AAVMC ADMISSIONS: REPORT OF 2019 STUDENT SURVEY ANALYSIS

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BACKGROUND

Over recent years, a decided trend has emerged among Association of American Veterinary Medical Colleges (AAVMC) member institutions toward expanded capacity to train veterinarians, with an accompanying increased number of students in veterinary medical student cohorts being admitted each year.[1] During the same period, the total number of applications for admission to AAVMC member institutions has increased at an even faster rate, resulting in a steadily increasing applicant-to-seat ratio.[1]

In the context of this significant growth curve, a study was designed to assess whether the 2018 system-wide applicant pool was of sufficient quality to sustain the increasing rate of admission to colleges/schools of veterinary medicine.[2] Results of that study indicate that the depth of quality was substantial, but that selection bias based on race/ethnicity and gender identity may have been occurring. If valid, those results would be particularly worrisome because based on Bureau of Labor Statistics (BLS) data, veterinary medicine remains the least diverse healthcare profession in the U.S.[3] For this reason, the current study was designed to review admissions decisions from 2019 to determine whether such selection bias occurred, and to determine if any significant patterns existed related to prerequisites or other characteristics of the applicant pool.

METHODS

AAVMC data from the 2018-2019 Veterinary Medical College Application Service (VMCAS) cycle post-application survey and the 2019 post-admissions student survey were combined into a single database. In considering the admissions process and the likelihood of candidates receiving an admission offer, both race/ethnicity and gender identities were the primary dimensions of diversity that were analyzed for potential bias. In addition to whether or not an offer of admission was received, secondary candidate characteristics that were considered included:

- The application process, including both number of times candidates had applied to veterinary school and the number of schools (CVMs) they applied to during this cycle,

- Preparation, including both experience hours and education,

- Socioeconomic status, as indicated by Pell Grant recipient status and estimated level of current education debt,

- Culture/heritage related to higher education, as indicated by first generation college student status, and

- Community culture, as indicated by the size of the community where candidates grew up and/or desired to practice upon graduation.

Finally, a few key dimensions of candidates' employment, confidence, and concerns were also assessed, and potential associations between primary and secondary candidate characteristics were explored.

In addition to simple summary and descriptive statistics, statistical analyses entailed Pearson's chi-squared tests, two-sample t-tests, and analysis of variance (GLM) to assess potential statistical significance. *For the current study, differences were deemed statistically significant if $p<0.05$, and they were considered trends or tendencies if $p<0.1$, respectively. This convention is followed consistently throughout the remainder of this report.* Calculations were performed using Minitab 19.2 (Minitab, LLC: State College, Pennsylvania).

RESULTS

General

Response rates for the post-VMCAS and post-admissions surveys were 29.8% and 24.1% respectively. For context, key primary descriptors of the respondent population are presented in Table 1. Most candidates identified as White (75.6%) and female (86.6%). Black/African American and Hispanic candidates, at only 4.8% and 10.1% of the applicant pool respectively, are markedly underrepresented in comparison to their overall proportions of the US population (13.4% and 18.5%, respectively).[3]

Secondary descriptors are presented in Table 2. Of note:

- Most candidates (77.0%) received at least one admission offer.

- Most candidates (80.5%) applied to more than one school.

- Most candidates (78.1%) were applying for the first time.

- On average, candidates reported 4 to 5 times as many veterinary and animal experience hours as they did research hours (1811 hours, 1977 hours, and 393 hours, respectively).

- Most candidates were *not* Pell Grant recipients (71.2%) and over half (54.6%) had no educational debt.

- Most candidates were *not* first-generation college students (72.6%).

- A majority of candidates grew up (55.2%) and want to practice (60.8%) in suburban settings.

Admission Offers

As mentioned, most respondents (77.0%) reported receiving at least one offer of admission (Table 2). Several important patterns emerged as admission data were compared between various groups.

- Regarding race/ethnicity, the probability of receiving at least one offer of admission:
  ◦ Tended ($p<0.1$) to be higher for those candidates who identified as white (77.9% vs. 71.6%),
  ◦ Was significantly higher for those candidates who identified as Asian (88.5% vs. 76.2%), and
  ◦ Was significantly lower for those candidates who identified as Hispanic (63.7% vs. 78.4%).

- With respect to the application process, the probability of receiving at least one offer of admission was significantly greater for those candidates who applied to more than one school. In general, candidates who applied to a greater number of schools had a greater probability of receiving an admission offer as follows:
  ◦ 1 school – 57.1% received at least one offer of admission
  ◦ 2 to 5 schools – 75.4%
  ◦ 6 to 10 schools – 88.0%
  ◦ 11 to 15 schools – 90.8%
  ◦ 16 or more schools – 100%

- Considering the number of hours of pre-veterinary experience reported, those candidates that received at least one offer of admission:
  ◦ Tended ($p<0.1$) to report a greater total number of hours of research experience (average of 478 hours vs. 304 hours). They also reported a significantly lower degree of difficulty in getting those research experience hours (43.3% vs. 54.5% reported "difficult" or "very difficult").
  ◦ Tended ($p<0.1$) to rate the overall quality of mentoring received from the primary veterinarian supervising their veterinary experience higher (60.7% vs. 51.4% rated the quality "far above average"). They also shadowed a significantly greater total number of veterinarians for their veterinary experience (average 6.9 vs. 5.6).

