CHCF

Here Today, Gone Tomorrow

California's Bottlenecked Education Pipeline Leaks Needed Latino/x and Black Medical Students

APRIL 2023

AUTHORS
Ephy Love, PhD, MS, Head of Data Science, Thalamus
Jason I. Reminick, MD, MBA, MS, CEO and Founder, Thalamus

Acknowledgments

In our research for this brief, we spoke with several subject matter experts actively involved in medical education at top institutions in and out of California who asked to remain anonymous. We greatly appreciate their contributions to our work. Thank you also to Sarah J. Love for designing the stylized maps and figures in this work.

About the Authors

Ephy Love, PhD, MS, Head of Data Science, Thalamus; and Jason I. Reminick MD, MBA, MS, CEO and Founder, Thalamus. Thalamus is a commercially available cloud-based graduate medical education interview management platform and scheduling software used by residency and fellowship programs.

About the Foundation

The California Health Care Foundation (CHCF) is an independent, nonprofit philanthropy that works to improve the health care system so that all Californians have the care they need. We focus especially on making sure the system works for Californians with low incomes and for communities who have traditionally faced the greatest barriers to care. We partner with leaders across the health care safety net to ensure they have the data and resources to make care more just and to drive improvement in a complex system. CHCF informs policymakers and industry leaders, invests in ideas and innovations, and connects with changemakers to create a more responsive, patient-centered health care system.

Contents

Introduction — the Problem

California's population of 39 million is increasingly diverse, with 39.4% of residents identifying as Latino/x and 5.7% as Black. However, only 6% of the state's physician workforce is Latino/x, and 3% is Black.[1] This significant gap has meaningful consequences for Californians seeking medical care; countless people lack access to a physician of their own ethnicity, which may mean they do not have a physician that speaks their preferred language. This is cause for concern since several landmark studies have shown that representative care contributes to improved outcomes for patients who disproportionately come from underrepresented communities.[2] California's Latino/x population is particularly impacted by the mismatch.[3]

The large disparity between population and physician diversity can be seen in the educational pipeline, where just 8% and 6% of medical students identify as Latino/x and Black, respectively. The research described in this report looked at the flow of Black and Latino/x medical school graduates, from inside and outside the state, into California residency programs to identify where in the process the state is gaining and losing much-needed physicians. The study used a novel data set of residency interviews and outcomes to explore potential avenues to increase the state's recruitment and retention of underrepresented-in-medicine physicians, particularly those identifying as Latino/x and Black.

California's Physician Education Pipeline

A nationwide shortage of all physicians provides a backdrop for California's problems. The American Association of Medical Colleges (AAMC) warns of a shortage of 37,800 to 124,000 physicians by 2034.[4] As the US population becomes more diverse, the physician shortage is expected to further exacerbate the disparities between the ethnicity of physicians and patients. Currently, medical school enrollment disproportionately comprises students who identify as White or Asian and are relatively affluent.[5]

Currently, medical school enrollment disproportionately comprises students who identify as White or Asian and are relatively affluent.

California's physician education pipeline has several strengths, including 15 medical schools — second only to Texas — and the fourth-highest medical school enrollment, in the nation at 1,632 students per year.[6] The state also boasts the highest retention rate after residency: 71% of its medical residents stay in the state after training.[7] California has the highest residency program volume in the nation, with 94 accredited institutions. Further, the state ranks second in accredited training programs, with 570 residency programs and 4,323 annual residency positions.[8]

However, despite these strengths, California ranks only 46th in medical school positions per year per thousand population. Further, in residency positions per year per thousand population, the state ranks only 26th nationally.

How Residency Matching Works

During their final year in medical school, students apply to residency programs through the Electronic Residency Application Service. Applicants who pass an initial review and screening are invited to complete interviews with residency programs. Then applicants and programs compile rank-order lists denoting their preferences for each other. The rank-order lists are submitted to the National Resident Matching Program (NRMP), which matches applicants with residency programs around the country. Every year, the applicants are notified on the third Friday of March, "Match Day." Depending on specialty, residents will train for three to seven years before subspecializing into further training via fellowship or entering the workforce as an attending physician.

Methodology

Researchers conducted a retrospective investigation using Thalamus data to estimate population-level parameters regarding the diversity of the 2020–21 residency recruitment season and its outcomes in California. Thalamus combined time-series interview data, US Census demographics, industry measurements (program accreditation, size, etc.), and other relevant data. Applicant and interviewee data were collected from applicants to residency programs in eight specialties including anesthesiology, family medicine, internal medicine, obstetrics and gynecology, orthopedic surgery, pediatrics, psychiatry, and surgery. The study population included 29,800 applicants out of the 37,140 entrants (81%) into the 2021 NRMP match for these specialties. (Appendix A provides a more complete description of the methodology and the limitations of this study.)

