Medical School Location and Sex Affect the In-State Retention of Pediatric Residency Program Graduates in Hawai'i

David Kurahara MD; Faith D. Hamamura BA; Christine Ifuku JD; John J. Chen PhD; Chloe A. Liu MS; Elisabeth M. Seamon MPH; Chloe S. Miwa; Brienna Maestas BS; Ria Oba; Shilpa J. Patel MD; and Bruce Shiramizu MD

Abstract

The objective of this study was to assess the impact of medical school, sex, career choice, and location of practice of one pediatric residency program on physician workforce. This is a retrospective study of all categorical pediatric graduates of a residency program located in Honolulu, Hawai'i from 1968 to 2015. Information on medical school training, sex, career choice (general pediatrics or specialty), and location of practice were studied by examining data into five 10-year graduation periods. The program graduated 319 residents over nearly a 50-year timespan. Of these, 181 (56.7%) residents remained in Hawai'i to practice (adjusted odds ratio [OR] = 7.46, 95% confidence interval [CI]: 3.61-15.43). There were 125 (39.1%) graduates who relocated to the continental US with the majority moving to the West (55.2%), while other graduates moved to the South, Midwest, and Northeast (25.6%, 13.6%, and 5.6%, respectively). The remaining 13 (4.1%) graduates moved internationally. Female residents steadily increased over time (P < .001), with females significantly choosing general pediatrics (OR = 3.05, 95% CI: 1.91–4.89). In the time periods with the highest percentage of University of Hawai'i medical school graduates, there was an increased percentage of graduates staying in Hawai'i. This study examined the regional and national impact of a small residency program. The results indicated that trends in gender and the impact of medical school location were important in establishing a pediatrician workforce for local communities. Support of both medical school and residency education should be considered when assessing future workforce needs.

Keywords

Medical Education, Pediatric Workforce, Pediatric Residency, Pediatric Specialty, General Pediatrics

Abbreviations

CI = confidence intervals
IMG = International medical graduate
JABSOM = John A. Burns School of Medicine
OR = odds ratio
KMCWC = Kapi'olani Medical Center for Women & Children
UH = University of Hawai'i
UHPRP = University of Hawai'i Pediatric Residency Program
US = United States

Introduction

The contributions to physician workforce from a specific residency program to the local and national communities have rarely been described in the literature.[1] One study evaluated the regional effect of closing family medicine residency programs, with the negative economic and geographic impact going undetected for years.[2] Hawai'i has the second-highest percentage of active physicians over the age of 60 (32.9%) in the nation raising significant concerns for future physician workforce issues.[3]

Recent trends in the field of pediatrics have indicated a shift in gender and generational influences on the pediatric workforce.[4] In order to sustain an adequate number of pediatricians, it is necessary to closely examine current trends, anticipate future needs, and formulate recruitment and retention strategies. Therefore, a balance of pediatric generalists and specialists is necessary to adequately care for the pediatric population in Hawai'i and the Pacific Basin.

As of 2018, Hawai'i is currently impacted by a physician shortage of 513 full-time physician equivalents.[5] Data from 2016 revealed that 113 (33.5%) of 337 pediatricians in the state were over the age of 60. This may mean that many may retire in the next decade.[6] Assuming no new pediatricians were added to the state's workforce, the remaining general pediatricians would theoretically only cover two-thirds of the patient population over the next 10 years or be overburdened to take on more patients. These workforce trends should be examined to strengthen graduate medical education for the community in order to supply sufficient numbers of pediatricians for the childhood population. In addition, Hawai'i's geographic isolation further restricts training a pediatrician workforce with enough capacity to adequately care for the children in the entire state.