- Related to pre-veterinary education, those candidates that received at least one offer of admission:
  ◦ Tended ($p<0.1$) to be less likely to have taken courses at a community college (73.8% vs. 78.6%). They also reported taking significantly fewer credit hours at community college (average 23.7 vs. 34.0).
  ◦ Were significantly more likely to have attended a high school that offered AP courses (78.2% vs. 72.2%).
  ◦ Were significantly more likely to have attended a private (vs. public) undergraduate institution (81.2% vs. 75.9%).

- Regarding socioeconomic status, those candidates that received at least one offer of admission:
  ◦ Were less likely to be Pell Grant recipients (25.1% of those that received an offer were Pell Grant recipients vs. 35.8% of those who did not receive an offer).
  ◦ Were significantly more likely to be free of current educational debt (59.1% of those that received an offer were debt free vs. 40.1% of those who did not receive an offer).
  ◦ Reported significantly lower current education debt (average $16,047 vs. $19,993, including both candidates with and without debt).
  ◦ Were significantly more confident in their ability to come up with $2000 if an unexpected need arose within the next month (55.2% of those that received an offer were certain vs. 43.1% of those who did not receive an offer).

- The probability of receiving at least one offer of admission tended (p<0.1) to be lower for those candidates who were first generation college students (72.1% vs. 77.8%).

- Considering community culture, the probability of receiving at least one offer of admission was significantly lower for those candidates who:
  ◦ Had grown up in a rural community (68.6% vs. 79.3%), or
  ◦ Expressed interest in a career with a rural setting (69.8% vs. 79.2%).

- Candidates that received at least one offer of admission expressed a significantly higher degree of confidence in their chances of admission post-VMCAS (81.1% vs. 48.1% were at least "moderately confident").

- Importantly, no significant differences or trends in the probability of receiving an offer of admission were found to be directly associated with:
  ◦ Candidates' gender identity,
  ◦ The number of times candidates had applied to veterinary school,
  ◦ The number of times candidates met with a pre-veterinary advisor,
  ◦ The number of reported veterinary, animal, or total experiential hours,
  ◦ The number of paid experiential hours reported,
  ◦ Employment status at time of application, or
  ◦ Candidates' confidence in their ability to repay student loans.

The Application Process

As with admissions offers, several interesting patterns were revealed as the data on candidates' application process to veterinary medical college were analyzed.

- **Number of schools applied to** – Because of the apparently strong association between the number of schools to which candidates applied and the likelihood of receiving at least one admission offer (mentioned above), this variable was investigated further, and the following patterns were identified.
  ◦ Candidates who grew up in a rural community applied to significantly fewer schools than their suburban and urban peers – 26.5% of rural-background candidates applied to one school only, compared to just 18.4% of those from suburban backgrounds and 15.5% from urban communities.
  ◦ Candidates who were Pell Grant recipients applied to significantly fewer schools than their peers – 23.6% of this group applied to one school only compared to 16.7% of their peers. In fact, 37.2% of non-Pell Grant recipients applied to more than 5 schools compared to just 28.2% of the Pell Grant group.

  ◦ A remarkably similar story holds for candidates who were first generation college students – 21.9% of this group applied to one school only compared to 17.5% of their peers. Overall, 36.9% of non-first-generation candidates applied to more than 5 schools compared to 28.6% of the first generation group.
  ◦ Candidates who identified as Black/African American tended (p<0.1) to apply to fewer schools than their peers – only 21.8% applied to more than 5 schools compared to 34.9% of candidates who did not identify as Black/African American.
  ◦ On the flip side, candidates who identified as Hispanic applied to a significantly greater number of programs than their peers – only 13.4% applied to a single school compared to 20.1% of their peers.

- **Number of times applied** – As mentioned above, no significant difference or trend in the probability of receiving an offer of admission was found directly associated with the number of times candidates had applied to veterinary school. In fact, no association was found between the number of times applied and any of the primary or secondary candidate descriptive characteristics except the experience variables. In general, the number of experiential hours reported by candidates was found to be significantly higher the greater the number of times a candidate had applied. This pattern was consistent across veterinary, animal, research, and total experiential hours.

Preparation

Several interesting patterns were revealed as the data on candidates' experiences and education in preparation for application to veterinary medical college were analyzed. These included:

- **Experience hours**
  ◦ **Veterinary experience** – In general, veterinary experience was highly valued by survey respondents. In total, 97% agreed (86% strongly agreed and 11% somewhat agreed) with the statement, "My veterinary experience was critical to my learning more about the veterinary profession". However, this seemingly important part of the pre-veterinary journey was not the same for all candidates.
    - On average, candidates reported 1435 (SEM=65.2) total veterinary experience hours. No significant differences or trends were found when total veterinary experience hours were considered by the candidates' gender identity, race/ethnicity, or Pell Grant recipient status. Candidates who were first generation college students reported significantly more veterinary experience than their counterparts (average 1751 hours vs. 1317). In addition, a significant difference

was identified when considering candidates' community of origin; those who grew up in an urban setting reported an average of 1727 hours compared to 1404 hours for suburban and 1204 hours for rural.

