Using MCAT® Data in 2019
Medical Student Selection
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My advice to you in 2019 student selection

This guide offers recommendations for using MCAT scores in conjunction with all the information provided by each medical school applicant. It also describes how medical schools work with MCAT scores in the context of holistic review.

Applicants provide admissions committees with rich information about their experiences, attributes, and academic backgrounds through their applications, personal statements, and interviews. Letter writers also provide information about applicants’ academic and personal competencies. Your institutional mission, goals, and priorities provide a framework for using this rich and varied information in holistic ways to evaluate applicants and admit a class of capable, caring students who bring diverse interests, talents, and experiences to your institution.

Holistic review practices provide the foundation for selecting applicants with the academic and personal competencies that future physicians need. It is important to remember the following recommendations for considering data about academic preparation in the context of all the information collected during the admissions process.

- Carefully consider the rich and assorted data that applicants provide. Weigh these data about applicants’ experiences, attributes, and academic preparation in ways that help you meet your institution’s goals.

- Triangulate score information from the MCAT exam with information about applicants’ course completion, grades, grade trends, institutions attended, research experience, and other academic indicators. You should look for consistencies and inconsistencies in the stories these data tell.

- For MCAT scores in particular, consider the precision with which total and section scores measure applicants’ academic preparation. When making decisions about whom to interview and accept, remember: scores that are close together are not meaningfully different.

- Scores from the MCAT exam should not outweigh other application data in deciding which applicants will get secondary application invitations, interview invitations, or acceptance offers.

Considering these recommendations and the data presented in this guide will help your admissions committee construct a class that meets the academic, clinical, service, and research missions of your medical school.

Please don’t hesitate to reach out to MCAT staff at mcatvalidity@aamc.org with questions.

Sincerely,

Theodore Hall, MD
The David Geffen School of Medicine at UCLA
Associate Dean for Admissions
Director, Medical Student Education in Radiology
Chair, AAMC Group on Student Affairs Committee on Admissions (COA)
What does the MCAT exam measure?

The MCAT exam is designed to help admissions committees select students who are academically prepared for medical school. MCAT scores are among many sources of application data that admissions committees use in student selection. The scores help admissions officers interpret grades and other academic data coming from undergraduate institutions that have different curricular emphases and grading standards.

The MCAT exam tests the foundational concepts and reasoning skills needed to be ready for today's medical school.

The MCAT exam has four sections:

1. Biological and Biochemical Foundations of Living Systems
2. Chemical and Physical Foundations of Biological Systems
3. Psychological, Social, and Biological Foundations of Behavior
4. Critical Analysis and Reasoning Skills

Shown in Figure 1, the two natural sciences and the behavioral and social sciences sections of the MCAT exam test 10 foundational concepts and four scientific inquiry and reasoning skills that are the building blocks for learning in medical school. These sections ask test takers to combine their knowledge of concepts from courses in first-semester biochemistry, psychology, and sociology and year-long courses in biology, chemistry, and physics with their scientific inquiry and reasoning skills to solve problems presented in passages and test questions. The resulting scores provide information about applicants’ readiness to learn in medical school.

The Critical Analysis and Reasoning Skills section tests how well test takers comprehend, analyze, and evaluate what they read, draw inferences from text, and apply arguments to new ideas and situations. The passages are drawn from the humanities and social sciences. All the information test takers need to respond to the questions on this section appears in the passages or in the questions themselves (see Figure 1).

Appendix A provides more detailed descriptions of the concepts and reasoning skills tested by each of the four sections of the exam.
Figure 1. Foundational concepts and scientific inquiry and reasoning skills tested on the MCAT exam.