The education and training landscape for the study is unique because Hawai'i is geographically isolated from the continental United States (US). This program is the only civilian pediatric residency in the state and is affiliated with the sole medical school in the state, the University of Hawai'i John A. Burns School of Medicine (JABSOM). This manuscript evaluated the effect of physicians trained in 1 residency program on the entire country and addresses the impact of these pediatricians on the regional workforce needs. The objective of this paper focused on the impact of a residency program on the physician workforce by investigating the career paths, changing demographics, and location of practice from an entire pediatric residency program's history over nearly 5 decades.

Methods

The University of Hawai'i Pediatric Residency Program (UHPRP) maintained an alumni database featuring all graduates from

1968 to 2015. UHPRP is based at Kapi'olani Medical Center for Women & Children (KMCWC), the primary children's hospital in Hawai'i and the major tertiary referral hospital for most children in the Pacific Basin. All pediatric specialties are available at this hospital, including a pediatric intensive care unit and a tertiary neonatal intensive care unit. Currently, as of 2019, the pediatric residency program has 24 residents and adds 8 new interns per year with 2 post-graduate chief residents for a total size of 26 resident positions per year.

JABSOM is the only Liaison Committee on Medical Education-accredited medical school available in the Pacific Ocean, making the university an important source of recruitment for the pediatric residency program. The first JABSOM graduates of the 4-year medical school were in 1975.[7] In addition, a physician rating and comparison database was used to collect demographic data of the total pediatric workforce currently in Hawai'i.

Residency graduates were classified into 3 categories of medical schools: JABSOM, continental US medical schools, and international medical schools. The graduates were further categorized based on their career choice into general pediatrics or specialties. The lead author of this manuscript is the current program director of the pediatric residency and has a database of the graduates' last known practice. The database is updated when graduates move practice because credentialing must go through the pediatric residency program office. Only categorical pediatric residents were included in this study. Medicine/pediatric and triple-board psychiatry/pediatric graduates were excluded because these programs were only a short time period of the history of the pediatric residency program. The data were then grouped by roughly 10-year time periods based on their graduation year from the residency program. The first time period (1968–1975) was inclusive of 8 years due to limited information and shorter residency requirements. The subsequent 10-year time periods were defined as 1976–1985, 1986–1995, 1996–2005, and 2006–2015.

Statistical Analysis

Data for the residency graduates were summarized by descriptive statistics and compared by time periods as described above. Unadjusted and adjusted logistic regression analyses were performed to evaluate the association between practicing in Hawai'i after residency and graduating from the local medical school. Odds ratios (OR) and respective 95% confidence intervals (CI) were derived. The OR were adjusted for the following possible confounding variables: residency training, sex, medical education, and year of graduation. A 2-sided *P* value of less than .05 was denoted as statistically significant. All data analyses were conducted using SPSS 23 software for Windows (Armonk, NY). Institutional review was done by Hawai'i Pacific Health Research Institute and was deemed exempt from full review by the Institutional Review Board.

Results

Geographic distribution of UHPRP graduates

There were 319 UHPRP graduates who completed the program over the 48-year time period. Following completion of the program, the graduates settled over a wide geographic area with their last known practice locations indicated in Figure 1. Of the total 319 pediatric graduates, 181 (56.7%) decided to stay and practice in the state of Hawai'i, while 13 (4.1%) moved to international locations, including Canada, England, Hong Kong, Japan, Micronesia, and Thailand. US Census Bureau regions were used to describe the distribution of these graduates across the country.[8] The remaining 125 (39.1%) moved to the continental US to practice. Of these, the majority at 55.2% (n = 69) relocated to the western region (excluding Hawai'i), followed by 25.6% (n = 32) to the southern region, 13.6% (n = 17) to the Midwest region, and 5.6% (n = 7) to the northeast region.

Differences in Resident Graduates by Time Period

During 1986–1995, there was a significantly higher percentage of JABSOM graduates attending the residency program (68.1%, $P < .001$) compared to other time periods. Since then, there was a gradual decrease in JABSOM graduates within the residency program from 44.0% and 30.7% during 1996–2005 and 2006–2015, with an increase in graduates from other US and international medical schools. In the most recent time period (2006–2015), pediatric residency demographics were more evenly distributed with graduates from 29.3% international medical schools, 30.7% JABSOM, and 40.0% other US medical schools. In the last three 10-year time periods, an increasing number of pediatric residency graduates were more likely to practice in Hawai'i after residency graduation ($P=.035$).