- Overall, 57.3% of all respondents reported little difficulty in getting hours with a veterinarian (31.9% said it was "easy" and 25.4% "very easy"). Notably, however, significantly fewer hours were reported on average by candidates who said it was difficult (800 hours) or very difficult (468 hours) than those who said it was easy (1273 hours) or very easy (2641 hours). On further analysis, patterns emerged indicating that the challenge was significantly greater for some particular candidate groups.
  - Of candidates who identified as female, 24.8% reported a substantial challenge in getting hours with a veterinarian (19.7% said it was "difficult" and 5.1% "very difficult"), which was significantly greater than the 16.6% (14.5% "difficult" and 2.1% "very difficult") of candidates who identified as male.
  - Of candidates who identified as URVM, 26.8% reported a substantial challenge in getting hours with a veterinarian (20.2% said it was "difficult" and 6.6% "very difficult"), which was significantly greater than the 22.8% (18.7% "difficult" and 4.1% "very difficult") of candidates who identified as non-URVM.
  - Of candidates who were Pell Grant recipients, 27.3% reported a substantial challenge in getting hours with a veterinarian (20.4% said it was "difficult" and 6.9% "very difficult"), which was significantly greater than the 22.3% (18.5% "difficult" and 3.8% "very difficult") of candidates who were not Pell Grant recipients.
- Across all respondents, an average of 23.3% of the total veterinary experience hours were reported as large/production animal (SEM=1.9). However, some differences were found between groups.
  - Overall, candidates who identified as URVM reported a significantly lower proportion of veterinary experience hours being large/production animal (average of 15.8% vs. 25.7%). In particular, the difference was significant for candidates who identified as Black/African American (average of 11.6% vs. 23.9%) and those who identified as Asian (average of 9.7% vs. 24.2%).
  - Candidates who grew up in a rural community reported a significantly higher proportion of veterinary experience hours being large/production animal than either their suburban or urban counterparts (averages of 31.4%, 22.8%, and 16.7%, respectively). Similarly, candidates who aspired to practice in a rural community reported a significantly higher proportion of veterinary

experience hours being large/production animal than either their suburban or urban counterparts (averages of 48.6%, 17.7%, and 10.3%, respectively).

- Even though 72.4% of respondents overall reported that the professional with whom they spent the most time during their veterinary experience was a veterinarian, the proportion was significantly lower for candidates who:
  - Identified as female (70.5% vs. 85.2% for male) or
  - Identified as URVM (66.4% vs. 74.2% for non-URVM).

Accordingly, a significantly higher proportion of candidates who identified as female or URVM reported spending most of their time with either a veterinary technician or other staff.

- In total, 58.3% of respondents reported that the overall quality of mentoring received from the primary veterinarian supervising their veterinary experience was "far above average". However, candidates who identified as URVM rated their experience significantly lower, with 54.0% in the "far above average" quality category compared to 59.7% of non-URVM candidates.

- **Animal experience** – On average, candidates reported 1549 (SEM=82.3) total animal experience hours. URVM candidates overall reported significantly fewer animal experience hours than those that were non-URVM (average of 1232 hours vs. 1649). Specifically, the difference was significant for candidates who identified as Asian (average of 866 hours vs. 1595) and was a trend (p<0.1) for those who identified as Black/African American (average of 1048 hours vs. 1576).
  - Overall, 67.9% of respondents overall reported very little difficulty in getting formal contact hours with animals beyond pets (37.2% said it was "easy" and 30.7% "very easy"). Notably, however, significantly fewer hours were reported on average by candidates who said it was difficult (883 hours) or very difficult (809 hours) than those who said it was easy (1316 hours) or very easy (2564 hours). Again, patterns emerged on further analysis.
  - Of candidates who identified as URVM, 18.2% reported a substantial challenge in getting formal contact hours with animals beyond pets (15.0% said it was "difficult" and 3.2% "very difficult"), which was significantly greater than the 13.0% (11.8% "difficult" and 1.2% "very difficult") of candidates who identified as non-URVM.
    - Of candidates who identified as Asian, 25.7% reported it was either "difficult" (23.0%) or "very difficult" (2.7%) to get formal contact hours with animals beyond pets, which was significantly

greater than the 13.5% (11.9% "difficult" and 1.6% "very difficult") of non-Asian candidates.

◇ Even though 60.6 % of candidates who identified as Hispanic reported little difficulty in getting formal contact hours with animals beyond pets (35.5% said it was "easy" and 25.1% "very easy"), the 68.7% total of non-Hispanic candidates in these categories (35.5% "easy" and 25.1% "very easy") tended (p<0.1) to be even greater.

○ Of candidates who were first generation college students, 16.2% reported a challenge in getting formal contact hours with animals beyond pets (13.6% said it was "difficult" and 2.6% "very difficult") that was significantly greater than the 13.6% (12.3% "difficult" and 1.3% "very difficult") of candidates who were not first generation students.

◦ **Research** – On average, candidates reported 380 (SEM=28.9) total research experience hours. Candidates who identified as Hispanic reported significantly fewer research experience hours than their non-Hispanic counterparts (average of 245 hours vs. 395).

• Overall, 48.0% of respondents reported considerable difficulty in getting research experience hours (33.1% said it was "difficult" and 14.9% "very difficult"). As with both veterinary experience and animal experience, significantly fewer research experience hours were reported on average by candidates who said it was difficult (143 hours) or very difficult (57 hours) than those who said it was easy (575 hours) or very easy (1415 hours). Again, patterns emerged on further analysis.

○ The 23.5% of candidates who were first generation college students that reported little difficulty in getting research experience hours (14.0% "easy" and 9.5% "very easy") was significantly less than the 29.4% (19.7% "easy" and 9.7% "very easy") of their counterparts who encountered little difficulty.