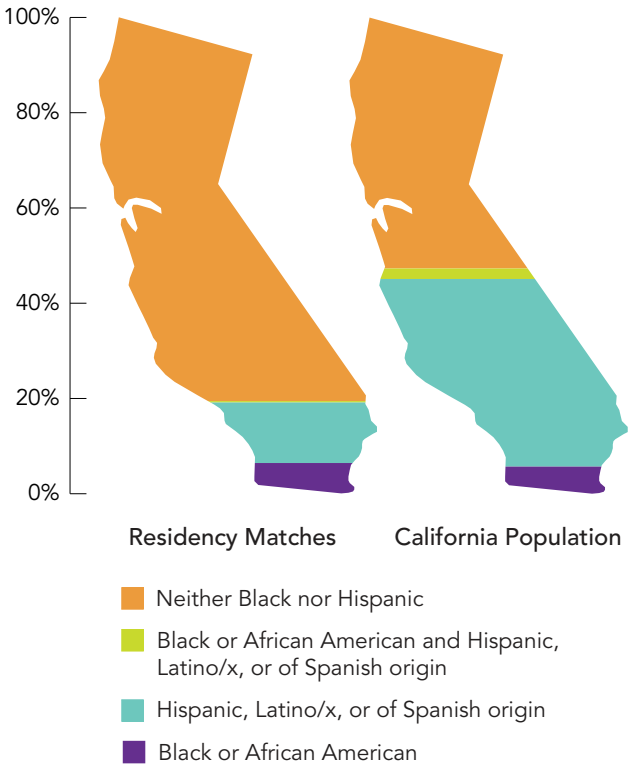
Data Reveal Pipeline Strengths and Leakage Points

The research showed that California currently lacks sufficient medical school and residency positions to produce a physician workforce that reflects the population. The study looked at various aspects of the resident-matching results.

Matches into California by Self-Identified Ethnicity

The maps in Figure 1 show the matching percentages of applicant groups by ethnicity compared to the California population shown in the 2020 Census.

Figure 1. Residency Matches Versus California Population, by Ethnicity



Source: Author analysis of Thalamus data, 2020–21.

The proportion of applicants matching into California residency positions that identified as Black or Latino/x were 6.4% and 12.7%, respectively (Table 1). Specific data for family medicine and internal medicine, the specialties with the largest applicant pools, are shown below for comparison.

Black family medicine physicians matched below the 2020 Census Proportion, while Black internal medicine physicians matched above it. Latino/x family medicine physicians were even more underrepresented, while the proportion of internal medicine physicians accounted for only about half of the Census population.

Across all eight specialties studied, California matched Black physicians at the rate of the 2020 Census population proportion. The state's residency programs invited and completed interviews with Black physicians slightly below national and regional averages, while matching Black physicians at slightly lower rates than the national average and the California Black population benchmark (Figure 2).

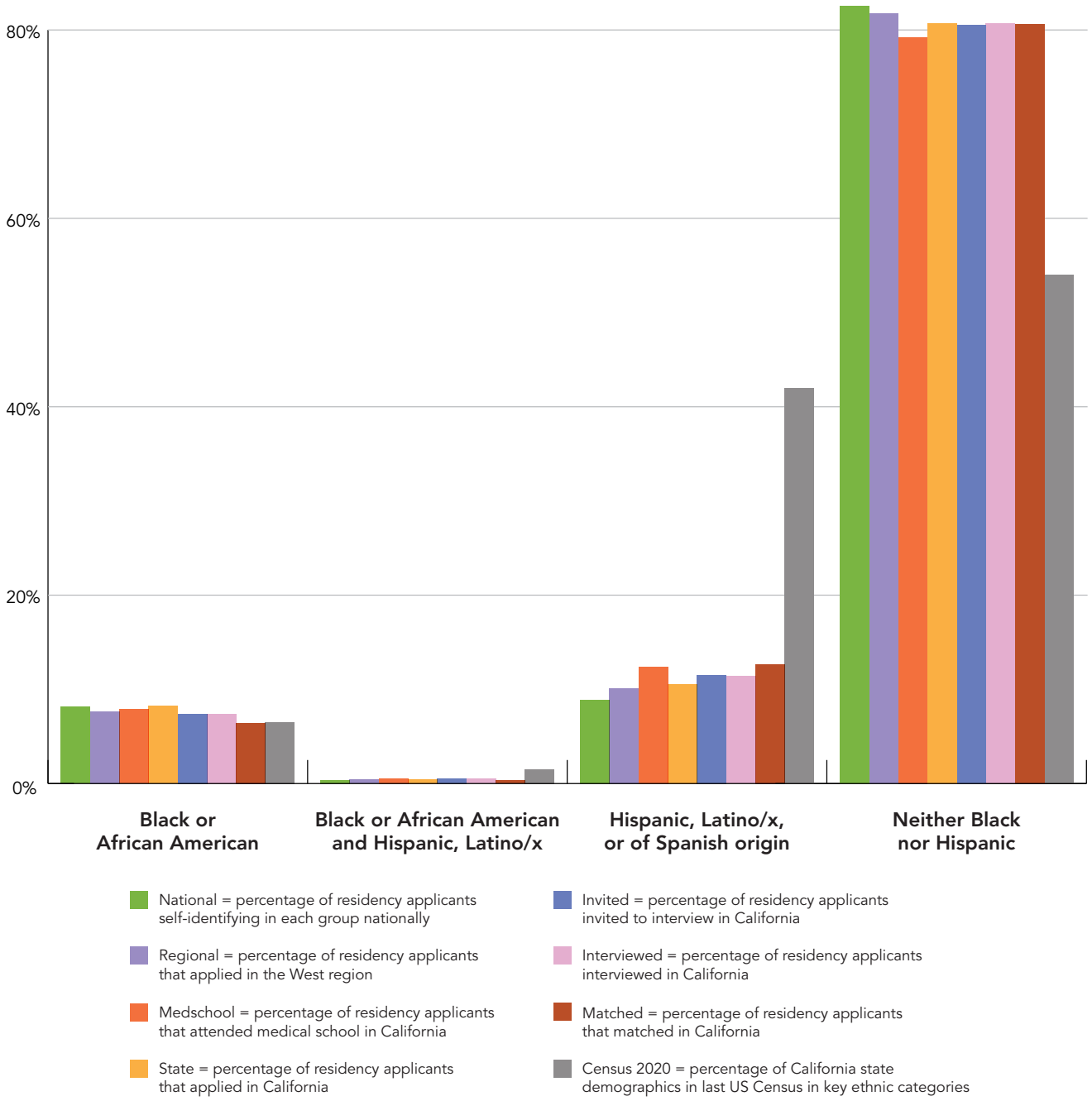
Latino/x physicians, however, matched far below the 2020 census population proportion for California. Residency programs in California invited and completed interviews and matched with Latino/x physicians above national and regional averages. However, this was well below the representative Latino/x population.

