Analysis IN BRIEF

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An Analysis of the Medical School Pipeline: A High School Aspirant to Applicant and Enrollment View

The "medical school pipeline" has been used as a metaphor for describing persistence on the path to medical education and, related, the "leaking out" of the pipeline has been used to discuss disparities in who exits this pathway across demographic groups.[a(1)] Along the pathway into medical school, members of different and often under-represented demographic groups progressively "leak out" of this pipeline at varying rates, which contributes to patterns of under-representation among medical applicants, matriculants, and physicians.[a(1)] Indeed, these disparities in medical education mirror disparities in four-year college[a(2–5)] and graduate school enrollment.[a(6–7)] However, within the medical education literature, this perspective is not well informed by empirical data on aspects of this pipeline prior to college. In this *Analysis in Brief*, the composition of the pipeline during the sophomore year in high school is compared to the composition of medical school applicants and matriculants. This analysis highlights the extent to which socio-economic status and race may matter in this "leaking out" process, if the pipeline is defined by an expressed aspiration for a career as a physician.[b] Using these analyses as a foundation, future analyses can isolate the causes of these leaks, which may lead to interventions that can help contribute to a more diverse and more effective physician workforce.[a(8)]

Methodology

The data for these analyses come from two sources: The Education Longitudinal Study of 2002 (ELS:2002), which is administered by the National Center for Education Statistics (NCES), and the American College Application Service (AMCAS®)[c] data system. The ELS:2002 is a nationally representative sample of 15,362 U.S. high school sophomores from 752 public and private schools, and the AMCAS data system contains records for every application to medical schools accredited by the Liaison Committee on Medical Education.

In the ELS2002 questionnaire, high school sophomores received the prompt: "Write the name of the job or occupation that you expect or plan to have at age 30." Of the 15,362 students who provided a valid free text survey response, 1,113 gave a response that indicated an expectation or plan to become a doctor.[d] Using NCES-provided data weights, the total population of high school sophomores in 2002 and the total population who indicated they had expectations to be a doctor were extrapolated. With these estimated population numbers, the distributions by gender, race/ethnicity, and parental educational attainment—a proxy for socioeconomic status (SES)—within the population were calculated. These distributions were compared along these variables to the actual gender, racial/ethnic, and parental education distributions of those from the 2004 high school graduation class who, in AMCAS years through 2012, applied to medical school and were accepted to medical school. Thus, the actual applicants and accepted students from the cohort from which the ELS:2002 was sampled were observed, up until the time that this cohort was 10 years beyond high school—well past the normative age that most medical students would have applied to medical school.

Results

Results show that many student aspirants leak out of the medical school pipeline by the time they would have applied to medical school (Table 1). The overall population of students who ultimately applied for entrance into medical school by 2012 is substantially smaller than the estimated number of high school sophomores from the same cohort who, in 2002, declared intentions of becoming a doctor.

Segments of the population that historically have had low representation among the physician workforce (e.g., blacks, Hispanics, women, and those whose parents have less than a college degree) are more likely to aspire toward a career as a physician than they are to apply or be accepted into medical school. For example, 18 percent of sophomore medical school aspirants are black, while just less than 7 percent of medical school applicants are black. Fully 59 percent of aspirants have parents who have less than a college degree, but only 15 percent of people who ultimately apply to medical school fit into this category. A result of these disparities is that historically disadvantaged minorities and lower SES groups persist in being underrepresented among enrollees when compared to population statistics. With gender, the situation

[a] All references to the literature appear in the supplemental information.
[b] While this analysis used expressed career aspirations for a career as a physician as a proxy for being in the pipeline, many other proxies exist and may yield different results (e.g., test scores or other indicators of academic preparation).
[c] For more information, see http://nces.ed.gov/surveys/els2002/ and https://www.aamc.org/students/applying/amcas/.
[d] Open-ended text responses were coded to arrive at this number.

is slightly different: the percentage of female aspirants (74 percent) is greater than the proportion of female applicants (50 percent). Yet, the share of admitted women students does reflect the share of women among the population of the cohort.

