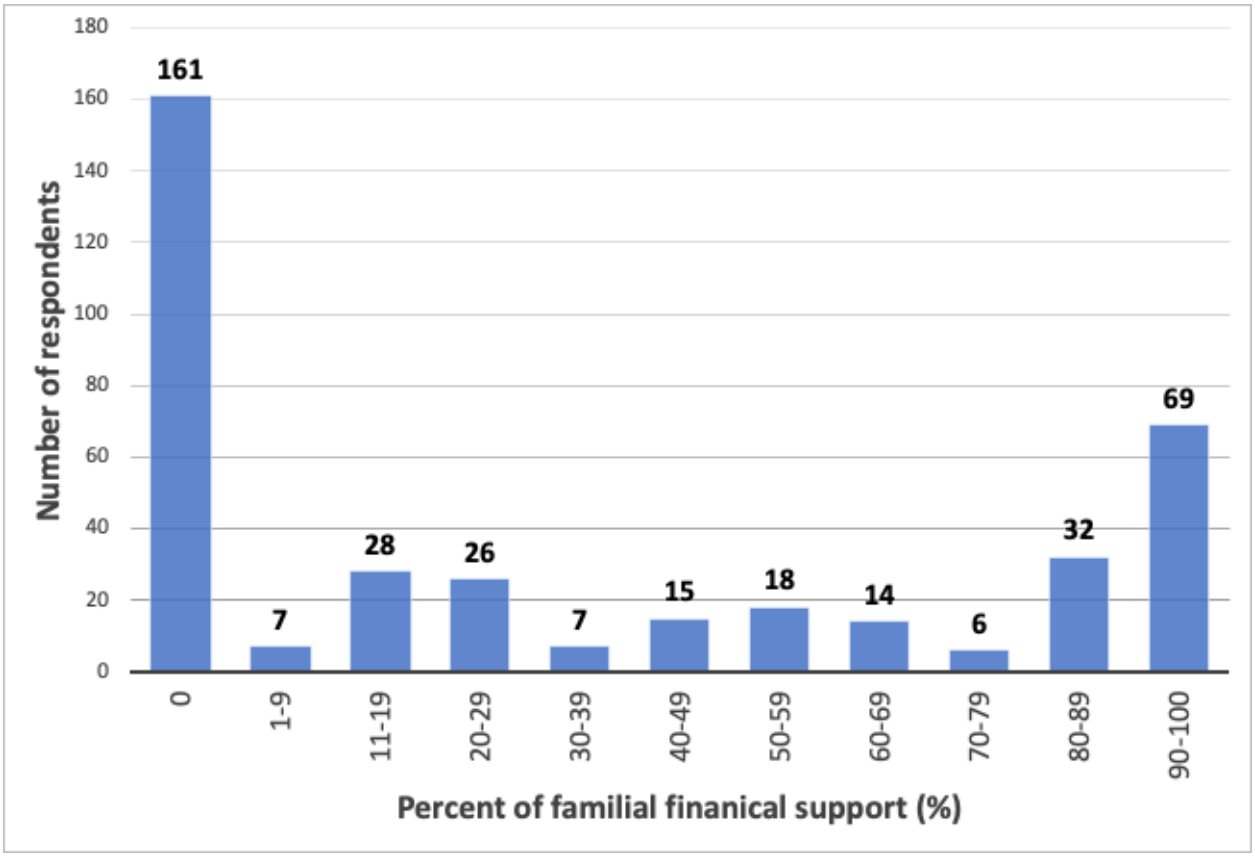

Figure 8. Almost half of respondents reported having no financial support from their families for application costs.

The graph shows the distribution of familial financial support in increments of ten percent. The higher the percentage, the more familial financial assistance was provided to offset respondents' total application costs. One hundred percent means all of the respondent's application costs were paid for by their family.

Table 13 summarizes the relationship between parental education level and percentage of total application costs covered by familial financial support. A higher level of

parental education was correlated with higher familial financial support for respondents' total application expenses. A non-parametric test indicated a statistically significant relationship between the percentage of total application costs covered by familial financial support and parental education level ($p = 0.0009$).

Table 13. Relationship between parental education level and percent of total application costs covered by familial financial support

Parental education level	n	Median percent of total application costs covered by familial financial support (%)	Range	p-value[1]
Neither with HS diploma	3	0	0	0.0009
HS/Associate	71	2	0 -100	
BA/BS	121	10	0 -100	
Master's or higher	128	20	0 -100	
Both with master's or higher	59	60	0 -100	

[1]The non-parametric Kruskal-Wallis test was used to analyze the relationship between parental education level and familial financial support.

3.6 Disparities between hURM and non-underrepresented respondents

Further analysis was done to examine whether there were differences between hURM and non-underrepresented respondents in specific aspects of the application process. Three respondents preferred not to disclose their racial and ethnic backgrounds and were excluded from this analysis. As shown in Table 14, when comparing the two

groups in the cohort that applied to only one application cycle, there was no statistical difference in median total application costs (p = 0.39). However, hURM respondents (n = 19) who applied to more than one application cycle had higher median total application costs than those who were not underrepresented (n = 100) ($6,713 versus $4,762, p = 0.03). For total accrued volunteer hours (Table 15), no statistical difference was observed between the two groups in the cohort that applied to only one application cycle (p = 0.66). In contrast, for those who applied to two or more application cycles, hURM respondents accumulated lower median total volunteer hours than those who were not underrepresented (246 hours versus 381 hours, p = 0.03).

Table 14. Total application costs between hURM and non-underrepresented groups

Application cycle attempts	Race/Ethnicity	Average number of programs applied to per application cycle	Median total application costs ($)	Range ($)	p-value[1]
One	Not underrepresented (n = 242)	6.3 ± 2.8	2,646	202 – 25,693	0.39
	hURM (n = 19)	6.1 ± 3.6	2,581	1,248 – 23,270	
Two or more	Not underrepresented (n = 100)	5.9 ± 3.2	4,762	883 – 24,206	0.03
	hURM (n = 19)	6.4 ± 3.1	6,713	2,194 – 25,242	

[1]Within each category of application cycle attempts, the non-parametric Wilcoxon Rank Sums test was used to analyze the relationship between race/ethnicity and total application costs.

Table 15. Total accrued volunteer hours between hURM and non-underrepresented groups

Application cycle attempts	Race/Ethnicity	Median total hours	Range (hours)	p-value[1]
One	Not underrepresented (n = 241‡)	270	0 – 5,030	0.66
	hURM (n = 18‡)	295	20 – 2,700	
Two or more	Not underrepresented (n = 100)	381	51 – 2,628	0.03
	hURM (n = 19)	246	83 – 980	

‡One response was excluded due to outlier data (>15,000 total accrued volunteer hours).
[1]Within each category of application cycle attempts, the non-parametric Wilcoxon Rank Sums test was used to analyze the relationship between race/ethnicity and total accrued volunteer hours.

Additionally, Table 16 summarizes parental education across the two groups. "Associate or lower" denotes respondents whose parents' education level was no higher than an associate's degree. "BA/BS or higher" represents those with at least one parent whose highest level of education attained was at least a bachelor's degree. Three respondents preferred not to disclose their racial and ethnic backgrounds and were excluded from this analysis. Non-underrepresented respondents were more likely to have at least one parent with a bachelor's degree or higher (n = 281, 82.2%) than hURM respondents (n = 26, 68.4%) (p=0.04). Conversely, 31.6% of hURM participants (n = 12) were more likely to have parents whose education level did not exceed an associate's degree than non-underrepresented participants (n = 61, 17.8%)(p = 0.04).

