EVALUATION OF A POST-BACCALAUREATE MEDICAL EDUCATION PROGRAM FOR DISADVANTAGED STUDENTS TO DIVERSIFY THE HEALTHCARE WORKFORCE IN HAWAIʻI (1996 – 2016)

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By

Chanley Mālia Purdy

Dissertation Committee:

Kathryn Braun, Chairperson
John Chen
Chung-Eun Ha
Winona Lee
Elizabeth McFarlane
Maile Tauali'i

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ABSTRACT

In Hawai‘i, Native Hawaiians and other Pacific Islanders (NHOPI) comprise 26.2% of the population, but make up only 3.7% of the physician workforce. The Association of American Medical Colleges (AAMC), the American Medical Association (AMA), and the Institute of Medicine (IOM) have stated that a health care workforce reflective of the population it serves will help reduce health disparities and increase equity. This is, in part, because physicians from underrepresented minority groups tend to be more likely to serve patient populations that are underrepresented, underserved, and in rural areas, and because many underrepresented patients prefer race- and language-concordant providers.

On average, less than 20% of John A. Burns School of Medicine graduates are of an underrepresented minority (JABSOM OSA, 2016). The Department of Native Hawaiian Health (DNHH) medical education division was created to increase diversity in the medical profession in Hawai‘i. The ‘Imi Ho‘ōla Post-Baccalaureate Program (IH), although longstanding, has *not been formally evaluated to determine whether they are meeting the mission of increasing diversity of the health care workforce.*

This dissertation included three studies. For the first, a secondary data analysis was conducted to determine profile differences between students who successfully completed the IH program, and those who did not. A high science grade point average (GPA) and attitude towards academic success are important predictors for IH program completion. Through a series of focus groups with program participants, the second study identified the key components of the IH program that led to successful matriculation and academic achievement in medical school. These included financial support, social support, and mentorship. The third study assessed the practice outcomes of IH graduates through a secondary data analysis and found that 58% of IH graduates

practice primary care, 39% practice in Hawai‘i or the Pacific Basin, and 44% practice in an underserved and/or rural area.

The findings of this research suggest that IH admits students who are committed to its mission of producing physicians that practice primary care in medically underserved areas in Hawai‘i and the Pacific Basin, and that pipeline and pathway programs such as IH are a successful way to increase diversity in the healthcare workforce. Taken together, recommendations for programming and policy include setting science GPA minimums for admission and increasing financial support and mentorship for participants of IH. Recommendations for future research include gathering better data on IH non-completers, and interviewing IH graduates to identify factors and barriers affecting their commitment to IH's mission.

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INTRODUCTION

Public Health Problem

Underrepresented Minorities in Medicine

By 2060, only 36% of all children in the United States will be single-race non-Hispanic white, compared to the 52% seen today (US Census, 2015). The US as a whole is expected to become a majority-minority nation as soon as 2044 (US Census, 2015). Racial and ethnic health disparities have been well documented, and negative or avoided clinical encounters contribute to such disparities (IOM, 2004). For example, negative stereotypes about minorities held by physicians can cause physicians to selectively recall information that confirms these stereotypes, and sometimes allow such stereotypes to enter into clinical decisions regarding diagnosis and appropriate course of treatment (Biernat & Dovidio, 2000). Minority race or ethnicity is found to be associated with generally more negative patient evaluations and lower rates of referral for clinical services, even when patients present with the same clinical condition (Balsa and McGuire, 2003).

Sociocultural differences between patient and provider influence communication and clinical decision making (Donini-Lenhoff and Hedrick, 2000; Schulman et al., 1999; van Ryn and Burke, 2000). Evidence suggests that racial, ethnic, and linguistic diversity among health professionals is associated with better access to and quality of care for disadvantaged populations. Racial and linguistic concordance can improve provider-patient communication, which is directly linked to patient satisfaction, adherence, and health outcomes. Ineffective communication in the medical encounter may lead to patient dissatisfaction, non-adherence to

medical advice, poorer health outcomes, and ultimately, racial and ethnic disparities in health care (Schulman et al., 1999; van Ryn and Burke, 2000; Donini-Lenhoff and Hedrick, 2000).

The Association of American Medical Colleges (AAMC), the American Medical Association (AMA), and the Institute of Medicine (IOM) have stated that a health care workforce reflective of the population it serves will help reduce health disparities and achieve health equity (US Department of Health and Human Services, 2016). This is, in part, because physicians who are underrepresented minorities are more likely to serve patient populations who are underrepresented, underserved, and live in rural areas (Basco et al., 2010; Bergen, 2000; Walker, Moreno, and Grumback, 2012), and in part because patients from underrepresented populations show a preference for race- and language-concordant providers (Cooper and Powe, 2004).

Underrepresented minorities (URMs) differ from place to place based on context, geographical location, profession, and culture. The AAMC now defines URMs as those racial and ethnic populations underrepresented in the medical profession relative to their numbers in the general population (AAMC, 2004). Prior to this definition, the AAMC used the term URM to include only Blacks, Mexican-Americans, Native Americans (to include American Indians, Alaska Natives, and Native Hawaiians), and mainland Puerto Ricans (AAMC, 2017).

In 2016, there were 53,029 applicants to medical school in the US, with 21,025 matriculating into medical schools across the states. Roughly 18% of matriculates were URMs (AAMC, 2016), while the URM population in the US is approximately 40% (US Census, 2016). If the goal is to have a physician workforce reflective of its population, medical schools in the US should be admitting URM students at similar proportions to the local populations. Understanding educational pathways for health occupations in the US is important for

strategizing how to reduce workforce shortages and increase diversity, since the number and type of graduating professionals ultimately influences workforce capacity, and ultimately, access to care (Washko, Snyder, and Zangaro, 2015).

Literature Review

Timeline of the Pipeline and Pathway Programs Initiatives

As growing numbers of ethnic and racial minorities in the US seek to pursue educational equity, integrate successfully into the health professions, and access quality health care benefits (Smith et al., 2009), more programs are needed to prepare URM students from disadvantaged communities to enter the medical and other healthcare fields. In 1978, the AAMC began to call for programs that established direct links between medical schools, undergraduate schools, secondary and elementary schools, in addition to programs that provided enrichment in the sciences for the purposes of improving the pool of URM applicants to medical school (Giordani et al, 2001). In 1991, the AAMC promoted a new initiative to specifically correct the significant underrepresentation of minority students in US medical schools (Giordani et al, 2001). By 2004, the federal government agencies, such as the National Institutes of Health (NIH), National Science Foundation (NSF), and the Health Resources and Services Administration (HRSA), spent $2.8 billion on more than 200 different minority educational programs in the Science, Technology, Engineering, and Math (STEM) fields that were implemented in all 50 states of the US (Schultz et al., 2011).

But enhancing access to STEM education alone is not enough. In the 1980s, the Robert Wood Johnson Foundation funded the Minority Medical Education Program and conducted a study to determine the effectiveness of an intensive summer program from 1989 to 1997 to support minority college students in their aspirations toward and preparation for medical school.

This study found that these participants had 70% greater odds than the minority control group of gaining admission to medical school (Cantor et al., 1998). Although many private foundations have provided financial support for health professions pipeline programs, the largest single funder for these types of activities has been the federal government, specifically, the Health Careers Opportunities Program (HCOP) authorized in 1972 and the Centers of Excellence (COE) Program administered by the Health Resources and Services Administration (HRSA, 2016).

HCOP programs were created to promote recruitment of qualified individuals from disadvantaged backgrounds into health and allied health professional programs, improve admission and retention rates by putting tailored enrichment programs that address the academic and social needs of disadvantaged trainees into action, and provide opportunities for community-based health careers trainings, emphasizing experiences in underserved communities (HSRA, 2016). COEs differ from HCOP because COEs are education centers designated to health professional schools as a way to recruit, train, and retain underrepresented minority students and faculty (HRSA, 2016). These minority educational intervention and training programs vary widely in their approach and the services they offer. The services offered by COE programs typically include one or more of the following: mentoring, stipends, test preparation, tutoring and specific skills training, college or graduate school preparation and exposure, research opportunities, enrichment programs and activities, supplemental instruction, and summer training programs (Schultz et al., 2011). Because these HCOP and COE programs are broad in their approach and the services they provide, programming are more introductory in nature and geared towards generating interest and exploration of possible health profession careers, in addition to supporting and retaining the URM faculty that already exists.

Both HCOP and COE programs have also been reported to have a positive impact on the communities they serve. These programs provide opportunities for students to work with underserved populations and, as a result, graduates who practice in underserved communities are more likely to be culturally competent health care professionals (AAMC, 2012). In a 2012 survey of HCOP and COE programs, directors of these programs reported that program participants improved test scores, had higher graduation rates, and improved in their attitudes from baseline (AAMC, 2012). By 2012, the HCOP and COE programs had encouraged a minimum of 459,036 underrepresented minorities, educationally disadvantaged, and economically disadvantaged students to consider a career in the health professions (AAMC, 2012).

Despite program successes across the country, in 2006, the federal government drastically reduced the budgets for HCOP by 89 % and for the COE by 65 %. As federal funding decreases, HCOPs and CEOs expect to see decreased recruitment of minority and disadvantaged students, deterioration of the pipeline for aspiring health professionals, and decreased opportunities for cultural competency initiatives (AAMC, 2012). Nearly two-thirds of programs report leveraging other funds in addition to federal grants. Among these, 69% of programs match at a rate equal to or surpassing the federal allocation. Still, reductions in federal funding jeopardize the continuation of pipeline interventions formerly supported by this funding, which will likely reduce the number of underrepresented minorities entering medicine (AAMC, 2012).

Post-Baccalaureate Premedical Programs

Another approach to increasing URMs in the physician workforce is pipeline programs that are more specific and tailored to prepare students to pursue careers in medicine, namely academic-enhancer, post-baccalaureate premedical programs that are primarily privately, state,

or university funded. Most of these programs are specifically designed to help URMs who have completed their bachelor's degree, as well as students who are in the advance stages of the medical school pipeline and ready to apply to medical school (Giordani et al, 2001), or had applied to medical school and did not have the academic performance qualifications for direct admissions (McDougle, Way, and Yash, 2008). These programs provide social support, Medical College Admission Test (MCAT) preparation, coaching in the application process, and upper-level science coursework to enhance the ability of the student to gain admission into medical school (Andriole and Jeffe, 2011). Most also have components focusing of professionalism and personal well-being, and provide strong student support services (Andriole et al, 2015).

Post-baccalaureate programs are designed to address the barriers of URM students pursing medicine. URM student perceptions of educational barriers to pursuing medicine include lower MCAT scores, lack of finances to attend medical school, pressure to perform academically, negative stereotypes, and ethnic discrimination (Henry, 2006). Medical school admission personnel believe URM recruitment is limited due to lower MCAT scores of applicants, lack of minority faculty, and lack of minority role models (Agrawal, Vlaicu, and Carrasquillo, 2005). Research suggest that post-baccalaureate, premedical programs are highly efficacious in increasing the likelihood that URM applicants will compete successfully for admissions to medical school (Grumbach and Chen, 2006), or gain conditional acceptance pending the completion of the program and/or meeting certain academic achievement standards (Grumbach, 2011).

There are at least 231 post-baccalaureate programs in the US (AAMC, 2017). Of the 231, about 164 are academic-record-enhancing, post-baccalaureate programs, 89 specifically recruit for URM, and 64 serve those who are economically and educationally disadvantaged

(AAMC, 2017). Post-baccalaureate intervention efforts tend to have high yields because they only require a single year of intervention with students who have an explicit commitment to pursuing a career in medicine (Epps, 2015). Fifteen % of all medical school students have completed a post-baccalaureate program (Grumbach, 2011), and research has shown that participants of post-baccalaureate programs are just as successful as non-participants in reference to timely graduation (Epps, 2015).

Previous Work & Community Buy-In

Native Hawaiian and Other Pacific Islanders in Medicine

The term "Native Hawaiians and Other Pacific Islanders" (NHOPI) is a federal designation referring to Native Hawaiians, Chamorro, Samoans, and other people tracing ancestry to any of the original people of the islands of Polynesia (such as Tahiti, Tonga, and Tokelau), Micronesia (such as the Marshall Islands, Palau, and Chuuk), and Melanesia (such as Fiji, Guinea, and the Solomon Island) (OMHHE, 2013). In 2011, there was an estimated 1.4 million (<1.0%) NHOPI in the US (OMHHE, 2013). Native Hawaiians and Other Pacific Islanders (NHOPI) bear a disproportionately higher prevalence of chronic disease, particularly diabetes, heart disease, and cancer, when compared to all other ethnicities in Hawai‘i (Look et al., 2013). When compared to the state as a whole, NHOPI have a 68% higher mortality rate caused by heart disease, a 130% higher mortality rate caused by diabetes, and a 70% higher prevalence of 'overweight' status in the population (Look et al., 2013). Nationally, age-adjusted prevalence of diabetes in 2010 was 3 times greater among NHOPI than non-Hispanic Whites, and when compared to other minority populations, NHOPI have higher prevalence of smoking and alcohol consumption (OMH, 2013). NHOPI also have a disproportionately higher prevalence of chronic and cardio-metabolic disorders (Mau et al., 2009). The life expectancy at

birth of Native Hawaiians was about 6.2 years lower than for the general population of Hawai‘i in 2010 (Wu et al., 2017).

Because NHOPI bear a disproportionate burden of disease, more research is needed to identify ways to improve NHOPI health. However, because NHOPI comprise less than 1 % of the US population, research on this group has been limited (Mau et al., 2010). Given the health disparities experienced by NHOPI, and the large proportion of NHOPI in Hawai‘i’s population, there is a need to understand how to best reach and serve the small and culturally diverse populations that fall under the NHOPI category.

In Hawai‘i, NHOPI and other minorities are the federally designated Medically Underserved Populations (MUP) and tend to live in Medically Underserved Areas (MUA). As defined by the Health Resources and Services Administration (HRSA), MUA/Ps are geographic areas and populations that are identified as having a lack of access to primary care services (HRSA, 2016). MUA/P designations are based on the Index of Medical Underservice (IMU) calculated based on four criteria: the population-to-provider ratio, the percentage of the population below the federal poverty level, the percentage of the population over age 65, and the infant mortality rate (HRSA 2016). The IMU score can range from 0 to 100, where 0 represents an area that is completely underserved. Any area or population with a score of 62 or less qualifies as an MUA/P (HRSA 2016). MUA/Ps can also be requested for populations and areas that may not meet the established criteria by giving explanation to the unusual, documented local conditions that prevent access to, or demonstrate the lack of personal health services, and written recommendation with supporting data from the state’s governor and local health officials (HRSA, 2016). Hawai‘i has a total of 11 designated MUA/Ps, with scores ranging from 56.8 in the Ko‘olauloa service area to 64.1 in the Wahiawa East area, which has a Governor’s exception

as a Medicaid-eligible MUP. Other areas of exception include Waikiki, Honolulu, Kalihi-Palama, Kauaʻi County, and Hāna/Hāʻikū in Maui County service areas. Service areas that meet MUA/P criteria include: the island of Maui (57.4), the island of Lānaʻi (59.6), Hawaiʻi County (61.2), and the island of Molokaʻi (61.3).

Another healthcare shortage designation area is the Health Professional Shortage Area (HPSA). HPSA designation considers provider supply in select specialty services, namely dental, mental, and primary care. HPSA is designed to identify areas experiencing workforce shortages for specific types of health professionals and are primarily intended to guide placement of personnel and professional training resources (Salinsky, 2010). HPSA designation is based solely on population-to-provider ratios. A HPSA score can range from 0 (least shortage) to 26 (greatest shortage). Hawaiʻi has a total of 24 designated HPSA areas for primary care services, from 6 in Kula, Maui to 20 on the island of Lānaʻi (HRSA, 2017).

Increasing the numbers of NHOPI health professionals can play a major role in reducing health disparities for all at-risk populations. There is an understanding that all healthcare professionals have an obligation to care for and treat patients of all racial and ethnic groups; however, immigrant and minority patients have a higher likelihood of selecting health care providers of their own racial or ethnic background (Nsiah-Kumi and Pamies, 2009). Therefore, URM medical providers, namely NHOPI health care providers in Hawaiʻi, can play a crucial role in the removal of barriers to health care utilization for Hawaiʻi's NHOPI population. NHOPI are the URMs in medicine in Hawaiʻi, with NHOPI comprising 26.2% of the population, but making up only 3.7% of the physician workforce (Ambrose et al., 2012). In 2016, of the 53,029 applicants to medical school in the US, just 32 were NHOPI. Of these 32 applicants, only 13 matriculated into medical school (AAMC, 2016). The low number of NHOPI applicants to

medical school is one explanation to why they are underrepresented in medicine. These statistics support the need to help NHOPI enter and succeed in educational pipelines to increase their interest in medicine and other healthcare fields.

Institutional commitment is vital to a post-baccalaureate program's sustainability (Andriole et al., 2015). The Department of Native Hawaiian Health (DNHH) was established in 2003 within the University of Hawai‘i (UH) John A. Burn School of Medicine (JABSOM) to purposely address the health of Native Hawaiians. The DNHH medical education division was created to increase diversity in the medical professions. This division is comprised of the Native Hawaiian Center of Excellence (NHCOE) and the ‘Imi Ho‘ōla Post-Baccalaureate Program (IH), the pipeline and pathway programs being utilized in Hawai‘i. The NHCOE provides programming that primarily targets secondary and undergraduate Native Hawaiian students to generate interest in the health care professions, but also provides financial and social support for Native Hawaiian students who are already in medical school. NHCOE is funded by HRSA whose intent is to "improve the public's access to quality, culturally-appropriate health care by increasing the number of underrepresented minority students who enter and successfully graduate from health professions training programs" (HRSA, 2016). The mission of NHCOE is to "promote the physical and mental health of all Native Hawaiians by recruiting students into the health professions, conducting health disparities research, promoting faculty and student development, implementing cultural competence development training, and disseminating informational resources relevant to the health of Native Hawaiians."