○ The 25.7% of candidates who were Pell Grant recipients that reported little difficulty in getting research experience hours (17.1% "easy" and 8.6% "very easy") was significantly less than the 28.6% (18.6% "easy" and 10.0% "very easy") of their counterparts who encountered little difficulty. On the flip side, 15.9% of Pell Grant recipients found it "very difficult" compared to 14.5% of non-Pell recipients.

○ With regard to gender, 48.9% of candidates who identified as female reported substantial difficulty in getting research experience hours (33.4% difficult and 15.5% very difficult), which tended (p<0.1) to be greater than the 43.2% of their male counterparts who encountered difficulty (32.5% difficult and 10.7% very difficult).

◦ **Total experiential hours** – Overall, candidates reported an average of 3353 total experiential hours (SEM=135). Candidates who identified as Asian reported significantly fewer total experience hours than their non-Asian counterparts (average of 2718 hours vs. 3397).

◦ **Paid experiential hours** – Overall, candidates reported an average of 53.1% of their experiential hours were paid experiences, for an estimated total of 2136 paid hours on average (SEM=112). However, some differences were identified.

• Candidates who identified as female reported a significantly lower proportion of their experiential hours were paid experiences than did their male counterparts (52.4% vs. 58.3% on average), although the estimated number of paid experiential hours was not found to be significantly different by gender.

• Candidates who identified as Black/African American reported significantly fewer paid experience hours than their non-Black/African American counterparts (average of 1500 hours vs. 2170).

• Candidates who identified as Asian reported significantly fewer paid experience hours than their non-Asian counterparts (average of 1626 hours vs. 2171).

• The number of paid experience hours tended (p<0.1) to vary by community of origin, with those candidates who grew up in an urban community leading the way (average 2588 hours) followed by rural (2023 hours) and suburban (1991 hours).

• **Education**
  ◦ **High school** – Overall, AP courses were offered in 86.9% of respondents' high schools. However, not all candidates had equal access.
    • Only 69.2% of candidates that grew up in a rural community had an opportunity to take AP courses at their high school, which is significantly less than the proportion of candidates who grew up in either urban or suburban communities (89.5% and 92.7%, respectively).
    • Although the differences between groups were somewhat smaller, both Pell Grant recipients and first-generation college students also had significantly less access to AP courses than their peers.
      ○ 82.8% of Pell Grant recipients attended high schools that offered AP courses compared to 89.5% of their peers.
      ○ For first generation college students, 83.9% had access to AP courses in their high school, compared to 89.1% of their peers.
  ◦ **Undergraduate**
    • Approximately 25% of candidates attended a private (vs. public) undergraduate institution (Table 2). Although those who attended a private college were

significantly more likely to receive at least one offer of admission (as mentioned above), no other significant differences were found between candidates who attended private vs. public institutions.

- Nearly half (49.4%) of all candidates had completed coursework at a community college (Table 2). As mentioned above, the probability of receiving at least one offer of admission tended ($p<0.1$) to be lower for those candidates. Several other patterns emerged when considering this dimension of the applicant pool. Candidates that had completed community college courses were significantly more likely to:
  - Be recipients of a Pell Grant (56.6% vs. 46.5%),
  - Be first generation college students (56.0% vs. 47.0%),
  - Have grown up in a rural community (26.3% vs. 18.0%),
  - Be interested in practicing in a rural community (27.0% vs. 17.9%),
  - Have reported that it was "difficult" or "very difficult" to get research experience hours (51.5% vs. 44.6%), and
  - Have reported a greater number of animal experience hours (average of 1725 vs. 1379).

In addition, a significantly lower proportion of candidates who identified as Asian reported taking community college courses than did their non-Asian peers (37.2% vs. 50.3%).

Socioeconomics

As candidates' socioeconomic data were evaluated, a number of noteworthy findings emerged. These included:

- **Pell Grant recipients** – Overall, 28.8% of candidates reported that they were Pell Grant recipients (Table 2).
  - When considered by race/ethnicity,
    - A significantly higher proportion of candidates who identified as Black/African American were found to be Pell Grant recipients (41.1% vs. 25.1% of peers).
    - A significantly higher proportion of candidates who identified as Hispanic were Pell Grant recipients (46.2% vs. 27.0%).
    - A significantly lower proportion of candidates who identified as White were found to be recipients of Pell Grants (26.2% vs. 42.0%).
  - No differences were found based on gender identity.
  - A significantly higher proportion of first-generation students received Pell Grants (47.7% vs.19.2% of peers).
  - A significantly higher proportion of those candidates who grew up in a rural community were found to be Pell Grant recipients as compared

to either their urban or suburban counterparts (38.9% vs. 25.0% and 28.0%, respectively).

- **Current educational debt** – Overall, 45.4% of respondents reported that they were currently holding educational debt (Table 2).
  - When evaluated by race/ethnicity,
    - A significantly higher proportion of candidates who identified as Black/African American were found to have current educational debt (60.5%% vs. 47.3% of peers).
    - A significantly lower proportion of candidates who identified as Asian reported having current educational debt (35.8% vs. 48.7% of peers).
  - A significantly higher proportion of Pell Grant recipients reported having current education debt than did their peers (65.8% vs. 40.8%).
  - A significantly higher proportion of first-generation students had current educational debt (63.0% vs. 42.4% of peers).
  - A significantly higher proportion of those candidates who grew up in a rural community were found to have current educational debt than either their urban or suburban counterparts (53.3% vs. 47.3% and 44.8%, respectively).
  - Patterns in the average amount of educational debt were similar.
    - Candidates who identified as Black/African American were found to have significantly higher current educational debt balances than their peers (average of $23,955 vs. $15,941).
    - Candidates who identified as Asian were found to have significantly lower current educational debt balances than their peers (average of $12,239 vs. $16,577).
    - Pell Grant recipients reported significantly higher current educational debt balances (average of $21,731 vs. $14,205 for peers).
    - First generation students reported significantly higher current educational debt balances (average of $22,668 vs. $13,981 for peers).