Finally, Table 17 summarizes the relationship between the percentage of total application costs covered by familial financial assistance and hURM and non-underrepresented respondents. Of those who applied to only one application cycle, the median familial financial contribution for hURM participants was 0% (range: 0% - 100%), while the median familial financial contribution for non-underrepresented respondents was 20% (range: 0% - 100%) (p=0.74). For the cohort that applied to two or more application cycles, the median familial financial contribution was 10% for both hURM and non-underrepresented respondents (p = 0.90).

Table 16. Differences in parental education level between hURM and non-underrepresented groups

Parental education level	Not underrepresented (n =342)		hURM (n = 38)		p-value[1]
	n	Percent (%)	n	Percent (%)	
Associate or lower	61	17.8	12	31.6	0.04
BA/BS or higher	281	82.2	26	68.4	

[1]The Pearson's chi-square test was used to analyze the relationship between race/ethnicity and parental education level.

Table 17. Differences in familial financial support between hURM and non-underrepresented groups, stratified by application cycle attempts

Application cycle attempts	Race/Ethnicity	Median (%)	Range (%)	p-value[1]
One cycle	Not underrepresented (n = 242)	20	0 – 100	0.74
	hURM (n = 19)	0	0 – 100	
Two or more cycles	Not underrepresented (n = 100)	10	0 – 100	0.90
	hURM (n = 19)	10	0 – 100	

[1]Within each category of application cycle attempts, the non-parametric Wilcoxon Rank Sums test was used to analyze the relationship between race/ethnicity and familial financial support.

IV. DISCUSSION

The genetic counseling profession has grown exponentially since it began over 50 years ago and has become an integral component of healthcare and precision medicine. However, diversity within the profession remains stagnant, raising an ongoing concern that the field does not reflect the multi-racial and ethnic population that it serves. Several barriers can hinder the effort of increasing diversity within the profession, but the financial barriers associated with the process of applying to genetic counseling graduate programs have yet to be extensively explored. Thus, the present study aimed to address the following: 1) What was the median application cost for prospective students when they applied to genetic counseling programs in the U.S.? 2) What type of expense was the highest during the application process? 3) Were there differences between applicants of historically underrepresented racial and ethnic backgrounds in medicine (hURM) and non-underrepresented applicants in total application costs, accrued volunteer hours, multi-language skills, parental education background, and familial financial support?

4.1 Total application costs

In the present study, the overall median total application costs for participants who applied to one application cycle were $2,634. For applicants who applied during the most recent academic cycles, median total costs were $2,424 and $2,654 for Fall 2020 and Fall 2015-2019, respectively. The financial burden of the application process was even higher for participants who applied to more than one application cycle. A substantial number of applicants reapply each year based on anecdotal evidence; however, available data to determine the actual number of reapplicants for a given academic cycle could not be

located. The costs reported in the current study appear to be much higher than those reported in Stoddard et al. (2021), where median total costs were reported to be $1,500 among students who were admitted to the Fall 2017 and Fall 2018 academic cycles. In both studies, participants applied, on average, to six programs during the application cycle.

There are a few possible explanations for the higher reported median total costs in the current study. First, the present study analyzed participants' various expenses throughout the application process in six major categories (Table 1), and the prior study asked only one question about an overall estimated expense. Each category was further broken down into a list of relevant items to assess additional expenses that participants may or may not have incurred when they applied, such as fees associated with NMS registration, transcripts, exam prep courses, and prerequisite coursework taken after their last degree. The survey's list of the individual items in the application process may have reminded applicants that they incurred these costs, preventing an underestimate of their total application costs. Second, this study also examined indirect costs that may be overlooked as application expenses but are still essential to the application process. These "hidden costs'' can include dependent care, interview attire, textbooks for prerequisite coursework, and conferences/workshops to enhance an applicant's skills and experiences. Finally, there is also the possibility that participants overestimated some of the expenses, especially if they applied some years ago. However, most respondents in the current study (n = 268, 70.0%) applied recently to Fall 2019 and/or Fall 2020 academic cycles. Notably, the differences in application costs reported between Stoddard et al. (2021) and the current study likely reflect an underrecognized financial stress that numerous prospective students shoulder before becoming genetic counseling trainees.

Although it is challenging to accurately calculate the application costs for other health professional degree programs, it is estimated that it costs prospective medical students approximately $4,139 to apply to 15 medical schools, covering expenses from application fees, exam (MCAT) registration, interview-related expenses, and other miscellaneous items (Turner, 2020). The average number of medical schools that students applied to for the Fall 2020 academic cycle was 17 (Association of American Medical Colleges, 2021). In contrast, respondents in the current study applied, on average, to 6 programs per application cycle. While there were more accredited medical schools than genetic counseling programs in North America (172 versus 55 as of May 2021), it is reasonable to expect that prospective students would apply to more schools as more accredited genetic counseling programs are established, potentially driving total application costs up even more (Association of American Medical Colleges, 2021; Accreditation Council for Genetic Counseling, 2021). Regardless of the field, high application costs represent a significant deterrent for low-income students seeking to obtain a health-related science education. The high financial burden of applying may also partly explain why many genetic counseling students tend to be from households of high socioeconomic status (Stoddard et al., 2021; Lega et al., 2005).

4.2 Interview-related costs

The current study also evaluated participants' spending on specific application-related categories. Not surprisingly, out of six application categories, the highest median expense during the application process was for interview-related items (one application cycle: $879; two or more application cycles: $1,310). Prior to the COVID-19 pandemic,

when many interviews were conducted in person rather than virtually, the median interview-related expense was even costlier: $1,101 for participants who applied to one application cycle and $1,888 for those who applied to two or more cycles. One of the possible contributors to higher costs in this category is that some interview invitations may be sent out with short notice to selected applicants, making affordable airfare and accommodations challenging to book. This can be a significant financial burden, especially for applicants whose program interviews are not local or within driving distance. Moreover, many programs have optional casual meet-and-greet sessions with current students and/or program staff before the interview day. Attending these sessions may necessitate spending more money on lodging for an additional night at the program's location. In addition to airfare and accommodations, miscellaneous expenses such as transportation to and from the airport, interview attire, and meals can all quickly add up and become a financial hurdle for many prospective students. To illustrate the financial burden of the interview process that many prospective students faced, one of the study participants shared the following: *"I turned down an interview because I could not afford the travel expense and, at the time, [the program] completely shut down the option for a virtual interview."* Importantly, this applicant's story demonstrates how the high cost of the interview process can create inequity by limiting admission opportunities to those with fewer financial resources.

A critical takeaway from the impact of the COVID-19 pandemic was that remote interviews provided some financial relief for applicants. For the Fall 2020 academic cycle, in which some applicants attended their interviews remotely, the current study reported median financial savings (e.g., airfare/lodging refunds) of about $400 for travel expenses.