The ‘Imi Ho‘ōla (Hawaiian for "Those Who Seek to Heal") post-baccalaureate program was established at UH JABSOM in 1972. IH's first class of 15 students entered in 1973. Funding was initially provided by the US Public Health Service to recruit underrepresented and

disadvantaged applicants who had the potential for a career in medicine. Since then, funding has been provided by various federal and state agencies, community health systems, grassroots organizations, and private donations. The goal of the IH program is to "assist underrepresented and disadvantaged post-baccalaureate students to qualify for and complete the Medical Doctor degree program at JABSOM". The mission of the program is to "improve healthcare in Hawai'i and the Pacific Basin by increasing the number of minority-serving physicians through an educational program that addresses potential barriers in an effort to increase diversity in the medical profession" (Lee et al., 2014).

While IH has been in existence for over 40 years, there has been minimal research on the outcomes of this Hawai'i-based program towards increasing the diversity of the healthcare workforce in Hawai'i. Increasing the diversity of the health care workforce to include more NHOPI and other minorities is an essential part of improving the health status of NHOPI. Given the health disparities suffered by NHOPI, and the large proportion of NHOPI in Hawai'i's population, there is a need to understand how to attract more NHOPI into the health professions, and produce qualified health professionals that have a desire to practice in Hawai'i. Without a formal evaluation of its outcomes, it is unknown whether IH of the DNHH at the UH JABSOM is meeting its mission to increase the diversity of the health care workforce in Hawai'i.

Dissertation Purpose

The objective of this dissertation was to comprehensively evaluate the IH program (1996 – 2016). This evaluation: 1) evaluated and analyzed profile differences between those who successfully completed the IH program and those who did not, with the intent to inform and improve retention services during the program year and better screen for applicants that are more likely to complete IH and matriculate into JABSOM; 2) qualitatively identified the key components of the IH program that led to successful matriculation and academic achievement in

medical school, as described by the program participants; and 3) determined the practice outcomes of IH graduates, specifically the percentage of graduates who are now practicing primary care in rural and/or underserved communities in Hawai‘i and the Pacific, and identified factors that best predict which applicants meet the mission of the IH program. The specific research questions (RQ) that were answered are as follows:

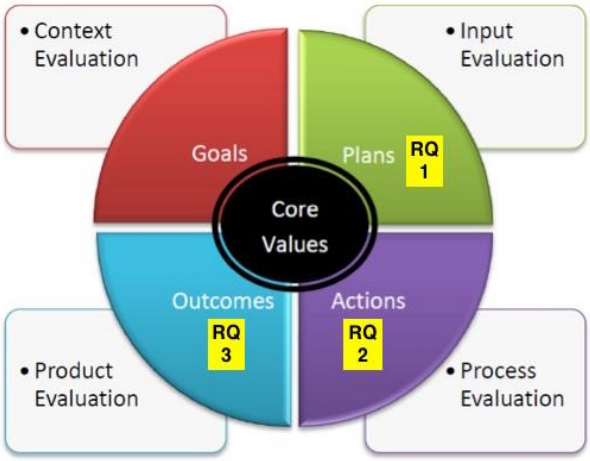
1. Does the profile of ‘Imi Ho‘ōla completers differ significantly from the profile of those that do not complete in terms of Grade Point Averages (GPA), MCAT scores, socio-economic demographics, and study habits as measured by the Learning and Study Strategies Inventory (LASSI)?
2. What are the key components of the ‘Imi Ho‘ōla Post-Baccalaureate Program that lead to successful matriculation and academic achievement in medical school, as identified by past participants?
3. What is the percentage of ‘Imi Ho‘ōla graduates currently practicing primary care in rural and/or underserved communities? Which factors best predict which applicants will ultimately meet the mission of the IH program?

Conceptual Framework

This dissertation was guided by the Context, Input, Process, Product (CIPP) conceptual model. CIPP was originally developed as a means to systematically provide timely evaluative information for the use in decision making and is intended to facilitate educational improvement through a proactive approach to evaluation (Stufflebeam, 1971). This evaluation model falls in the category of improvement/accountability (Zhang et al., 2011) and is a comprehensive framework for guiding evaluations of programs, projects, personnel, products, institutions, and

systems. The CIPP model is useful in evaluating programs aimed at effecting long-term, sustainable

Figure 1.1. Context, Input, Process, Product (CIPP) Evaluation Model for Education



Adapted from Stufflebeam, Daniel L. 1983. *"The CIPP Model for Program Evaluation." In Evaluation Models, 117–41. Evaluation in Education and Human Services. Springer, Dordrecht.*

improvements with core parts of context, input, process, and product evaluation. In general, these four parts of an evaluation respectively ask: What needs to be done? How should it be done? Is it being done? Did it succeed?

In the context of evaluating educational program, the CIPP model can help identify administration needs of the program, as well as needs of the program's participants. The input evaluation component can help assess things happening in the program and suggest responses that might address identified needs. The process evaluation component monitors the program process, and potential facilitators and barriers to identify program adjustments that need to be made. The product evaluation component measures, interprets, and judges the program outcomes and interprets merit, worth, significance, and integrity (Zhang et al., 2011).

The IH program has a unique context because of its mission to produce primary care

physicians who stay in Hawai‘i and/or the Pacific Basin and serve in underserved areas. These goals are unique when compared to other premedical post-baccalaureate programs across the US. RQ1 examined IH program's input data, as it was a comparison study analyzing already-collected data to distinguish between those who completed the program and those who did not based on information provided to the IH program by the participant when he/she applied to the program. RQ 2 was a process evaluation that qualitatively investigated the most- and least-beneficial services provided by IH to students while they are in the program. Lastly, RQ3 was a product evaluation, as the analysis of practice outcomes of IH program completers was done, and factors that best predict IH applicants that eventually practice primary care in underserved communities in Hawai‘i and/or Pacific Basin were determined.

The following chapters present more specific literature as well as the methods and findings for each research question. Specifically, Chapter 2 presents methods and findings on RQ1; Chapter 3 presents methods and findings on RQ2; and Chapter 4 presents methods and findings on RQ3. Chapter 5 summarizes the key findings and recommendations for programming, policy, and research from all three studies taken together.

CHAPTER 2

PROFILE COMPARISON OF ‘IMI HO‘ŌLA POST-BACCAULAUREATE PROGRAM COMPLETERS AND NON-COMPLETERS

Abstract

Post-baccalaureate programs have the potential to increase medical school admissions for underrepresented minorities. However, despite rigorous criteria for admission to these programs, not all students complete them and matriculate into medical school. The purpose of this study was to compare the profiles of ‘Imi Ho‘ōla Post-Baccalaureate Program (IH) participants who completed the program and those who did not complete the program to identify factors which may help improve completion rate of the program in the future. Univariate and multivariate logistic regressions were performed to assess the associations between demographic variables, educational background, educational disadvantage, economic disadvantage, social disadvantage, academic predictors, and subscales from the Learning and Study Strategies Inventory (LASSI) and program completion status. The findings suggest that higher score on the attitude subscale of the LASSI, a higher Science GPA, and higher MCAT scores in the physical sciences were predictive of IH program completion. Based on these findings, IH should consider revisions to its admission criteria related to measures of attitude towards academic success, science GPA, and MCAT scores. Findings also support the need for focus on mastery of science-related competencies needed for medical school during the IH program.

Introduction

Post-baccalaureate programs

There is no shortage of underrepresented minorities (URM) and disadvantaged students interested in medicine. However, too high a percentage becomes discouraged by financial and

academic barriers they face in college, in addition to being unprepared to cope effectively with the rigors of medical school (Giordani et al., 2001). Common educational barriers faced by URMs include low MCAT scores, limited financial support, negative stereotypes, ethnic discrimination, lack of minority faculty, and lack of same-race mentor and role model (Agrawal, Vlaicu, and Carrasquillo, 2005; Bright, Duefield and Stone, 1998; Henry, 2006). More recent research has also shown that ethnicity-related disparities in medical school performance exist even after adjusting for age, gender, and other variables (Lionis, 2015). Lower scores on standardized tests among URM groups might be caused by lower levels of social capital across the life course, which could have limited their experience with testing and limited interaction with high-performing students, tutors, and clinicians during their elementary, secondary, and undergraduate years (Lionis, 2015).

Post-baccalaureate premedical programs serve as a valuable intervention to increasing the diversity of physicians in the US (Grumback and Chen, 2006). Several reports have described non-degree-granting and academic-enriching, one-year programs that recruit and train college graduates from groups that are underrepresented in medicine and/or are from economically and/or educationally disadvantaged backgrounds (Giordani et al., 2001; Grumbach and Chen, 2006; Jackson et al, 2003; Lipscomb et al, 2009; McDougle, Way, and Yash, 2008;). These programs vary considerably in selection criteria for participation, curricular design, and extent of medical-school-conditional-acceptance agreements for participants who successfully complete the program. Despite the array of differences, previous research suggests that grade point averages (GPA) and medical college admission test (MCAT) scores, and traditional admission eligibility requirements tend to be lower in URMs, and are not reliable predictors for the retention of URM students in medical school (Giordani et al., 2001). URMs who participate in

post-baccalaureate programs can successfully compete for admission into and complete the rigors of a medical school program (Epps, 2015; Giordani et al., 2001; Grumbach and Chen, 2006).

It is important to identify barriers and challenges that URMs face so that post-baccalaureate programs can better support and strengthen the medical-school bound. It is also important to know the characteristics of where URMs are starting from and how far they need to go so that these programs can provide proper supports. Even after admission, URM medical students often report lack of support, discrimination, isolation, and lack of empowerment as inhibitors to their success (Lionis, 2014). Predictors of success among medical students have been found in the literature (reviewed below); however, no research has been done on predictors of success among URM students admitted to a post-baccalaureate, medical-school-preparation, program in Hawai‘i.

Profiles and Predictors of Academic Success Among Medical Students

A study to determine predictors of attrition and of academic success among medical students found that the most significant predictors of medical school completion were high school grades and entrance exam scores (Kruzicevic et al., 2012). Students who are at the cusp of medical school admission cut-offs in terms of GPA and MCAT score usually need close monitoring and are more likely to require academic support, as GPA of the premedical year, or the last year of undergraduate schooling can be used to predict academic performance in medical school. In an attempt to determine if delayed graduation due to academic difficulties in the early stages of medical school can be predicted early, Rosenfeld et al. (1992) suggested that MCAT scores of 8 and an undergraduate science GPA of 3.25 are pivotal predictors.

Beyond MCAT scores and GPA, the effects of achievement motivations, social and familial background, and intelligence of the individual on educational attainment were also examined. Cassidy and Lynn (1991) found that academic motivation (as measured using a 20-item scale), school-type, and home and parental factors played a bigger role in educational attainment than an individual's intelligence measured by an IQ test. A study that examined longitudinal associations between contextual influences and educational attainment found that neighborhood and family-level variables contributed more towards educational attainment than did individual level variables (Boyle et al., 2007). In a study looking at how commitment, gender, and age predicted academic performance, commitment (as measured by items like: "I often wake up eager to take up life wherever it left off") was identified as the most significant positive correlate of academic performance (Sheard, 2009). When looking at the association between commitment and academic achievement, Pop et al. (2016) found that high academic achievement led to high levels of commitment. Findings from these studies suggest that predictors of academic success are multifaceted, and programs created to increase academic success should not only include components that enhance the academic record, but should also consider components of social support, level of commitment, alleviation of financial burden, and mentorship with a role model of similar background.

Research suggest that study strategies are also significant factors affecting academic achievement in medical schools (Barker & Olsen, 1997; Durak et al., 2006). The Learning and Study Strategies Inventory (LASSI) was designed to help students gather information about learning, study practices, attitudes towards learning, and methods of studying (Weinstein, Palmer and Acee, 2016). The test is an 80-question self-assessment divided into 10 scales: anxiety, attitude, concentration, information processing, motivation, selecting main ideas, self-testing,

study aids, test strategies, and time management. Utilizing the LASSI to provide medical school students with information about their strengths and weaknesses and implementing targeted support in specific student strategies may yield positive academic performance outcomes (Zhou, Graham and West, 2016). A study looking to determine whether relationships could be identified between academic aptitude, study strategies measured by LASSI, and academic performance found that time management and self-testing were stronger predictors of first-semester academic performance than aptitude (West and Sadoski, 2011). Using LASSI, another study looking at study skills and academic performance among second-year medical students in problem-based learning found that students who performed in the top third of the class were less likely to use study aids, concluding that a better understanding of the differences in study habits and study aid use in relation to academic performance is needed (Sleight and Mavis, 2006).

ʻImi Hoʻōla Post-Baccalaureate Program

Recent figures in the US suggest that African Americans, Hispanic, and American Indians and Alaska Natives comprise 26% of the population; however, they represent only 13% of medical school graduates, and only make up 6% of the physician workforce (McDougle, Way and Yash, 2008). In Hawaiʻi, NHOPI make up 26.2% of the total population (Ambrose et al., 2012) and roughly 17% of medical school graduates in 2012 (JABSOM unpublished data, 2017), but only 3.7% of the total Hawaiʻi physician workforce (Ambrose et al., 2012). The ʻImi Hoʻōla Post-Baccalaureate Program (IH) was created in 1973 to increase Native Hawaiian and Pacific Islander representation in medical school by increasing their competitiveness to successfully gain admission to and graduate from the John A. Burns School of Medicine (JABSOM) (Lee et al., 2014).

In the first two decades of the program's history (1973-1994), IH focused on premedical

academic enrichment for Native Hawaiian and Pacific Island students preparing to apply to medical school. Up to 25 students were accepted into each class and, upon completion, students would become more competitive applicants for admission into JABSOM. During the 1995-1996 academic year, IH underwent a significant organizational transformation due to changes in federal funding priorities and did not have a cohort.

Beginning with the 1996-1997 class, the IH program became an official post-baccalaureate program within the University of Hawai‘i at JABSOM, with a mission to improve healthcare in Hawai‘i and the Pacific Basin by increasing the number of physicians through an educational program that addresses disadvantaged students' academic and social-emotional needs in an effort to increase diversity in the medical profession (Izutsu et al., 2012; Lee et al., 2014). At this time, the program modeled HCOP programs and expanded its focus from Native Hawaiians and Pacific Island students only to individuals from "disadvantaged background." Disadvantaged was defined as a person who comes from an environment that has prevented the individual from obtaining the knowledge, skills, and abilities required to enroll in and graduate from medical school and/or comes from a family with an annual income below low-income thresholds based on family size as published by the U.S. Census Bureau.

The program provides services that address social-emotional issues, in addition to academics supports. Services include help coping with stressors, individualized educational plans informed by learning assessments for each student, and help dismantling ineffective study habits then reforming and reinforcing study habits that are beneficial. IH faculty and JABSOM Learning Specialists are also able to refer students to a clinical psychologist working for the Counseling and Student Development Center at the University of Hawai‘i at Mānoa, to help students work through barriers and identify any other supports that a student might need.

Initially, the re-formatted program accepted up to 10 students each year. Once enrolled in the program, students gained a conditional acceptance to JABSOM and automatic matriculation if the student successfully completed IH.

These program enhancements led to greater success. For example, from inception in 1973 to 1996, there was a 41% IH completion rate. After the transformation in 1996 until 2016, the IH completion rate with matriculation into JABSOM rate increased to 81%. In 2010, JABSOM increased the IH enrollment from 10 to 12 students per class. Since then, the IH program has seen an increased amount of attrition and a decreased completion rate of 68%.

Each IH application goes through a holistic admissions process to determine eligibility for entrance into the program. A holistic review is defined as a flexible, individualized way of assessing an applicant's capabilities by which balanced consideration is given to experiences, attributes, and academic metrics, in combination with how the individual contributes value as a medical student and physician (AAMC, 2017). While most medical school admission processes heavily weigh GPA and MCAT, IH first looks at an applicant's degree of disadvantage, commitment to serve, and lastly, academic program requirements. While a holistic admission approach is more suitable for URMs in medicine, this could also potentially be the reason for the lower completion rates.

The purpose of this chapter is to describe the characteristics of IH participants, and compare those who successfully completed the program and those who did not. Evaluating characteristics of those who completed IH and those who have not could lead to strengthening the program and increase overall IH-participant matriculation into JABSOM.

Methods

Data and Sample

The IH program database consists of several parts. Demographic cross-sectional data was collected at the time of application for admissions into the IH program. The databased also includes variables measuring degree of disadvantage, but only for IH completers from class of 1974 to 2018. Thus, for this study, data on degree of disadvantage of non-completers were extracted from paper copies of applications and added to the database. The IH program database also included LASSI percentiles for each of its ten subscales. These data were not collected upon application, but rather collected during Phase I of the program and added to the database at the end of Phase I each year.

The full IH database includes records for 328 students ever enrolled in the IH program. For this study, however, the analysis was restricted to the 210 IH enrollees between 1996 and 2016. This inclusion range was chosen to reflect a reasonably homogeneous exposure to the academic course work based on revisions in the program curriculum in 1996. In March 2015, the AAMC released a new MCAT with a new scoring system in which there is no easy way to properly convert the old MCAT scores to new MCAT score. For this reason, the sample of the study ends in 2016. Even restricting the database, the study allowed for exploration of data trends for 20 years of IH participants. To ensure confidentiality, names were deleted from the database before analysis.