<table>
<thead>
<tr>
<th>Biological and Biochemical Foundations of Living Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundational Concept 1: Biomolecules have unique properties that determine how they contribute to the structure and function of cells and how they participate in the processes necessary to sustain life.</td>
</tr>
<tr>
<td>Foundational Concept 2: Highly organized assemblies of molecules, cells, and organs interact to carry out the functions of living organisms.</td>
</tr>
<tr>
<td>Foundational Concept 3: Complex systems of tissues and organs sense the internal and external environments of multicellular organisms and, through integrated functioning, maintain a stable internal environment within an ever-changing external environment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scientific Inquiry and Reasoning Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCAT questions on these three sections ask test takers to solve problems using the following scientific inquiry and reasoning skills.</td>
</tr>
<tr>
<td>Knowledge of Scientific Concepts and Principles</td>
</tr>
<tr>
<td>• Demonstrating understanding of scientific concepts and principles</td>
</tr>
<tr>
<td>• Identifying the relationships between closely related concepts</td>
</tr>
<tr>
<td>Scientific Reasoning and Problem Solving</td>
</tr>
<tr>
<td>• Reasoning about scientific principles, theories, and models</td>
</tr>
<tr>
<td>• Analyzing and evaluating scientific explanations and predictions</td>
</tr>
<tr>
<td>Reasoning About the Design and Execution of Research</td>
</tr>
<tr>
<td>• Demonstrating understanding of important components of scientific research</td>
</tr>
<tr>
<td>• Reasoning about ethical issues in research</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical and Physical Foundations of Biological Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundational Concept 4: Complex living organisms transport materials, sense their environment, process signals, and respond to changes using processes that can be understood in terms of physical principles.</td>
</tr>
<tr>
<td>Foundational Concept 5: The principles that govern chemical interactions and reactions form the basis for a broader understanding of the molecular dynamics of living systems.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Psychological, Social, and Biological Foundations of Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundational Concept 6: Biological, psychological, and sociocultural factors influence the ways that individuals perceive, think about, and react to the world.</td>
</tr>
<tr>
<td>Foundational Concept 7: Biological, psychological, and sociocultural factors influence behavior and behavior change.</td>
</tr>
<tr>
<td>Foundational Concept 8: Psychological, sociocultural, and biological factors influence the way we think about ourselves and others.</td>
</tr>
<tr>
<td>Foundational Concept 9: Cultural and social differences influence well-being.</td>
</tr>
<tr>
<td>Foundational Concept 10: Social stratification and access to resources influence well-being.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Critical Analysis and Reasoning Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examinees demonstrate their information processing skills in three areas.</td>
</tr>
<tr>
<td>Foundations of Comprehension</td>
</tr>
<tr>
<td>• Understanding basic components of the text, such as the main idea and conclusions</td>
</tr>
<tr>
<td>• Inferring meaning from rhetorical devices, word choice, and text structure</td>
</tr>
<tr>
<td>Reasoning Within the Text</td>
</tr>
<tr>
<td>• Integrating different components of the text to increase comprehension or analysis</td>
</tr>
<tr>
<td>Reasoning Beyond the Text</td>
</tr>
<tr>
<td>• Applying or extrapolating ideas from the passage to new contexts, situations, possibilities, alternatives, options, or proposals</td>
</tr>
<tr>
<td>• Assessing the impact of introducing new factors, information, or conditions to ideas from the passage</td>
</tr>
</tbody>
</table>
How is the MCAT exam scored?

The section and total score scales are centered on memorable numbers that draw attention to the center of the scales. Scores on the four sections of the exam are reported on numeric scales centered at 125 and ranging from 118 to 132. Scores from the four sections are summed to produce a total score centered at 500 and ranging from 472 to 528.

The MCAT score scales draw attention to the center of the scales to encourage admissions committees to consider applicants with a wide range of scores.

Research on the old exam (administered from 1991 to January 2015) suggests that the students who enter medical school with scores at the center of the scale succeed; they graduate in four or five years and pass their licensing exams on the first try (Dunleavy et al 2013). If history is a guide, applicants with a wide range of scores on the current MCAT exam who are admitted to medical school will also succeed. Early findings from this exam presented on page 16 show that 2016 entrants with a wide range of scores progressed to year 2 without delay.
Who takes the MCAT exam?

Figure 2 shows the percentages of the more than 186,000 examinees, from different backgrounds and experiences, who took the MCAT exam from 2015 to 2017. More than half of examinees were female. When describing their race/ethnicity, almost half of examinees identified as white, 10% as black or African American, 11% as Hispanic, and 27% as Asian. About 7% were awardees of the AAMC’s Fee Assistance Program, almost 20% reported that none of their parents had a bachelor’s degree, and about 1% tested with a nonstandard testing condition. Finally, 24% of examinees took the exam more than once from 2015 to 2017.