While the present study did not investigate costs from participants of the Fall 2021 academic cycle, it may be reasonable to expect that interviews would be less costly. Given the travel restrictions and universities' policies for visitors, all of the interviews for the Fall 2021 cycle were most likely done via video conference. The COVID-19 pandemic has demonstrated that conducting remote interviews on a large scale is not only a feasible option for future application cycles but would mitigate the financial burden of the interview process for all prospective students. Money saved from travel expenses can offer applicants the opportunity to apply to additional programs, be used for expenses in other areas of the application process, or could potentially be saved for future tuition expenses.

If virtual interviews are to be considered as an option, then graduate programs should conduct them virtually for all of their selected applicants. Offering a choice between in-person and remote interviews might create an advantage for applicants with the financial capabilities to travel for in-person interviews. For example, in-person applicants would have the advantage of more time and interaction with faculty and students that would not be equally available for remote interviewees, which could bias judgment during the admission selection process. This would also remove social pressure on those with limited financial resources to incur the cost of in-person interviews because of concerns of appearing less committed to the program.

4.3 General Record Examinations (GRE)

Another costly expense for many participants was graduate-level exams, specifically the GRE. Total median costs for exam related-items were about $405 for the cohort that applied to one application cycle. While some genetic counseling programs and other

graduate programs in other academic disciplines have recently eliminated the GRE from their prerequisites, it can still be another significant hurdle for many prospective students. Along with GPA, letters of recommendations, volunteer experiences, and personal statements, many admission committees have utilized GRE scores to predict an applicant's achievements in graduate studies. However, numerous studies have demonstrated that performance on the GRE is not a useful predictor of students' success in graduate school (Moneta-Koehler et. al., 2017; Sealy et. al., 2019; Williams et. al., 2021). Other studies have also noted that the exam can be a deterrent to increasing diversity in some professions (Miller & Stassun, 2014; Wolf, 2014). In particular, those who have the financial means can afford high-priced exam prep courses to help increase their GRE scores and their competitiveness as an applicant, which can further disadvantage those from lower socioeconomic backgrounds, leading to a concern that the GRE is more of a measure of applicants' wealth, rather than a predictor of their future academic success.

In 2021, the University of California system announced that it would no longer consider SAT and ACT scores when reviewing applications for admission or scholarships through 2025 (Allsup, 2021). The system also observed a surge in undergraduate applications from Black, Latin-American/Latinx, and other underrepresented students since the elimination of standardized testing requirements for the Fall 2021 academic cycle (Watanabe, 2021). In a similar move to enhance positive change in medical education, the United States Medical Licensing Examination (USMLE) updated its Step-1 exam scoring, part of a 3-step board exam for medical students, from numerical scoring to pass/fail (Murphy, 2020). The rationale of this decision was to help students develop other competencies such as communication and teamwork skills, and remove the stress of

achieving high exam scores to demonstrate their competencies, and prevent the use of this score as a metric for future residency training admission. Thus, all genetic counseling programs and graduate divisions in other academic areas should reevaluate their reliance on GRE scores and determine if the GRE requirement is an unnecessary hurdle imposed onto their applicants. Eliminating the GRE requirement might also free up resources for prospective students to obtain skills and relevant volunteer experiences, such as crisis counseling, teaching, and working with individuals with disabilities or medical conditions, that are critical to their professional development as genetic counselors.

4.4 Coursework

In the present study, 47% of participants (n = 183) did not incur expenses for classes taken after their last degree to fulfill coursework prerequisites. Forty-three respondents (11.2%) reported expenses for a post-baccalaureate program, with a few (n = 8, 2.1%) indicating at least $10,000 in spending. Post-baccalaureate programs, or "postbacs," allow students of non-science degree background to pursue a career in healthcare by completing prerequisite courses for admission into medical schools or other graduate programs such as genetic counseling. However, the costs with these programs can be steep; a postbac program for premed students can range from $15,000 to $40,000 (California State University Long Beach Health Professions Advising Office). In addition to the financial burden associated with the application process, needing to obtain a postbac can put an immense financial strain on individuals with little to no science courses seeking to make a career change to become a genetic counselor. If genetic counseling programs strive to form student cohorts that encompass individuals of different perspectives,

backgrounds and experiences, then financial assistance for achieving these application requirements should be considered by stakeholders within the profession to help address the unique financial challenges that these nontraditional applicants face.

4.5 Parental education level and familial financial assistance to total application costs

The 2019 American Community Survey reported that 32.1% of the population in the United States had a bachelor's degree or higher. In contrast, the present study found that 63.4% of the mothers and 69.5% of the fathers of respondents had at least a bachelor's degree or higher. Three respondents (0.08%) reported that neither of their parents had a high school diploma, and 71 (18.6%) indicated the highest degree attained by at least one parent was a high school diploma or associate's degree. This finding is similar to the Stoddard et al. (2021) study, which found that among genetic counseling students admitted to Fall 2017 and Fall 2018 academic cycles, 62.8% of the mothers and 64% of the fathers had at least a college degree or higher. It is also consistent with findings from previous studies demonstrating that higher parental education level is associated with higher awareness of genetic counseling as a profession among high school and college students (Oh & Lewis, 2005; Lega et al., 2005).

Additionally, this study also found that a higher level of parental education was correlated with more financial support from families to cover respondents' application expenses. Most notably, those who had both parents with an advanced degree (i.e., master's degree or higher) reported a median of 60% for familial financial contribution. While data for household income was collected in the study, it was excluded from analysis due to a lack of clarity in the survey regarding this variable. Because the survey did not explicitly

define what constitutes household income, some respondents could have unintentionally excluded their parental incomes and only entered their own, which would underestimate their access to financial resources. Nevertheless, there is clear evidence that higher educational attainment is associated with higher earnings (Tamborini et al., 2015); for master's, professional, and doctorate degrees holders in 2019, the median salary were $77,844, $96,772, and $97,916, respectively (US. Bureau of Labor Statistics, 2019). This would suggest that parents with an advanced degree had the financial resources to help offset the financial strain of application costs, potentially giving some applicants the opportunity to apply to more programs and access to other resources to enhance their applications. This would raise an important issue as to whether an individual's likelihood of success in the admission process is not only influenced by the applicant's merit but also by generational socioeconomic factors. Therefore, increasing opportunities for financial aid and scholarships for prospective students from low- and middle-income families could help mitigate the financial burden of the application process and improve access to genetic counseling graduate programs for individuals of diverse backgrounds.

4.6 Socioeconomic disparities in expenses and resources

The study also assessed differences in the application process among its participants, specifically between individuals from races and ethnicities that are historically underrepresented in medicine and those that were not underrepresented. When looking at the cohort that applied to only one application cycle, the two groups had similar total application costs and accrued volunteer hours. In contrast, hURM respondents in the two or more application cycles cohort had very different application experiences

compared to participants who were not underrepresented: they had higher median total application costs ($6,713 versus $4,762, p = 0.03) and lower median total accrued volunteer hours (246 hours versus 381 hours, p = 0.03). When looking at their cost breakdown, hURM participants in this cohort spent more in the exam, coursework, and miscellaneous (e.g., conferences, workshops) categories, although no statistical analyses were done for these subcategories (Appendix F). Since they were not offered admission in their first application attempt, it is possible that hURM respondents in this cohort incurred additional expenses specifically in these categories to strengthen their application profile for the next cycle (e.g., higher GRE scores, improve grades in prerequisite coursework, stay abreast in the field). Additionally, the decrease in accrued volunteer hours could indicate time constraints or barriers to obtaining relevant volunteer experiences, such as fewer opportunities to shadow/interview a genetic counselor or train as crisis counselors.