Impact of JABSOM on Retention of Residency Graduates

The majority of graduates, 56.7% (n = 181), remained in Hawai'i to practice medicine following graduation. The adjusted OR of JABSOM graduates practicing in Hawai'i compared to international medical graduates (IMG) was 7.46 (95% CI: 3.61-15.43; Table 2). The odds of in-state retention for US graduates from other medical schools compared to students from international schools was 1.84 (95% CI: 0.97-3.49). However, residency graduates who pursued specialty training were less likely to practice in-state compared to general pediatricians (OR = 0.38, 95% CI: 0.22-0.64).

Sex Influence on Pediatric Career Choice

Over each of the time periods, a significant increase was observed in the percentage of female residents. For example, in the first time period 17.1% of the residents were female. This percentage increased to 61.3% by the most recent time period

($P < .001$; Table 1). Overall, the number of females in the residency program increased in every time period since the first interval. In the last 30 years, the majority of UHPRP residents have been female with the most recent 10-year period being 61.3% (Table 1) in comparison to the overall female pediatrician workforce in Hawai'i at 57.6% as of 2016.[6] With the increase in class size over recent decades, the number of males entering the program decreased, while the number of females increased.

General Pediatrics Versus Specialist Career Choices

When studying the career choices of program graduates, there was an increase in general pediatrics and a decrease in specialty training, in contrast with the national trend.[9] In Table 1, the percentage of graduates entering specialty training decreased over the five 10-year time periods were 57.1%, 43.1%, 39.1%, 34.7%, and 36.0%, respectively. Conversely, the percentage of general pediatricians has increased steadily each time period at 42.9%, 56.9%, 60.9%, 65.3%, and 64.0%, respectively.

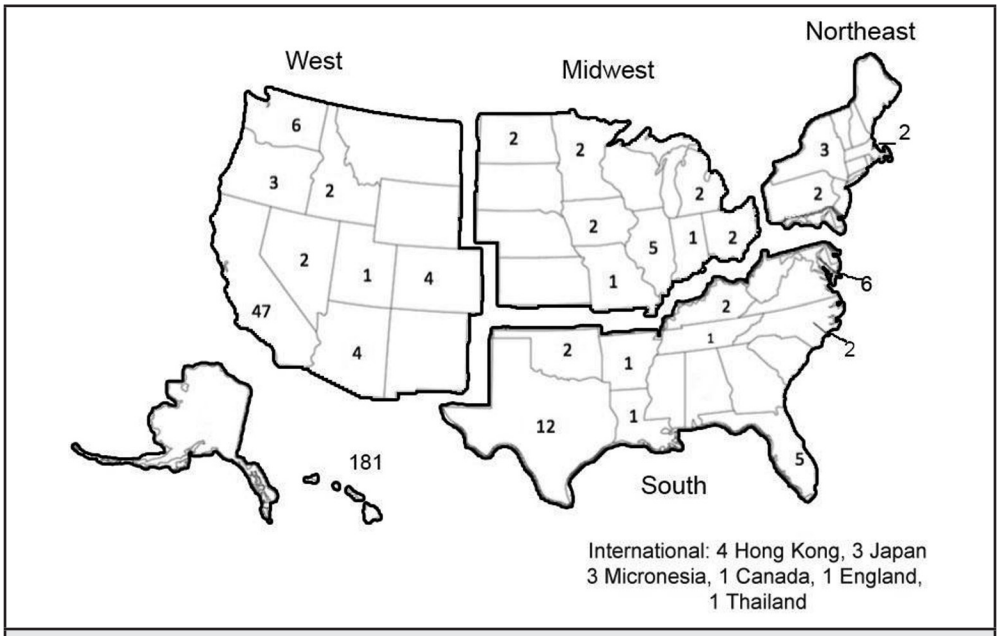

Figure 1. The Geographic Regional Distribution of Where University of Hawai'i Pediatric Residency Program (UHPRP) Graduates Practice or Attend Fellowship Post-residency from 1968 to 2015 (n = 319).