Table 1. Breakdown of Groupings Among All Matched Residents in California

SELF-IDENTIFIED ETHNICITY GROUPING	PROPORTION OF CALIFORNIA MATCHES	FAMILY MEDICINE PROPORTION	INTERNAL MEDICINE PROPORTION	2020 CENSUS PROPORTION
Black or African American	6.4%	4.5%	7.1%	5.7%
Hispanic, Latino/x, or of Spanish Origin	12.7%	9.4%	18.6%	39.4%
Both Black or African American and Hispanic, Latino/x, or of Spanish Origin	0.3%	0.2%	0.6%	2.2%
Neither Black nor Hispanic	80.6%	85.8%	73.7%	52.7%

Source: Author analysis of Thalamus data, 2020–21.

Figure 2. Overall Applicant Recruitment Pipeline for Eight Specialties into California



Source: Author analysis of Thalamus data, 2020–21.

Matches into and out of California by Permanent Residence

For applicants whose permanent address is in California, 57.3% of Latino/x students matched into the state for residency. Among non-Californians, 6.4% of Latino/x students matched into the state for residency — the highest rate of any subpopulation analyzed (Table 2).

As noted previously, California celebrates a 71% retention of physicians completing residency — the highest rate in the nation. The data presented in Table 2 show large proportions of both in-state retention and out-of-state matching into California.

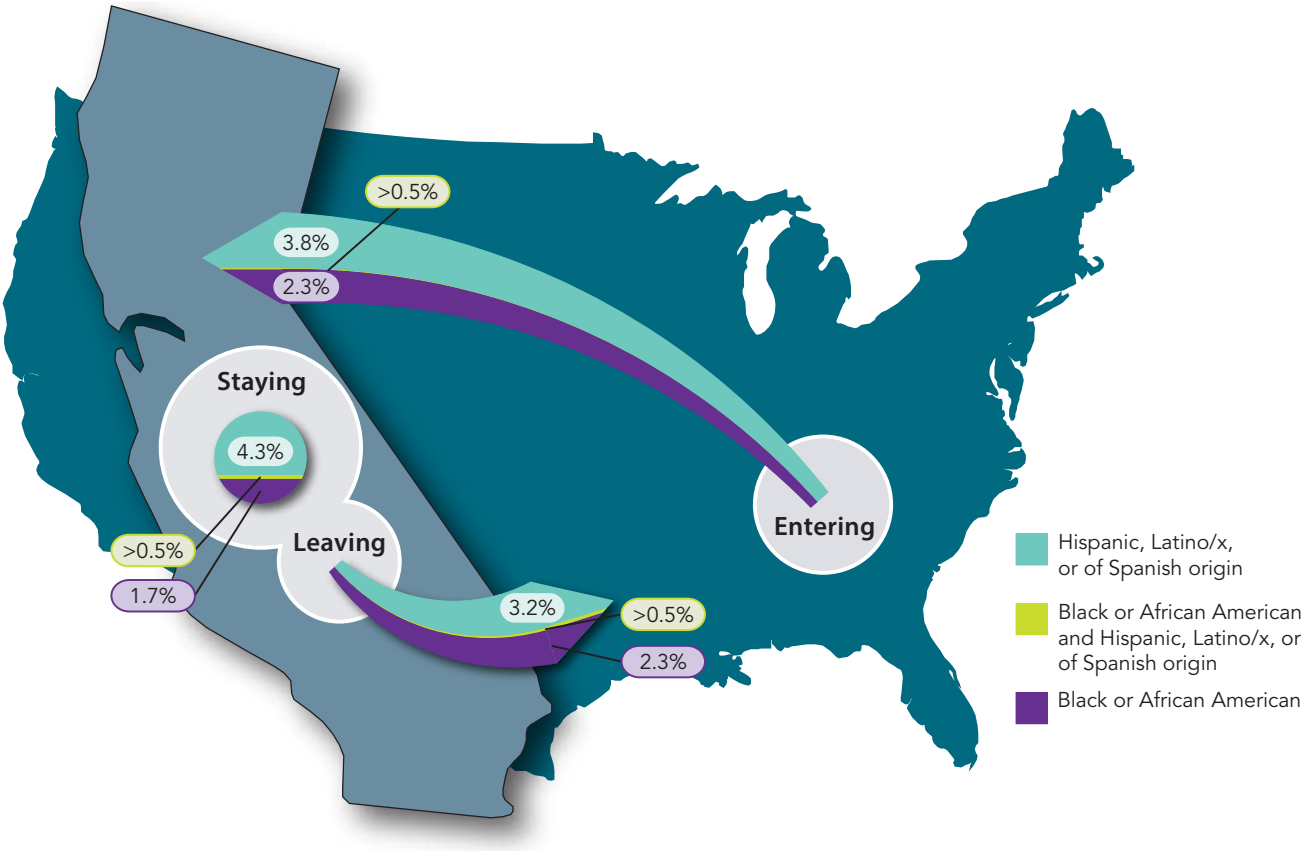
California is a net importer of Latino/x medical students and is net neutral on Black medical students for medical residency by permanent address (Figure 3).