Higher Education Heritage/Culture

Overall, 27.4% of respondents reported being first-generation college students (Table 2). In addition to those findings already mentioned, a number of patterns related to candidates' first-generation status were discovered.

- With regard to race/ethnicity,
  - A significantly higher proportion of candidates who identified as Hispanic were first-generation college students (42.6% vs. 25.7% of peers).

- A significantly lower proportion of candidates who identified as White were first-generation college students (26.2% vs. 42.0% of peers).

- A significantly higher proportion of those candidates who grew up in a rural community were found to be first-generation students than either their urban or suburban counterparts (38.4% vs. 24.0% and 24.9%, respectively).

- A significantly higher proportion of those candidates who aspire to practice in a rural community were found to be first-generation students than either their urban or suburban counterparts (32.2% vs. 26.5% and 24.5%, respectively).

Community Culture

The overall distributions for candidates' community of origin (where they grew up) and desired destination (where they would like to practice) are presented in Table 2. Specific patterns, in addition to those already mentioned, included the following.

- **Community where they grew up** – Significant differences were found based on both race/ethnicity and gender:
  - A higher proportion of candidates who identified as Black/African American grew up in urban communities (41.2% vs. 22.7% of peers), and lower proportions grew up in suburban and rural communities (51.0% vs. 55.4% of peers and 7.8% vs. 21.9% of peers, respectively).
  - A higher proportion of candidates who identified as Asian grew up in urban communities (38.7% vs. 22.5% of peers), and lower proportions grew up in suburban and rural communities (53.5% vs. 55.3% of peers and 7.7% vs. 22.2% of peers, respectively).
  - A higher proportion of candidates who identified as Hispanic grew up in urban communities (41.5% vs. 21.5% of peers), and lower proportions grew up in suburban and rural communities (48.4% vs. 56.0% of peers and 10.1% vs. 22.5% of peers, respectively).
  - Higher proportions of candidates who identified as White grew up in rural and suburban communities (23.3% vs. 11.6% of peers and 56.3% vs. 50.3% of peers, respectively), and a lower proportion grew up in urban communities (20.4% vs. 38.2% of peers).
  - A higher proportion of candidates who identified as male grew up in rural communities (27.0% vs. 20.3% of females), and lower proportions grew up in suburban and urban communities (50.7% vs. 56.1% of females and 22.3% vs. 23.8% of females, respectively).

- **Community where they would like to practice** – Again, significant differences were found based on both race/ethnicity and gender:
  - A higher proportion of candidates who identified as Black/African American aspire to practice in urban communities (36.3% vs. 16.6% of peers), and lower proportions aspire to suburban and rural communities (55.9% vs. 61.1% of peers and 7.8% vs. 22.3% of peers, respectively).
  - Higher proportions of candidates who identified as Asian aspire to practice in suburban and urban communities (63.4% vs. 60.7% of peers and 28.2% vs. 16.8% of peers, respectively), and a lower proportion aspires to rural communities (8.6% vs. 22.5% of peers).
  - A higher proportion of candidates who identified as Hispanic aspires to practice in urban communities (30.0% vs. 16.1% of peers), and lower proportions aspire to suburban and rural communities (53.5% vs. 61.7% of peers and 16.6% vs. 22.2% of peers, respectively).
  - Higher proportions of candidates who identified as White aspire to practice in rural and suburban communities (23.9% vs. 11.1% of peers and 61.3% vs. 58.7%, respectively), and a lower proportion aspires to urban communities (14.8% vs. 30.3% of peers).
  - Higher proportions of candidates who identified as male aspire to practice in rural and urban communities (25.9% vs. 20.9% of females and 19.1% vs. 17.3% of females, respectively), and a lower proportion aspires to suburban communities (55.0% vs. 61.8% of females).

- For the most part, candidates expressed a significantly higher preference to practice in a community similar to where they grew up.
  - Of candidates who grew up in a rural community,
    - 49.8% aspired to practice in a rural community,
    - 45.4% aspired to a suburban community, and
    - 4.8% aspired to an urban community.
  - Of candidates who grew up in a suburban community,
    - 15.1% aspired to practice in a rural community,
    - 73.8% aspired to a suburban community, and
    - 11.1% aspired to an urban community.
  - Of candidates who grew up in an urban community,
    - 11.3% aspired to practice in a rural community,
    - 44.5% aspired to a suburban community, and
    - 44.3% aspired to an urban community.

Other Dimensions

In addition to those characteristics presented in Tables 1 and 2, a number of other dimensions help to describe the applicant pool.

- **Current employment** – Nearly all candidates (94.6%) were working in some capacity at the time of application. Although no significant relationship was found between

employment status and likelihood of admission, several potentially important patterns did emerge.