There was also a difference between the two groups in parental education level. Non-underrepresented respondents were more likely to have at least one parent with a bachelor's degree or higher degree than were those from the hURM cohort (82.1% versus 68.4%, p = 0.04). hURM participants were more likely to have a parent whose education level did not exceed an associate's degree (31.6%) in comparison to non-underrepresented participants (17.9%). However, the two groups did not differ in their reported familial financial contribution based on the study's limited power to detect a difference with the small size of the hURM group. There is an intersectionality between an individual's race/ethnicity, parental education level, ability of parents to support a child's education, and other likely confounding variables (i.e., age of applicants) that this study could not sufficiently explore. Therefore, given the small sample size of hURM applicants in the

current study, future studies with more representation by individuals who are hURM are needed to clarify these findings.

4.7 Study Limitations

While the study was able to collect participants with different application histories, it was not able to capture the entire population of applicants for any given academic cycle. For instance, there were 1,652 applicants registered in NMS for the Fall 2020 academic cycle (National Matching Services, 2021). Of these, 130 completed the survey (130/1,652, 7.9% response rate). Therefore, it is not possible to conclude that findings reported in the present study are generalizable to all applicants, especially for those who were not offered admission since 81% of this study cohort was admitted to a genetic counseling program but only about 26 - 30% of applicants overall are offered admission (National Matching Services). This is also true for findings pertaining to hURM individuals since the study only included 38 responses (9.9%) for this cohort, of which 34 (89%) were admitted to a program. There is the possibility that hURM non-responders who were not offered admission had very different experiences in their application process, which this study could not address. Additionally, because participants were asked to remember previous application expenses and hours of volunteer time, some responses could be influenced by recall bias, especially from those who applied many years ago.

Another limitation to the study is the slider-style survey questions. Sliders with a more extensive range of options (i.e., 0 - 1,000 versus 0 - 100) pose more challenges for respondents to mark their desired numerical response on a computer or mobile device. The current study had a total of nine slider-style questions, of which four were in the range

of 0 - 2000, one in the range of 0 - 1000, and the remaining were either in the range of 0 - 200 or smaller. For consistency, participants were asked to select the next highest value on the slider that their devices allowed, which would slightly overestimate their intended responses. However, every effort was made to select the most optimal range for each slider question depending on the category in question to ensure ease of response entry. For instance, the slider-style question relating to application expense was set with a range of $0 - $2000, which would overestimate participants' responses by no more than $10 - $25, depending on the device utilized to complete the survey. Sliders with a range of 0 - 200 units or less have a higher resolution capability to allow for more precise entry, with an overestimation of no more than one unit.

4.8 Recommendations for future study

Future studies should extensively examine the total application costs for those who did not receive an admission offer. While the present study was able to capture expenses incurred by a few respondents who were not admitted to a genetic counseling program, these participants only comprised 18% of the study population (32 interviewed but were not admitted, and 37 had no interview offers). Furthermore, additional analysis needs to explore hURM respondents who were not offered admission since 89% of the hURM participants in the current study were admitted to a program. As a comparison, NMS reported that for the Fall 2020 academic cycle, 486 applicants (29.4%) interviewed but were not admitted, and 674 (40.8%) did not submit ranks to NMS, either because they withdrew or did not receive a program interview (National Matching Services, 2020). Since NMS registration became a prerequisite for all prospective students in the Fall 2018

academic cycle and beyond, future study should investigate the possibility of using the NMS system as a way to directly recruit previous applicants who were not admitted to better characterize and understand the financial obstacles they faced during the application process. NMS was considered as a possible recruitment strategy for the present study but was not included because individuals who registered with the system were not asked to provide consent for recontact after the Match process; thus, the consent process for the Match should be examined with consideration of such a study in the future. Another potential strength of this proposed strategy is that it would allow the study to have a representative sample of applicants of various admission statuses and demographic characteristics, which would likely reduce the influence of sample bias.

Another area of focus for future study is to include other demographic dimensions of applicants in relation to the financial barriers of the application process. For instance, the hURM cohort in the present study only encompassed individuals of historically underrepresented racial or ethnic backgrounds. It did not include other characteristics defined by NIH as historically underrepresented in medicine and health-related sciences, such as disability and socioeconomic status. There are also other critical variables to consider, such as gender identity and LGBTQ+ status, which were recently incorporated in 2020 as part of the professional status survey administered by NSGC. Currently, the NIH's diversity statement does not consider LGBTQ+ individuals as underrepresented in medicine. However, many individuals in this community still face discrimination and violence in the workplace, public sphere, and in their access to healthcare (Gruberg et al., 2020). Thus, it is essential to evaluate whether there are hidden obstacles, including financial barriers, that LGBTQ+ applicants have to face to gain admission to a genetic

counseling program. Incorporation and assessment of other demographic dimensions may also provide additional insight into whether individuals from multiple underrepresented backgrounds are further disadvantaged during the application process.

Future research should also explore ways to help lower the financial barriers of the application process. For instance, one genetic counselor informed the study lead of a potential project to establish scholarships for prospective students to partially offset the full spectrum of application costs (personal communication, 2021). In addition to introducing scholarship and other types of funding, there should be an effort made to disseminate information about the funding sources to individuals who may not otherwise be considering genetic counseling, especially among hURM populations. Such aid would not only help mitigate some of the burden of application costs for prospective students but would also be a step towards promoting financial equity in the admission process as well.

Finally, admission to a genetic counseling program is only one of many domains in a student's journey to becoming a genetic counselor. A longitudinal study should explore other financial barriers that genetic counseling students may face at various points of their training trajectory. These potential socio-economic hurdles could be even more pronounced for certain underrepresented students, which may influence their professional development, attitudes towards the field, and retention and promotion in the workforce. Understanding these post-admission barriers from a holistic perspective could further enhance efforts toward diversifying the profession (Quintero-Rivera and Hisama, 2020).

4.9 Conclusion

The present study analyzed the financial barriers of the application process experienced by prospective genetic counseling graduate students. Specifically, it assessed median application costs for prospective students who previously applied to genetic counseling programs in the United States, with Fall 2020 (n = 130, 33.9%) and Fall 2019 (n = 138, 36.0%) being the most applied academic cycles among the study's cohort. It found that the median total application costs for respondents who applied to only one application cycle were $2,634 (n = 264). For those who applied to two application cycles, the median total costs were $4,762 (n = 84). The study also examined expenses of various application categories and found that interview-related items had the highest median cost (one application cycle: $879; two or more application cycles: $1,310). Among those who applied to more than one cycle, individuals of historically underrepresented racial and ethnic backgrounds in medicine (hURM) (n = 19) had higher median total costs ($6,713 versus $4,762, p = 0.03) and lower median total volunteer hours (246 versus 381 hours, p = 0.03) than non-underrepresented respondents (n = 100). Additionally, there was a difference in parental education level (p = 0.04) between hURM and non-underrepresented respondents. Higher parental education level was correlated with a higher percentage of familial financial support (p = 0.0009). Our findings provide evidence that financial aspects of the application process can serve as barriers to some and can have a profound impact on many prospective students, especially on those with fewer resources. Furthermore, this study reinforces the need for stakeholders within the profession to implement evidence-based strategies to lower the financial hurdle and the resulting inequities in the application process. Such action would not only bolster ongoing efforts to diversify the profession, but

it would also translate to higher quality patient care that aligns with the diverse needs of the populations it serves.