Figure 2. Percentages of MCAT examinees from 2015 to 2017, by gender, race/ethnicity, fee assistance status, parental education, testing condition, and repeater status.¹

1. The total number of 2015-to-2017 MCAT examinees was 186,450.
2. Percentages describe examinees who provided information about their gender, race/ethnicity, and parental education.
3. Percentages add up to more than 100% because racial/ethnic minority results include examinees who may have designated more than one race/ethnicity.
4. Fee assistance eligibility is limited to examinees who are U.S. citizens or U.S. permanent residents.
5. Starting in the 2016 testing year, examinees report the highest level of education for up to four parents. In 2016 and 2017, 124,781 examinees provided information about parental education.
6. Score reports do not indicate whether scores were obtained under standard or nonstandard testing conditions.
7. Repeaters are examinees who took the new MCAT exam more than once from 2015 to 2017.
How do examinees prepare for the MCAT exam?

As described previously, the MCAT exam tests concepts from first-semester biochemistry, psychology, and sociology courses and year-long courses in biology, chemistry, and physics. It asks examinees to demonstrate that they can reason about research and data to answer questions about those concepts.

Data about the courses examinees completed show how they prepared in these areas (see Figure 3). Almost all examinees took biology, chemistry, and physics courses. Most examinees also took courses in biochemistry, psychology, and statistics before testing; many took courses in sociology and research methods.

About half of examinees took either a commercial preparation course or a course based at a university or medical school before sitting for the exam. Examinees prepared for the MCAT exam in a variety of other ways, too. Fifty percent of examinees reported using the Khan Academy MCAT collection, which includes free, online, video-based lessons and test questions covering concepts and reasoning skills tested on the MCAT exam. On the AAMC’s Post-MCAT Questionnaire (2017), many respondents reported reading on their own, taking online courses, or volunteering or working in research labs or other settings that provided exposure to topics tested on the MCAT exam. (The 2017 Post-MCAT Questionnaire Report is available at aamc.org/data/pmq.)

Figure 3. Percentages of MCAT examinees from 2015 to 2017 who completed college coursework in the natural, behavioral, and social sciences or who prepared for the MCAT exam by using the Khan Academy or completing a test preparation course.¹

<table>
<thead>
<tr>
<th>Coursework²</th>
<th>Biochemistry</th>
<th>Introductory Psychology</th>
<th>Introductory Sociology</th>
<th>Research Methods</th>
<th>Statistics</th>
<th>Biology</th>
<th>General Chemistry</th>
<th>Organic Chemistry</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>87%</td>
<td>84%</td>
<td>50%</td>
<td>42%</td>
<td>83%</td>
<td>95%</td>
<td>93%</td>
<td>96%</td>
<td>94%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MCAT Preparation³</th>
<th>Khan Academy</th>
<th>Course from University or Medical School</th>
<th>Commercial Course</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50%</td>
<td>6%</td>
<td>42%</td>
</tr>
</tbody>
</table>

1. The total number of MCAT examinees from 2015 to 2017 was 186,450.
2. Percentages were calculated from the data supplied by respondents to the Post-MCAT Questionnaire (PMQ) who provided information about their coursework. Respondents self-reported the courses for which they had Advanced Placement (AP), International Baccalaureate (IB), College Level Examination Program (CLEP), community college, four-year college, postbaccalaureate, graduate, and professional school credit. The number of 2015-to-2017 respondents was 62,105. Results are based on respondents' most recent responses for those who responded to the PMQ more than once.
3. Percentages were calculated from information from examinees who provided information about their MCAT test preparation after they completed the MCAT exam. The number of 2015-to-2017 examinees who provided this information was 185,782. Results are based on examinees' most recent responses for those who tested more than once.
How well do examinees score on the MCAT exam?

Figure 4 shows the distribution of MCAT total and section scores for all exams administered from 2015 to 2017. These data include scores for students who tested more than once. The mean MCAT total score was 500.5, and the standard deviation was 10.5. Means and standard deviations for the section scores also appear in Figure 4.

Figure 4. Distributions of MCAT total and section scores for exams administered from 2015 to 2017.

Figure 5 summarizes the MCAT total scores from 2015 to 2017 overall and for examinees from different backgrounds and experiences, including gender and race/ethnicity, status in the AAMC’s Fee Assistance Program, and highest level of parental education. It also shows scores from examinees who tested under standard and nonstandard testing conditions and first- and second-attempt scores for examinees who took the exam more than once.

