



# The Matthew Effect: Prevalence of Doctor and Physician Parents among Ophthalmology Applicants

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## Abstract

**Objective** This article determines the prevalence of physician parents among ophthalmology residency applications.

**Design** Retrospective, single-center cohort study.

**Subjects** All applicants to the University of Kentucky Ophthalmology Residency between 2018 and 2023.

**Methods** Residency applications were reviewed, with data collection including applicant gender, self-identified Under-Represented in Medicine (URiM) status, United States Medical Licensing Examination (USMLE) Step 1 score, USMLE Step 2 score, and whether the application identified a doctor or physician as a parent. Doctor was defined as a profession requiring a doctorate degree, and similarly, physician as a profession requiring a medical degree.

**Results** A total of 2,057 applications were reviewed, representing 54% of all match participants during the study period. Fourteen percent (296) of applications indicated a parent was a doctor and 12% (253) a parent was a physician. There were no differences between gender, URiM, USMLE Step 1, and Step 2 scores between applicants indicating a doctor or physician as a parent and those that did not ( $p$  all  $> 0.4$  and Cohen's  $d$  all  $< 0.02$ ). Of the type of doctors, 85% (253) were physicians, 6% (17) optometrists, 6% (17) Doctors of Philosophy, 3% (8) dentists, 1% (1) pharmacist, and 1% (1) veterinarian. Eighty-six percent (217) of applications with a physician parent provided the type of physician, with ophthalmologist the most common (93, 43%). Ninety-eight percent (249) of applications with a physician parent provided the gender of the parent, with father (168, 68%) more common than mother (42, 17%) or both parents (39, 16%).

**Conclusion** Physician parents are substantially overrepresented in ophthalmology residency applicants. This raises concerns regarding diversity and inclusion efforts for recruitment in medicine.

## Keywords

- ▶ ophthalmology residency
- ▶ residency application
- ▶ graduate medical education
- ▶ recruitment
- ▶ physician parents
- ▶ socioeconomic status

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The Matthew effect or “cumulative advantage” refers to the adage “For to all those who have, more will be given.” Sociologists have utilized this phenomenon to demonstrate, qualitatively and quantitatively, prior opportunities and exposure play an oversized role in individual progress; those most successful yesterday are likeliest to be so today and tomorrow.<sup>1</sup>

This is readily evident in the barriers to enter the field of medicine, where household income and education levels are closely intertwined.<sup>2</sup> The parental income of students entering medical school is roughly double the estimated United States median income, and one in four students come from a home where their parents earn more than \$250,000 a year.<sup>3</sup> Only 5% of all matriculants into medical school in 2017 were in the lowest household-income quintile, whereas 24% were in the top 5%.<sup>4</sup> The cost of medical school tuition has been rapidly growing, outpacing inflation by 750%,<sup>5</sup> helping to explain the growing association between family income and medical school application rates over the past two decades.<sup>6</sup>

Less is known about these barriers in the entrance to residency, in part because socioeconomic status and childhood household income are not generally surveyed among applicants. One study of interns at a single academic center found all interns, whether white or Under-Represented in Medicine (URiM), grew up in households on average more affluent than the general population.<sup>7</sup> To better evaluate the Matthew effect, and by proxy the role of childhood household income, in the matriculation to residency, this study was designed to determine the proportion of applicants to a single ophthalmology residency program over a 5-year period that explicitly and voluntarily indicated they had a physician or doctor as a parent.

## Methods

This study was approved by the Institutional Review Board at the University of Kentucky and adhered to the tenets of the Declaration of Helsinki. All residency applicants to the University of Kentucky between 2018 and 2023 were reviewed in the SF Match Residency Application System.<sup>8</sup> Data collection included applicant gender, self-identified URiM status, United States Medical Licensing Examination

(USMLE) Step 1 score, USMLE Step 2 score, and whether the application identified a doctor or physician as a parent. A voluntary checkbox within the SF Match application identified candidates as URiM, which was defined as black or African American, Hispanic or Latino, and/or Native American (American Indian/Alaska Native/Native Hawaiian).<sup>8</sup> Gender was determined by pronoun usage within the Letters of Recommendation (LOR) and Medical Student Performance Evaluations (MSPE); all applications exclusively utilized he/him/his and she/her/hers pronouns. Doctor was defined as a profession requiring a doctorate degree, and similarly, physician as a profession requiring a medical degree. The personal statements, LORs, and MSPEs were reviewed for all applicants and instances where explicit mention of a parent or step-parent as a doctor or physician were recorded, as well as the type of doctor or physician and gender of the parent(s), when provided.