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Appendix A: Letter of Confirmation for Self-Determination Process

THE EXEMPT SELF DETERMINATION PROCESS

March 2021

To Whom it May Concern:

The Exempt Self-Determination Tool may be used for self-determining certain types of exempt research at UCI, including exempt research conducted through the Undergraduate Research Opportunities Program (UROP). Exceptions do apply. Please refer to UCI HRPP Policy # 12 for the current exceptions.

As part the Exempt Self-Determination Tool process, UCI IRB review is not required and will not be provided. For studies that are submitted to the IRB where the Exempt Self-Determination Tool may be used instead, the study will be returned to the researcher to self-exempt. For exempt studies that require UCI IRB review, Lead Researchers must submit an IRB application and supporting documents to the UCI IRB for review.

UROP students using the Exempt Self-Determination Tool to conduct exempt research should contact UROP for questions related to the use of the tool.

As part of using the Exempt Self-Determination Tool, Lead Researchers and Faculty Sponsors (as applicable) provide their assurance that they will follow relevant Human Research Protection Program (HRPP) policies and procedures, among other criteria. For a copy of the assurance, please review the following page.

If there are any questions regarding UCI HRPP Policy # 12, please contact HRPP Staff.

-The UCI HRPP

Appendix B: Survey Advertisements

Advertisement posted on online forums and distributed via email:

I applied to six genetic counseling graduate programs and it cost me almost $5,000! How about you?

Let's face it. Applying to graduate school is *expensive*. In addition to application fees, there are fees for GREs, prerequisite classes, technology, travel, attire, and many more. It's a costly process and can pose a barrier for many prospective applicants. If this sounds familiar, researchers from UC Irvine **want to hear from you!**

If you applied to at least one genetic counseling (GC) graduate program in the U.S. for admission in Fall 2005* – Fall 2020*, **regardless of the outcome of your application(s)**, you are encouraged to participate in an anonymous online survey.

We are looking for responses from a diverse group of applicants to **ALL** GC graduate programs. Findings from the study could help remove barriers and broaden diversity in the GC profession.

Participants may enter a raffle for a chance to win one of 100 $5 Starbucks gift cards!

Learn more about the study and participate:

GET INVOLVED

https://uci.co1.qualtrics.com/jfe/form/SV_5u1pu7EKb6dVKxT

Survey closes on 3/30/2021

If you have any questions, please contact the lead researcher, Dexter Lee, at dexterl2@hs.uci.edu or the faculty sponsor, Kathryn Singh, at kesingh@hs.uci.edu

*Fall 20XX denotes the academic term for which you applied to BEGIN the program if admitted/matched, NOT the year in which you submitted the application materials.

Appendix C: Survey

University of California, Irvine
Study Information Sheet

Analysis of Financial Barriers Experienced by Prospective Genetic Counseling Students

Lead Researcher
Dexter Lee
Division of Genetic and Genomic Medicine

Faculty Sponsor
Kathryn Singh
Division of Genetic and Genomic Medicine

- Every year, hundreds of genetic counseling (GC) applicants are burdened with the upfront cost of the application process. In addition to the standard application fees, there are also the "hidden costs" of applying – from graduate exam fees to travel expenses for interviews – that can become a financial challenge for many prospective students. The financial burden can also pose a barrier for lower-income applicants and can affect the diversity of the GC profession. Furthermore, there are limited studies that have examined the amount of time and money spent by GC applicants.
- The purpose of this study is to understand more about the financial barriers that applicants experience when they apply to GC programs in the United States. We would like you to complete an **anonymous survey** to learn about your history of applying to GC program(s), spending throughout the application process, and other demographic information. Findings from the study could uncover inequities in the application process, an important step towards broadening diversity in the GC field.
- **All applicants who have applied to at least one accredited GC program in the U.S. for admission in Fall 2005* – Fall 2020*, regardless of the outcome of their application(s), are invited to participate in the study.**
- *Fall 20XX denotes the academic term for which you applied to BEGIN the program, NOT the year in which you submitted the application materials.
- Participation in this anonymous survey is voluntary. You may refuse to participate or discontinue your involvement at any time during the survey for any reason.
- Estimated time to complete the survey: 15 - 20 minutes.
- Participants may provide their email address at the end of the survey to enter a raffle for one of 100 $5 Starbucks gift cards. Your email address will NOT be tied to your survey responses.

- All research data collected will be stored securely and confidentially.
- Future Research Use: Researchers will use the information you provide to conduct this study. Once the study analyses are complete, we may share your de-identified data with other researchers for future studies. We will not ask you for additional permission to share this de-identified information.
- If you have any questions regarding this study, please contact the lead researcher, Dexter Lee, at dexterl2@hs.uci.edu, or the faculty sponsor, Kathryn Singh, at kesingh@hs.uci.edu
- If you have questions or concerns about your rights as a research participant, you can contact the UCI Institutional Review Board by phone, (949) 824-6662, by email at IRB@research.uci.edu
- **What is an IRB?** An Institutional Review Board (IRB) is a committee made up of scientists and non-scientists. The IRB's role is to protect the rights and welfare of human subjects involved in the research. The IRB also assures that the study complies with applicable regulations, laws, and institutional policies.

If you want to participate in this study, click the *Agree* button. Then click the arrow button to start the survey.

Agree

○

Block 1

Instructions:

The first part of the survey will ask about your history of applying to GC program(s) in the U.S. for Fall 2005 - Fall 2020 admission.

Click the arrow at the bottom left of each page to view a previous screen of questions. Do not use the back button on your browser or mobile device.

Which of the following best describes you?

- ○ I am currently a student enrolled in a GC program
- ○ I have graduated from a GC program
- ○ I applied but was not offered an interview
- ○ I applied and interviewed, but did not match/receive an admission offer to a GC program
- ○ I applied and matched/received an admission offer to a GC program, but decided not to attend

In a few words, describe your reasons not to attend a GC program.

In total, how many **application cycles** have you applied for admission to GC program(s)?

Indicate the application cycle(s) you applied for admission. If you applied more than once, list them in descending order starting with the most recent cycle. You can list up to four cycles (if applicable).

Note: Fall 20XX denotes the academic term for which you applied to BEGIN the program, NOT the year you submitted the application materials.

Leave any unused fields blank.

Application cycle (most recent)	
Application cycle	
Application cycle	
Application cycle	

Enter the number of GC programs to which you applied and number of interviews you were offered for each application cycle selected.