Table 1. Characteristics of JABSOM Pediatrics Residency Program Graduates, 1968–2015[a,b]

Characteristic	Year of Residency Graduation (N = 319)					
	1968–1975 (n = 35)	1976–1985 (n = 65)	1986–1995 (n = 69)	1996–2005 (n = 75)	2006–2015 (n = 75)	*P* value[c]
Sex, n (%)						
Female	6 (17.1%)	24 (36.9%)	37 (53.6%)	38 (50.7%)	46 (61.3%)	<.001
Male	29 (82.9%)	41 (63.1%)	32 (46.4%)	37 (49.3%)	29 (38.7%)	
Medical Education, n (%)						
International Graduates	16 (45.7%)	14 (21.5%)	8 (11.6%)	12 (16.0%)	22 (29.3%)	<.001
JABSOM Graduates	0 (0.0%)	23 (35.4%)	47 (68.1%)	33 (44.0%)	23 (30.7%)	
Other US Graduates	19 (54.3%)	28 (43.1%)	14 (20.3%)	30 (40.0%)	30 (40.0%)	
Specialty Training, n (%)						
General Pediatrician	15 (42.9%)	37 (56.9%)	42 (60.9%)	49 (65.3%)	48 (64.0%)	.21
Specialist	20 (57.1%)	28 (43.1%)	27 (39.1%)	26 (34.7%)	27 (36.0%)	
Place of Practice, n (%)						
Hawai'i	16 (45.7%)	32 (49.2%)	50 (72.5%)	41 (54.7%)	42 (56.0%)	.035
Non-Hawai'i	19 (54.3%)	33 (50.8%)	19 (27.5%)	34 (45.3%)	33 (44.0%)	

JABSOM = John A. Burns School of Medicine, US = United States. [a] There are 168 male and 151 female JABSOM residency program graduates during 1968–1975.
[b] The percentage (%) is compared to total number per category. [c] *P* values are based on Chi-square tests with comparisons over each time period.

Table 2. Adjusted Odds Ratios of JABSOM Pediatrics Residency Program Graduates Practicing in Hawai‘i after Graduation by Characteristics, 1968–2015		
Characteristic	**Practice in Hawai‘i**	
	Unadjusted OR (95% CI)	**Adjusted OR (95% CI)**
Year of Graduation		
2006–2015 (Reference)	1.00	1.00
1968–1975	0.66 (0.30-1.48)	1.23 (0.50-3.01)
1976–1985	0.76 (0.39-1.48)	0.67 (0.31-1.44)
1986–1995	2.07 (1.03-4.15)	1.22 (0.55-2.71)
1996–2005	0.95 (0.50-1.80)	0.68 (0.33-1.42)
Sex		
Female (Reference)	1.00	1.00
Male	0.72 (0.46-1.13)	1.08 (0.63-1.84)
Medical Education		
International Graduates (Reference)	1.00	1.00
JABSOM Graduates	8.61 (4.44-16.67)	7.46 (3.61-15.43)
Other US Graduates	1.90 (1.03-3.49)	1.84 (0.97-3.49)
Residency Training		
General Pediatrics (Reference)	1.00	1.00
Specialist	0.31 (0.20-0.50)	0.38 (0.22-0.64)

OR = odds ratio, CI = confidence interval, JABSOM = John A. Burns School of Medicine, US = United States

Discussion

This comprehensive study of a pediatric residency program in Hawai‘i with only 1 medical school highlights the unique distribution of post-graduate residents, factors that may affect retention of pediatricians to address the state's workforce needs, and the changing sex profile of pediatric residents from 1968 to 2015. This study suggests that a pediatrician who completed both medical school and residency training locally was more likely to remain in the state to practice.