Table 2. Applicant Matches into and out of California by Permanent Address

	SELF-IDENTIFIED ETHNICITY GROUPING	MATCHED IN CALIFORNIA	MATCHED OUTSIDE CALIFORNIA
Permanent Address in California	Black or African American	42.0%	58.0%
	Hispanic, Latino/x, or of Spanish origin	57.3%	42.7%
	Both Black or African American and Hispanic, Latino/x, or of Spanish origin	46.7%	53.3%
	Neither Black nor Hispanic	44.4%	55.6%
Permanent Address Outside California	Black or African American	4.1%	95.9%
	Hispanic, Latino/x, or of Spanish origin	6.4%	93.6%
	Both Black or African American and Hispanic, Latino/x, or of Spanish origin	1.8%	98.2%
	Neither Black nor Hispanic	4.8%	95.2%

Source: Author analysis of Thalamus data, 2020–21.

Figure 3. Migration of Black and Latino/x Medical Students into and out of California for Residency by Permanent Address



Note: Percentages are based on the total study population (*N* = 4,373). To show scale effectively, the "Neither Black nor Hispanic" subpopulation, substantially the largest group in the sample, is not shown. The removal of this subpopulation results in a different denominator compared to Table 2, and is the cause of the differing values.

Source: Author analysis of Thalamus data, 2020–21.

Matches into and out of California by Medical School Location

For applicants who attended medical school in California, 62.8% of neither Black nor Hispanic medical students matched into California — the only subpopulation in the majority. Among Black California medical students, almost half (47.2%) remained in the state for residency. This was significantly above Latino/x medical students at 18.5%. For applicants who attended medical school in another state, Latino/x students matched at the highest rate, 7.8% (Table 3).

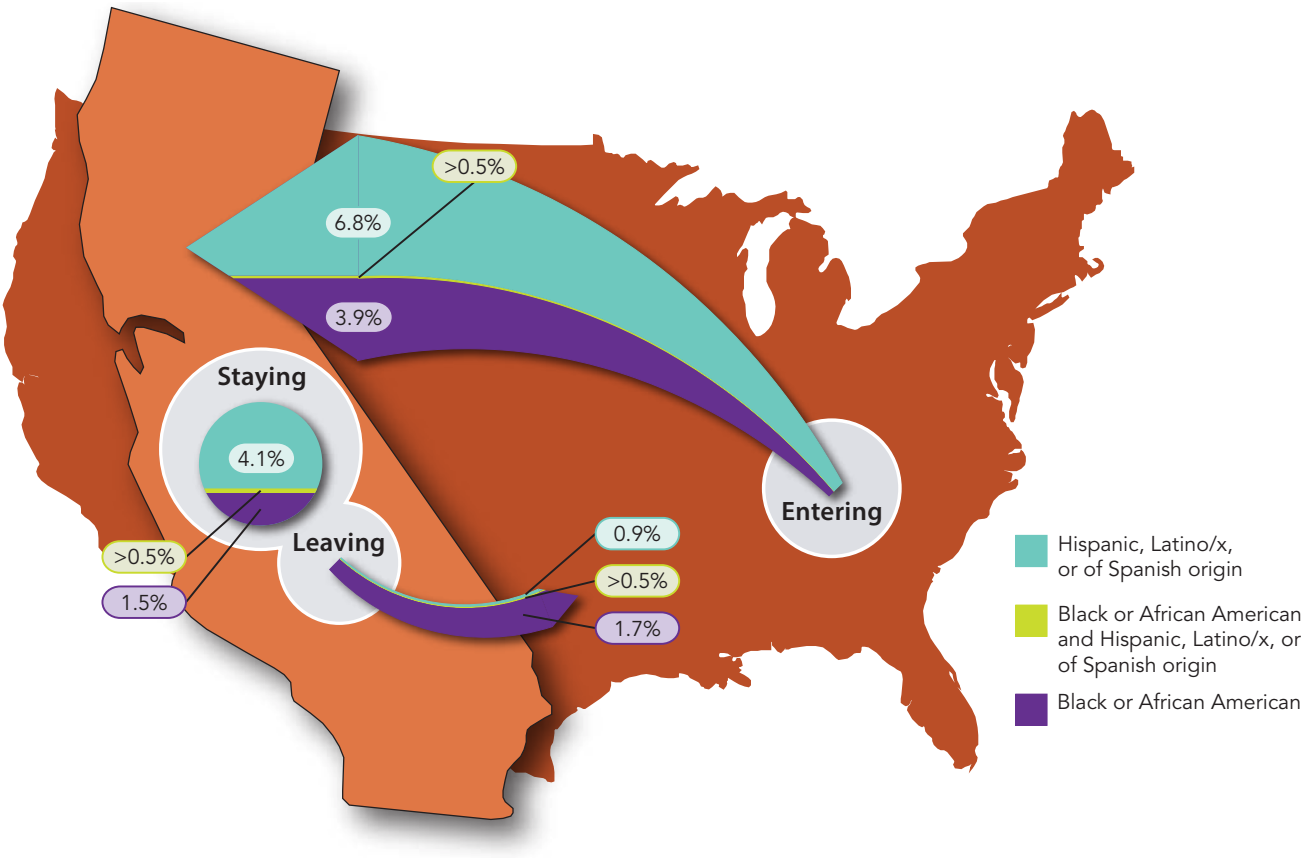
California is a net importer of both Latino/x and Black medical students for medical residency by medical school location (Figure 4).