	Number of programs applied	Number of interviews offered
${q://QID59/ChoiceGroup/SelectedAnswers/1}		
${q://QID59/ChoiceGroup/SelectedAnswers/2}		
${q://QID59/ChoiceGroup/SelectedAnswers/3}		
${q://QID59/ChoiceGroup/SelectedAnswers/22}		

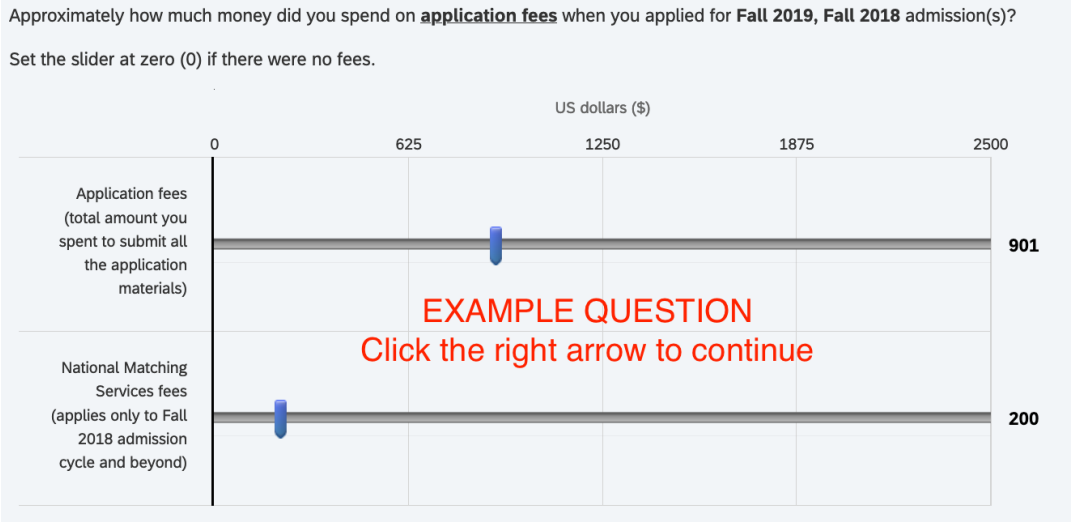
Instructions:

The next section will ask about your spending throughout the application process.

A slider will appear next to a series of items. Move the slider that best reflects the amount you spent on the item in TOTAL across all the application cycles in which you have participated.

If your computer or mobile device cannot mark the exact amount, select the next highest value your device allows.

As an example below, if you spent $400 on application fees for Fall 2019 and $500 for Fall 2018, you would slide to $900. If you could only slide to $898 or $901, select $901.



Block 2

How much money did you spend on **application fees** when you applied for ${q://QID59/ChoiceGroup/SelectedAnswers}?

Set the slider at zero (0) if there were no fees.

US dollars ($)

0 500 1000 1500 2000

Application fees (total amount you spent to submit all the application materials)

National Matching Services fees (applies only to Fall 2018 admission cycle and beyond)

If you spent more than $2000 on application fees: set the slider at zero (0), above, and enter the amount spent**,** without commas (,) or "$" sign, below.

Leave the fields blank if unused.

US dollars ($)

Application fees

How much money did you spend on **exams** when you applied for ${q://QID59/ChoiceGroup/SelectedAnswers}?

Set the slider at zero (0) if there were no fees.

If you spent more than $2000 for a specified item: set the slider at zero (0), above, and enter the amount spent**,** without commas (,) or "$" sign, below.

Leave the fields blank if unused.

	US dollars ($)
GRE exam	
TOEFL/IELTS exam	
Supp study materials	
Exam Prep classes/tutoring	

How much money did you spend on **additional coursework** (outside of any prior degrees) when you applied for ${q://QID59/ChoiceGroup/SelectedAnswers}?

Set the slider at zero (0) if there were no fees.

US dollars in thousands (k)

	0	5	10	15	20	25
Post-bacc program (for those who have completed little to no health science requirements)						

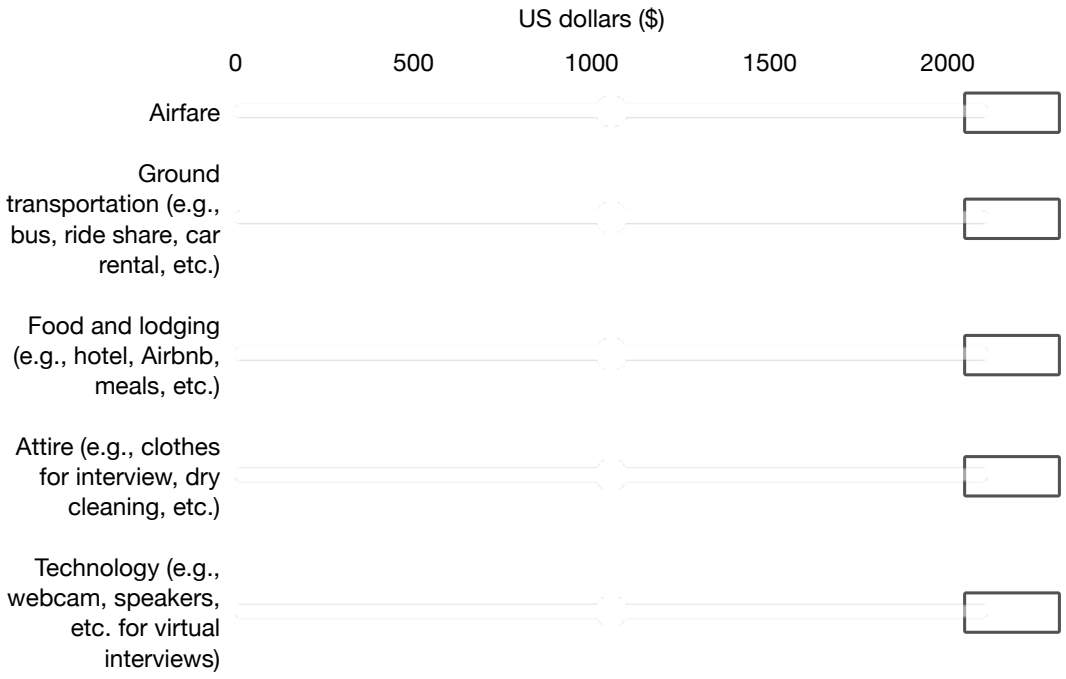
If you spent more than $25k for a post-bacc and/or $2000 for another specified item: set the slider at zero (0), above, and enter the amount spent, without commas (,) or "$" sign, below.

Leave the fields blank if unused.

	US dollars ($)
Post-bacc	
Classes	
Technology	
Textbooks	

How much money did you spend on **interviews** when you applied for ${q://QID59/ChoiceGroup/SelectedAnswers}?

Set the slider at zero (0) if there were no fees.



If you spent more than $2000 for a specified item: set the slider at zero (0), above, and enter the amount spent**,** without commas (,) or "$" sign, below.

Leave the fields blank if unused.

	US dollars ($)
Airfare	
Ground transportation	
Food and lodging	
Attire	
Technology	

Was your travel plan impacted by Covid-19 when you applied to GC program(s)?

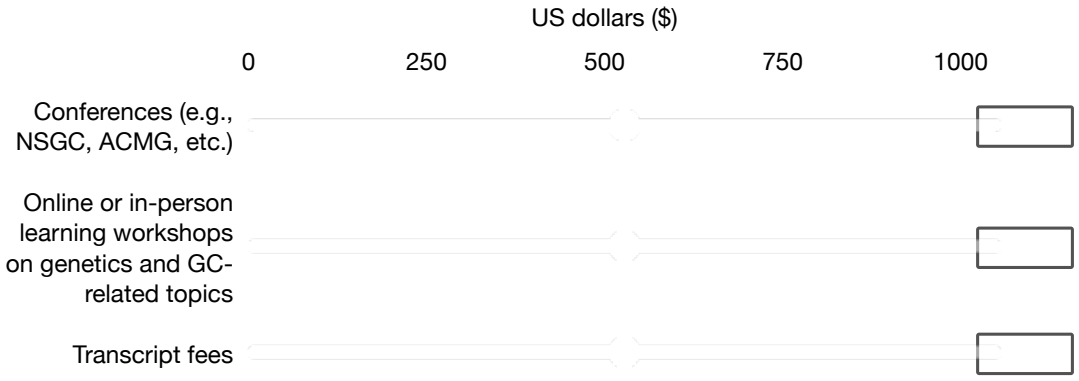
- ○ Yes
- ○ No

How much money did you **save** (e.g., refunded $500 for airfare + lodging reservations) because of Covid-19? Enter the total amount without commas (,) or "$" sign.