Measures and Variables

Demographic variables in the study dataset include: age (in years), sex (male or female), English as a first language (yes or no), place of origin (Hawai‘i, Pacific, Asia, US Continent, or Other), and ethnicity (Hawaiian, Filipino, Pacific Islander (Chamorro and Samoan), Asian

(Chinese, Japanese, Korean, Vietnamese), White, and Other). Based on target ethnicity of IH program, the ethnicity variable was further grouped into Hawaiian, Filipino, Pacific Islander (Chamorro and Samoan), and all other. We did this because the motivation to start IH was to increase NHOPI representation in the medical school, its graduates, and the overall healthcare workforce in Hawai‘i.

Educational background measures included: first-generation college student (yes or no), graduate school attendance (yes or no), undergraduate major (science or non-science), undergraduate location (HI, Continental US, or Pacific), and years to undergraduate completion (<=4 years or >4 years). Whether or not an applicant had children at the time of applying (yes or no), and whether the applicant was married at the time of applying (yes or no) were also collected.

Measures of disadvantage in the areas of education, economics, and social support were included in this study. Educational disadvantage included the variables of: both parents lacking a bachelor's degree (yes or no), attending a high school that had limited or no science courses/laboratory experiences, and attending a high school that lacked counselling toward pursuing higher education (yes or no). Economic disadvantage included the following: an income below the state median (yes or no), father having a service or clerical, non-upper management occupation at the time of applying (yes or no), and mother having a service or clerical, non-upper management occupation at the time of applying (yes or no). Social disadvantage was measured by: whether the participant grew up in a HPSA/MUA designated area (yes or no), whether the participant lacked a physician role-model (yes or no), and whether the participant lacked a support system to pursue higher education (yes or no).

Academic predictors included: science GPA, overall GPA, verbal MCAT section score, physical science MCAT section score, biological sciences MCAT section score, overall MCAT score, and MCAT percentile. LASSI is one of the formative assessments the IH program uses to determine the students' baseline study skills. The LASSI is administered during Phase I of the program, after all students have been accepted and are being oriented to their learning styles and personality types. LASSI percentile scores were included as a way to measure anxiety, attitude, motivation, and other factors that may impact student success. The 10 different study domains include: anxiety (e.g.: *I am very tense when I study*), attitude (e.g.: *I do not care about getting a general education, I just want to get a good job*), concentration (e.g.: *My mind wanders a lot when I study*), information processing (e.g.: *I try to find relationships between what I am learning and what I already know*), motivation (e.g.: *When work is difficult, I either give up or study only the easy parts*), selecting main ideas (e.g.: *When studying, I seem to get lost in the details and miss the important information*), self-testing (e.g.: *I stop periodically while reading and mentally go over or review what was said)*, study aids (e.g.: *To check my understanding, I make up possible test questions and try to answer them*), test strategies (e.g.: *I have difficulty adapting my studying to different types of courses* (all items are reverse scored)), and time management (e.g.: *I find it hard to stick to a study schedule*). The response options utilize a 5-point Likert-type scale ranging from "not at all typical of me" to "very much typical of me". The percentiles range from 0-100. A score below the 50^{th} percentile indicates an area that needs more improvement. A score from the 50^{th} – 75^{th} percentile means that the student should consider improving the skill to promote their academic performance. A score over the 75^{th} percentile means that no work is needed in that area. LASSI variables included percentile scores for each of the ten domains (Weinstein, Palmer and Schulte, 1987).

Quantitative Analysis

Descriptive statistics were computed for all participants and for completers and non-completers separately. Independent t-tests were conducted to compare all continuous variables, and Chi-square tests were used to compare all categorical variables between completers and non-completers. When analyzing the academic predictors, 7 out of 12 students in the last year of the inclusion period of the study were admitted based on the new MCAT score. As there is no accurate way of converting new MCAT scores to old MCAT scores, these 7 students were removed from all MCAT analyses resulting in a sample of 203 rather than 210. Odds ratios and their 95% confidence intervals (CI) were derived based on univariable logistic regression analysis. Multivariable logistic regression models were developed considering all variables with p-values < 0.1 in the bivariate analyses. A backwards model selection procedure was used to determine the variables in the final model. Gender and target ethnicity, both important variables for the IH program, were then added to the final model, if they were not chosen based on the model selection process. For ease of interpretation of the logistic regression analysis, the LASSI percentiles were divided by 10 to make the unit of measure 10% instead of the original 1%. Statistical analyses were conducted using SPSS version 25 and a p-value of less than 0.05 was regarded as statistically significant

Human Subjects

This study was submitted to the Institutional Review Board (IRB) at the University of Hawai‘i at Mānoa on November 30, 2017 and approved on December 24, 2017 with an exempt status (#2017-00964).

Results

From 1996 to 2016, there were a total of 210 program participants, of which 168 (80%) completed the program, and 42 (20%) did not. The mean age of IH participants was 25 years old upon entry, and did not differ between the completers and non-completers (t (208) = -0.399, p = 0.690). Forty-three percent (43%) of participants were female. Majority of program participants are from Hawai‘i (80%) or the Pacific Basin (15%). The ethnic make-up of IH participants were Native Hawaiian (30%), Filipino (27%), Asian (inclusive of Chinese, Japanese, Korean, Vietnamese) (21%), Pacific Islander (10%), and Other (Caucasian, American Indian / Alaska Native, White, African American, and other Asian/Indians) (13%). Sixty-seven percent (67%) of completers and 62% of non-completers were of the program's target ethnicity.

The findings from the bivariate analysis of non-continuous variables between groups are shown in Table 2.1. While there were minor demographic differences between completers and non-completers, none of the differences were statistically significant. About 70% of both completers and non-completers spoke English as a first language. Seven percent of completers vs. 10% of non-completers were married at the time of applying. At the time of applying, 7% of both completers and non-completers had children.

Nor were there significant difference found between completers and non-completers in terms of educational background. An average of 63% of both groups were first-generation college students, and 19% of completers and non-completers attended graduate school. About 85% of all participants entered IH with a science-major degree, and 64% of undergraduate degrees earned were from colleges in Hawai‘i. Sixty-one percent (61%) of completers vs. 52% of non-completers took 4 years or less to complete their undergraduate degree.

Table 2.1. Summary of Demographic Characteristics

Variable	Total n (%)	Completers n (%)	Non-Completers n (%)	Significance (p-value)
Completer (yes = 1)	210 (100)	168 (80)	42 (20)	
Demographics				
Age mean (std dev)	25 (4)	25 (4)	25 (3)	.690
Sex (female = 1)	90 (43)	69 (41)	21 (50)	.296
Target ethnicity (yes = 1)	139 (66)	113 (67)	26 (62)	.512
Origin Hawai‘i Pacific Asia US Continent Other	 168 (80) 32 (15) 5 (2) 4 (2) 1 (1)	 134 (80) 28 (17) 4 (2) 2 (1) 0 (0)	 34 (81) 4 (10) 1 (2) 2 (5) 1 (2)	--
Ethnicity Native Hawaiian Filipino Asian Pacific Islander Other	 62 (30) 57 (27) 44 (21) 20 (10) 27 (13)	 53 (32) 42 (25) 37 (22) 18 (11) 18 (11)	 9 (21) 15 (36) 7 (17) 2 (5) 9 (21)	--
English as a first language (EFL) (yes = 1)	148 (71)	118 (70)	30 (71)	.880
Married at the time at of applying (yes = 1)	15 (7)	11 (7)	4 (10)	.709
Children at the time of applying (yes = 1)	15 (7)	12 (7)	3 (7)	1.00
Educational Background				
First Generation UG (yes = 1)	135 (64)	109 (64)	26 (62)	.719
Graduate School Attendance (yes = 1)	39 (19)	30 (18)	9 (21)	.594
Major (science = 1)	178 (85)	143 (85)	35 (83)	.773
Undergraduate Location (Hawai‘i = 1)	135 (64)	108 (64)	27 (64)	1.00
Years to UG completion (<4 years = 1)	124 (60)	102 (61)	22 (52)	.326
Educational Disadvantage				
Both parents lack a bachelor’s degree (yes = 1)	139 (66)	114 (68)	25 (60)	.307
Limited HS science resources (yes = 1)	51 (24)	39 (23)	12 (29)	.469

Economic Disadvantage				
Income below the state median (yes = 1)	127 (61)	98 (58)	29 (69)	.204
Father non-management occupation (yes = 1)	132 (63)	106 (63)	26 (62)	.886
Mother non-management occupation (yes = 1)	147 (70)	117 (76)	30 (71)	.821
Social Disadvantage (n = 189)				
Grew up in HPSA/MUA area (yes = 1)	84 (44)	63 (42)	21 (50)	.356
Lack of a physician role-model (yes = 1)	45 (23)	34 (23)	11 (26)	.634
Lack of a support system (yes = 1)	116 (60)	93 (62)	23 (55)	.397

*p-values were based on t-tests for continuous variables and Chi-square tests for categorical variables.

When looking at educational disadvantage, 68% of completers (vs. 60% of non-completers) had parents who both lacked a bachelor's degree. Twenty-three percent (23%) of completers (vs. 29% of non-completers) attended a high school that had limited or lack of science courses/laboratory experiences. When examining economic disadvantage, 58% of completers (vs. 69% of non-completers) reported having a combined family income that was below the state median at the time of applying, about 63% of both completers and non-completers had a father whose occupations was non-managerial, and an average of 73% for both groups had a mother whose occupation was non-managerial at the time of applying. Finally, when analyzing the social disadvantage of program participants, 42% of completers (vs. 50% of non-completers) grew up in a HPSA/MUA designated area, an average of 23% of all participants lacked a physician role-model, and 62% of completers (vs. 55% of non-completers) lacked a support system to pursue higher education.

Table 2.2. Summary of Academic Predictors

Variable	**Completer** mean (SD)	**Non-Completer** mean (SD)	**Significance** (p-value)
GPA Science (N = 210)	3.21 (0.41)	3.08 (0.46)	.062
GPA Overall (N = 210)	3.38 (0.34)	3.34 (0.34)	.575
MCAT Verbal (N = 203)	7.60 (1.75)	8.11 (1.60)	.108
MCAT Physical Science (N = 203)	**7.80 (1.42)**	**7.27 (1.28)**	**.037**
MCAT Biological Science (N = 203)	8.48 (1.37)	8.14 (1.32)	.161
MCAT Overall (N = 203)	24.34 (4.90)	24.27 (3.53)	.923
MCAT Percentile (N = 203)	44.91 (22.55)	44.52 (18.23)	.677

*p-values were based on t-tests.

Table 2.2 displays academic variables of overall and science GPAs, and overall and section scores of the MCAT. A significant difference was only found in the Physical Sciences section of the MCAT score (t (201) = -2.097, p = .037). Science GPA approached significance (t (208) = -1.877, p = .062), however, there was no significant difference found in all other academic predictors between IH completers and non-completers, which included: overall GPA, verbal MCAT score, biological sciences MCAT score, overall MCAT score, and overall MCAT percentile.

Table 2.3 shows percentiles of LASSI predictors. Out of the 10 study strategy domains of anxiety, attitude, concentration, information processing, motivation, self-testing, selecting main ideas, study aids, time management, and test strategies, only one domain showed a statistically

Table 2.3. Summary of Baseline LASSI Percentiles

Variable	**Completer** mean (SD) (n=168)	**Non-Completer** mean (SD) (n=42)	**Significance** (p-value)
Anxiety	51.49 (28.45)	47.43 (23.98)	.395
Attitude	**70.01 (25.04)**	**56.88 (23.25)**	**.002**
Concentration	61.74 (25.83)	53.12 (24.89)	.053
Information Processing	64.90 (25.37)	68.26 (26.32)	.447
Motivation	69.55 (24.82)	66.00 (24.41)	.407
Self-Testing	60.26 (28.01)	55.14 (28.39)	.292
Selecting Main Ideas	55.84 (64.34)	49.90 (28.12)	.582
Study Aids	63.80 (26.94)	65.26 (23.07)	.747
Time Management	56.90 (29.38)	54.10 (30.48)	.584
Test Strategies	57.33 (27.14)	54.29 (25.94)	.513

*p-values were based on t-tests

significant difference, with another approaching significance. Attitude (t (208) = -3.082, p = .002), which accounts for attitude and interest in college and academic success, is significantly different between completers and non-completers. Attitude measures how clear students are about their own educational goals, and whether or not school is important or worthwhile. Concentration (t (208) = -1.948, p = .053), which measures focusing attention and maintaining concentration over time, approached significance.

Table 2.4 summarizes both univariate and multivariable logistic regressions results. Categories of variables included demographics, educational background, educational disadvantage, economic disadvantage, social disadvantage, academic predictors, and LASSI. No

significant associations were found between demographic variables and completion status. These include having children at the time of applying, English being a first language, being female, being married at the time of applying, and being of a target ethnicity (Native Hawaiian, Pacific Islander, Filipino). No significant associations were found between completion status and any of the educational background variables, which included graduate school attendance, having a science major undergraduate degree, attending undergraduate school in Hawai‘i, and completing an undergraduate degree in 4 years or less.

There was no significant association when both parents lacked a bachelor's degree, and/or a participant attended a high school that have limited science resources. No significant associations were found in economic and social disadvantage categories. These categories included: coming from a family with a combined income that was less than the state median, both father and mother having non-managerial occupations, growing up in a HPSA/MUA, lacking a physician role-model, and lacking a support system to pursue higher education. When analyzing academic predictors, the physical science section of the MCAT was found to be significantly associated with completing IH program (OR = 1.33; 95% CI: 1.014, 1.752), suggesting a higher score is associated with IH program completion. Science GPA was near statistical significance for association (OR = 2.15; 95% CI: 0.96, 4.82). Other variables (overall GPA, overall MCAT score, MCAT percentile, and MCAT section scores in biology and verbal) were not significantly associated with completion status.

Finally, when assessing the LASSI percentiles at baseline, the subscale attitude (which measures one's attitudes toward their own educational goals) was found to have a slight, but significant association with IH completion (OR = 1.22; 95% CI: 1.07, 1.39). This finding suggests that when an IH participant's attitude and interest in academic success is clear and

related to their future life goals, the participant is more likely to complete the program. Concentration was another subscale that indicated marginal association with completion (OR = 1.13; 95% CI: 1.00, 1.29), demonstrating that the better a participant's ability to direct and maintain attention on academic tasks, the grater the odds of completing IH. No significant association was found in any of the other scales (anxiety, information processing, motivation, self-testing, selecting main ideas, study aids, time management, and test strategies).

For multivariable logistic regression analysis, four variables which reached p-value < 0.1 in the bivariate association analysis were considered: science GPA, physical science MCAT score, attitude, and concentration. Table 2.4 displays the results of both the adjusted model and the final model. Of the 4 variables included, concentration proved to have the weakest association and was not statistically significant (OR = 1.02; 95% CI: 0.86, 1.20). The remaining 3 variables, physical science MCAT score, science GPA, and attitude, together with gender and target ethnicity were included in the final model. Based on the final model, attitude toward learning and academic success showed a statistically significant association (OR = 1.19; 95% CI: 1.04, 1.37) with IH program completion, while science GPA (OR = 2.23; 95% CI: 0.89, 5.59), and physical science MCAT score (OR = 1.33; 95% CI: 0.98, 1.50) approached significance. This means that for every 10% increase in LASSI attitude subscale score, a student is 20% more likely to complete the IH program. For every 1-point increase in science GPA, a student is two times more likely to complete the IH program, and for every point increase in physical science MCAT score, a student is 30% more likely to complete the IH program.