Figure 5 uses box-and-whisker plots to show the median (50th-percentile) score, along with 10th-, 25th-, 75th-, and 90th-percentile scores. The 10th- and 90th-percentile scores are shown by the ends of the “whiskers,” the 25th- and 75th-percentile scores are shown by the “box” (the left edge of each box shows the 25th-percentile score, and
the right edge shows the 75th-percentile score), and the median is shown by the vertical bar inside each box. For example, for female examinees, the 10th-, 25th-, median-, 75th-, and 90th-percentile scores were 485, 492, 499, 507, and 513, respectively. The mean MCAT total score for each group appears in parentheses by the group label.

For every group, there are examinees with scores near the bottom, at the middle, and near the top of the MCAT total score scale.

There is variability in the median MCAT total scores for examinees from different sociodemographic backgrounds. However, there is a great deal of overlap in the scores for different groups. The similarities and differences in these data are similar to those reported in the literature for other admissions tests (Roth et al 2001; Sackett and Shen 2010). Research suggests that the differences in MCAT scores for examinees from groups underrepresented in medicine based on race/ethnicity and other background characteristics reflect societal inequalities in income, education, and other factors rather than test bias (Davis et al 2013).

Figure 5. MCAT total scores for exams administered from 2015 to 2017, overall and by gender, race/ethnicity, fee assistance status, parental education, testing condition, and repeater status.1,2

Overall                     Total (mean = 500.5; N = 239,681)
Gender
Male (mean = 502.1; N = 108,262)
Female (mean = 499.2; N = 130,777)
Race/Ethnicity3
Black or African American (mean = 493.5; N = 24,559)
Hispanic (mean = 495.7; N = 25,668)
Asian (mean = 502.0; N = 63,201)
American Indian or Alaska Native (mean = 496.9; N = 2,452)
Native Hawaiian or Other Pacific Islander (mean = 498.6; N = 690)
Fee Assistance4
Did not receive (mean = 500.7; N = 188,406)
Received (mean = 496.4; N = 15,025)
Parental Education5
Bachelor's degree or higher (mean = 501.8; N = 124,985)
No bachelor's degree (mean = 496.3; N = 27,493)
Testing Condition6
Standard (mean = 500.5; N = 237,429)
Nonstandard (mean = 501.9; N = 2,252)
Repeater Status7
Nonrepeater (mean = 502.6; N = 141,592)
Repeater, 1st attempt (mean = 496.1; N = 44,858)
Repeater, 2nd attempt (mean = 499.1; N = 44,858)

1. The total number of exams administered from 2015 to 2017 was 239,681.
2. These results include multiple scores for the 24% of examinees who tested more than once from 2015 to 2017.
3. The numbers of exams in each racial/ethnic group add up to more than the total number of exams because racial/ethnic minority results include scores for examinees who may have designated more than one race/ethnicity. Data for examinees who reported their race/ethnicity as “other” are not shown.
4. Fee assistance eligibility is limited to examinees who are U.S. citizens or U.S. permanent residents.
5. Starting in the 2016 testing year, examinees report the highest level of education for up to four parents. These results are for the highest level of parental education for exams from 2016 to 2017.
6. Score reports do not indicate whether scores were obtained under standard or nonstandard testing conditions.
7. Repeaters are examinees who took the new MCAT exam more than once from 2015 to 2017.
How precise are examinees’ MCAT scores, and how should they be interpreted?

Four components are essential for interpreting MCAT scores: the total and section scores, the confidence bands, the percentile ranks associated with the scores, and the score profile. Figure 6 shows an example of an examinee’s score report that includes these four components. Details about the confidence bands, percentile ranks, and the score profile are included below. Other resources—including an interactive version of the score report; videos describing the concepts and reasoning skills tested by the new exam; and downloadable fact sheets describing the scores, confidence bands, percentile ranks, and score profile—can be found at aamc.org/mcatscorereport.

**Figure 6. Example score report.**

<table>
<thead>
<tr>
<th>Section</th>
<th>Score</th>
<th>Confidence Band</th>
<th>Percentile Rank of Score</th>
<th>Score Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical and Physical Foundations of Biological Systems</td>
<td>124</td>
<td>123-125</td>
<td>43%</td>
<td>118-125-132</td>
</tr>
<tr>
<td>Critical Analysis and Reasoning Skills</td>
<td>123</td>
<td>122-124</td>
<td>35%</td>
<td>118-125-132</td>
</tr>
<tr>
<td>Biological and Biochemical Foundations of Living Systems</td>
<td>127</td>
<td>126-128</td>
<td>75%</td>
<td>118-125-132</td>
</tr>
<tr>
<td>Psychological, Social, and Biological Foundations of Behavior</td>
<td>127</td>
<td>126-128</td>
<td>73%</td>
<td>118-125-132</td>
</tr>
<tr>
<td>MCAT Total</td>
<td>501</td>
<td>499-503</td>
<td>52%</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

1. Test scores, like other measurements, are not perfectly precise. The confidence bands around test scores mark the ranges in which the test taker’s true scores probably lie. The diamond shapes and shading show the test taker’s true scores are more likely to be their reported scores (in the second column) than the other scores in the confidence bands.