UHPRP graduates not only have a substantial impact on the pediatrician workforce in Hawai‘i, but they also contribute to the physician workforce across the country. Out of 319 graduates, 138 (43.3%) chose to practice out of state. One way to quantify this impact would be to estimate the number of children cared for by UHPRP graduates by multiplying this number by the average number of children a pediatrician cares for in a career. If one uses 1,546 patients as the average number of patients cared for by a pediatrician, this would imply that UHPRP graduates have cared for 213,348 children outside of Hawai‘i.[10]

To our knowledge, this is the first time that the majority of a single pediatric residency program has been analyzed and can be important information on the trends seen in medicine over a nearly 5-decade time period. In reviewing the literature, a few studies examining aspects of residency graduates over shorter periods of time were found. The Children's Hospital in Boston, affiliated with Harvard Medical School, reported the choice and activities of its residency graduates during 1974–1986. That study examined a large residency program over a shorter timeframe with its focus on academic research careers, which is different from this study's focus on career paths, changing demographics, and location of practice.[1] Another study on a surgical residency over a 15-year time period examined the career path of 34 non-designated general surgery residents at Massachusetts General Hospital also in Boston.[11] Finally, a group reported 4 years of an internal residency program in Guyana affiliated with the University of Maryland which graduated 6 residents from its start in 2013 to 2017. This described some of the challenges and successes for a program in a resource limited environment and has a much different focus than in our study.[12]

UHPRP graduates have cared for a significant majority of Hawai‘i's children, showcasing the program as a vital component to ensure the quality of pediatric care in the state. Assuming all 181 (56.7%) graduates are actively practicing clinical pediatrics in Hawai‘i, the total impact could be as high as 279,826 children or more than 90% of the children in the state.[10] However, this may be overstated as recent graduates may not have yet cared for this many patients and others may have retired from practice. Similar studies could provide data for hospitals and state governments to understand the impact of residencies in meeting the healthcare needs of their local populations.

The likelihood of JABSOM graduates practicing in-state after residency was significantly higher than continental US medical schools or IMGs in our study. It is more likely for a resident who graduated from our local medical school to stay and practice in Hawai‘i following residency. When looking at physicians who completed both in-state medical school and residency, Hawai‘i has the highest retention in the country at 86.6%, which exceeds

the national median at 69.0%.[6] JABSOM's commitment to in-state students may contribute to this outcome.[13] Furthermore, completing both medical school and residency in Hawai'i could potentially increase in-state networking, leading to possible future improvements in the residents' knowledge of job opportunities and increase the comfort level of potential employers with residents' competency. These results may increase the likelihood of graduates choosing to practice in Hawai'i.

Comparatively, a cross-sectional study done in 2017 using a physician rating and comparison database was conducted to look at the total pediatric workforce in Hawai'i (n = 281), resulting in a finding of 36.7% (n = 103) who were UHPRP graduates. The difference may be accountable by this database including the pediatricians from the military systems (unpublished data).

Similar trends for physician retention have been observed elsewhere. A study from the University of Buffalo found that medical students with geographic ties to New York who graduated in 1989–1991 were more likely to practice locally mid-career. The likelihood of their local medical students practicing in the same area after residency graduation was found to be 15-fold greater in those who were not (OR = 15.7, 95% CI: 8.9-27.5). Their study looked at the graduates' mid-career locations, which was different than the focus of this study despite similar outcomes.[14]

The outcomes of IMG graduates who attended UHPRP were also examined. JABSOM gained accreditation as a 4-year institution in 1973, which may explain the absence of JABSOM graduates and the peak percentage of IMGs between 1968–1975.[7] Following that time period, there was a subsequent decrease in IMGs to 21.5% from 1976–1985 with the lowest percentage at 11.6% during 1986–1995. In 1996–2005, IMGs in the UHPRP increased and the proportion of IMGs peaked at 29.3% in 2006–2015. Currently, with hundreds of applicants a year for 8 positions, competition for these residency positions has increased. Historically, many IMGs in our residency program have already completed residencies and even fellowships prior to applying to this program and bring a wealth of pediatric experience.