How much money did you **lose** (e.g., non-refundable deposit) because of Covid-19? Enter the total amount without commas (,) or "$" sign.

How much money did you spend on **miscellaneous items** when you applied for ${q://QID59/ChoiceGroup/SelectedAnswers}?

Set the slider at zero (0) if there were no fees.



If you spent more than $1000 for a specified item: set the slider at zero (0), above, and enter the amount spent**,** without commas (,) or "$" sign, below.

Leave the fields blank if unused.

	US dollars ($)
Conferences	
Learning workshops	

Were there other relevant items for which you incurred expenses that were not listed in previous questions?

- ○ Yes
- ○ No

Specify the item name and the amount spent, without commas (,) or "$" sign, below. Leave any unused fields blank.

	US dollars ($)
Item name	
Item name	
Item name	
Item name	
Item name	

How many **total hours** did you spend on obtaining the following types of **volunteer** experiences when you applied to GC program(s)?

Set the slider at zero (0) if there were no hours.

If you spent more than 200 hours for a specified experience: set the slider at zero (0), above, and enter the number of hours spent, below.

Optional: You can add other **volunteer** work and hours spent, below, that are not listed.

	Total Hours
Shadowing GC	
Healthcare Setting	
Disabilities/med conditions	
Advocacy	
Counseling	
Other. Please specify:	
Other. Please specify:	

Block 3

Instructions:

The last section will ask questions about your background, education level, employment status, annual income, and family contribution when you were preparing your application(s) and applying to GC program(s).

What was your age in years when you applied for ${q://QID59/ChoiceGroup/SelectedAnswers/1}?

What is your gender identity?

- Female
- Male
- Non-binary
- Genderqueer
- Transgender
- I prefer to self-describe:
- I prefer not to answer

Were you a parent or caretaker of dependents when you were applying to GC program(s)?

- Yes
- No

How much money (if any) did you spend on childcare/dependent care when you were applying to GC program(s)? Enter the amount, without commas (,) or "$" sign, below.

Which of the following options best describes your race and ethnicity? Select all that apply.

- [ ] American Indian or Alaska Native
- [ ] Asian
- [ ] Black, African American, or African
- [ ] Hispanic or Latinx
- [ ] Middle Eastern or North African
- [ ] Native Hawaiian or other Pacific Islander
- [ ] White
- [ ] [ ] I prefer to self-describe
- [ ] I prefer not to answer

Do you identify as LGBTQIA+?

- ○ Yes
- ○ No
- ○ I prefer not to answer

Do you identify as someone with a disability?

- ○ Yes
- ○ No
- ○ I prefer not to answer

Which of the following options best describes your religious affiliation? Select all that apply.

- [ ] Buddhist
- [ ] Catholic
- [ ] Christian
- [ ] Hindu
- [ ] Jewish
- [ ] Muslim
- [ ] No affiliation
- [ ] [ ] I prefer to self describe:
- [ ] I prefer not to answer

What was your highest education level when you were applying to GC program(s)?

- ○ Bachelor's degree in process
- ○ Bachelor's degree
- ○ Master's degree
- ○ Applied or professional doctorate (MD, DO, DDS, JD, PharmD)
- ○ Doctorate degree (EdD, PhD)

What is the highest level of education your parents completed?

Mother [ ]

Father [ ]

Which language(s) can you comprehend and speak proficiently? Select all that apply.

- [ ] Arabic
- [ ] Bengali
- [ ] English
- [ ] Farsi
- [ ] French
- [ ] German
- [ ] Hindi
- [ ] Italian
- [ ] Japanese
- [ ] Korean
- [ ] Mandarin
- [ ] Spanish
- [ ] Tagalog
- [ ] Vietnamese
- [ ] [ ] Other. Please specify:

Which language(s) are you most comfortable speaking (native language)? Select all that apply.

- [ ] Arabic
- [ ] Bengali
- [ ] English
- [ ] Farsi
- [ ] French
- [ ] German
- [ ] Hindi
- [ ] Italian
- [ ] Japanese
- [ ] Korean
- [ ] Mandarin
- [ ] Spanish
- [ ] Tagalog
- [ ] Vietnamese
- [ ] [ ] Other. Please specify:

Which of the following best describes your employment status when you were applying to GC program(s)? Select all that apply.

- [ ] Working
- [ ] Not working
- [ ] Student - Full-time (≥ 12 credits per semester/quarter)
- [ ] Student - Half-time (6 - 8 credits per semester/quarter)
- [ ] Student - Less than half-time (≤ 5 credits per semester/quarter)
- [ ] Retired
- [ ] Other. Please specify:

How many hours per week were you working for your employment when you were applying to GC program(s)?

Hours per week

0 20 40 60 80 100

Employment

Did your employment limit your ability to obtain other relevant experiences (e.g., shadowing a GC, crisis counseling, etc.) when you were applying to GC program(s)?

- ○ Yes
- ○ No

Which of the following categories best describes the industry of your employment when you were applying to GC program(s)?

- ○ Education (science or healthcare related)
- ○ Education (non-science or healthcare related)
- ○ Healthcare (patient interaction)
- ○ Healthcare (no patient interaction)
- ○ Retail or other service industry
- ○ Laboratory (healthcare, but not related to genetics)
- ○ Laboratory (genetics)
- ○ Laboratory (non-healthcare related)
- ○ [ ] Other industry. Please specify:

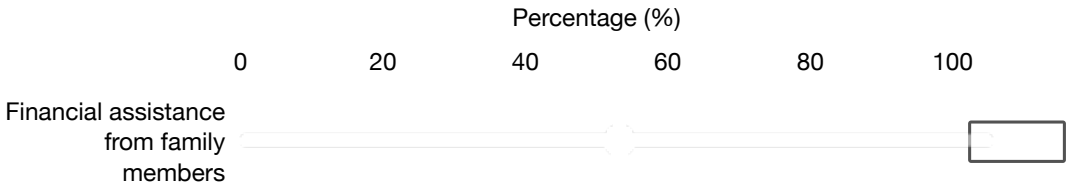
What was your annual household income from all sources (employment, investments, rental income, businesses, etc.) when you applied to GC program(s)?

[ ]

Block 4

Based on your responses, your combined application costs were approximately **$${e://Field/Grand_total}**.

What percentage (%) of your combined application costs, shown above, was covered by financial assistance from family members when you applied to GC program(s)?



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Appendix D: List of proficient and native languages, including free-response answers

Number of native and proficient language speakers.