Table 3. Applicant Matches into/out of California by Medical School Location

		MATCHED IN CALIFORNIA	MATCHED OUTSIDE CALIFORNIA
Medical School in California	Black or African American	47.2%	52.8%
	Hispanic, Latino/x, or of Spanish origin	18.5%	81.5%
	Both Black or African American and Hispanic, Latino/x, or of Spanish origin	14.3%	85.7%
	Neither Black nor Hispanic	62.8%	37.2%
Medical School Outside California	Black or African American	4.9%	95.1%
	Hispanic, Latino/x, or of Spanish origin	7.8%	92.2%
	Both Black or African American and Hispanic, Latino/x, or of Spanish origin	2.5%	97.5%
	Neither Black nor Hispanic	5.9%	94.1%

Source: Author analysis of Thalamus data, 2020–21.

Figure 4. Migration of Black and Latino/x Medical Students into and out of California for Residency by Medical School Location



Note: Percentages are based on the total study population (*N* = 4,373). To show scale effectively, the "Neither Black nor Hispanic" subpopulation, substantially the largest group in the sample, is not shown here. The removal of this subpopulation results in a different denominator compared to Table 3, and is the cause of the differing values.

Source: Author analysis of Thalamus data, 2020–21.

Matches into and out of California by Type of Medical Degree

Overall, California residency programs recruit allopathic (MD) graduates at a higher rate than the national average, but recruit osteopathic (DO) graduates and international medical graduates (IMGs) at lower rates. In fact, IMGs match in California at only half the rate they match outside the state (Table 4).

KEY TAKEAWAY. International medical graduates match in California at only about half the rate they match in residencies outside the state.

Table 4. Applicant Matches into and out of California by Type of Medical Degree

MEDICAL SCHOOL CATEGORY	MATCHED IN CALIFORNIA	MATCHED OUTSIDE CALIFORNIA
MD	71.3%	57.0%
DO	15.4%	20.6%
IMG	7.1%	14.2%
IMG — Caribbean	6.2%	8.2%
IMG — Canadian	<.5%	<.5%

Source: Author analysis of Thalamus data, 2020–21.

Discussion

Medical school graduates in California are 8% Latino/x and 6% Black. This increases to 12.3% Latino/x and 6.4% Black in residency programs, consistent with the net-import effect demonstrated in this study. However, these populations then decrease again to 6% Latino/x and 3% Black in the greater California physician workforce.

The research shows that, in terms of number and diversity of physicians being trained, California's population — particularly its Latino/x population — is underserved. The data indicate that the state outperforms national averages in the recruitment of Latino/x and Black medical graduates into residency, with the major drivers of matching being permanent California residency or attending medical school in the state. In addition, California gets many graduates from out-of-state medical schools into its residency programs. Yet the state is losing some Latino/x graduates and failing to recruit enough to build a Latino/x physician workforce that would represent the population. Further, California matches international medical graduates at only about half the rate of other states.

KEY TAKEAWAY. Although the proportion of Latino/x applicants matching into California residency (12.7%) is well above the national average, it is far below the 39.4% Latino/x population in the state.

The proportion of Black applicants matching into California for residency (6.4%) is slightly below national application averages but higher than the Black population of the state (5.7%). Black applicants match at significantly higher rates into residency in California if they are from or attend medical school in the state, consistent with previous findings on the importance of same-state geography.

An important factor in this research is the number of California medical school seats (1,632 per year) compared to the state's residency positions (4,323 per year). That medical school seats represent only 37% of residency places may have several effects:

- The limited number of seats may prevent students (of all ethnicities) who want to attend medical school in California from doing so.
- Non-Californians unable to enter the state for medical school — as well as Californians who had to leave the state for medical school — may get another opportunity to enter or return to the state for residency.

The insufficiency of both medical school and residency positions impedes the state's ability to build a physician workforce that reflects its population. When population density is factored in, the limited number of medical school seats likely means that many more medical students would attend school in California if provided the opportunity. The medical schools could then serve as a pipeline into California residency programs and eventually into the state's physician workforce.