- ◦ Approximately half (49.7%) of all candidates were working part time for pay, over one third (37.6%) were working full time for pay, and an additional 7.3% were working as volunteers.
- ◦ In general, candidates working full time for pay were significantly more likely to respond that it was "very easy" to obtain experience hours (whether related to veterinary, animal, or research experience), suggesting that these jobs served a dual purpose – both income and experience.
- ◦ A significantly higher proportion of those candidates who identified as female reported working part time for pay than did their male counterparts (50.9% vs. 41.0%). In contrast, a significantly higher proportion of those candidates who identified as male reported working full time for pay than did their female counterparts (42.6% vs. 36.9%).
- ◦ There was a tendency ($p < 0.1$) for those candidates who identified as URVM to be more likely to be working full time for pay than their non-URVM (White) counterparts (41.2% vs. 36.4%, respectively). Conversely, candidates who identified as White tended ($p < 0.1$) to be more likely to be working part time for pay than did their URVM counterparts (51.1% vs. 45.1%, respectively).

- **Confidence and concerns** – Candidates were asked several questions on the VMCAS post-application survey to define specific areas of confidence and potential concerns. Again, several patterns emerged.
  - ◦ Candidates were asked a question related to their degree of confidence in their chances of admission (Table 3). In considering responses to this question:
    - • Those candidates with relatively high confidence in their probability of success in the admissions process (rating of 4 or 5) reported a significantly greater number of animal experience hours (average 2095 hours vs. 1423) and total experience hours (average 4125 hours vs. 3166).
      - ◦ First generation college students were significantly less confident in their chances of success, with only 16.4% providing a rating of 4 or 5 compared to 20.5% of their peers.
      - ◦ Candidates that identified as female tended ($p < 0.1$) to be less confident, with only 18.8% providing a 4 or 5 rating compared to 23.6% of males.
      - ◦ Candidates who expressed relatively high confidence in the pre-vet advising they received were also significantly more confident in their chances of success with the admissions process (25.1% vs. 15.6 % with a rating of 4 or 5).
      - ◦ Candidates who applied to more than 5 schools were more likely to express

relatively high confidence than those who applied to 5 or less (24.1% provided a 4 or 5 rating vs. 17.0% of their peers).
- ◦ When cross-referenced with the post-admissions survey, those candidates with relatively high confidence in their probability of success in the admissions process (rating of 4 or 5) post-application were significantly more likely to receive at least one offer of admission (89.7% vs. 72.1%).

- ◦ Candidates were also asked about their level of concern related to their ability to repay student debt after graduation (Table 3). In considering the responses to this question:
  - • Overall, 30.5% of respondents expressed either moderate or extreme concern (19.3% and 11.2%, respectively). Candidates that identified as female were significantly more likely to express a higher level of concern, with 31.6% responding as either moderately or extremely concerned compared to 22.3% of males.
  - • In general, candidates that expressed the highest levels of concern also reported significantly higher current estimates of debt for their undergraduate education, and vice versa. Overall, the average current estimated debt for all candidates (including those with zero debt) was $16,353 (SEM=658). When considered by level of concern, the following average estimated debt levels were determined.
    - ◦ Extremely concerned – $24,610 (n=200)
    - ◦ Moderately concerned – $18,115 (n=350)
    - ◦ Somewhat concerned – $18,469 (n=464)
    - ◦ Slightly concerned – $13,417 (n=494)
    - ◦ Not at all concerned – $10,418 (n=298)
- ◦ Candidates were asked about their level of concern related to their employability after graduation (Table 3). Several patterns emerged in the responses to this question:
  - • Overall, 12.8% of respondents expressed either moderate or extreme concern (9.8% and 3.0%, respectively). However, candidates that identified as URVM were significantly more likely to express a higher level of concern, with 17.5% responding as either moderately or extremely concerned compared to 11.3% of their non-URVM peers. Specifically,
    - ◦ Of candidates who identified as Black/African American, 19.5% responding as either moderately or extremely concerned, which was significantly greater than the 12.4% of their non-Black/African American peers who responded similarly.
    - ◦ Of candidates who identified as Asian, 20.2% responding as either moderately or extremely concerned, which was significantly greater than the 12.3% of their non-Asian peers who responded similarly.

- Candidates that identified as female were significantly more likely to express a higher level of concern, with 13.8% responding as either moderately or extremely concerned compared to 6.3% of males.
- Candidates who grew up in rural or urban communities were significantly less concerned about their employability, with 35.1% and 31.8% (resp.) responding that they were not at all concerned, compared to 28.3% of their suburban peers. Similarly, candidates who hoped to practice in rural or urban communities were significantly less concerned, with 32.8% and 33.7% (resp.) responding as not at all concerned, compared to 28.8% of their suburban peers.

DISCUSSION

To remain relevant and to effectively meet the increasingly diverse needs of an increasingly diverse society, veterinary medicine must adequately reflect the society it seeks to serve. Unfortunately, results of the current study clearly indicate that unintentional bias occurred during the 2019 veterinary medical college admissions processes at AAVMC member institutions. Although some of this bias is reflected directly in the distribution of admission offers, many manifestations are indirect, and the related outcomes are nuanced through various dimensions of the admissions process. In effect, these indirect impacts likely constitute not only barriers to admission, but may deter candidates from even submitting an application in the first place.