2. The percentile ranks of scores are the percentages of test takers who received the same scores or lower scores. The percentile ranks are updated on May 1 every year to reflect the results from previous calendar year(s).

3. For the four sections, non-overlapping confidence bands show a test taker’s likely strengths and weaknesses. Overlapping confidence bands suggest that there are not meaningful differences in performance between sections.
Confidence bands

Like other measurements, MCAT scores are imperfect measures of examinees’ true levels of preparation. They are not perfectly precise. Examinees’ scores can be dampened by factors such as fatigue, test anxiety, and less-than-optimal test room conditions, or they can be boosted by recent exposure to some of the tested topics.

Confidence bands remind admissions committee members not to overemphasize small differences in scores.

Confidence bands describe the precision of MCAT total and section scores. They show the ranges in which an examinee’s true scores probably lie. Reviewing applicants’ scores with the confidence bands in mind prevents overinterpretation of small differences in test scores.

MCAT total scores are reported with a 68% confidence band of plus or minus two points, and MCAT section scores are reported with 68% confidence bands of plus or minus one point. Adding and subtracting two points to an MCAT total score of 500, for example, defines a confidence band that begins at 498 and goes to 502. This means that in 68% of cases, the true score for an examinee with a reported score of 500 lies within the band that goes from 498 to 502.

Figures 7 and 8 illustrate how confidence bands can be used to interpret MCAT total scores. The reported score for each examinee is shown as a square. The 68% confidence band around each examinee’s score is shown by the dashed lines in the figure.

Figure 7 shows that examinee A scored 500 and examinee B scored 502. The 68% confidence bands around these scores overlap. The overlap between the two confidence bands suggests that the two reported scores may not be meaningfully different from each other.

Figure 8 shows examinee A’s score of 500 and a score of 506 for examinee C. The confidence bands around their scores do not overlap, suggesting that the two scores are more likely to be meaningfully different from each other (compared with the scores for examinees A and B).
Percentile ranks
The percentile ranks for the total and section scores show how the scores of individual applicants compare with the scores of others who took the exam. The percentile ranks show the percentages of test takers who received the same or lower scores on the exam.

For example, the MCAT total score in Figure 6 is 501. It has a percentile rank of 52%. This means that 52% of MCAT scores were equal to or less than 501.

Every year on May 1, the percentile ranks for MCAT scores are updated using data from the previous three administration years. This is a common practice in the standardized test industry and ensures that percentile ranks reflect current information about applicants’ scores. The current percentile ranks are based on data from 2015, 2016, and 2017.

Because examinees change from one year to the next, the percentile ranks associated with scale scores may change over time. Basing the percentiles on data from three administration years instead of one year makes the results more stable, but it doesn’t prevent year-to-year changes.

That is why MCAT scores have more meaning than percentile ranks. The methods that MCAT developers use to write test questions and build and equate test forms keep the meaning of scores constant over test forms and time. The exam is not graded on a curve. No matter when applicants tested, whom they tested with, or what test forms they took, their scores have common interpretations. MCAT scores describe applicants’ academic readiness in relation to the body of knowledge and skills that medical school faculty have described as prerequisite for entering medical students.

Appendix B shows the MCAT total and section score percentile ranks that will be in effect from May 1, 2018, to April 30, 2019. Again, these percentile ranks are based on the scores of everyone who took the exam in 2015, 2016, and 2017.

Score profiles
Score profiles highlight applicants’ strengths and weaknesses across the four sections of the exam through reported scores for each section. Figure 6 illustrates the score profile associated with an applicant’s MCAT section scores. Applicants’ strengths and weaknesses on the exam can be considered along with other information about their academic preparation (e.g., coursework and grades) and in relation to institutional missions and goals.
How do examinees’ scores change when they retake the MCAT exam, and how do admissions officers use scores for applicants who test more than once?