Closing the Gap

California's scarcity of both medical school and residency positions, given the state's population and geography, impedes its ability to build a sufficiently large and diverse physician workforce. In fact, for residency programs to recruit a representative Latino/x population (39%), they would need to match about 40% of all Latino/x students applying nationally, more than triple the state's current match rate. The data suggest that residency programs will need to increase recruitment of medical school graduates from across the nation and internationally. The following are several recommendations for meeting these goals.

KEY TAKEAWAY. For California residency programs to recruit a representative Latino/x population (39%), they would need to match about 40% of all Latino/x students applying nationally, more than triple the state's current match rate.

Plan for medical school enrollment relative to population metrics. To help correct the diversity gap, geographic and demographic allocation can support Latino/x and Black enrollment and retention. The process could include linkage or bridge programs and provide consistent focus on the alignment between the physician workforce and the population.

The research identified the significant pull of Latinos/x to California's medical schools and residencies. Given the large number of public medical schools in California, state representatives may consider offering a higher percentage of positions to such students, increasing the number of medical school positions, particularly for the Latino/x community, or both. A more aggressive approach would be to open a medical school in an area of predominantly Latino/x population, with the specific mission of training Latino/x physicians, supporting Latino/x patient populations and communities, or both. It may also be useful to recruit more DO and IMG graduates, in which California lags other states. Recruitment strategies could target DOs and IMGs from Central and South America — including possibly providing more visa sponsorship to encourage employment of nonresident IMGs.

Explore more locations for growth. Most of the state's medical schools are in larger cities, but many other locations and smaller cities may provide fertile ground for new programs. For example, Fresno has no allopathic medical school, although its population of 545,000 is larger than that of Sacramento — home to UC Davis School of Medicine. (In contrast, Cleveland, Ohio — with a population of 368,000 — has three medical schools.) Fresno has several residency programs and institutions, showing its support for medical education infrastructure. Many other California institutions and cities might consider the benefits of creating a medical school.

New medical schools are in fact being opened in the state. Kaiser Permanente School of Medicine in Pasadena welcomed its first class in 2020. Even more recently, the Charles R. Drew University of Medicine and Science, a historically Black college and university, received accreditation for its medical degree program in 2022 and plans to begin instruction in the summer of 2023. Drew was founded in 1966 in response to inadequate medical access in the Watts region of Los Angeles, a predominantly Latino/x and Black area.

Increase the number of residency training positions. California ranks only 26th in available residency positions per thousand residents, despite having the second-largest number of medical schools and the second-largest number of residency programs and positions in the country. While the 2021 Consolidated Appropriations Act requires the addition of 1,000 new graduate medical education (GME) positions nationally over the next five years, California will require more positions to provide a medical workforce in areas of the state that remain vastly underserved. Over 200 California locations are designated as Health Professional Shortage Areas (HPSAs) based on geography and population needs.

Over 200 California locations are designated as Health Professional Shortage Areas (HPSAs) based on geography and population needs.

Find ways to decrease attrition. A proportion of medical students and residents leave medicine during training. For example, although Black applicants match into residency in California at rates similar to the representative population, nationally, Black residents are more likely to leave medicine due to family and marital pressures and have the highest dismissal rate. They also are more likely to experience abuse in residency and report lower levels of support from their faculty and peers.[9] To reverse this effect, medical schools, residency programs, and hospitals will need to make concerted efforts to support Black residents and other groups underrepresented in medicine. In general, more focus needs to go into diversity, equity, inclusion, and belonging at all points in the medical education pipeline.

Invest in infrastructure to measure medical education workforce trends. There is little real-time information about the demographic makeup of medical education outcomes. GME training programs compile this information several months after

Additional research is needed to extend this work to the next transition point, in which graduating residents move on to fellowship or become attending physicians. This study population may be extended to the greater physician workforce by mapping academic physician identities to reimbursement data identifiers. More detailed regional analysis of California's trainee and physician workforce by population density would be a helpful next step.

completion of the NRMP residency match. However, the data are insufficiently detailed to provide stakeholders and state and national representatives (including the federal Centers for Medicare & Medicaid Services, which allocates funding for residency training) with real-time information that could be used to award additional training slots. This problem inequitably affects California because of the state's geographic size and large population. In the 2022 match, for example, emergency medicine positions that went unfilled were in California's more rural and underserved areas.

Invest in the whole pipeline — starting early. The state should focus on the entire medical education pipeline, starting in grade school, where the desire to pursue a medical career can begin through childhood access to medicine and medical professionals. For older students, every part of the pipeline — high school, college, medical school, and residency — offer opportunities to encourage interested people to pursue this work. Innovative linkage programs, such as UC Davis's new Avenue M program (see box), can offer a robust premed pathway for rural community college students.

Achieving the goal of better matching California's physician workforce with its population needs, considering ethnicity, will be a multiyear endeavor. Many state, city, and educational entities around the country are engaged in the work of building diverse and plentiful physician workforces. California is positioned to join these efforts and must to provide medical care to all Californians.

Avenue M Offers Pathway to Medical Careers

California's extensive system of community colleges is the focus of a program to help students — particularly those from underrepresented and historically excluded backgrounds throughout Northern California — to pursue a medical career. The program, Avenue M (for Medicine) cites evidence that 51% of Latino/x and 33% of Black residency trainees attended community college. The program is a collaboration of the University of California Davis School of Medicine, the UC Davis STEM Strategies group, Sacramento State University, Cal Poly Humboldt, and Kaiser Permanente Northern California.