Table 2.4. Summary of Logistic Regression Analysis

Adjusted Variables	**Univariate Odds Ratio** [OR (CI)]	**Sig.**	**Multivariate Adjusted Odds Ratio** [OR (CI)]	**Sig.**	**Final Adjusted Odds Ratio Model (including demographics)** [OR (CI)]	**Sig.**
DEMOGRPHICS						
Having Children (yes = 1)	1.00 (0.27 – 3.72)	1.000	---	---	---	---
English as 1st Language (yes = 1)	0.94 (0.45 – 1.99)	0.880	---	---	---	---
Female (yes = 1)	0.70 (0.35 – 1.37)	0.297	---	---	1.38 (0.65 – 2.95)	0.409
Married (yes = 1)	1.49 (0.45 – 4.95)	0.512	---	---	---	---
Target Ethnicity (yes = 1)	1.26 (0.63 – 2.55)	0.512	---	---	1.31 (0.58 – 2.97)	0.519
EDUCATIONAL BACKGROUND						
Graduate School Attendance (yes = 1)	0.80 (0.35 – 1.84)	0.595	---	---	---	---
UG Science Major (science = 1)	1.14 (0.46 – 2.86)	0.773	---	---	---	---
UG Location in HI (HI = 1)	1.00 (0.49 – 2.03)	1.000	---	---	---	---
Years to UG Completion (<4 years = 1)	1.41 (0.71 – 2.77)	0.327	---	---	---	---
EDUCATIONAL DISADVANTAGE						
Both parents lack BA (yes = 1)	1.44 (0.72 – 2.88)	0.309	---	---	---	---

Limited HS resources (yes = 1)	0.76 (0.35 – 1.62)	0.470	---	---	---	---
ECONOMIC DISADVANTAGE						
Income below state median (yes = 1)	0.63 (0.31 – 1.29)	0.628	---	---	---	---
Father non-managerial (yes = 1)	1.05 (0.52 – 2.11)	0.886	---	---	---	---
Mother non-managerial (yes = 1)	0.92 (0.44 – 1.94)	0.821	---	---	---	---
SOCIAL DISADVANTAGE						
Grew up in HPSA/MUA (yes = 1)	0.72 (0.37 – 1.44)	0.357	---	---	---	---
Lack of physician role-model (yes = 1)	0.83 (0.38 – 1.81)	0.634	---	---	---	---
Lack of a support system (yes = 1)	1.35 (0.68 – 2.69)	0.397	---	---	---	---
ACADEMIC PREDICTORS						
Science GPA	2.15 (0.96 – 4.82)	0.064*	2.32 (0.93 – 5.79)	0.071**	2.23 (0.89 – 5.59)	0.088
Overall GPA	1.33 (0.49 – 3.57)	0.573	---	---	---	---
Overall MCAT	1.00 (0.93 – 1.08)	0.937	---	---	---	---
MCAT Percentile	1.00 (0.99 – 1.02)	0.711	---	---	---	---
MCAT Bio	1.21 (0.93 – 1.59)	0.162	---	---	---	---
MCAT Physical Science †	1.33 (1.01 – 1.75)	0.039*	1.28 (0.96 – 1.72)	0.097**	1.33 (0.98 – 1.80)	0.066
MCAT Verbal	0.84 (0.68 – 1.04)	0.109	---	---	---	---
LASSI						
Anxiety	1.06 (0.93 – 1.19)	0.393	---	---	---	---

Attitude †	1.22 (1.07 – 1.39)	0.003*	1.21 (1.06 – 1.38)	0.006**	**1.19 (1.04 – 1.37)**	**0.012**
Concentration	1.13 (1.00 – 1.29)	0.055*	---	---	---	---
Info Processing	0.95 (0.83 – 1.09)	0.446	---	---	---	---
Motivation	1.06 (0.93 – 1.21)	0.405	---	---	---	---
Self-Testing	1.07 (0.95 – 1.20)	0.292	---	---	---	---
Selecting Main Ideas	1.03 (0.94 – 1.14)	0.533	---	---	---	---
Study Aids	0.98 (0.86 – 1.17)	0.745	---	---	---	---
Time Management	1.03 (0.92 – 1.16)	0.582	---	---	---	---
Test Strategies	1.04 (0.92 – 1.18)	0.565	---	---	---	---

† Indicates variables that were statistically significantly different between IH completers and non-completers.

* Indicates significant predictor by univariate analysis and was included in multivariate analysis due to $p < 0.100$

** Indicates significant odds ration by adjusted model and was included in final model due to $p < 0.100$

Discussion

This was the first study exploring differences between IH completers and non-completers. The findings provide insight into profiles of IH participants and identified areas in which IH could improve its selection criteria and/or its curriculum to increase the percentage of individuals admitted to IH that successfully complete the program.

Giordani et al. (2001) suggested that GPA, MCAT scores, and traditional admission eligibility requirements that tend to be lower in URMs, are not reliable predictors for the retention of URM students in medical school, however, this may not be the case for IH participants. While both science GPA and physical science MCAT scores only approached significance, they are worth consideration and worth discussing. This study found that for every point increase in science GPA, a student is twice more likely to complete the IH program, and for every point increase in MCAT, specifically in the physical science section, a student is 30% more likely to complete the IH program. A meta-analysis of published research on the predictive validity of the MCAT for medical school performance and licensing examinations found a predictive validity coefficient of $r = 0.39$ (CI = 0.21-0.54) for the MCAT in regard to medical school performance (Donnon et al, 2007). Although only moderately predictive, it does indicate a positive relation between MCAT and medical school performance. A study looking at MCAT and academic performance in osteopathic medical schools found that the MCAT physical science section was significantly correlated to science GPA and significantly predicted passing national board scores (Evans and Wen, 2007).

Our finding is important for the IH program to consider because currently there is no minimum requirement set for the science GPA or the new MCAT. Previous research suggested that MCAT scores of 8 and an undergraduate science GPA of 3.25 are pivotal predictors

(Rosenfeld et al., 1992). The findings of this study align with what previous research has suggested, as the average science GPA for IH completers is 3.21 (and 3.08 for IH non-completers) and the average physical science MCAT score for IH completers is 7.80 (and 7.27 for IH non-completers). While the bivariate analysis showed that MCAT physical sciences scores for both groups were below 8 and that the science GPAs for both groups were below 3.25, we see that IH completers are nearer these cut-offs when compared to IH non-completers, and these differences were statistically significant. With a newly revised MCAT score ranging from 118-132 per section or 472-528 in total, it would be beneficial for IH to consider setting minimums. Other research suggests that academic performance indicators, such as MCAT and GPA allow for an efficient evaluation of applicants to invite for the interview, but MCAT and GPA are less important when deciding whom to admit (Monroe et al., 2013).

The IH curriculum heavily focuses on addressing the science scores and preparing students to enter medical school with a strong foundation of basic sciences. However, while in the process of strengthening the science foundation, a student must simultaneously foster the right attitude in order to successfully complete the IH program. The major finding of this study was around attitudes toward school and the importance of academic success. Addressing science scores is something that can successfully be done in a one-year program, but attitude could be a bit more challenging to address during the same timeframe.

A study analyzing the relationship between academic ability (measured by MCAT and GPA), study skills (measured by LASSI), and academic performance in first-semester medical students found that time management and test-taking strategies were the stronger predictors of academic performance than aptitude (West & Sadoski, 2011). This study also reported that attitudes towards the importance of college, and clarity around one's educational goals can be

adopted and practiced. A study utilized the LASSI as a pre-post measure for second year medical science students participating in a course to strengthen learning and study skills. This study reported mean differences in attitude, time management, information processing, main-ideas selection, study aids, and self-testing scales, to be significantly higher in the intervention group when compared to a control group that was not given access to the learning and study skills (Haghani & Sadeghizadeh, 2011). Another study investigating the relationship between study strategies and academic performance among medical students reported that LASSI subscales of concentration, motivation, time management, and test strategies tended to be correlated to positive academic performance outcomes (Zhou, Graham and West, 2016). It appears that each of these previous studies had a set of program- and population-specific LASSI predictors, and more research should be done specifically looking at how the attitude subscale of the LASSI affects educational attainment.

This study explored LASSI predictors for disadvantaged URM students who participated in the IH program, and found that for every 10th percentile increase in the LASSI attitude subscale, a student is about 20% more likely to complete IH. The LASSI items that measure attitude include: *I don't care if I finish school as long as I find a husband/wife; I feel confused and undecided as to what my educational goals should be; I would rather not be in school; I often feel like I have little control over what happens to me in school; I do not care about getting a general education, I just want to get a good job; I only study the subjects I like; I dislike most of the work in my classes; In my opinion, what is taught in my courses is not worth learning.* The attitude subscale measures attitude towards succeeding in school. If the relationship between school and life goals are not clear, then it is difficult to maintain a mindset that promotes good

work habits, concentration, and attention to school and its related tasks (Weinstein, Palmer, and Schulte, 1987).

Currently, the LASSI is administered early in Phase I of the program, after admissions. If attitude is a possible predictor of IH completion, one recommendation to the program might be to administer at least the attitude subscale of the LASSI as part of the admissions process. The attitude subscale could become a page in the IH application that could then be submitted with the rest of the information that used in the study, or the LASSI could be administered when an applicant comes in for an interview. Collecting this information early during the admission process would allow the admissions committee members to review percentiles and be informed on where an applicant would fall on the LASSI attitude spectrum, and could be taken into consideration when recommending a student to be admitted into IH. Another option would be to incorporate the significance of attitude towards educational attainment into the curriculum, and help IH participants either establish, develop, or reinforce their relationship between school and life goals to promote a mindset that promotes good work habits, concentration, and attention to school and its related tasks towards academic success. This could be introduced Phase I, where the LASSI is currently administered, and continued into the Humanities of Medicine course where a student's sense of self, openness, attitude, and beliefs are explored.

No demographic differences between completers and non-completers were found. The findings on demographics, background, and disadvantage of the entire sample show that the IH program are admitting students that the program was intended to reach, URMs with some degree of disadvantage. This study also shows that at least 80% of URMs with some degree of disadvantage can finish IH and matriculate into JABSOM as first-year medical students.

As this was an exploratory study looking at determinants of completing the IH program, more research should be done with the IH non-completer subset, investigating any trends over time in non-completion. Collection of data on "reason for drop out" would also allow the program to better understand the barriers facing IH students and discover ways to improve the program. Future research should also involve more investigation of psychosocial factors, like academic motivation, self-esteem, and perceived stress, outside of the LASSI. These topics are introduced in Phase I, but not fully integrated into curriculum throughout the year long program.

Limitations

The nature of the program is such that only 12 students each year are given the opportunity to be in the IH program, and therefore the limitation of this study is the relatively small sample size. As each year passes and the program continues to grow, the overall sample size will increase. Other factors that contributed to the small sample size involved conditions of the program, which changed its curriculum in 1996, and important measures like the MCAT, which changed its scoring system in 2015.

Conclusion

The purpose of this chapter is to describe the characteristics of IH participants, and compare those who successfully completed the program to those who did not. This exploratory study made three important discoveries. The first was that the IH program is admitting the types of students it was designed to admit, which are disadvantaged URMs. Secondly, this study identified that attitude towards academic success is the most important factor that can potentially predict successful completion of the IH program, while science GPA and MCAT scores show some importance. Lastly, this study offers recommendations for possible changes to program admission criteria and to the curriculum.

CHAPTER 3

KEY COMPONENTS OF THE *'IMI HO'ŌLA POST-BACCALAUREATE PROGRAM* THAT LED TO SUCCESSFUL MATRICULATION AND ACADEMIC ACHIEVEMENT

Abstract

Many medical schools have premedical or post-baccalaureate programs that target URMs and disadvantaged students with the intent to increase the number that matriculate into medical school. While research suggests that post-baccalaureate programs are effective for boosting GPAs, MCAT scores, and matriculation into medical schools, URM and disadvantaged students experience more than just academic barriers when striving for educational attainment. The IH program has been assisting underrepresented and disadvantaged students to qualify for and complete the MD program at JABSOM since 1978. However, it is not known which program components are most helpful to and used by, or which resources are additionally needed for, URM students in Hawai'i. This study took a phenomenological approach to understand URMs experiences with the components of IH. Data were gathered directly from IH graduates through a series of focus groups with each class currently enrolled at JABSOM at the time of research. The purpose of these focus groups were to examine IH program components, identify those that were useful, and identify programmatic gaps. Analysis of interviews followed interpretative phenomenological analysis (IPA), which allowed us to make sense of particular IH program components and processes. The coding process was inductive, and themes in the data were identified by close, line-by-line analysis, or coding. Three themes with 7 subthemes emerged from this qualitative analysis: preparation (IH helped with academic enrichment and medical school preparation), support (peers, mentors, and stipends are all important), and improvements

(need for better transitions and better publicity). Findings will be used to help improve IH, and may apply to other programs aiming to increase URM success in the health sciences.

Introduction

Pipeline and pathway programs are designed to increase the representation of underrepresented and underserved groups in the health profession (Nsiah-Kumi and Pamies, 2009). In Hawai‘i, Native Hawaiian and other Pacific Islanders (NHOPI) are the underrepresented minorities (URM) in medicine, with the *‘Ahahui o Nā Kauka* (Association of Native Hawaiian Physicians) estimating approximately 300 Native Hawaiian physicians practicing worldwide (‘Ahahui, 2014). In 2010, there were 118 Native Hawaiian physicians practicing in Hawai‘i, which represented about 3% of the state’s physician workforce, while Native Hawaiians make up 26% of the state’s population (Ambrose et al., 2012). Not only are NHOPI underrepresented in medicine, but also generally underrepresented among those who have obtained bachelors, graduate, or professional degrees (Look et al., 2013).

Many medical schools have premedical or post-baccalaureate programs that target URMs and disadvantaged students with the intent to increase the number that matriculate into medical school. A study by Grumbach and Chen (2006) examined the effectiveness of these post-baccalaureate programs through a retrospective cohort study (1999 through 2002) of the 265 graduates of five University of California (UC) post-baccalaureate medical school programs. A control group of 296 college graduates who applied to the post-baccalaureate program but did not participate was compared. Of the participants, 66% were underrepresented minorities, and 50% were first-generation college students. By 2005, 67.6% of participants and 22.5% of controls had matriculated into a US medical school accredited by the Liaison Committee on Medical Education (LCME). This study concluded that post-baccalaureate pre-medical programs

appear to be an effective intervention to increase the number of medical school matriculates from disadvantaged and underrepresented groups.

More recently, the US Department of Health and Human Services conducted a literature review on undergraduate pipeline programs. Fourteen studies were evaluated, and all but one demonstrated statistically significant outcomes, including improved science grades and average grade point average (GPA), improved medical college admissions test (MCAT) scores, and increased acceptance into medical school (Evans, 2007).

While research suggest that post-baccalaureate programs are effective for boosting GPAs, MCAT scores, and matriculation into medical schools, URM and disadvantaged students experience more than just academic barriers when striving for educational attainment. A study examining barriers and biases in the medical education experienced fourth-year medical students found that URMs were more likely to report that their race affected their educational experience than it did Whites (76% versus 30%, $P<.0001$) (Bright, Duefield, and Stone, 1998). URMs also had more difficulty establishing a support network and good working relationships with peers and with finding same-race role and same-race mentors when compared to Whites (Bright, Duefield, and Stone, 1998). When asked to identify the most important recourses that help URM students succeed in premedical studies, respondents consistently identified three factors: having high-quality advisors; having the support of other students; and having the support of the faculty (Barr, Gonzalez and Wanat, 2008).

There are more than 200 post-baccalaureate programs in the US with varied missions and purposes. Many have specific missions or objectives targeting students from URM and disadvantaged backgrounds (McDougle et al., 2015). For example, the Advanced Baccalaureate Learning Experience (ABLE) program at Michigan State University “is a year-long enriched

academic experience offered each application cycle to an invited group of disadvantaged students who have applied for admission to the College of Human Medicine." (MSU website, 2016). The UC Davis School of Medicine Post Baccalaureate Program is an "academic-enhancing one-year program designed to help educationally and/or socio-economically disadvantaged students become more competitive applicants to medical school" (AAMC, 2017).

Components of successful diversity-enhancing pipeline programs often include academic enrichment, particularly in the sciences, advising and mentoring, test and admissions preparation, and psychosocial support. Additionally, comprehensive, sustained programs that recruit students early in their undergraduate years promote success for URM students (Cohen et al., 2002).

The 'Imi Ho'ōla Post-Baccalaureate Program Components

The 'Imi Ho'ōla Post-Baccalaureate Program (IH) is one of the 200 programs that has a mission of "increasing the number of physicians through an educational program that addresses disadvantaged students' academic and social-emotional needs in an effort to increase diversity in the medical profession" (Lee et al., 2014). The IH program has been assisting underrepresented and disadvantaged students to qualify for and complete the MD program at JABSOM since 1978. The IH program is small, accepting just 12 students per year, relative to JABSOMs student body of 70 students per year. On average, about 20% of JABSOM graduates are of an underrepresented minority (JABSOM, 2016).

In Phase I of the program, which runs for the first 4 weeks of the program, students do a summer orientation and assessment, in which program staff administer assessments to obtain baseline data on students' knowledge in the sciences, reading, and learning skills. Curriculum includes instruction in learning skills (e.g., time management, exam preparation) with application to content-specific material; exercises to foster self-esteem and confidence as a learner; cultural

impact on learning and problem-solving; introduction to Problem Based Learning (PBL) process, which is the way the medical students at JABSOM learn; and use of campus resources (Judd et al. 2007).

Phase II of the program, which is the bulk of the academic enrichment spanning the following 10 months, is an integrated approach in which students learn to improve critical thinking skills in content areas. The curriculum includes the following classes: Biology, Biochemistry, and Scientific Basis of Medicine (SBOM) (Judd et al. 2007). SBOM later becomes a Humanities in Medicine course. Biology is taught in a modified PBL format, and biochemistry in lecture format. Gross Anatomy Lab and Biochemistry Lab are conducted. Social determinants of health, health care systems, and cultural and community health experiences in Hawai‘i and the Pacific Basin are integrated within the Humanities in Medicine course.

Phase III, which is the final 4 weeks of the program, is the pre-matriculation phase designed to ease students' transition into medical school (Judd et al. 2007). Students are taught JABSOM's PBL format, which is different from the modified PBL they learn in Phase II, and they receive an introduction to clinical skills with focus on doctor-patient relationship and cultural competency. They also participate in a two-week shadowing experience with a physician in a rural setting. Once the students pass Phase III, they matriculate into JABSOM as first-year medical students.

As part of the IH process, exit interviews of IH graduates on their experience of going through the program are conducted at the end of each year. In the thematic analysis of the exit interviews, two emerging themes were personal growth and improvement in study skills. Personal growth was experienced by the students in terms of becoming better at asking for help, relying on peers, balancing school and life, opening to other perspectives and feedback,

perseverance, and speaking aloud. Improvement in study skills included being able to learn more effectively, being able to better utilize study aids, improving test taking strategies, and improving time management skills. While these findings were informational, they are general reflections of the student experience and differ from this proposed research study, which focused on looking more specifically at the IH programmatic components of each phase to assess which were most impactful in achieving success.