Descriptive statistics of the study were summarized by count (%) for categorical variables and mean (standard deviation) for continuous or ordinal variables. USMLE scores were compared by gender, self-identified URiM status using a two-sample *t*-test. The mean difference and its 95% confidence interval of the score by two groups were estimated and Cohen's *d* was calculated for the standardized effect size to compare across the scores.<sup>9</sup>

## Results

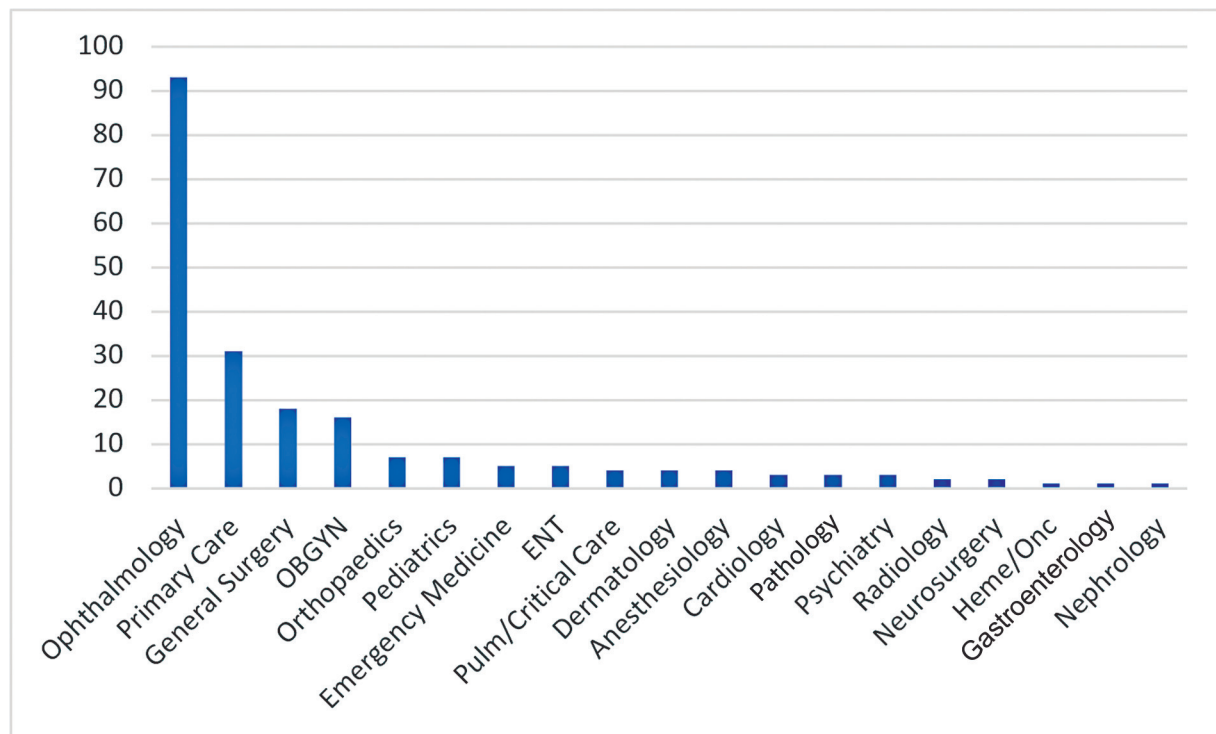
A total of 2,057 applications were reviewed, representing 54% of all match participants for the study period of 2018 to 2023.<sup>8</sup> Females were 36% (739) and URiM 13% (261) of applicants, and the mean Step 1 and Step 2 scores were  $241 \pm 16$  and  $250 \pm 16$ , respectively. Fourteen percent (296) of applications indicated a parent was a doctor and 12% (253) indicated a parent was a physician. There were no differences between gender, URiM, Step 1, and Step 2 scores between applicants indicating a doctor or physician as a parent and those that did not (*p* all > 0.4 and Cohen's *d* all < 0.02) (► **Table 1**). Of the type of doctors, 85% (253) were physicians, 6% (17) optometrists, 6% (17) Doctors of Philosophy (PhD), 3% (8) dentists, 1% (1)