The UHPRP data showed an overall increase in residents who chose general pediatrics and a slight overall decrease in those who chose specialty practices during 1968–2015, which contrasted national trends of increasing specialization.[4,9] The growing interest towards general pediatrics locally may be related to the greater number of female residents in our program since our data shows females are more likely to enter a career as a generalist. The increasing trend of female UHPRP residents reflects national trends. In 1975, females constituted 23.0% of the pediatric workforce nationally, which is comparable to Hawai'i's 17.1% during a similar time period.[15] Then, in 2012, 73.0% of pediatric residency graduates nationally were female, which is also comparable to 61.3% in Hawai'i during a similar time period for this study.[16] The data support the general trend of more females entering the field of pediatrics nationally.

Another important factor was that this program lacks fellowship opportunities, which may also influence career decisions, especially for graduates who did not want to relocate for fellowship training. However, career choice is a highly complex phenomenon, and many other factors can be involved. When deciding on a career choice, residents may be influenced by residency program size, availability of fellowship opportunities, medical school location, career location, debt, potential income, residency mentors, work-life balance, interest in specific disciplines, job opportunities, and family circumstances.[4,9] Likewise, media coverage of workforce shortages may play a role in decision making.[17] This trend potentially provides more primary care physicians for the local community's pediatric needs. These findings have potential implications for resident recruitment and training such as the need to offer family-friendly benefits like child care and flexible scheduling to attract potential applicants.[18]

Issues that influence whether a pediatric resident pursues specialty training and remains in Hawai'i may be multifactorial, including limited fellowship opportunities in the state, job market, and a higher cost of living. According to a 2011 study conducted by Rochlin and Simon, financial factors may also play a key role, based on their findings that pediatric fellowship training often resulted in decreased financial returns compared to general practice.[19] Pediatric residents with medium or high indebtedness are then more likely to practice general pediatrics or hospitalist medicine.[20]

In some situations, the residency program is unaware of where graduates have moved. Even though the program has tried to keep records, the data for 9 individuals was unavailable. Also, information on when graduates leave fellowship is not known.

By studying 1 pediatric residency program throughout its entire history, the impact of these trained pediatricians on the local workforce can be examined. Graduates from the UHPRP program mainly remained in-state to practice. However, 43.3% of graduates left the state and chose to practice in the continental US or international locations. From the standpoint of improving the pediatrician workforce in Hawai'i, the local medical school and the pediatric residency program should strive to provide valuable clerkship experiences for medical students to build interest in their specialties. The collected data of this study indicates that students who attend both medical school and residency in one location are more likely to remain in that area and contribute to the workforce locally and regionally.

More longitudinal research is required to further examine these emerging trends in the context of workforce sustainment. There are shortages in pediatric specialties including cardiology, endocrinology, hematology/oncology, gastroenterology, and neurology.[21] Recruitment of future pediatricians and pediatric specialists can start as early as medical school. Residency programs and medical schools can partner together to provide educational services that benefit the students, residents, and communities that they serve.

Conflict of Interest

The authors have indicated they have no conflicts of interests relevant to this article to disclose.

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Authors' Affiliations:
- Department of Pediatrics, John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI (DK, FDH, CI, CAL, EMS, CSM, BM, RO, SJP, BS)
- Department of Quantitative Health Sciences, John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI (JJC)

Correspondence to:
David Kurahara MD; 1319 Punahou St. #753, Honolulu, HI 96826;
Email: davidk@kapiolani.org

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