Usually post-baccalaureate pre-medical programs are informed based on previous research, which suggest that URM students benefit from programs that develop a student's sense of belonging to a shared, common-interest, academic community, programs that create a supportive environment, and programs that enhance knowledge and provide meaningful experiences (Brommer and Eisen, 2006; Terrell, 2006; Thomson et al., 2010). However, it is not known which program components are most helpful to, or even used by, URM students in Hawai‘i. Nor has IH investigated if additional resources are needed by URM students in the program. This study seeks to address these gaps.

As a Native Hawaiian in higher education I often reflect on all the opportunities afforded to me as a student. Working closely with these programs, I wonder how much of my experience is shared by other URMs, and if there are similarities in the support needed to help us along our academic journeys. Also being from a neighboring island, where academic learning opportunities are less accessible and sometimes even unavailable, I wonder if this program can be replicated and translated elsewhere, as well as work not just for pre-medical students, but for students trying to enter higher education in different health disciplines. By doing this research, I am making the assumption that IH can be broken down into its components and replicated. Native Hawaiians are generally underrepresented in graduate education, as well as in medical

school, and struggle to complete undergraduate degrees on time (Balutski and Wright, 2012). Thus, there may be wide application of this research. This study hopes to understand the best ways to support NHOPI and other URM students to pursue, continue, and complete higher education.

Methods

This study took a phenomenological approach to understand URMs experiences with the components of IH while progressing to success. The phenomenological approach is adapted from the phenomenology method of qualitative inquiry. Phenomenology is an understanding of the phenomenon (that which is being studied) through a first-person point of view, or the lived experience (Mayan, 2016). This study specifically looked to the participants of IH to understand the student's lived experience of participating in IH. Data were gathered directly from IH graduates through a series of focus groups with each class enrolled at JABSOM at the time of research. An advantage of this methodology are that it is suited for small-scale research because of the in-depth descriptions the researcher gets from each participant (Denscombe, 2014). The humanistic style of this approach is also culturally appropriate for use by URMs who come from disadvantaged backgrounds and have overcome obstacles to matriculate into JABSOM.

Sample

Participants in this study completed IH and were enrolled at JABSOM as medical students at the time this research was being conducted. Those who were currently enrolled were selected to reduce temporal bias caused by the passage of time since participating in IH. The number of possible participants was 28 spanning 4 different IH classes—2014, 2015, 2016, and 2017. Of this sampling frame, 40% were male and 60% were female. Half were Asian, and 21% were Native Hawaiian, 18% were Filipino, 7% were Pacific Islander, and 4% were East

Asian/Indian. Forty-three percent of students reported English as a second language. The suggested sample size until saturation is reached using a phenomenology approach is between 5-9 participants (Mayan 2016). However, a target to recruit 10-15 total participants was set in order to ensure saturation.

Measures

Four focus groups were conducted, one for each class year. The purpose of these focus groups was to examine IH program components, identify those that were useful, and identify programmatic gaps. Other areas of focus that were informed by previous literature included support systems, supportive environments, and belonging. Table 3.1 below displays the questions asked at each focus group.

Procedures

The Director of IH suggested a point of contact for each class to help organize his/her

Table 3.1. ʻImi Hoʻōla Completer Focus Group Questions

1. Please identify program components that were most helpful/useful to matriculating into medical school? How was the component applied, and why was the component so helpful/useful?
2. What were the programmatic gaps that could help the program improve?
3. Please identify resources outside of the program that were used to become successful in matriculating into medical school.
4. Tell me about your social support groups while in IH and after IH while in medical school.
5. Tell me about the IH mentor experience.
6. What are the impacts that IH has had on your medical school journey while at JABSOM?

class focus group based on the leadership role the student took during their time in IH. The procedure used to organize and schedule all four focus groups is as follows. First, an e-mail was sent to the identified IH alumna of each class to help coordinate fellow IH classmates. The email included the background, purpose, and goals of the study. This email was meant to help the point of contact for each class have some background on the reason their IH class was being asked to convene. The point of contact was then asked to organize the schedules of their classmates to identify the best time to conduct the focus group. IH staff worked to identify a space in which to hold the focus groups. Once the date, time, and space was set, the focus groups were conducted.

On the day of the focus group, myself and one other staff member would set up the room so that all focus group participants were sitting around a conference table. Chart paper was hung on walls, and a laptop was set-up off to the side. The chart paper was used for me, as the facilitator, to track the topics that were being discussed for each question, and to keep track of ideas and points of discussion as the focus group progressed. The laptop was used for the second staff member to take more in-depth notes around the topic listed on the chart paper.

Once focus group participants arrived, it was explained to them that this space was safe, any information shared would be de-identified, and they would be audio recorded (with permission). It was further clarified that these focus groups should be more of talk-story sessions that allowed students to build on each other's experiences, while trying to examine key program components and gaps. All questions participants had were addressed at this time. Next, I went over the consent form, which further informed them that the data collected in this focus groups would be utilized for dissertation research and future publication and asked each individual permission to participate and to be audio recorded. A meal was served at every focus group as both an incentive and a token of appreciation for their time.

Qualitative Analysis

Interviews were first transcribed by Rev.com and received by July 2018. This allowed for audio files to be converted into Microsoft Word files. Transcripts were reviewed and cleaned. Final versions of each transcript were imported into NVivo Mac 12 to manage the data. The chart paper notes that were taken during the focus groups were used to create the first set of codes for each question. Parent nodes were established based on the questions. Themes in the data for each question were identified and subthemes became child nodes. Once the set of codes were established, 10% of the transcripts were coded by two people who work closely with the IH program. At this point, coders had an inter-reliability rate of 0.70, which indicated the codes worked, and thus, the rest of the transcripts were coded based on this coding scheme. Upon completion of transcription analysis and coding, the same two raters from the program had inter-rater agreement (kappa coefficient) of 0.78, which meant a good agreement.

Analysis of transcripts followed interpretative phenomenological analysis (IPA) (Mayan, 2016), which allowed us to make sense of particular IH program components and processes. The coding process was inductive, and themes in the data were identified by close, line-by-line analysis, or coding. The IPA process allowed us to understand the experiences of IH completers, and simultaneously evaluated programmatic services and identified areas of improvement.

Human Subjects

This research project posed less than minimal risk and did not involve a vulnerable population. Conducting focus groups for the purposes of program evaluation, program improvement, and/or feasibility of program translation, presents very little risk to human subjects involved. This study was submitted to the Institutional Review Board (IRB) at the University of

Hawai‘i at Mānoa on March 4, 2018 and approved on April 12, 2018 with an expedited status (#2018-00202).

Results

A total of four focus groups were conducted from May to June 2018, with a total of 26 (out of 28 possible) participants. All focus groups discussed each question. Focus group lengths ranged from 1.5 hours to 2.5 hours, for a total of about eight hours. Three themes with seven subthemes emerged from this qualitative analysis. Table 3.2 contains a summary of illustrative quotes.

Theme 1: Preparation

Academic Enrichment

According to all four focus groups, the training during Phase I on study skills, such as concept mapping, exam strategies, and time management, were highly beneficial for IH program participants. The assessment of their skills coupled with corresponding strengths and weaknesses of how they learn allowed students to develop learning plans that helped them become successful in not only IH, but in JABSOM as well. In the following quote, a student shares that learning how to organize materials in a way that made sense for the particular individual was especially helpful even as they transitioned into medical school:

> I would say the [training in] exam strategies and time management were helpful. Even though we're all smart and we think we know how to take exams, ‘Imi exams were totally different from what we were used to and then, because we learned how to study or what works for us during phase one, then we didn't really have to worry about that during med school.

When IH participants were asked about the skills learned and knowledge gained from the program, a reoccurring theme across all focus groups was the ease of their transition into JABSOM. Much of what IH offered had students feeling prepared to enter JABSOM as first-year

medical students. The following two quotes exemplify and give specific examples of how exposure to PBL, and content-specific courses helped them build a strong foundation to be successful in medical school.

> I think PBL is super important. Just because being trained at that and moving on to UH med school, like you want to have that continuity. And I think the actual content that we learn in PBL, although you learn a lot more in med school, like all the fundamentals are there. And I think that's like something that people who are in med school now, may miss because they don't stress it as much.

Medical School Preparation

During Phase III of the program, students are taught JABSOM's PBL format and receive an introduction to clinical skills with a focus on doctor-patient relationship and cultural competency. All four focus groups mentioned that participation in Phase III was critical in their preparation for medical school. They highlighted how the faculty were role models and set the standard for the type of physicians they hope to be:

> What I thought was helpful was, I think maybe before we went on our rural shadowing, we had a training. We got taught how to take a history, do a physical, we just did basic blood pressure, how to listen to the heart, things like that. We did that over at Kaiser Hawai‘i Kai. That was helpful for me. Plus, she has excellent bedside manner and rapport with her patients. Watching her was, " Oh, that seems so easy." And then you do it and you're like, "That was wrong." I think just the faculty are role models for us in how they interact with patients really helped us and makes us want to do the same.

As IH students talked about the impact that IH had on their matriculation to JABSOM, all four focus groups spoke about its impact on their confidence. Because of the confidence gained while in the program, the quote below illustrates how IH students become the leaders of their JABSOM class:

> I think one good thing about ‘Imi also is that they encourage leadership. We had a president of her class, vice president, and the historian. But we all had some sort of leadership position, and that kind of sets the tone for the class, I feel like. I think there was one point where all the presidents or almost all the presidents in the school were from ‘Imi. I feel like the faculty especially goes through the president and gauges what

> kind of class it's going to be like. So I encourage ʻImi to continue to encourage them to become leaders and set the tone for the school.

Theme 2: Support

Peers (ʻImi Hoʻōla Class)

The experience of being a premedical student as you go through the admissions process is highly competitive. Another important component of Phase I is the bonding and relationship building that happens with each class. IH is a shared experience of a small group of individuals who all have the same goals--survival of IH and matriculation into JABSOM. All four focus group participants reflected upon their systems of support, and found that their IH classmates were the primary source because no one else understood what it was like to be in their shoes. The following quote illustrates why the building of relationships are so important:

> Phase I is a good opportunity to make sure that we get rid of everyone's ego and pride, and try to make sure we set boundaries and rules of what we expect of each other going forward to Phase II when it's gonna be really stressful.

Mentors

The peer mentoring component of the IH program was also identified as being key by three of the four focus groups. This component pairs a current IH student with an IH graduate who is either a first- or second-year medical student at JABSOM. Support from mentors widely ranged. Some shared that their mentor was more of a moral supporter and a cheerleader along the way, while others shared that their mentor would send them daily practice questions to help them study. Regardless of the level of the engagement, it was a component much appreciated by IH participants. More importantly, having a mentor that survived IH gave current students hope:

> Just seeing, oh my god, this is awesome they know this now after a year and then it's like they're role models, at least for me, for us. Having constant interaction with them really helped with putting what we're doing into perspective. It will be worth it. This is so stressful, but look, they made it. That was a big part of the mentoring portion of it.

While the peer mentorship component of the IH program was identified as a key component to student success, students felt like improvements could be made. Mentors seemed unsure of the boundaries and did not want to share too much information and be in a position where they could find themselves in trouble, and mentees were unsure of which questions were appropriate and inappropriate to ask. Many ideas to strengthen the peer mentorship component were discussed as explained below:

> In JABSOM, we get in first year, second year, third year, from the upper classmen, this- ... First aid, kind of how to survive. It's passed down. But in a way that it's official to where you're not gonna get in trouble for giving them too much information. You kind of do it in a right way versus- So you're more careful. As a compilation of upper classmen's information that the faculty and the program coordinator, director, can look at and say, "Okay. This is valid. I can-" That they're aware of. I can give this to them, versus- You are getting in trouble because oh, I didn't know I wasn't supposed to send that or do that kind of thing.

Even later in the JABSOM years students commented on the mentorship they receive from the IH network. Throughout the clinical training, IH graduates meet and work alongside physicians who are also IH alumni, regardless of class year. Students emphasized the bond, network, and mentorship being valuable:

> Even being part of the ‘Imi network, it's a special bond. When you see people out at the hospitals and you're like, "Oh you're ‘Imi." And it’s just like a bond. It really does open opportunities for us to network with physicians and when we see them, you feel comfortable with what we're doing because they're from ‘Imi.

Stipends

Due to the rigors of the IH program, students are advised against working because studying should be the priority. The program therefore, provides each participant with a monthly stipend. Across all four focus groups, participants were very thankful for the financial support. One student shares, *“those stipends are really helpful. To have this is way more than we thought,*

so it's nice". However, students also reflected on that fact that those who have to relocate to the island of O'ahu in order to participate in IH and have no familial support, it may not have been enough.

> I think for us that live here, that's enough. For example, people who are from other islands, I'm not sure if that was enough. I think if it was a little bit more for rent for them because they have to kinda live on their own.

Theme 3: Ways to Improve

Better Transitions

According to all four focus groups, Phase I was integral to preparing IH participants with study skills to help prepare for what is to come in Phase II. However, participants pondered whether or not there could have been a better way to structure Phase I so that it was a gradual slope upward to set themselves up for the rigors of Phase II. The exerpt below describes how a student equates the Phase I to Phase II transition:

> It feels like you're learning this way in the kiddie pool and then the next thing you know you're thrown into the deep end with no floaters in phase two, like phase one is a kiddie pool and then- No hands.

Another point of transition for IH students is their matriculation into JABSOM. Although IH students matriculate into JABSOM as confident leaders, students from two out of four focus groups commented about unwarranted pressure and expectations that JABSOM faculty had of them. Because 'Imi students are familiar with PBL, and have the skills to help facilitate learning, students are aware that they have an advantage and are mindful of non-IH students as they begin to learn the PBL process. The following conversation by one particular class illustrated their experiences of how PBL tutors at JABSOM have varying expectations of IH students after they matriculate into JABSOM:

> You definitely become a mentor for other first years, whether it be anatomy lab or just in your PBL, especially for MD1. You're definitely a mentor. And then when people say "oh, I don't have an 'Imi in my PBL group," they get kind of salty.
>
> I think you're definitely held to a higher standard when people find out what 'Imi is. They look at you and if you don't have the answer, then they like, "oh, shouldn't you know this already?"

One class had varying expectations. One student commented that the attention you get from completing IH and matriculating into JABSOM is "*Unappreciated. Unwanted. Uncomfortable. Uncomfortable attention.*" Another student from this class shared "*comments that I got from tutors was "we know you went through 'Imi, so we're expecting more from you*"". A third student then built off of this and shared a conflicting experience, *"in the beginning, I did what I learned, and how I felt comfortable doing it, and I got told to pull back. Just the 'Imi level of how we did it, it was too much."* While a fourth student shared, "*mine was the opposite. It's like, "oh, we know you were in 'Imi. You should be doing more." Which kind of sucks. 'Imi discrimination*."

Better Publicity

Recruitment is an on-going effort that the IH program attempts to improved. All four focus groups brought up recruitment and word choice for the IH program. The IH participants, especially those from neighbor islands or the Pacific, were quick to discuss how not a lot of people know about the IH program, despite its existence for over 40 years, "*I feel like a lot of kids don't really know about it, because I was on Maui, and when I talk about the program, nobody really knows it."* Some students went on to volunteering themselves to recruit as a solution: *"I found out from 'Imi grads, who were from Guam. So maybe promoting that more... If you go back to Big Island, maybe you can do something like that ... a talk, or something".* Students also brought up the fact that the verbiage used to describe the IH program, which is often along the lines of "a post-baccalaureate program to help underserved and disadvantaged

students gain entry into medical school," was off-putting, as many of the IH participants do not consider themselves to be disadvantaged:

> And I guess for ... you know how 'Imi is for disadvantaged students, or whatever? So I didn't apply the first time I applied to med school, because I didn't think I was disadvantaged. So it's just ... just defining that term. Because actually, my friends, they also had same thought as me. So they're ... "Oh, I'm not disadvantaged. I'm not going to apply." And then they saw me get accepted. And they're ... "Oh." And then they asked me, "What does it mean?"

Table 3.2. Supporting Quotes To Illustrate Identified Themes

Theme	Subtheme	Illustrative Quotes
Preparation	Academic Enrichment	"…'Imi, because it's a year-long program and it's set up pretty much like how first year is, it's PBL, it's anatomy, you get some of the biochemistry, it sets you up so that you have a nice foundation."
	Medical School Preparation	"We were able to have this nice set leadership. A lot of us...we were all in different PBL groups, and I think we all took the lead as far as helping everyone, the new students, get ready in MD1. That was really, really nice, and we established our place in medical school. But not in a tantaran way. It was more just like, okay, you know, we've been here for a bit, we don't mind helping people out."
Support	Peers ('Imi Ho'ōla Class)	"I think we can all agree that 'Imi basically teaches us hard work. Perseverance is number one. I think that it teaches us to really stick together, versus being alone, which you would probably just burn, but if you can stick together, you guys can pretty much make it through everything. I think that's what 'Imi really teaches, kind of the family, kind of... Yeah, teamwork."
	Mentorship	"She'd like text me only some days to wish me good luck, and meet with me. To talk about stress and, especially when I failed the first Midterm and one of the finals, she was helpful. Cause she went through that too."
	Stipends	"That was more than I expected to get, let's just say that. Forty dollars a day. We basically were paid to go to 'Imi. You can't find that anywhere else"
Improvements to the program	Better Transitions	"I'm thinking with the purpose of phase one is to make it easier, the transition. I think the transition from phase one to phase two shouldn't be that, kind of, like drop. Because that's the purpose of phase one, is to make it a little easier. So gradually just ramp it up. Because I think

	phase one for the whole month it was all very straight forward. If it could have been like a gradual slope instead of straight forward and then up.”
Better Publicity	“You know the JABSOM ambassador? They give tour to new applicants. Oh, my God. One of the new applicants were asking, "Oh, so what is this ‘Imi? I heard it's a back door to the med school." Or whatever. And then that specific ambassador said something like, "Oh. Yeah. It's just for the people that don't get in." And I was so mad. But maybe now it's gotten better. People actually know- What ‘Imi is really about, but I guess promoting. If you are having an ambassador and they're gonna talk about this program, make sure that they know what they're talking about.”