**Table 1** Demographics and USMLE performance of ophthalmology applicants with doctor and physician parents

|                      | N     | Gender female | %    | URiM  | %    | Step 1 | SD   | Step 2 | SD   |
|----------------------|-------|---------------|------|-------|------|--------|------|--------|------|
| Total                | 2,057 | 739           | 35.9 | 261   | 12.7 | 240.6  | 15.5 | 249.2  | 16.1 |
| Doctor parent        | 296   | 101           | 34.1 | 30    | 10.1 | 240.7  | 14.1 | 249.4  | 14.5 |
| Non-doctor parent    | 1,761 | 638           | 36.2 | 222   | 12.6 | 240.5  | 15.8 | 249.2  | 16.5 |
| <i>p</i> -Value      |       | 0.505         |      | 0.756 |      | 0.848  |      | 0.829  |      |
| Cohen's <i>d</i>     |       |               |      |       |      | 0.013  |      | 0.013  |      |
| Physician parent     | 253   | 85            | 33.6 | 28    | 11.1 | 240.5  | 13.8 | 249.3  | 14.1 |
| Non-physician parent | 1,804 | 654           | 36.3 | 224   | 12.4 | 240.5  | 15.8 | 249.2  | 16.5 |
| <i>p</i> -Value      |       | 0.431         |      | 0.432 |      | 0.984  |      | 0.912  |      |
| Cohen's <i>d</i>     |       |               |      |       |      | 0      |      | 0.0065 |      |

Abbreviations: SD, standard deviation; USMLE, United States Medical Licensing Exam; URiM, Under-Represented in Medicine.

Note: Values are count (%) for categorical variables and mean (standard deviation) or median (interquartile range) for continuous variables. *p*-Value is for comparison between applicants with a two-sample *t*-test.



**Fig. 1** Medical specialty of ophthalmology applicant parent physicians. The x-axis represents the different medical specialties and the y-axis represents the absolute number of specialty reported by applicants with available data ( $n = 217$ ). ENT, otolaryngology; OB/GYN, obstetrics and gynecology; Heme/Onc, Hematology/Oncology.

pharmacist, and 1% (1) veterinarian. Eighty-six percent (217) of applications with a physician parent provided the type of physician, with ophthalmologist the most common (93, 43%), followed by primary care (31, 14%), general surgery (18, 8%), and obstetrics and gynecology (16, 7%) (→ Fig. 1). Ninety-eight percent (249) of applications with a physician parent provided the gender of the parent, with father (168, 68%) more common than mother (42, 17%) or both parents (39, 16%).

## Discussion

Prominent academic medical and specialty organizations including the Association of American Medical Colleges, Accreditation Council for Graduate Medical Education, American Academy of Ophthalmology, and Association of University Professors of Ophthalmology have strong and well-defined statements on equity and inclusion as it pertains to recruitment and acceptance for membership.<sup>10–13</sup> These statements and associated efforts are intended to decrease barriers for underrepresented individuals and groups to enter our profession. The current study demonstrates evidence of a previously unexplored area of concern regarding those efforts and found that while physicians represent less than 0.5% of the labor force,<sup>14,15</sup> 12% of applicants to an ophthalmology residency over a 5-year period reported having a parent who is a physician. This information was provided without instruction or guidance, suggesting the actual percentage is higher.

There is little published data on the prevalence of doctor or physician heritage in medicine. A 2017 to 2020 survey

of U.S.-based tenure-track faculty across eight science, technology, engineering, and math disciplines found that almost a quarter (22.2%) reported one parent with a PhD and over one half (51.8%) had a parent with a graduate degree, in comparison to less than 10% of the general adult population. The faculty with parent PhDs reported greater support for their careers and were more likely to be employed at elite institutions.<sup>16</sup> There are several studies outside the U.S. with data on physician parents that are quite similar to the current one. An analysis of all Norwegian students admitted for university between 1980 and 2003 found 12% of physician children were in medical school.<sup>17</sup> Similarly, 16% of students interviewed for admission to the University of Southern Denmark School of Medicine between 2002 and 2007 had physician parents.<sup>18</sup> A retrospective study of all physicians born between 1950 and 1990 and living in Sweden found that 14% had a parent physician and 2% had a two-parent physician household. The prevalence increased significantly over time from 6% for physicians born in 1950 to 20% for those born between 1980 and 1990.<sup>19</sup>