Scholarly literature suggests that the influence of unconscious or implicit bias is a wide-ranging concern in decision-making. Bias often operates in individualized decision-making; however, groups, such as admissions committees, are also deeply influenced by the biases of individual members. Implicit biases quietly operate as facts in decision-making scenarios at the group level.[4,5]

A 2017 study of implicit bias in medical school admissions found that all members of the admissions committee displayed significant levels of implicit racial preference, and 21% of committee members acknowledged that knowing about their implicit bias impacted future admissions decisions.[6] It is important to note that all committee members in the study were made aware of their biases, but only a fraction of participants acknowledged using this new information in future decision-making. This suggests that while training and awareness can support greater equity in admissions processes, actual process changes may be needed to reduce the influence of bias in applicant evaluations.

Much like the results presented in this report, an analysis of dental school applicants found selection bias based on pre-admission criteria. Heavy reliance on GPA, standardized test scores and experiential hours favored applicants who were white and affluent.[7] The authors recommended more holistic admissions evaluations to mitigate the effects of the unintended bias on future applicants.

Certainly, biases related to the primary dimensions of diversity – race/ethnicity and gender identity – are of concern. But in addition, biases related to secondary dimensions such as socioeconomic status and culture are an important issue. Each of these primary and secondary factors was found in the current study to have a direct relationship, in some fashion, to the probability of receiving an offer of admission to a veterinary medical college. But the impacts are, in fact, compounded through the indirect relationships that were identified. These relationships weave a complex web of interconnectedness, ultimately leading to what most would agree are unintended consequences.

Consider, for example, the requirements for veterinary, animal, and research experience that characterize many, if not most, veterinary medical admissions programs.

- Candidates overwhelmingly reported that their veterinary experience was critical to their understanding of the veterinary medical profession. However, candidates who identified as URVM or female, along with those who were Pell Grant recipients, reported greater difficulty in obtaining their veterinary experience. In addition, URVM candidates reported a lower proportion of large/production animal hours – a feature that is particularly important for some colleges. Further, URVM and female candidates were less likely to spend most of their veterinary experiential time with a veterinarian (as opposed to a veterinary technician or other staff), and URVM candidates rated their experience significantly lower in overall quality.

- Candidates with higher numbers of animal experience hours were found to have significantly greater confidence in their prospects of receiving an admission offer. However, candidates who identified as URVM overall reported significantly fewer animal experience hours and, along with first-generation candidates, reported greater difficulty in obtaining these hours.

- The number of candidates' research experience hours was found to be directly related to the probability of receiving an admissions offer. However, these experiences were found to be the most difficult for candidates to attain when compared to veterinary and animal experiences. Candidates who identified as Hispanic reported significantly fewer research hours, on average, than their peers. And candidates who identified as female, along with first-generation students and Pell Grant recipients, reported greater difficulty in obtaining these hours.

- Many of the various experience hours were obtained as part of candidates' employment activities. However, candidates who identified as female, Black/African American, or Asian reported significantly fewer paid experience hours relative to their peers.

- Several correlations were identified that add even more complexity to the issue of experiential requirements: higher proportions of candidates identifying as URVM were also first-generation students and/or Pell Grant recipients, as were candidates from rural communities. In addition, Pell Grant recipients were more likely to be first-generation students.

Although this study found no significant relationship between the number of veterinary, animal, or total hours and the probability of admission, evidence of inherent bias in the selection process was associated with the number and type of experiential hours reported by applicants. Clearly, the possibility of barriers to admission and deterrents to application must be addressed by admissions committees, and the validity of requiring pre-veterinary experiential hours must be questioned.

A similar, complex story can be compiled related to pre-veterinary education. Simply put:

- Having access to AP classes in high school increased the likelihood of receiving an admissions offer. However, access to AP classes was less likely for first-generation students, Pell Grant recipients, and students from rural communities.

- Attending community college seemingly decreased the probability of receiving an admissions offer. However, students completing at least some community college courses were more likely to be first-generation, Pell Grant recipients, and from or aspiring to practice in a rural community. They also found it significantly more difficult to attain research experience hours.

- Again, to complicate this story about pre-veterinary education is the fact that higher proportions of candidates identifying as URVM were also first-generation students and/or Pell Grant recipients.

As with the experiential requirements, the inherent biases detected related to pre-veterinary education suggest that reevaluating the role of high school AP and community college courses would be timely.

Additional stories could well be constructed from other perspectives (e.g. socioeconomic or cultural). However, the bottom line is that certain groups are directly or indirectly disadvantaged, to some degree, with current admissions processes and systems. These include:

- Candidates who identify as URVM
- Candidates who identify as female
- Pell Grant recipients
- First-generation college students
- Candidates who grew up in a rural community
- Candidates who aspire to practice in a rural community

Conversely, certain groups enjoy either a direct or indirect advantage. These include:
- Candidates who identify as White
- Candidates who identify as male
- Candidates who grew up in a suburban community
- Candidates who aspire to practice in a suburban community
- Candidates who are not Pell Grant recipients
- Candidates whose parents attended college

Certainly, not all of these biases are likely occurring at all AAVMC member institutions. However, because these data sets were collected across all member institutions utilizing VMCAS, the findings should be viewed as highly representative and robust. Some institutions will likely have greater biases than others, but all colleges should question their own admissions practices and programs.