Discussion

The objective of this study was to identify key IH program components that led to success for URM students pursuing medicine. While exploring the key components that facilitate success, students also identified gaps in current program components and highlighted the impact of the IH program. This study was the first of its kind, collecting qualitative feedback regarding the experience of being an IH participant. This research was explorative in nature, and therefore many themes emerged. This discussion will review the findings in three ways: emergent themes that were found in previous literature, new themes that are specific to the context of Hawai‘i, and programmatic themes that are exclusive to IH and JABSOM.

Preparation and support, which were key themes extracted from focus groups participants, were in line with previous literature. Specific subthemes included: academic enrichment, medical school preparation, peers, and mentors. In previous literature, successful diversity-enhancing pipeline programs included academic enrichment, advising and mentoring, and psychosocial support (Cohen et al., 2002), all of which are offered by the IH program. While gaps were found in the standards of mentoring, it is a component being offered, and this research provides specific ways that students felt this component of the program could be strengthened.

Other barriers for URMs identified by previous research focused on social support, with URMs having more of a difficult time establishing a supportive and good working relationships with peers and role models compared to whites (Bright, Duefield, and Stone, 1998). However, participation in the IH program afforded URMs the opportunity to build relationships with their peers who then became their primary support system throughout medical school. IH students have also commented on the supportive network of role models they gain by participating in the program.

The most important resources that help URM students succeed in premedical programs were identified as having the support of other students, having high-quality advisors, and having faculty support (Barr, Gonzalez and Wanat, 2008). During the focus groups, students talked about how the faculty of the IH program are role models who emulate characteristics of the types of physicians the program intends to produce. These role model physicians also happen to be their biggest supporters and mentors.

The one new subtheme that emerged from this research was the stipend support. This new theme may be specific to the context of Hawai‘i, where the cost of living is higher than most of the continental United States. The journey to pursue medicine is not only academically challenging, but financially as well. Focus group participants commented on the financial assistance being unexpected because being in the pursuit of a medical career, the expectation is to take on the financial burden. For disadvantaged URMs, the monthly stipends were an added bonus that IH participants found to be very helpful.

Lastly, this study discovered several programmatic implications specific to improving IH and JABSOM, but could also inform other educational programs for URMs locally in Hawai‘i and nationally: better transitions and better publicity. Hard transitions occur in two places, from Phase I to Phase II and the matriculation from IH to JABSOM. The biggest curricular concern seemed to be the dramatic difference between Phase I and Phase II. Feedback from students suggested that if Phase I is supposed to help prepare a student for Phase II, more of Phase II-like activities, such as a biological PBL case demonstration with the actual Biology tutors, should appear in the low-stress environment Phase I. The matriculation from IH to JABSOM is also stressful, as JABSOM faculty have contradictory expectations of IH graduates. Some IH students reported that JABSOM faculty expected them to lead their PBL groups, while other IH

students reported faculty would tell them to tone it down. This can only be addressed by the IH program and JABSOM. Students participate in IH because they have been identified, by both IH and JABSOM, as having the potential to succeed in medical school if given a little more academic preparation, despite having to overcome more disadvantages throughout their journey compared to those who have been traditionally admitted. With that being said, faculty of the medical school should have no extra-ordinary expectations of IH students after matriculation into JABSOM.

The second theme specific to improving IH at JABSOM is better publicity. IH students mentioned that the language used to describe the program ("a post-baccalaureate program for underrepresented and disadvantaged students") is misleading and does not resonate with them. In order to create better publicity, programs for URMs should be strength-based and described in a way that appeals to most, but has admission requirements that align with the target populations. Secondly, if medical schools are going to institutionalize a post-baccalaureate program, students, faculty, and staff should all be aware and educated about the program and its mission. The importance and value of the program, and how it contributes to the medical institution should also be communicated. For example, 89% of Samoans (14 of 16) who graduated from JABSOM gained accessed to JABSOM via IH.

Future Research

While there is a great body of literature examining the practice outcomes of premedical post-baccalaureate programs, rarely ever do they discuss the non-practice impacts of participation. The confidence gained in the IH program allows students to take on roles for student body council, create new or spearhead interest groups, and become mentors and leaders of their class. This study highlighted the fact that premedical post-baccalaureate program

participation afforded students confidence to take on leadership roles as they matriculated into medical school. More research should be done in the area of non-practice outcomes of premedical post-baccalaureate program participation.

Limitations

A limitation of using focus groups as the method of the study is the potential for social desirability bias, where students might not have wanted to admit that they came from disadvantaged backgrounds. However, because the study focused on success factors, despite their background, topics discussed in the focus groups were what led these individuals to their success. There could have also been issues around the interview effect in which participants could have responded differently based on how they wanted to be perceived by the facilitator, as well as by others in the group. These issues were addressed in the very beginning of each focus group as I called out my biases, and set the tone to be a very honest and non-judgmental environment. Due to the nature of the study, there was a mutual understanding that there is no power imbalance because everyone in the room was a URM in higher education, in pursuit of a doctoral degree.

Conclusion

The purpose of this study was to identify, which program components are most helpful to URM students in Hawai‘i, and which additional resources are needed for URM students in the program. This study resulted in three key themes of preparation, support, and improvements. Academic enrichment, support from both peers and faculty, and financial support are all key components to educational programs for URMs in Hawai‘i. Transitionary periods should be examined to ensure clarity of expectation for participants of these educational programs. Cautionary measures should be kept in mind as educational programs are publicized. Results

from this study can improve the IH program and highlights the needs of URM pre-medical, and more generally pre-graduate health science students.

CHAPTER 4

FACTORS THAT BEST PREDICT ʻIMI HOʻŌLA GRADUATES MEETING THE MISSION OF THE PROGRAM

Abstract

Post-baccalaureate programs have been proven to help underrepresented minority (URM) students who come from disadvantaged backgrounds matriculate into health profession schools. Generally, racial, ethnic, and linguistic diversity among health professionals is associated with better access to and quality of care for disadvantaged populations. ʻImi Hoʻōla (IH) is the official post-baccalaureate program of the John A. Burns School of Medicine. The mission of IH is to diversify the physician workforce in Hawaiʻi. The program strives to increase the number of URM physicians that: 1) practice primary care; 2) practice in rural and/or underserved communities; and 3) practice in Hawaiʻi or in the Pacific Basin, and this study investigated whether or not IH is meeting its mission. Univariate and multivariable logistic regressions were performed to test the relative associations of various demographic variables, educational background, and admission criteria (such as kamaʻāina ties, commitment to serve, and science GPA) with each of the three practice outcomes. The findings suggest that female gender, being a first-generation college student, and science GPA are associated with primary care practice. A higher science GPA predicts against practicing in Hawaiʻi or the Pacific Basin, and when compared to JABSOM graduates as a whole, IH produces statistically significantly more physicians who stay in Hawaiʻi and the Pacific Basin. Minority group membership (e.g., NHOPI, Filipinos, other Asian/Indian, AIAN, and African American) and having a commitment to serve URMs and underserved communities were related to choosing to practice in a rural and/or underserved areas. We can conclude that IH, a focused intervention for URM and

disadvantaged students at the post-baccalaureate level, has been successful in increasing the numbers of URMs in medicine, as well as the numbers of physicians working in primary care and in rural and/or medically underserved areas.

Introduction

The health career educational pipeline includes a constellation of programs and interventions that aim to increase the number of underrepresented minority (URM) students successfully matriculating into health professions schools. There is an emphasis on educational pipeline interventions to create a larger pool of competitive medical school applicants from disadvantaged backgrounds by increasing exposure to health care careers in elementary, secondary, and college education.

Post-baccalaureate programs are a major part of the health career educational pipeline and have been in existence for more than 30 years (Jackson et al., 2003). Nationally, 15% of medical students completed a post-baccalaureate program prior to gaining entry into medical school (AAMC, 2016). The American Association of Medical Colleges (AAMC) Post-Baccalaureate Pre-Medical Programs database states that there are 94 post-baccalaureate programs designed specifically for underrepresented minority (URM) students or students who come from disadvantaged backgrounds (AAMC, 2017). They are highly efficacious in increasing the likelihood that URM applicants will compete successfully for medical school admissions, with some programs having matriculation rates as high as 100% (Grumbach and Chen, 2006). Underrepresented and disadvantaged students who participate in a post-baccalaureate program have an over six times greater odds of entering medical school than non-participants, even after adjusting for student characteristics and college grade point average (Jeffe and Andriole, 2011).

Post-Baccalaureate Premedical Programs Increase Access to Care

Post-baccalaureate premedical programs tend to increase access to care for minority Americans. This is because these programs increase the racial, ethnic, and linguistic diversity of the population of health professionals and because medical students from low socioeconomic backgrounds or racial minorities have a greater likelihood of choosing primary care (HRSA, 2008; Lakhan, 2003). Studies have shown a strong correlation between physicians of URMs and their preference to work with patient populations who are underrepresented, underserved, and living in rural areas (Basco et al. 2010; Grumbach and Mendoza, 2008; Walker, Moreno, and Grumback 2012). In a study by Jeffe and Andriole (2011), post-baccalaureate program participation was also a significant predictor of medical students' intent at graduation to practice in an underserved area, and the strongest predictor of medical students' intent at graduation to practice primary care (most often family medicine) in an underserved area.

A study examining the long-term effectiveness of the Advanced Baccalaureate Learning Experience (ABLE) program at the Michigan State University College of Human Medicine tracked academic outcomes, performance, progress, and specialty choice of post-baccalaureate participants. Authors found that 94% of participants successfully completed the program and matriculated into medical school, 64% of matriculates graduated from medical school (with 26% who were still enrolled), and more than 50% of the graduates selected primary care specialty fields (Lipscomb et al., 2009). The Medical/Dental Education Preparatory Program (MEDPREP) program at the Southern Illinois University School of Medicine aimed to determine how MEDPREP enhanced US physician diversity and practice within underserved communities (Metz, 2017). This study concluded that 79% of participants become practicing physicians, 53% of program alumni chose primary care specialties (compared to 34% of U.S. physicians), and

MEDPREP alumni were 2.7 times more likely to work in medically underserved areas than physicians nationally (Metz, 2017).

Other research has identified several variables associated with practicing in medically underserved communities, including gender (specifically females), being a member of a racial/ethnic minority group, low family income level, growing up in a rural or inner-city area, having a strong interest before medical school in practicing in a rural area or a low-income neighborhood, participation of premedical or health career opportunity (HCOP) programs, and clinical experiences with underserved populations or in underserved areas during medical school (Rabinowitz et al., 2000).

ʻImi Hoʻōla Post-Baccalaureate Program

In 1973, the ʻImi Hoʻōla Post-Baccalaureate (IH) program was created to increase Pacific Islander and Native Hawaiian representation in the John A. Burns School of Medicine (JABSOM) at the University of Hawaiʻi at Mānoa by increasing their competitiveness to successfully gain admission to and graduate from the medical school (Lee et al., 2014). In the first two decades of the program's history (1973-1994), IH focused on premedical enrichment for post-baccalaureate students preparing to apply to medical school. Up to 25 students were accepted into each class and, upon completion, students would competitively apply for entrance into JABSOM. Funding was initially provided by the U. S. Public Health Service to recruit URM applicants who had the potential for a career in medicine. Since then, funding has been provided by various federal and state agencies, community health systems, grassroots organizations, and private donations.

Beginning with the 1996-1997 class, IH underwent a significant organizational transformation due to changing federal funding priorities, gained federally recognition, and

became the official post-baccalaureate program of JABSOM (Lee et al., 2014). The program now has outcome objectives to produce physicians that: 1) practice primary care; 2) practice in rural and/or underserved communities; and 3) practice in Hawai‘i or in the Pacific Basin. At that time, the program reduced its capacity to ten students each year. Once enrolled in the program, students would gain a conditional acceptance to JABSOM and matriculate once a student passes all courses in IH. In 2010, JABSOM increased the IH enrollment to 12 students per class. About 81% of IH students eventually graduate from JABSOM, but no study has been done on their post-graduation practice patterns.

The ‘Imi Ho‘ōla Post-Baccalaureate Program Admissions Process

To apply for IH, an applicant must simultaneously submit an application to both IH and JABSOM. The admissions process to gain entry into IH is different from that of gaining entry into JABSOM, although both admission processes give preference to applicants with ties to Hawai‘i. These are referred to as kama‘āina ties. Kama‘āina is a Hawaiian word for “child of the land” and, more recently, Hawai‘i resident. In addition to information demonstrating kama‘āina ties and fulfilling academic requirements, each IH application must submit information to determine degree of disadvantage and commitment to serve underrepresented populations in Hawai‘i and/or the Pacific. The IH program searches for evidence that an applicant is a URM and/or comes from a disadvantaged background, has first-hand knowledge of Hawai‘i and the Pacific, is not attracted by superficial considerations, and has rational reasons for wanting to live and practice in Hawai‘i or the Pacific.

A Community Advisory Committee guides the program in selecting the most qualified candidates for the program. The committee consists of individuals from various sectors including medicine and other health professions, education, law, and business. The committee reviews all

facets of the applicants, looking at academic and professional potential as well as their commitment to serve in underserved communities of Hawai‘i and the Pacific. The Community Advisory Committee members review, discuss, and rate the IH applicants. This process results in a ranked list of applicants recommended to be considered for IH admission based on the average ratings of committee members. The final list of recommended applicants is submitted to the JABSOM Admissions Committee in alphabetical order, and the program director of IH presents each case to the JABSOM Admissions Committee. The JABSOM Admissions Committee makes the final selection of the students that are granted admission to the IH program based on other criteria that are unknown at this time. Upon successful completion of the one-year IH program, students matriculate into JABSOM as first-year medical students.

Gap the Research Aims to Fill

Increasing the number of NHOPI health professionals may help reduce health disparities experienced by NHOPI (Ambrose et al., 2012). The IH program is an educational model for increasing the representation of disadvantaged and URM students. Currently we know that IH has contributed to the NHOPI diversity of JABSOM student body and graduates over the past 40 years with 89% of Samoan, 60% of Micronesian, and 37% of Native Hawaiian graduates gaining entry to JABSOM via IH. But we do not know how IH contributes to the greater practice outcomes of the physician workforce in Hawai‘i and the Pacific. The unique IH admissions process, which considers kama‘āina and commitment factors along with required academic standards, is one of the ways the program has the potential to attract physicians that will choose to practice primary care, in rural and/or underserved communities in Hawai‘i or the Pacific. However, after over 40 years of running the IH program, an accurate assessment of the practice outcomes of JABSOM graduates who matriculated through the IH program has yet to be

conducted. This study investigates whether or not IH is meeting the outcome objectives of producing URM physicians that: 1) select a primary care specialty; 2) serve populations in Hawai‘i or the Pacific Basin; and 3) provide health care to those in rural and/or underserved areas. This study is significant because it may provide evidence that IH, a focused intervention for URM and disadvantaged students at the post-baccalaureate level, increases the numbers of URMs in medicine, as well as the numbers of physicians working in primary care and in rural and/or medically underserved areas of Hawai‘i and the Pacific Basin.

Methods

Study Design and Sample

This secondary data analysis utilized the IH SPSS database, which contained application information for program completers who successfully matriculated into JABSOM from 1996 to 2016 (n=165). The sample for this study excluded students who are still in medical school. Therefore, the analysis to explore predictors of choosing a primary care specialization and practicing in rural or underserved locations in Hawai‘i and/or the Pacific Basin was conducted on a sample of 137 medical school graduates that completed IH. For this study, predictor variables were extracted from the existing IH database and practice outcomes were gathered from IH paper records and obtained from JABSOM residency match list to create a new study analysis data set.

Measures & Variables

Predictor Variables

Predictor variables were informed by previous studies, variables found to be significant in predicting IH completers (from Study 1), and other admission scores. Data for predictor variables were collected via IH admission applications and were inputted into the study data set. Variables included in this study were: gender (male or female), being a member of a racial/ethnic

minority group (Native Hawaiian, Pacific Islanders, Filipinos, other Asian/Indian, AIAN, and African American or Asians and Caucasians), combined family income level below Hawai‘i median (yes or no), growing up in a rural or underserved area (yes or no), previous participation in a program for URMs or disadvantaged students along the pre-IH pathway (yes or no), lack of physician or healthcare role model/mentor (yes or no), lack of support system while attending college (yes or no), both parents lacking a BA (yes or no), science GPA, and attitude towards college as measured by the Learning and Study Strategies Inventory (LASSI). LASSI is an 80-question self-assessment divided into 10 scales (anxiety, attitude, concentration, information processing, motivation, selecting main ideas, self-testing, study aids, test strategies, and time management), designed to help students gather information about learning, study practices, attitudes towards learning, and methods of studying (Weinstein, Palmer and Acee, 2016). LASSI is one of the formative assessments the IH program uses to determine a students' baseline study skills. A positive attitude toward education has shown to be predictive of IH completion in a previous study (Purdy et al., unpublished manuscript). A study examining premedical education suggested that coursework in preparation for the MCAT is not the only thing necessary for success, but what is needed is an opportunity that encourages students, early in the premedical years, to reflect on their motives for choosing to become a physician (Gross et al., 2008), which is what the attitude subscale in LASSI aims to measure, thus its inclusion in the study.