Growing up in a household with a physician parent is also a proxy for socioeconomic status. There is a known correlation between household income and education levels, most notably in acceptance into medical school.<sup>4</sup> In 2023, the estimated average physician salary is \$350,000,<sup>20</sup> well above the national real median household income of \$70,186.<sup>21</sup> The mean physician compensation is also within the top 5% of earners,<sup>21</sup> the same household income level for one-quarter of students entering medical school.<sup>3</sup> Between 2014 and 2019, both applicants and matriculants to Doctor of Medicine granting

programs increasingly came from households with higher incomes, with applicants reporting an income of less than \$50,000 annually 48% less likely to be accepted than applicants reporting an income of \$200,000 or more.<sup>22</sup>

There are several probable reasons for the high proportion of physician parents in medicine: substantial financial support, a home environment promoting an interest in the profession, and a desire to maintain social status.<sup>17</sup> The finding in the current study that 43% of reported physician parents were ophthalmologists is likely at least partly supportive of the role of the home environment in this population. Beyond direct socioeconomic background, both social and cultural factors also impact academic success, including access to role models, the relative value of career decisions, and advancement opportunities.<sup>16</sup> Disadvantaged applicants are less likely to have opportunities to engage in activities such as health care-related volunteer work or research, and students with paid work experience outside health care are less likely to apply and be accepted into medical school.<sup>23</sup> These life experiences both increase exposure to the field of medicine and are important factors considered in the application process,<sup>24</sup> and the disparity in access to these opportunities on the basis of socioeconomic status may be increasing over time.<sup>22</sup>

Having a physician parent also has direct financial implications in medical matriculation. The cost of medical education is now roughly \$300,000.<sup>5</sup> While loans are the most common mechanism of financial planning for medical students, family or personal support represents the sole source for almost 40% of students, one-half of which come from families in the top 5% of household incomes. Having access to familial financial support is significantly less likely for students in the bottom 40% of household incomes, and especially black students.<sup>25</sup> The intersection of race, ethnicity, and socioeconomic status in medical matriculation is well established, with URiM applicants and trainees more likely to have lower childhood household incomes and fewer options for financial support.<sup>7</sup> Specific to the financing of resident education, the application and interview process alone is expensive,<sup>26</sup> and 60% of residents are rent-burdened, as defined as 30% or more of first year gross monthly salary captured by the mean local monthly rent index. Rent-burdened institutions are also less likely to offer housing-related benefits.<sup>27</sup>

The recent Supreme Court decision on affirmative action in higher education will likely have a significant impact in medical education recruitment.<sup>28</sup> Prior analyses in undergraduate, law, and business schools demonstrates race-neutral admissions processes significantly reduces the acceptance of URiM applicants.<sup>24</sup> However, despite a similar state-level ban, the University of California Davis has tripled enrollment of URiM students over the past 15 years, utilizing several initiatives including the “Davis Scale,” a measure of socioeconomic disadvantage including financial information from the medical school application.<sup>29</sup> Given the correlation between socioeconomic and URiM status, the systematic use of these financial data has been shown to minimize disparities for both lower socioeconomic and URiM applicants to medical school without a change in graduation rates.<sup>24</sup> Similar data are not currently available for Graduate Medical Education (GME) recruitment.

This study has several important limitations. It represents a single institution and only 54% of nationwide applicants during the study period. The designation of a physician or doctor parent was voluntary and heterogeneous, likely underestimating the proportion of applicants from this background. Socioeconomic status was inferred by occupation and only for physicians. These all point to need for more extensive study of this topic and exploration of utilizing these data in recruitment decisions.

## Conclusion

This study demonstrates an outsized percentage of ophthalmology residency applicants have a parent who is a physician. The cumulative advantage of this background influences the present and future physician workforce.

### Conflict of Interest

D.B.M. declares a physician parent. The other authors report no conflict of interests.

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