MCAT examinees can test up to three times in one calendar year and four times across two calendar years. An examinee cannot take the exam more than seven times in their lifetime. About 24% of examinees tested more than once from 2015 to 2017.

Analyses of MCAT total scores for test takers who test more than once show the types of score gains obtained by these examinees. Figure 9 uses box-and-whisker plots (described earlier for Figure 5) to show the distributions of score gains (and losses) on examinees’ second attempts at the exam, by their initial scores. These results are from examinees who initially sat for the MCAT exam from 2015 to 2017 and then tested a second time before the end of the 2017 administration year.

The data show that retesters across a wide range of scores tend to obtain higher scores on their second exams. Figure 9 shows that the median gain for examinees who tested a second time and whose initial scores ranged from 472 to 517 was two to three score points, and for examinees whose initial scores ranged from 518 to 528, it was one point. It is important to note, however, that there was considerable variation in the magnitude and direction of score changes, with some examinees posting increases or decreases greater than four points.

Figure 9. Changes in MCAT total scores between the first and second attempts for MCAT examinees from 2015 to 2017 who retested.¹

¹ These box-and-whisker plots show changes in MCAT total scores from the first to the second attempt. Twenty-four percent (N = 44,858) of examinees tested more than once from 2015 to 2017.
A recent survey asked admissions officers how they work with retesters’ MCAT total scores in the admissions process (AAMC MCAT Validity Committee unpublished data from 2017). The results showed that admissions officers use different strategies for examining retesters’ scores. For example, some admissions committees use all exam scores in conjunction with other information about academic preparation that may explain any score changes. Other admissions committees use each applicant’s most recent exam scores in the admissions process or each applicant’s “best score” as represented by the highest total score from a single attempt. Other committees compute the average total score across the multiple attempts.

It is important for admissions officers to examine the information in applicants’ transcripts and applications in interpreting retesters’ scores. For example, gains in applicants’ scores over time may be explained by their completing a postbaccalaureate program or other coursework.
How do admissions officers use MCAT scores and other application data in the holistic review of applicants’ qualifications?

MCAT scores are among many sources of application data that admissions committees use to select medical students. The scores help admissions officers interpret grades and other academic data that come from undergraduate institutions with different curricular emphases and grading standards. In addition to applicants’ academic data, admissions officers examine applicants’ experiences and demographic and personal attributes. Applicants provide a great deal of data about their academic and life experiences, demographics, and personal characteristics through their applications, personal statements, and interviews. Letter writers also provide rich information about applicants’ academic, experiential, and personal attributes.

The procedures that admissions officers from different medical schools use to review these data on applicants’ qualifications differ in ways that reflect the schools’ unique educational missions and goals as well as the sizes of their applicant pools. To learn more about the holistic review of applicants’ qualifications, the AAMC surveys admissions officers about the importance of different academic, experiential, demographic, and personal attribute data in making admissions decisions (e.g., Mitchell et al 1994; Monroe et al 2013; AAMC Admissions Initiative unpublished data from 2013; AAMC and SRA International, Inc. 2016; AAMC MCAT Validity Committee unpublished data from 2017).

Table 1 summarizes the results of a 2015 AAMC survey of admissions officers. The table highlights the importance of different types of data in admissions decision making. The results of this and previous AAMC surveys on the use and importance of data for making admissions decisions show that experiences, academic metrics, demographics, and attributes all weigh heavily in decisions to offer acceptances (Dunleavy et al 2011; AAMC Admissions Initiative unpublished data from 2013).

More recently, admissions officers were surveyed about the relative weight they give to undergraduate grade point averages (GPAs) and MCAT scores compared with other information in each applicant’s file to learn how they place these metrics in context at different stages of the admissions process. Gathering richer data about applicants’ experiences and attributes enhanced admissions officers’ understanding of how these factors shape applicants’ readiness for medical school (AAMC MCAT Validity Committee unpublished data from 2017).