Admission evaluation scores for commitment to serve, degree of disadvantage, and kama‘āina ties were also included in this study. The commitment-to-serve criterion is measured by an applicant's demonstration to serve in areas of need in Hawai‘i and the Pacific. The information is found in the essay portion of the application and is scored from 0 to 3, the higher

the score, the better the applicant's demonstration of commitment. For the purpose of this study, two program employees read and scored each essay and ranked it based on the applicant's expressed desire to serve the underserved, a demonstration of commitment through examples, and the identification in the essay of a specific underserved area they hoped to serve in the future. There is no minimal score for this requirement to move forward in the admissions process.

The disadvantage screening includes a review of an applicant's educational, economic, and social background and is given a score based on a number of criteria. The educational disadvantage criterion considers the applicant's educational background, whether he/she attended public or private high schools and/or colleges, if he/she attended schools with a lack of support for the sciences, or attended a high school that lacked counselling toward pursuing higher education. The economic disadvantage considers the applicant's financial history, income, and lifetime participation of federal/state assistance programs. The social disadvantage criterion considers support systems, such as the lack of a mentor, or familial support to pursue higher education, and growing up in HPSA/MUA designated areas. All necessary information to determine degree of disadvantage is derived from responses on the student's application. Should an applicant score less than 5 out of 10 possible points, the applicant fails to meet the disadvantage criterion and does not move forward in the admissions process.

Kamaʻāina ties screening is not unique to IH and is also used by JABSOM's general admission, but for different purposes. Both IH and JABSOM have the same 5 items that establish connectedness to Hawaiʻi (e.g., applicant was born in Hawaiʻi or the Pacific, attended high school in Hawaiʻi or the Pacific, has a legal residence in Hawaiʻi or the Pacific, legal residence of the applicant's parents are in Hawaiʻi or the Pacific, and location of college or

university attended by the applicant is in Hawai‘i or the Pacific.) JABSOM includes a sixth legacy item, in which an applicant has the opportunity to earn a kama‘āina point if a parent/legal guardian is a JABSOM faculty member or JABSOM graduate. The applicant must attain three or more points to pass screening for both IH and JABSOM. JABSOM uses this screening to determine residency, while it is a requirement of IH that you are kama‘āina.

Lastly, the applicants are screened for academic requirements. Applicants must have a conferred baccalaureate degree, with a minimum overall GPA of 2.0, must have completed required prerequisite courses for IH (e.g., General Biology with lab, General Chemistry with lab, Organic Chemistry with lab, General Physics with lab, Molecular & Cell Biology, and Biochemistry), and must have taken the MCAT within 3 years of projected matriculation into JABSOM. The American Medical Colleges Application Services (AMCAS) Summary Sheet, which a student must complete in order to apply to JABSOM, is used to determine whether or not the applicant has met the program academic requirements. This is a pass or fail requirement, with three possible outcomes: 1) If the applicant does not meet the academic requirements of the program, he/she is denied entry into the program; 2) If an applicant meets the academic requirements, he/she moves on to be rated by the IH Community Advisory Committee; 3) Although the requirement specifies that applicants need to have a conferred bachelor's degree with a GPA of 2.0, applicants with a GPA below 3.0 are flagged. For the last group, a GPA cut-off is set based on the average of flagged applicants; those who fall above the cut-off point move forward and are discussed by the IH Community Advisory Committee. Applicants who fall below the cut-off point do not move forward in the admissions process.

Practice Variables

Practice outcome data were gathered from participant paper records that are maintained

by the IH program, as individual participants are followed after IH participation to determine medical school academic progress, completion, residency specialty choice, and practice location. Many alumni stay in contact with the program with career updates, and records are continually updated. To determine practice outcomes for those who do not stay in contact with the program, a record review and update was conducted. IH program records, JABSOM records, internet searches, and personal communications that track participants after leaving the IH program was utilized. Any missing tracking data was obtained via personal communication with the IH graduate and physician search engines (e.g., Healthgrades, Vitals, Doximity, and the AMA DoctorFinder).

Outcome measures of analysis included: currently practicing primary care (yes or no), currently practicing in Hawai‘i or Pacific Basin (yes or no), and currently practicing in an HPSA and/or MUA after residency (yes or no). Primary care choice was first determined by JABSOM residency match list, and then confirmed or updated by program records and/or physician online profiles. Data on IH-JABSOM and non-IH-JABSOM graduates who selected a residency in primary care in Hawai‘i was obtained from the publicly available JABSOM residency match list from 2001 – 2018. This data source was used only for the comparison analysis for two reasons. The first being that residency was the earliest practice choice indicator after the completion of participating in IH, which was important to capture prior to the influence of factors that affect practice choice during and after residency years. The second reason for using the match list was that this is the single source of information available that contained practice outcome proxies for both IH-JABSOM and non-IH JABSOM groups. Current practice location was determined via physician online profiles. The US Department of Health and Human Services Health Resources

and Service Administration (HRSA) shortage area designation finder was used to identify physician alumni with practice locations in HPSA or geographically defined MUAs.

Data Analysis

Descriptive statistics for IH-JABSOM graduates were computed. Pearson's chi-square tests were conducted to compare the practice outcomes of IH-JABSOM graduates and non-IH-JABSOM graduates. A univariate logistic regression for each outcome was conducted for all variables mentioned in the section above. Univariate predictors that had a p-value < 0.10 were included in a multivariable logistic regression. Key demographics (such as gender and ethnicity) were also included in the final model, independent of their statistical significance to facilitate comparison and reporting. Results from the final model of the multivariable logistic regression helped determine the most important predictors of each practice outcome (primary care, in Hawai‘i or Pacific Basin, HPSA/MUA). Statistical analyses were conducted using SPSS version 25. A p-value of less than 0.05 was regarded as statistically significant.

Human Subjects

This study was submitted to the Institutional Review Board (IRB) at the University of Hawai‘i at Mānoa on November 30, 2017 and approved on December 24, 2017 with an exempt status (#2017-00964).

Results

One-hundred and thirty-seven (137) IH participants matriculated into JABSOM and successfully completed medical school between 1996 – 2016. Table 4.1 displays descriptive statistics for the study sample. Of 137, 42% were male, and 58% were female. Minority group membership is defined by the target ethnicities of IH which include: Native Hawaiian, Pacific Islanders, Filipinos, other Asian/Indian, AIAN, and African American, making 81% of the study

population minorities. Asians and Caucasians are not considered minorities. Thirty-one percent (31%) self-identified as Native Hawaiian as their primary ethnicity, followed by 27% Filipino, 18% Asian, 11% Pacific Islander, 8% Other Asian / Indian, 3% American Indian / Alaska Native (AIAN), 1% African American, and 1% Caucasian.

At the time of applying for admission into the IH program, 57% of these 137 graduates reported coming from a family that had a combined income below the state median, and 46% reported a permanent address located in a designated HPSA/MUA. In preparation for medical school, 47% of IH graduates reported participation in a HCOP or HCOP-like program that supports minorities in healthcare, 77% of graduates lacked a healthcare of physician role model, and 42% reported lacking a support system to pursue college. Sixty-five (65%) percent of IH participants had both parents lacking a bachelor's degree, making them first generation college students.

Table 4.1 also shows that the mean science GPA of IH-JABSOM graduates was 3.2, and the average LASSI attitude subscale percentile was about 71% (*SD* = 25.86%). In regard to admissions criteria scores, the average commitment score was 2.24 (*SD* = 0.86), the average disadvantage score was 6.05 (*SD* = 1.34), and IH-JABSOM graduates were meeting the kamaʻāina score with an average of 4.28 (*SD* = 0.75).

Table 4.2 describes the residency outcomes, i.e., the percentages of IH-JABSOM graduates that chose a residency in primary care and/or in Hawaiʻi or the Pacific Basin compared to the percentages of non-IH JABSOM graduates. Fifty-eight percent (58%) of IH graduates (vs. 52% of JABSOM graduates) chose a residency in primary care, and 26% of IH graduates (vs. 21% of JABSOM graduates) chose a residency in primary care in Hawaiʻi or the Pacific Basin; these differences were not statistically significant. However, 39% of IH graduates (vs. 26% of

Table 4.1. Descriptive Statistics Of IH-JABSOM Graduates (N=137)

Variables	n (%)
Gender – Female	79 (58)
Minority group membership	111 (81)
Had a combined family income below HI median	78 (57)
Origin HPSA/MUA designation [n = 121]	55 (46)
Participation of HCOP or other programs for disadvantaged students [n = 106]	50 (47)
Lack of physician or healthcare role model/mentor [n = 121]	93 (77)
Lack of support system while attending college [n = 121]	51 (42)
Both parents lack BA	89 (65)
Variables	**Average (SD)**
Science GPA	3.19 (0.39)
Attitude Percentile	70.75 (25.86)
Commitment Score (0 to 3)	2.24 (0.86)
Disadvantage Score (need 5 out of 10)	6.05 (1.34)
Kamaʻāina Score (need 3 out of 5)	4.28 (0.75)

JABSOM graduates) completed residency in Hawai‘i or the Pacific Basin (t (1) = 9.948, p = .002), and 72% of IH graduates (vs. 57% of JABSOM graduates) completed their residency in either primary care or in Hawai‘i or the Pacific Basin (t (1) = 10.33, p = .001). These differences were found to be statistically significant. Lastly, 44% of IH graduates completed residency in HPSA/MUA areas. No comparison to JABSOM graduates could be made due to a lack of data collection by JABSOM for the outcome of HPSA/MUA service.

Table 4.3 displays univariate logistic analyses between each predictor and each outcome.

Table 4.2. Residency Outcome Comparison of ʻImi Hoʻōla & JABSOM Graduates

OUTCOMES	ʻImi (%) (n=137)	JABSOM (%) (n=934)	Significance (p-value)
Residency in primary care	79 (58)	481 (52)	0.177
Residency in primary care in Hawaiʻi or the Pacific Basin	35 (26)	195 (21)	0.214
Residency in Hawaiʻi or the Pacific Basin	55 (39)	247 (26)	0.002*
Residency either in primary care or in Hawaiʻi or the Pacific Basin	98 (72)	533 (57)	0.001*
Residency in HPSA/MUA	60 (44)	n/a	n/a

(p-values were based on Pearson's chi-square tests)
*Indicates significant difference between IM and JABSOM at $p < 0.05$

Statistically significant predictors of primary care practice include: being female (OR = 2.06; 95% CI: 1.02, 4.13), both parents lacking a bachelor's degree (OR = 2.11; 95% CI: 1.03, 4.30), and higher science GPA (OR = 2.97; 95% CI: 1.19, 7.45).

Predictors of practicing in Hawaiʻi or the Pacific Basin included LASSI attitude and science GPA. Science GPA predicted against practicing in Hawaiʻi or the Pacific Basin (OR = 0.36; 95% CI: 0.14, 0.90). In other words, graduates who had a high science GPA were less likely to practice in Hawaiʻi or the Pacific Basin. However, for every 10% increase in attitude towards academic success measured by LASSI, a graduate was 17% more likely to practice in Hawaiʻi or the Pacific Basin (OR = 1.17; 95% CI: 1.01, 1.35). Predictors of practicing in Hawaiʻi or the Pacific Basin that approached statistical significance were a combined family income below the state median (OR = 0.55; 95% CI: 0.27, 1.09) and the lack of a physician or healthcare role model (OR = 0.50; 95% CI: 0.21 – 1.17). In both instances, a low family income and lack of physician role model, predicted a lower likelihood of practicing in Hawaiʻi or the Pacific Basin.

Predictors of choosing to practice in a HPSA/MUA were minority group membership (OR = 3.10; 95% CI: 1.15, 8.31) and commitment to serve (OR = 1.73; 95% CI: 1.12, 2.69). An IH graduate who identified as one of the ethnicities of the minority category was three times more likely to practice in a HPSA/MUA, and for every point increase in commitment to serve a IH graduate was about 73% more likely to practice in HSPA/MUA.

Table 4.3. Univariate Analysis of Predictors On Each Outcome Variable

Predictor Variables	Primary Care [OR (CI)]	Sig.	Hawai'i/Pacific Basin [OR (CI)]	Sig.	HPSA/MUA [OR (CI)]	Sig.
Gender (female = 1)	**2.06 (1.02 – 4.13)**	**0.04***	1.51 (0.25 – 1.51)	0.25	0.75 (0.38 – 1.50)	0.41
Minority group membership (yes = 1)	1.47 (0.62 – 3.46)	0.38	1.39 (0.57 – 3.38)	0.47	**3.10 (1.15 – 8.31)**	**0.03***
Income below HI median (yes = 1)	0.79 (0.40 – 1.56)	0.49	0.55 (0.27 – 1.09)	0.09†	0.70 (0.35 – 1.39)	0.31
Both parents lack BA (yes = 1)	**2.11 (1.03 – 4.30)**	**0.04***	1.71 (0.82 – 3.55)	0.15	0.62 (0.30 – 1.28)	0.20
Science GPA	**2.97 (1.19 – 7.45)**	**0.02***	**0.36 (0.14 – 0.90)**	**0.03***	1.83 (0.75 – 4.48)	0.18
Attitude	0.89 (0.78 – 1.03)	0.12	**1.17 (1.01 – 1.35)**	**0.03***	1.01 (0.88 – 1.15)	0.92
Commitment Score	1.23 (0.76 – 1.67)	0.55	1.25 (0.83 – 1.87)	0.29	**1.73 (1.12 – 2.69)**	**0.01***

* Indicates significant predictor ($p<0.05$) by univariate analysis and was included in multivariable analysis due to $p < 0.05$

† Indicates marginally significant ($p<0.10$) predictors by univariate analysis and was also included in multivariable analysis due to $p < 0.10$

Tables 4.4, 4.5, and 4.6 present the multivariable logistic regressions for the three practice outcomes. Table 4.4 shows both the adjusted and final models of predictors on primary care. Variables included in the adjusted model included female (OR = 2.19; 95% CI: 1.06, 4.52), both parents lacking a bachelor's degree (OR = 2.10; 95% CI: 0.10, 4.42), and science GPA (OR = 3.01; 95% CI: 1.17, 7.75). The final model added the demographic of minority group membership. All variables were still statistically significant and had greater predictive odds: gender (OR = 2.20; 95% CI: 1.06, 4.56), both parents lacking a bachelor's degree (OR = 2.25; 95% CI: 1.06, 4.80), and science GPA (OR = 3.13; 95% CI: 1.21, 8.10). Females are two times more likely to practice primary care compared to males. Minority group membership was twice as likely to practice primary care, but did not reach statistical significance (OR = 1.81; 95% CI: 0.73, 4.49). A first generation college student is also twice as likely to practice primary care compared to a student who has a parent that has a bachelor's degree. Lastly, for every point increase in science GPA, a student is three times more likely to choose primary care.

Table 4.5 shows both the adjusted and final models of predictors for practicing in Hawai‘i and the Pacific Basin. Variables in the adjusted model included: combined family income lower than the Hawai‘i state median, science GPA, and attitude towards academic success. Combined family income below the Hawai‘i state median (OR = 0.72; 95% CI: 0.35, 1.47) predicted against practicing in Hawai‘i, but was not statistically significant. Science GPA (OR = 0.42; 95% CI: 0.16, 1.06) also predicted against practicing in Hawai‘i and the Pacific Basin, but was also not statistically significant. Attitude towards academic success (OR = 1.14; 95% CI: 0.98, 1.32) was slightly predictive of practicing in Hawai‘i and the Pacific Basin, but was not statistically significant. While all predictors were not statistically significant, science GPA and attitude towards academic success met the cut of $p < 0.10$ to be included in the final

model. Gender and minority group membership were demographic variables also included. Science GPA (OR = 0.40; 95% CI: 0.16, 0.99) became statistically significant and predicted against practicing in Hawai‘i and the Pacific Basin, meaning a higher science GPA is related to a lower likelihood of practicing in Hawai‘i.

Table 4.6 displays both the adjusted and final models of predictors for practicing in a HPSA/MUA. In bivariate analysis, minority group membership (OR = 3.10; 95% CI: 1.15, 8.31), and commitment (OR = 1.73; 95% CI: 1.12, 2.69) were the only two statistically significant predictors for practicing in HPSA/MUA. After analyzing the multivariable model, minority group membership remained statistically significant (OR = 2.94; 95% CI: 1.08, 8.04), and findings suggest the minority students were almost 3 times more likely to practice in a HPSA/MUA. The commitment score also remained statistically significant (OR = 1.68; 95% CI: 1.07, 2.64), and showed that for every point increase in commitment, a graduate was almost 70% more likely to practice in a HPSA/MUA. For the final model gender was added as a key demographic variable, and was analyzed with minority membership and commitment. In the final model minority group membership continued to be statistically significant, increasing the odds of practicing in HPSA/MUA by almost 3 times (OR = 2.95; 95% CI: 1.08, 8.08). Commitment to serve again remained statistically significant, and in this final model found that for every point increase in commitment, a graduate was 75% more likely to practice in a HPSA/MUA (OR = 1.75; 95% CI: 1.11, 2.77).