Results also show that the disparities between the composition of high school sophomores who aspire to medical school and medical school applicants are similar to the disparities between high school sophomore aspirants and medical school matriculants. Differences in the demographic composition of medical school applicants and matriculants are comparatively modest.

Table 1. Percentage of Physician Aspirants While in High School, Medical School Applicants, and Medical School Matriculants from the 2004 High School Graduating Class, by Demographic Characteristics

Demographic Variables	U.S. High School Sophomores in 2002	HS Sophomores (2002) with Intentions to be a Physician	Medical School Applicants[1]	Medical School Matriculants[1]
Gender				
Male	50.4	25.6	49.7	48.6
Female	49.6	74.4	50.3	51.4
Race/Ethnicity				
White	60.2	48.1	60.2	61.0
Black	14.4	18.2	6.7	6.1
Asian	3.9	5.8	23.0	22.5
Native Hawaii/ Pacific Islands	.2	.3	.2	.1
Multiracial	4.3	3.2	2.9	3.0
Hispanic	7.1	24.4	6.8	7.0
Parental Education				
Less Than H.S.	6.4	4.8	1.8	1.3
H.S. Diploma/GED	20.8	16.7	6.0	4.6
More Than H.S.	35.1	37.8	7.6	6.1
College Degree	21.8	19.9	28.9	26.8
Master's Degree	10.4	11.9	25.0	26.3
Advanced Degree	5.5	9.0	30.6	35.0
Total:	3,410,873[2]	220,800[2]	23,807[3]	14,658[3]
Data Source	ELS	ELS	AMCAS®	AMCAS

Notes: 1. High school graduating class of 2004.
2. Counts based on extrapolations from sample data weighted to population totals.
3. Exact counts from observed data.

Discussion

If the pathway into medical school represents a pipeline, and statements from high school sophomores serve as an indicators of being in the pipeline, then these results shows that the pipeline does not leak in a trickle, but as a sieve. At the life stage in which most aspiring doctors would have applied to medical school, the number of actual applicants within the 2004 high school graduating class is only one-tenth of the estimated number of individuals who aspired to become a doctor earlier on in high school. Moreover, the flow in and out of this pipeline varies by important demographic characteristics. The group of individuals who, when in high school, express intentions to pursue a career as a physician are much more diverse than those who actually matriculate into medical school, and those who leak out the most are from groups least represented in medicine. These changes confirm that disparities in medical schools (and by extension in medical careers) occur despite the composition of the individuals who aspire toward a career in medicine.

This analysis does not speak to the causes of the differences highlighted. Importantly, this analysis has not accounted for the impact of academic preparation and aptitude in this process, and counts among those high school sophomores who aspire to become a physician include individuals with and without strong academic preparation. Further research is needed to account for individual differences in educational and non-educational experiences and achievements along the way toward critical transitions such as application and acceptance into medical school. Continued research to understand specific types of experiences and accomplishments that matter most in persisting within the pipeline toward a career as a physician can help optimize strategies for outreach and recruitment efforts, which are critical to promote a future workforce that supports health care across all of our nation's communities.

Such research can help inform current efforts designed to engage diverse audiences and provide resources to persist along pathways into medicine such as the Summer Medical and Dental Education Program and Aspiring Docs.[e] Further, a group of educators and administrators from U.S. medical schools (Student Diversity Affairs representatives) are invested in K-16 diversity and outreach efforts. A sustained, broad, and aggressive outreach strategy is needed to engage audiences earlier, target groups traditionally underrepresented in the medical school applicant pool, and provide support and resources so that these students have the opportunity to thrive.

Authors:
Emory Morrison, Ph.D., Director, Policy Research Studies, Research and Data Programs, emorrison@aamc.org

David A. Cort, Ph.D., Lead Specialist, Statistical Analysis, dcort@aamc.org

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Association of American Medical Colleges
2450 N Street, N.W.
Washington, D.C. 20037-1127
analysis@aamc.org
www.aamc.org/data/aib

[e] For more information, see: http://smdep.org/ and https://www.aamc.org/students/aspiring/.