The importance of undergraduate GPAs and MCAT scores, relative to other criteria, decreases as more information is gathered. Admissions officers are better able to balance data about academic metrics when they are placed in the context of applicants’ experiences and attributes. For example, in moving from interview invitations to acceptance offers, a third more admissions officers rated other criteria just as or more important than undergraduate GPAs and MCAT scores; that is, 60% of admissions officers rated other criteria just as or more important in inviting applicants to interview, whereas 80% rated other criteria just as or more important in making acceptance offers. Placing applicants’ MCAT scores in the context of all the applicants’ information during the admissions process enables medical schools to meet their missions and goals and not overlook students who would make valuable contributions.
Table 1. Mean Importance Ratings of Academic, Experiential, Demographic, and Interview Data Used by Admissions Committees for Making Decisions About Which Applicants Receive Interview Invitations and Acceptance Offers

<table>
<thead>
<tr>
<th>Mean Importance Ratings</th>
<th>Academic Metrics</th>
<th>Experiences</th>
<th>Demographics</th>
<th>Other Data</th>
</tr>
</thead>
</table>
| Highest Importance Ratings (≥3.0) | • GPA: cumulative biology, chemistry, physics, and math  
  • MCAT total score  
  • GPA: grade trend  
  • GPA: cumulative total  
  • GPA: cumulative total from postbaccalaureate premedical program  
  • MCAT total score trend  
  • Completion of premedical course requirements | • Community service/volunteer: medical/clinical  
  • Community service/volunteer: not medical/clinical  
  • Physician shadowing/clinical observation  
  • Leadership | • U.S. citizenship/permanent residency (Public)³  
  • State residency (Public)³  
  • Rural/urban underserved background | • Interview results⁴ |
| Medium Importance Ratings (≥2.5 and <3.0) | • Completion of challenging upper-level science courses  
  • GPA: cumulative “all other” (not biology, chemistry, physics, and math) | • Paid employment: medical/clinical  
  • Research/lab  
  • Other extracurricular activities  
  • Military service | • Race/ethnicity  
  • U.S. citizenship/permanent residency (Private)³  
  • Parental education/occupation/socioeconomic status (SES) | |
| Lowest Importance Ratings (<2.5) | • Degree from graduate or professional program  
  • Completion of challenging nonscience courses  
  • Selectivity of undergraduate institution(s)  
  • Undergraduate major | • Teaching/tutoring/teaching assistant  
  • Paid employment: not medical/clinical  
  • Intercollegiate athletics  
  • Honors, awards, recognition  
  • Conferences attended, presentations, posters, publications | • First-generation immigrant status  
  • Fluency in multiple languages  
  • Gender  
  • English language learners  
  • State residency (Private)³  
  • Legacy status  
  • Community college attendance  
  • Age | |

1. Admissions officers at 130 medical schools completed the 2015 AAMC survey. The survey asked, “How important were the following data about academic preparation, experiences, attributes/personal competencies, biographic/demographic characteristics, and interview results in identifying the applicants to [interview, offer an acceptance]?”

2. Importance was rated on a scale ranging from 1 to 4 ("Not Important," "Somewhat Important," "Important," and "Very Important," respectively). For each variable, we computed an overall mean importance rating based on admissions officers’ ratings of importance for making decisions about whom to interview and whom to accept (the mean importance rating for the interview variable is the exception to this rule because interview data were not available until applicants were invited to interview). We chose to classify variables using overall mean importance ratings because their mean importance ratings were similar for the interview and the acceptance phases. Variables are ordered by overall mean importance rating.

3. Overall mean importance ratings for public and private institutions were significantly different from one another.

4. Only available at the admissions stage where admissions committees make a decision to offer an acceptance.
National-level data on the academic credentials of applicants whom admissions committees accept reinforce the messages the survey data provide. Table 2 shows the percentages of applicants with different undergraduate GPAs and MCAT total scores who were accepted into one or more medical schools in 2017. These data show that although undergraduate GPAs and MCAT scores are important factors in admissions, they are not the sole determinants of admissions decisions.

Each year, some applicants with high MCAT scores and undergraduate (GPAs) are rejected by all the medical schools to which they applied. In contrast, other applicants with more modest MCAT scores and undergraduate GPAs are accepted by at least one medical school. For example, in 2017 student selection, 11% of applicants with GPAs of 3.8 or above and MCAT total scores of 518 or above were rejected by all of the medical schools to which they applied. In contrast, about 14% of applicants with GPAs of 3.0 to 3.19 and MCAT total scores ranging from 498 to 501 were accepted by at least one medical school.