Table 4.4. Multivariable Logistic Analysis of Predictors on Primary Care Outcome

Predictor Variables	Univariate Analysis on Primary Care [OR (CI)]	Sig.	Multivariate Adjusted Odds Model [OR (CI)]	Sig.	Final Adjusted Odds Ratio Model [OR (CI)]	Sig.
gender (female = 1)	2.06 (1.02 – 4.13)	0.04*	2.19 (1.06 – 4.52)	0.03**	**2.20 (1.06 – 4.56)**	**0.03**
minority group membership (NHOPI/Filipino = 1)	1.47 (0.62 – 3.46)	0.38	---	---	1.81 (0.73 – 4.49)	0.20
income below HI median (yes = 1)	0.79 (0.40 – 1.56)	0.49	---	---	---	---
origin HPSA/MUA designation (yes = 1)	0.59 (0.29 – 1.23)	0.16	---	---	---	---
participation of HCOP and other disadvantaged programs (yes = 1)	1.10 (0.51 – 2.37)	0.80	---	---	---	---
lack of physician or healthcare role model/mentor (yes = 1)	1.03 (0.44 – 2.44)	0.93	---	---	---	---
lack of support system while attending college (yes = 1)	1.07 (0.52 – 2.23)	0.85	---	---	---	---
Both parents lack BA (yes = 1)	2.11 (1.03 – 4.30)	0.04*	2.10 (0.10 – 4.42)	0.05**	**2.25 (1.06 – 4.80)**	**0.04**
Science GPA	2.97 (1.19 – 7.45)	0.02*	3.01 (1.17 – 7.75)	0.02**	**3.13 (1.21 – 8.10)**	**0.02**
Attitude	0.89 (0.78 – 1.03)	0.12	---	---	---	---
Commitment Score	1.23 (0.76 – 1.67)	0.55	---	---	---	---
Disadvantage Score	1.14 (0.87 – 1.50)	0.34	---	---	---	---
Kamaʻāina Score	1.06 (0.68 – 1.66)	0.80	---	---	---	---

* Indicates significant predictor by univariate analysis ($p<0.10$) and was included in multivariable analysis
** Indicate significant predictor in multivariable analysis ($p<0.10$) and was included in the final model

Table 4.5. Multivariate Logistic Analysis of Predictors on Practicing in Hawai‘i or Pacific

Predictor Variables	Univariate Analysis on Hawai‘i/Pacific [OR (CI)]	Sig.	Multivariate Adjusted Odds Model [OR (CI)]	Sig.	Final Adjusted Odds Model [OR (CI)]	Sig.
gender (female = 1)	1.51 (0.25 – 1.51)	0.25	---		1.27 (0.61 – 2.62)	0.53
minority group membership (NHOPI/Filipino = 1)	1.39 (0.57 – 3.38)	0.47	---		1.28 (0.50 – 3.24)	0.61
income below HI median (yes = 1)	0.55 (0.27 – 1.09)	0.09*	0.72 (0.35 – 1.47)	0.37	---	
origin HPSA/MUA designation (yes = 1)	0.63 (0.30 – 1.32)	0.23	---		---	
participation of HCOP and other disadvantaged programs (yes = 1)	1.03 (0.47 – 2.25)	0.94	---		---	
lack of physician or healthcare role model/mentor (yes = 1)	0.50 (0.21 – 1.17)	0.11	---		---	
lack of support system while attending college (yes = 1)	0.79 (0.38 – 1.66)	0.54	---		---	
Both parents lack BA (yes = 1)	1.71 (0.82 – 3.55)	0.15	---		---	
Science GPA	0.36 (0.14 – 0.90)	0.03*	0.42 (0.16 – 1.06)	0.07**	**0.40 (0.16 – 1.00)**	**0.05**
Attitude	1.17 (1.01 – 1.35)	0.03*	1.14 (0.98 – 1.32)	0.09**	1.14 (0.98 – 1.32)	0.08
Commitment Score	1.25 (0.83 – 1.87)	0.29	---	---	---	---
Disadvantage Score	0.93 (0.71 – 1.22)	0.60	---	---	---	---
Kama‘āina Score	1.19 (0.75 – 1.88)	0.46	---	---	---	---

* Indicates significant predictor by univariate analysis ($p<0.10$) and was included in multivariable analysis

** Indicate significant predictor in multivariable analysis ($p<0.10$) and was included in final model

Table 4.6. Multivariate Analysis of Predictors on HPSA/MUA Outcome

Predictor Variables	Univariate Analysis on HPSA/MUA [OR (CI)]	Sig.	Multivariate Adjusted Odds Model [OR (CI)]	Sig.	Final Adjusted Odds Ratio Model [OR (CI)]	Sig.
gender (female = 1)	0.75 (0.38 – 1.50)	0.41	---	---	0.67 (0.32 – 1.38)	0.28
minority group membership (NHOPI/Filipino = 1)	3.10 (1.15 – 8.31)	0.03*	2.94 (1.08 – 8.04)	0.04**	**2.95 (1.08 – 8.08)**	**0.04**
income below HI median (yes = 1)	0.70 (0.35 – 1.39)	0.31	---	---	---	---
origin HPSA/MUA designation (yes = 1)	1.23 (0.59 – 2.57)	0.59	---	---	---	---
participation of HCOP and other disadvantaged programs (yes = 1)	1.63 (0.73 – 3.62)	0.23	---	---	---	---
lack of physician or healthcare role model/mentor (yes = 1)	0.92 (0.38 – 2.22)	0.85	---	---	---	---
lack of support system while attending college (yes = 1)	1.04 (0.49 – 2.18)	0.92	---	---	---	---
Both parents lack BA (yes = 1)	0.62 (0.30 – 1.28)	0.20	---	---	---	---
Science GPA	1.83 (0.75 – 4.48)	0.18	---	---	---	---
Attitude	1.01 (0.88 – 1.15)	0.92	---	---	---	---
Commitment Score	1.73 (1.12 – 2.69)	0.01*	1.68 (1.07 – 2.64)	0.02**	**1.75 (1.11 – 2.77)**	**0.02**
Disadvantage Score	0.99 (0.76 – 1.30)	0.96	---	---	---	---

* Indicates significant predictor by univariate analysis ($p<0.10$) and was included in multivariable analysis
** Indicate significant predictor in multivariable analysis ($p<0.10$) and was included in final model

Discussion

Reflecting on the mission of IH, which is to diversify the physician workforce in Hawai‘i and produce URM physicians who practice primary care in underserved communities, the findings of this study are valuable. The purpose of this study was to get an accurate assessment of the practice outcomes of graduates who have accessed JABSOM through participation of the IH program. When compared to non-IH JABSOM graduates, we found that a higher percentage of IH-JABSOM graduates chose to practice primary care (58% IH-JABSOM graduates vs. 52% non-IH-JABSOM graduates). When examining who stays to practice in Hawai‘i and/or the Pacific Basin, about 40% of IH-JABSOM graduates chose to practice in Hawai‘i and/or the Pacific Basin, compared to non-IH-JABSOM's 26%. The study also investigated predictors of producing physicians that: 1) select a primary care specialty; 2) serve populations in Hawai‘i or the Pacific Basin; and 3) provide health care to those in rural and/or underserved areas. Each practice outcome is discussed separately below.

Primary Care

This study found that top IH candidates for future primary care physicians are first-generation college females with a high science GPA. Females are two times more likely to practice primary care when compared to males. This finding was in alignment with those of Jeffe and Andriole (2011) who also found that female medical school graduates were more likely to choose primary care than male graduates. Being a first-generation college student (both parents lacking a bachelor's degree) doubled the odds of choosing primary care, when compared to a student with a parent with a bachelor's degree. Lastly, for every point increase in science GPA, a student has three times greater odds at practicing primary care. The trend is that science GPA correlates with USMLE Step 1 scores (Zahn et al., 20012), and the higher the USMLE Step

score the more competitive a student for residency placement. Usually, those who are more competitive choose a non-primary care specialty, however, this study found the exact opposite. While this might seem to go against normal medical school train of thought, this might be an effect of participating in the IH program, in which the need for primary care physicians is emphasized, and therefore regardless of one's competitiveness for residency, a primary care specialty is the choice.

Hawai'i and the Pacific Basin

It was interesting that the only predictor of practicing in Hawai'i or the Pacific Basin was a lower science GPA, which is opposite to what we found about science GPA and choosing primary care practice. In this instance, a higher science GPA meant a lower likelihood in practicing in Hawai'i or the Pacific Basin. A recent study found that Hawai'i was the third worst state in the nation to practice medicine due to low wages and a lack of opportunity (Kiernan, 2018). The low pay, high cost of living, and medical school debt may work against a student choosing to stay and practice in Hawai'i. However, in comparison to JABSOM graduates as a whole, IH-JABSOM gradautes produced statistically significantly more physicians who stay in Hawai'i and the Pacific Basin (39% of IH-JABSOM graduates vs. 26% of non-IH-JABSOM graduates). This finding was based on publicly available residency match data, which means we must consider a number of factors that further explain this finding. The first is that when examining match data, we must keep in mind that Hawai'i is limited by the number of residency spaces it can provide. Currently, Hawai'i offers at most 82 first year residency spots, with 44 spots being in primary care. While the entering class is 72 students, not all students are wanting to complete residency training here in Hawai'i, and students attending medical school on the continent are also competing for these residency slots. Early in a medical career, a common

tendency is to stay where you complete your residency to practice, however this finding could be missing the number of graduates that choose to seek residency training in the continental United States, and then return to Hawai‘i to practice in their later years. Faculty of the IH program found this finding to be reasonable, considering the best and more competitive primary care residency programs are in fact not found in Hawai‘i. To become the best-trained primary care doctor possible, one would need to relocate to the continental United States, and then return to Hawai‘i or the Pacific Basin to practice.

Underserved Areas

Lastly, this study found that minority group membership increased the odds of practicing in a HPSA/MUA by almost 3 times, and for every point increase in the commitment score, a graduate was 75% more likely to practice in a HPSA/MUA. While Rabinowitz et al. (2000) identified several variables associated with practicing in medically underserved communities, including gender (specifically females), being a member of a racial/ethnic minority group, low family income level, and growing up in a rural or inner-city area, among others. This study can only validate that being a member of a racial/ethnic minority group is a significant predictor. The commitment score is something specific to IH. This study showed that regardless of what state an IH physician decided to practice, there was still a strong commitment to serving in HPSA/MUAs. The commitment of IH physicians choosing to practice in HPSA/MUA is more about the desire to serve those who need it most, rather than for a financial reimbursement.

Implications

There are several implications of this study. The first is that IH proportionally produces more physicians that stay in Hawai‘i compared to JABSOM in general. Thus, IH is helping to address the physician shortage in Hawai‘i but is not often viewed as a solution or a model

program. For example, one-third of JABSOM's 2017-2018 incoming class of 2022 received full tuition scholarships in hopes that these students will choose to practice in Hawai‘i. Scholarship donors are hoping that the investment will help retain physicians for Hawai‘i's future healthcare needs, however, scholarship recipients have no pay-back stipulation or contract (Schrire, 2018). IH students were ineligible to receive the full tuition scholarship, yet, findings of this research can be used as evidence to make the case that investment in IH students would pay-off for the future healthcare needs of Hawai‘i.

The next set of implications are recommendations for future admissions. Factors that this study found to be significant in producing physicians who meet the mission of IH include: being female, being a first-generation college student, having a high science GPA, minority group membership, and commitment. The IH program admissions committee and the IH Community Advisory Committee should pay special consideration to applicants that fit this profile. Programmatically, IH cannot only admit females and first-generation college students. The program can, however, focus on admitting more students from the target minority groups of Native Hawaiian, Pacific Islanders, and Filipinos followed by other minorities (other Asian/Indian, AIAN, and African American). We see the benefit of setting a minimum for science GPA, as it is a significant predictor for entering primary care (but not of staying in Hawai‘i).

Lastly, more attention should be given to the commitment score, as it is very predictive of creating physicians who practice in underserved areas. Because the commitment score appears to be such a strong indicator, the reliability and validity of scoring commitment is worth examining. Currently, three program employees read and score essays individually using no rubric. They then come together to discuss the essay and reach consensus on the final score. The

creation of a rubric could help to minimize discrepancies and provide content validity, ensuring that content of the essays is being properly assessed and is aligned to IH's commitment objectives.

The result of this study increases awareness and knowledge regarding factors that play an important role in an applicant's future practice decision. Future qualitative research would be useful to further understand why some IH-prepared physician graduates chose to practice primary care in Hawai‘i or the Pacific and why others do not. This would provide more information on the challenges and barriers to practice primary care in underserved areas in Hawai'i or the Pacific. This future research could also collect ideas on ways to incentivize new medical school graduates to continue to stay in Hawai‘i for residency training or return to Hawai‘i or the Pacific Basin to practice.

Limitations

There is no formal procedure in place to track IH alumni after graduating from JABSOM. If graduates are not in contact with the program, online physician profiles were relied on for the most updated practice information.

Conclusion

This study is significant because it provides evidence that IH, a focused intervention for URM and disadvantaged students at the post-baccalaureate level, increases the numbers of URMs in medicine who work in primary care, and in rural and/or medically underserved areas. This study also provides useful information that can be used to help identify applicants for IH who are most likely to meet the practice outcomes. Findings can provide evidence to strengthen advocacy efforts to increase funding to support pipeline programs for underrepresented

minorities and those coming from disadvantaged backgrounds. Findings could also be used to increase the number of IH seats at JABSOM.

CHAPTER 5

CONCLUSION

Three studies were conducted for this dissertation for a comprehensive evaluation of the IH post-baccalaureate program. We first examined the characteristics of IH participants, and compare those who successfully completed the program to those who did not. We found that the IH program is admitting the types of students it was designed to admit, which are disadvantaged URMs. Attitude towards academic success is the most important factor that can potentially predict successful completion of the IH program, while science GPA and MCAT scores show some importance.

We then identified which program components are most helpful to, and used by, URM students in the program, and which additional resources are needed. Three key themes emerged from a qualitative analysis of focus groups with IH graduates. Most helpful components of the program were academic enrichment, support from both peers and faculty, and financial support for educational programs for URM students participating in educational pipeline or patheay programs in Hawai‘i. IH could be improved by smoother transitions between phases during the program, and better publicity to highlight the strengths of IH

The final study investigated whether or not IH is meeting its mission of diversifying the health care workforce in Hawai‘i by increasing the number of URM physicians that: 1) practice primary care; 2) practice in rural and/or underserved communities; and 3) practice in Hawai‘i or in the Pacific Basin. This study found that female gender, being a first-generation college student, and higher science GPA are associated with choosing primary care practice. A higher science GPA predicts against practicing in Hawai‘i or the Pacific Basin. When compared to JABSOM graduates as a whole, IH produces statistically significantly more physicians who stay

in Hawai‘i and the Pacific Basin. Minority group membership (e.g., NHOPI, Filipinos, other Asian/Indian, AIAN, and African American) and commitment to serve URMs and underserved communities are related to choosing to practice in a rural and/or underserved areas.

Key findings from this dissertation tell us three things. The first is that attitude towards academic success is the most important factor for success. Despite lower GPA and MCAT scores, attitude towards education and clarity of educational goals help URM students graduate from IH and matriculate to JABSOM. Programs components that lend to successful performance in JABSOM include preparation and support. URM students need preparation to build a strong foundation of knowledge, in partnership with support from peers and faculty, in order to be successful. Lastly, IH is meeting its mission of producing primary care physicians. IH proportionally produces more physicians that stay in Hawai‘i compared to JABSOM in general. Thus, IH is helping to address the physician shortage in Hawai‘i and should be viewed as a solution or a model program. Considering the results from the three studies together, this chapter presents overall findings and makes recommendations for programming, policy, and research.

This study offers recommendations for both programming and policy changes. While attitude is the stronger predictor of IH success when compared to GPA and MCAT scores, these scores also help the program to identify candidates that have the greatest potential to succeed. Currently, there is no minimum requirement set for the science GPA or the new MCAT, and the program has been discussing imposing such minimums for the past few years. The finding that higher science GPA is associated with success may warrant the setting of score minimums.

A second admissions-related recommendation would be to focus on admitting more students from the target minority groups of Native Hawaiian, Pacific Islanders, and Filipinos followed by other minorities (other Asian/Indian, AIAN, and African American), paying close

attention to the commitment-to-serve score, and weighing the student's attitude towards education. These traits in combination create physicians that will meet the mission of IH.

One curricular recommendation can be made. Being that the right attitude is important for successful completion of the IH program, student attitude towards education and the importance of academic success should be assessed and fostered throughout the one-year program. Another recommendation is to rework the transitional periods during program, and work with JABSOM to ensure a smooth transition as IH graduates matriculate into medical school. Lastly, better overall publicity and choice of words for describing the IH program are needed.

Recommendations for future research would include qualitative investigation of non-completers. What are the psychosocial stressors and things outside of the program related to non-completion? While many of the reasons related to non-completion may be out of the program's control, it is vital to understand and identify the barriers that affect URM students in Hawai‘i that then lead to non-completion of educational goals. If we can get every student to succeed in IH and matriculate into medical school, then maybe we would have figured out what it takes for all URMs to succeed in any field in the university setting.

Recommendations for future research in relation to the physician shortage would be to further understand the challenges and barriers to practicing primary care in underserved areas in Hawai'i or the Pacific. This research would include collecting ideas on ways to incentivize new medical school graduates to continue to stay in Hawai‘i for residency training or return to Hawai‘i or the Pacific Basin to practice.

In conclusion, this research has given us knowledge that could potentially impact the admissions criteria and curriculum of IH, as well as helped identify key components and areas of improvement for the program. More importantly, this research has allowed us to definitively

determine that IH, a focused intervention for URM and disadvantaged students at the post-baccalaureate level, has been successful in increasing the numbers of URMs in medicine, as well as the numbers of physicians working in primary care and in rural and/or medically underserved areas. We hope that this research will strengthen advocacy efforts to increase funding to support pipeline programs for underrepresented minorities and those coming from disadvantaged backgrounds.

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