It offers a robust pathway for community college students to transfer to one of three four-year colleges, then to the UC Davis School of Medicine. The students receive academic and wraparound supports. Made possible by a $1.8 million grant from the Foundation for California Community Colleges, Avenue M is aimed toward students from underserved and rural regions of the state. The first cohort of 50 students joined Avenue M in January 2023, and are expected to transfer to the participating four-year colleges within two years of enrollment.

Appendix A. Methodology

Thalamus is a commercially available cloud-based graduate medical education interview management platform and scheduling software used by residency programs. Data were aggregated from Thalamus's central data lake, which combines time-series interview data, US Census demographics, industry measurements (program accreditation, size, etc.), and other relevant ancillary data. Researchers conducted a retrospective investigation using Thalamus data to estimate population-level parameters regarding the diversity of the 2020–21 residency recruitment season and its outcomes in California.

Applicant and interviewee data were collected from applicants to residency programs in eight specialties including anesthesiology, family medicine, internal medicine, obstetrics and gynecology, orthopedic surgery, pediatrics, psychiatry, and surgery. The study population included 29,800 applicants, 81% of the 37,140 entrants in the 2021 NRMP Match for these specialties.[10] Note: The exact number of applicants into the match varies by source (the Electronic Residency Application Service tracks applications, NRMP track rank lists and matches). Some applicants will apply to residency but receive no interviews and thus cannot enter the match. Also, some applicants apply to and/or submit rank-order lists for more than one specialty.

The data used for each applicant/interviewee included medical school attended, medical school state, present address, and self-identified ethnicity. This last category is defined by the Association of American Medical Colleges as one of six possible categories: American Indian or Alaska Native; Asian; Black or African American; Hispanic, Latino/x, or of Spanish origin; Native Hawaiian or Pacific Islander; and White. Although CHCF does not use the racial categories Hispanic, African American, or of Spanish origin, this report includes the categories used by the data source.

Applicants were categorized. Those that (a) had a permanent address in California, (b) attended a medical school in California and/or (c) matched into California for residency (or for whom a and/or b was true, but matched outside of California for residency) were included in the study.

The residency programs to which these applicants/interviewees matched were determined from the following publicly available resources: program trainee lists, published medical school match lists, interviewees' Doximity profiles, LinkedIn profiles, and/or Google searches of their name with terms such as "anesthesiology resident" or similar. In some cases, programs reported their matched interviewees. Only applicants with complete data were included in the analysis. Overall, this resulted in a final sample size of 4,373 applicants.

Geocoding of interviewees (address) and residency programs (listed address on the Accreditation Council for Graduate Medical Education) was completed through Google's secure geocoding application program interface. Reverse geocoding also allowed for the confirmation or addition of the interviewees' state field (i.e., extrapolated from the address including postal code).

Identifying data (including applicant name, etc.) were removed from the data set before processing and analysis. Applicants were sorted into one of four categories based on self-identified ethnicity: (1) Black or African American; (2) Hispanic, Latino/x, or of Spanish origin; (3) Both Black and Hispanic (to include those identifying as both); and (4) Neither (including American Indian and Alaska Native; Asian, Native Hawaiian, and Pacific Islander; and White). For each individual, permanent residence, medical school location, and whether they matched into a residency program in California was determined. Interview data were determined

from Thalamus. Performance data such as average scores on the United States Medical Licensing Exam (USMLE) Step 1 and Step 2 CK were also determined. Benchmarking to the 2020 US Census was included. Data were reported as percentages of the total sample and any result calculated to be <0.5% of the overall sample was reported as such to ensure de-identification standards.

Study Limitations

This study is limited in that it is a representative sample of the population rather than the entire population. As noted, historically this is challenging, as there are applicants who apply to residency but receive no interviews or receive interviews but do not match. Others apply to, interview with, or try to match with more than one specialty. Ethnicity in residency recruitment is also self-reported and optional. This makes a complete population difficult to define, with parts of the overall data set spread across several representative stakeholders. The sample used in this report accounts for 81% of the overall population, but given the above, it may likely represent a higher percentage. Further, International Medical Graduates (IMGs) — graduates of medical schools outside the US (who may comprise both US and non-US citizens) — make up a nontrivial proportion of matched residents annually, several of whom may have been excluded through the specific study design. Also, this retrospective study assessed only same state with likelihood of match in the representative populations. It did not consider applicant and/or program preferences (which ultimately determine the outcomes of the match) or the change in those preferences over the recruitment season (as applicants do or do not receive and attend interviews at various residency programs). Finally, only eight of the larger residency specialties were included in the analysis.

Appendix B. Applicant Matches into and out of California by Permanent Residence and Medical School

Permanent residence and medical school location in California (or not) was also combined in aggregate and mapped to match outcome in California (or not). Study proportions were shown as follows.