Languages	Number of native language speaker[1]	Percent (%)	Number of proficient language speaker[1]	Percent (%)
American Sign Language[2]	-	-	1	0.3
Arabic	1	0.3	2	0.5
Cantonese[2]	2	0.5	7	1.8
Dutch[2]	1	0.3	1	0.3
English	374	97.7	374	97.7
Farsi	1	0.3	2	0.5
French	7	1.8	21	5.5
German	1	0.3	9	2.3
Gujarati[2]	1	0.3	2	0.5
Hebrew[2]	-	-	1	0.3
Hindi	3	0.8	4	1.1
Hungarian[2]	2	0.5	2	0.5

Italian	-	-	3	0.8
Japanese	3	0.8	4	1.1
Kannada[2]	-	-	1	0.3
Konkani[2]	-	-	1	0.3
Korean	1	0.3	3	0.8
Kutchi[2]	1	0.3	1	0.3
Mandarin	3	0.8	9	2.3
Marathi[2]	1	0.3	1	0.3
Russian[2]	1	0.3	2	0.5
Sinhalese[2]	1	0.3	1	0.3
Spanish	11	2.9	41	10.7
Tagalog	-	-	2	0.5
Tamil[2]	-	-	1	0.3
Urdu[2]	1	0.3	2	0.5
Vietnamese	-	-	1	0.3

[1]Respondents could select more than one option, so the total exceeds 100%
[2]Language entered as a free-response answer

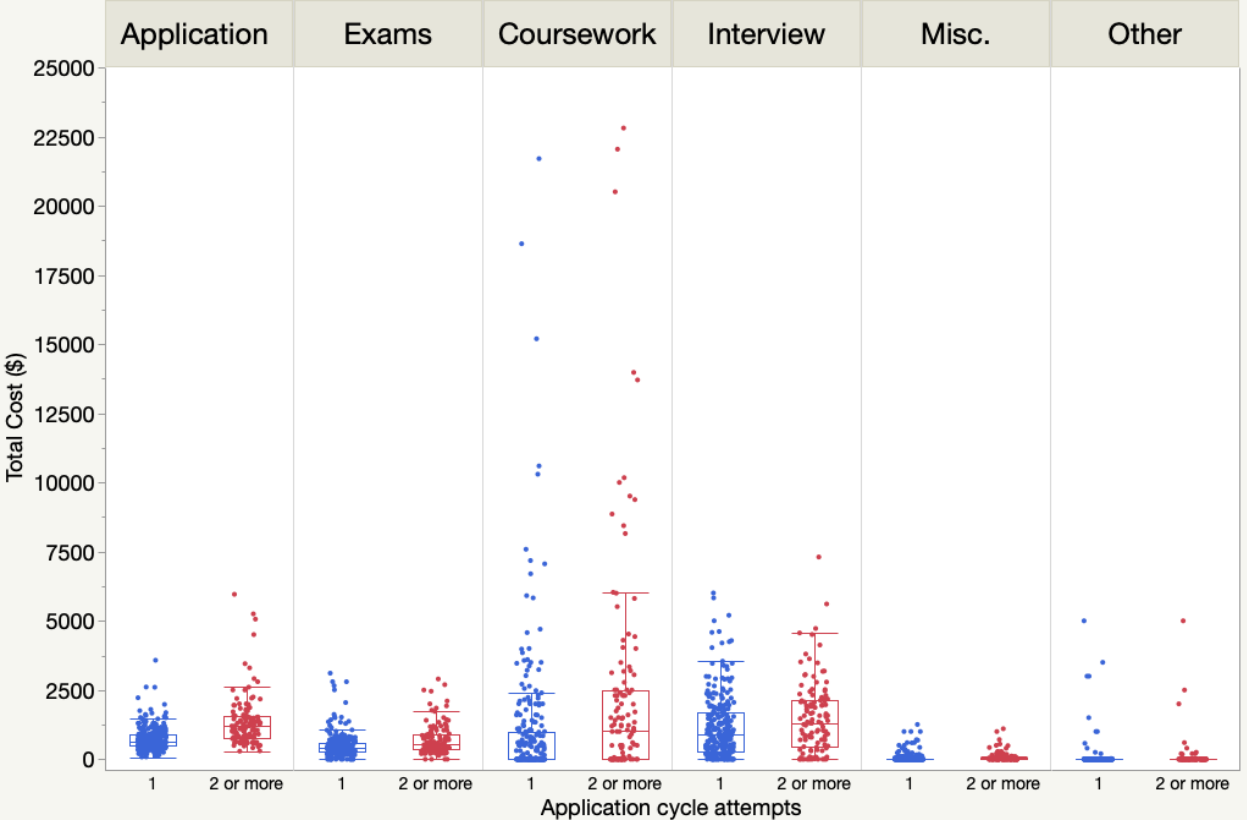
Appendix E: Household income

Survey question: What was your annual household income from all sources (employment, investments, rental income, businesses, etc.) when you applied to genetic counseling program(s)?

Household income[1]	n = 383	Percent (%)
Less than $ 10,000	74	19.3
$ 10,000 - $ 19,999	45	11.7
$ 20,000 - $ 29,999	45	11.7
$ 30,000 - $ 39,999	68	17.8
$ 40,000 - $ 49,999	36	9.4
$ 50,000 - $ 59,999	19	5.0
$ 60,000 - $ 69,999	13	3.4
$ 70,000 - $ 79,999	14	3.7
$ 80,000 - $ 89,999	9	2.3
$ 90,000 - $ 99,999	8	2.1
$100,000 - $149,999	30	7.8
More than $150,000	22	5.7

[1]Household income variable was excluded from data analysis. This variable was not explicitly defined on the survey as earnings from every member with whom respondents resided at the time of their last application cycle. Therefore, it is unclear whether the amount that respondents selected reflects an income of only one or multiple household members.

Appendix F: Cost breakdown by expense categories and number of application attempts (all data points)



Cost breakdown by expense categories and number of application attempts. This figure includes eight data points with values greater than $12,500 in the coursework category that were previously omitted in Figure 5 to optimize the y-axis range.
Data points are overlaid on each of the box and whisker plots shown. Color indicates application cycle attempts (blue, one attempt; red, two or more attempts). From bottom to top, the five horizontal lines of each box plot represent the five-number summary: minimum non-outlier value, 25th percentile (Q1), median, 75th percentile (Q3), and maximum non-outlier values (e.g., values less than Q3 + 1.5*IQR). Data points outside the top horizontal line are "outliers" by box and whisker plots standards but are notable because they reflect the few respondents who had significantly high total application costs.

Appendix G: Application cost breakdown by race/ethnicity group in the two or more application cycles cohort

	hURM (n = 19)		Non-underrepresented (n = 100)	
	Median ($)	Range ($)	Median ($)	Range ($)
Application Fees	1,124	423 – 2,201	1,101	186 – 5,200
Exams	850	200 – 2,103	506	0 – 2,900
Coursework	1,409	501 – 22,042	751	0 – 22,806
Interview	1,643	25 – 5,609	1,309	0 – 7,307
Miscellaneous[1]	217	0 – 1,101	110	0 – 1,230
Other[2]	0	0 – 2,500	0	0 – 5,000
Total application costs[3]	6,713	2,194 – 25,242	4,762	883 – 24,206

[1] Conferences and workshops

[2] Optional free text-response for participants to enter other expenses not inquired by the survey

[3]For total application costs, there was a difference observed between hURM and non-underrepresented respondents ($p = 0.03$). The non-parametric Wilcoxon Rank Sums test was used to analyze the relationship between race/ethnicity and total application costs.