Considering the strong and widespread expressed interest in admitting a greater proportion of candidates who identify as URVM, candidates who are Pell Grant recipients, first-generation college students, candidates who grew up in a rural community, and candidates who aspire to either rural or urban communities, these findings signal a very real need to reexamine admissions processes. Schools and colleges of veterinary medicine should objectively and rigorously review their admissions processes and reevaluate those elements, such as the number of veterinary, animal, or total experience hours, that may be a source of inherent bias against particular groups of applicants. In this regard, clear focus should be placed on potential barriers to admission *and* potential deterrents to application. And admissions committees should regularly participate in implicit bias training.[6]

SUMMARY

When analyzing AAVMC application and admissions data in the current study, *numerous significant direct and indirect biases associated with both primary (race/ethnicity and gender identity) and secondary (socioeconomic status and culture) dimensions of diversity were clearly identified*. Indirect connections involved links through the application process, pre-veterinary preparation (both experience and education), and relationships to candidates' secondary descriptive characteristics. To the extent that these factors contribute or are related to the likelihood of success in the admissions process, together they effectively constitute barriers to

admission to the veterinary medical profession, and perhaps even deterrents to application.

Admittedly, the barriers/deterrents are not absolute – many disadvantaged candidates are ultimately successful in gaining an offer for admission – but the playing field is certainly not level for all candidates; candidates from disadvantaged groups must overcome disproportionate degrees of difficulty to achieve their goals. What's more, to the extent that this situation might be recognized by potential applicants, it could actually be limiting the scope of possible candidates who might be willing to take on the challenging admissions process as they consider the prospects of a career in veterinary medicine. Whether or not the biases are intentional, the net effect of the various barriers is institutional racism, institutional classism (both socioeconomic and cultural), and institutional sexism.

The results of this study strongly suggest a broad-based re-examination of our admissions processes is needed. Each criterion, requirement, and process we propose must be carefully reviewed through a dual lens: 1) a lens that first critically evaluates the validity of the measure in today's world – in today's educational systems, for today's veterinary medical profession, to meet the needs of today's society, and 2) an inclusive lens that considers the measure with a view toward full representation and engagement, and equal access for all.

Continued vigilance will also be crucial. Ongoing monitoring of our admissions processes – both who we attract and who we admit – will be the ultimate measure of our success. Active, progressive data collection, rigorous analysis, and open sharing of results will be vital to identify and highlight improvements along the way, and to celebrate our successes.

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Table 1: VMCAS applicants' primary descriptive characteristics

Characteristics	Groups	Levels
Race/ethnicity	White/Middle Eastern (only)	75.6%
	All others (URVM*)	24.4%
	• White/Middle Eastern (in combination)	6.6%
	• Black/African American**	4.8%
	• Hispanic**	10.1%
	• Asian**	6.6%
	• American Indian/Alaskan Native**	1.7%
	• Native Hawaiian/Pacific Islander**	0.5%
	• Race not listed**	2.3%
	• Foreign national**	0.7%
Gender	Female	86.6%
	Male	13.1%
	Other	0.3%

*URVM=Under-represented in veterinary medicine
**Alone or in combination

Table 2: VMCAS applicants' secondary descriptive characteristics

Characteristics	Groups	Levels
Received at least one admission offer	Yes	77.0%
	No	23.0%
How many schools (CVMs) did you apply to during this cycle?	1 school	19.5%
	2 to 5	46.2%
	6 to 10	26.9%
	11 to 15	6.1%
	16 or more	1.3%
How many times have you applied to veterinary school?	First time	78.1%
	2 times	17.2%
	3 times	3.8%
	4 or more times	0.9%
Experience hours (average number)	Veterinary	1811
	Animal	1977
	Research	393
	Total	3533
Did your high school offered AP classes?	Yes	87.7%
	No	10.1%
	Unsure	2.3%
Did you take any courses at a community college?	Yes	49.4%
	No	50.6%
Undergraduate institution	Private for profit	10.8%
	Private not for profit	13.9%
	Public	75.3%
Pell Grant recipient	Yes	28.8%
	No	71.2%
Do you have any educational debt?	Yes	45.4%
	No	54.6%
Estimated current educational debt (average)	All candidates	$16,353
	Candidates with debt	$34,064
First generation college student	Yes	27.4%
	No	72.6%
Which of the following best describes where you grew up?	Rural	21.3%
	Suburban	55.2%
	Urban	23.5%
Which of the following best describes where you would like to practice?	Rural	21.6%
	Suburban	60.8%
	Urban	17.6%

Table 3: Employment, confidence, and concerns of VMCAS applicants

Question	Possible Responses	Percent of Candidates
Are you working at the time of submitting your application?	Yes, full time for pay	37.6%
	Yes, part time for pay	49.7%
	Yes, volunteer work	7.3%
	No	5.4%
Which of the following ratings most accurately reflects the degree of confidence you have in your chances of admission?	1 – Not very confident (I am worried I will receive no acceptances)	12.2%
	2	18.8%
	3 – Moderately confident (I believe I will receive at least one acceptance)	49.5%
	4	13.0%
	5 – Very confident (I believe I will receive multiple acceptances)	6.4%
Please rate your level of concern about your ability to pay off your student loans within a 10-25 year period after earning your DVM degree.	Not at all concerned	16.4%
	Slightly concerned	27.4%
	Somewhat concerned	25.8%
	Moderately concerned	19.3%
	Extremely concerned	11.2%
Please rate your level of concern about your employability at the completion of your DVM degree.	Not at all concerned	30.6%
	Slightly concerned	34.8%
	Somewhat concerned	21.9%
	Moderately concerned	9.8%
	Extremely concerned	3.0%