Table B1. Breakdown of Applicant Matches into and out of California by Permanent Address and Medical School Location

	PERMANENT RESIDENCE IN CALIFORNIA	MEDICAL SCHOOL IN CALIFORNIA	MATCHED IN CALIFORNIA	STUDY PROPORTION
Black or African American	False	False	True	1.8%
		True	False	0.5%
			True	0.4%
	True	False	False	1.6%
			True	0.9%
		True	False	0.6%
			True	0.7%
Black or African American and Hispanic, Latino/x, or of Spanish Origin	False	False	True	<0.5%
		True	True	<0.5%
	True	False	False	<0.5%
			True	<0.5%
		True	False	<0.5%
			True	<0.5%
Hispanic, Latino/x, or of Spanish Origin	False	False	True	2.6%
		True	False	<0.5%
			True	1.0%
	True	False	False	2.7%
			True	2.1%
		True	False	<0.5%
			True	2.0%
Neither Black nor Hispanic	False	False	True	21%
		True	False	4.4%
			True	4.7%
	True	False	False	24.8%
			True	13.3%
		True	False	4.1%
			True	9.9%

Source: Author analysis of Thalamus data, 2020–21.

Appendix C. Medical Students by Specialty: California Matches Versus Outside Matches

California residency programs recruit applicants with performance on USMLE Step 1 and Step 2CK at rates equivalent to the national average.

Table C1. Breakdown of Applicant Matches into and out of California by USMLE Average Scores

SPECIALTY	MATCHED IN CALIFORNIA	USMLE STEP 1		USMLE STEP 2CK	
		MEAN	STD DEV	MEAN	STD DEV
Anesthesiology	False	232.3	14.9	244.3	14.0
	True	236.0	13.6	247.1	12.5
Family Medicine	False	218.3	15.6	233.6	14.6
	True	218.0	14.8	232.5	13.7
Internal Medicine	False	234.3	16.6	246.1	14.8
	True	235.3	16.5	246.8	15.3
Obstetrics and Gynecology	False	229.3	15.5	245.5	14.1
	True	230.3	16.0	246.6	13.5
Orthopedic Surgery	False	244.9	13.6	253.8	11.9
	True	248.4	12.1	255.4	12.7
Pediatrics	False	227.5	16.7	243.1	15.1
	True	229.8	14.8	244.7	13.3
Psychiatry	False	225.4	16.4	239.4	14.9
	True	226.6	16.7	240.2	13.2
Surgery	False	235.1	15.2	247.5	13.6
	True	236.3	16.0	248.2	14.2

Source: Author analysis of Thalamus data, 2020–21.

Endnotes

1. "Census Bureau Data," US Census Bureau, accessed October 31, 2022.
2. Mark D. Eisner et al., "Socioeconomic Status, Race, and COPD Health Outcomes," *Journal of Epidemiology & Community Health* 65 (2011): 26–34; Safyer McKenzie-Sampson et al., "Maternal Nativity and Risk of Adverse Perinatal Outcomes Among Black Women Residing in California, 2011–2017," *Journal of Perinatology* 41 (2021): 2736–41; Alexander N. Ortega et al., "Health Care Access and Physical and Behavioral Health Among Undocumented Latinos in California," *Medical Care* 56, no. 11 (Nov. 2018): 919–26; and Soon Kyu Choi, Krystal Kittle, and Ilan H Meyer, "Health Disparities of Older Adults in California: The Role of Sexual Identity and Latinx Ethnicity," *Gerontologist* 61, no. 6 (Sept. 2021): 851–57.
3. Lyndonna M. Marrast et al., "Minority Physicians' Role in the Care of Underserved Patients: Diversifying the Physician Workforce May Be Key in Addressing Health Disparities," *JAMA Internal Medicine* 174, no. 2 (Feb. 1, 2014): 289–91.
4. "AAMC Report Reinforces Mounting Physician Shortage," Assoc. of Amer. Medical Colleges (AAMC), June 11, 2021.
5. Arman A. Shahriar et al., "Socioeconomic Diversity of the Matriculating US Medical Student Body by Race, Ethnicity, and Sex, 2017-2019," *JAMA Network Open* 5, no. 3 (Mar. 15, 2022): e222621; and Alexander R. Green et al., "Implicit Bias Among Physicians and Its Prediction of Thrombolysis Decisions for Black and White Patients," *Journal of General Internal Medicine* 22 (Sept. 2007): 1231–38.
6. "2019 State Profiles," AAMC, accessed October 31, 2022; and "Choose DO" (list of osteopathic medical schools), Amer. Assoc. of Colleges of Osteopathic Medicine, accessed October 31, 2022.
7. Janet Coffman, Emmie Calimlim, and Margaret Fix, *California Physicians Almanac, 2021: A Portrait of Practice*, California Health Care Foundation, March 5, 2022.
8. "Accreditation Council for Graduate Medical Education (ACGME) - Public," ACGME, accessed October 31, 2022.
9. Risa L. Wong et al., "Race and Surgical Residency: Results from a National Survey of 4339 US General Surgery Residents," *Annals of Surgery* 257, no. 4 (Apr. 2013): 782–87; and Gabriella E. Ode et al., "Achieving a Diverse, Equitable, and Inclusive Environment for the Black Orthopedic Surgeon — Part 1: Barriers to Successful Recruitment of Black Applicants," *Journal of Bone & Joint Surgery* 103, no. 3 (Feb. 3, 2021): e9.
10. *Results and Data, 2021 Main Residency Match* (PDF), National Resident Matching Program, accessed October 31, 2022.