Table 2. Percentage and Number of 2017 Applicants Accepted Into at Least One Medical School, by MCAT Total Score and Undergraduate GPA Range

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>3.80–4.00</td>
<td>4%</td>
<td>5%</td>
<td>10%</td>
<td>21%</td>
<td>54%</td>
<td>54%</td>
<td>54%</td>
<td>67%</td>
<td>76%</td>
<td>85%</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td>2/51</td>
<td>5/98</td>
<td>10/234</td>
<td>44/1152</td>
<td>53/1,040</td>
<td>920/1,692</td>
<td>1,538/2,310</td>
<td>1,587/2,461</td>
<td>1,798/2,112</td>
<td>1,792/2,014</td>
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</tr>
<tr>
<td>3.60–3.79</td>
<td>0%</td>
<td>1%</td>
<td>5%</td>
<td>15%</td>
<td>26%</td>
<td>38%</td>
<td>76%</td>
<td>68%</td>
<td>76%</td>
<td>85%</td>
<td>48%</td>
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<tr>
<td></td>
<td>0/126</td>
<td>1/323</td>
<td>5/2442</td>
<td>129/867</td>
<td>366/1,430</td>
<td>764/1,996</td>
<td>1,197/2,225</td>
<td>1,388/2,040</td>
<td>987/1,301</td>
<td>639/755</td>
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</tr>
<tr>
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<td>2%</td>
<td>1%</td>
<td>4%</td>
<td>10%</td>
<td>21%</td>
<td>29%</td>
<td>479/1,635</td>
<td>661/1,659</td>
<td>55%</td>
<td>65%</td>
<td>33%</td>
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<td></td>
<td>2/483</td>
<td>1/293</td>
<td>5/2255</td>
<td>100/955</td>
<td>265/1,286</td>
<td>613/1,659</td>
<td>1,261/2,040</td>
<td>1,388/2,040</td>
<td>1,550/2,014</td>
<td>1,044/1,024</td>
<td>33%</td>
</tr>
<tr>
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<td>0%</td>
<td>3%</td>
<td>9%</td>
<td>18%</td>
<td>24%</td>
<td>279/873</td>
<td>257/613</td>
<td>176/314</td>
<td>63/109</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>0/226</td>
<td>0/136</td>
<td>5/4527</td>
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<td>279/873</td>
<td>255/631</td>
<td>176/314</td>
<td>63/109</td>
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</tr>
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<td>9%</td>
<td>18%</td>
<td>24%</td>
<td>32%</td>
<td>40%</td>
<td>56%</td>
<td>85%</td>
<td>42%</td>
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<td>35%</td>
<td>98/282</td>
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<td>14/79</td>
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<td>2/501</td>
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<td>6/14/233</td>
<td>34/203</td>
<td>25%</td>
<td>30%</td>
<td>29%</td>
<td>59/149</td>
<td>42%</td>
</tr>
<tr>
<td>2.60–2.79</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>6%</td>
<td>18/58</td>
<td>18/107</td>
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<td></td>
<td>0/157</td>
<td>0/217</td>
<td>0/527</td>
<td>12/238</td>
<td>6/14/233</td>
<td>34/203</td>
<td>25%</td>
<td>30%</td>
<td>29%</td>
<td>59/149</td>
<td>42%</td>
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<tr>
<td>2.40–2.59</td>
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<td></td>
<td>0/118</td>
<td>0/217</td>
<td>0/527</td>
<td>12/238</td>
<td>6/14/233</td>
<td>34/203</td>
<td>25%</td>
<td>30%</td>
<td>29%</td>
<td>59/149</td>
<td>42%</td>
</tr>
<tr>
<td>2.20–2.39</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>6%</td>
<td>18/58</td>
<td>18/107</td>
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<td>40%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>0/69</td>
<td>0/217</td>
<td>0/527</td>
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<td>6/14/233</td>
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<td>25%</td>
<td>30%</td>
<td>29%</td>
<td>59/149</td>
<td>42%</td>
</tr>
<tr>
<td>2.00–2.19</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>6%</td>
<td>18/58</td>
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<td></td>
<td>0/41</td>
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<td>25%</td>
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<td>59/149</td>
<td>42%</td>
</tr>
<tr>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>6%</td>
<td>18/58</td>
<td>18/107</td>
<td>17/36</td>
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<td></td>
<td>0/15</td>
<td>0/217</td>
<td>0/527</td>
<td>12/238</td>
<td>6/14/233</td>
<td>34/203</td>
<td>25%</td>
<td>30%</td>
<td>29%</td>
<td>59/149</td>
<td>42%</td>
</tr>
<tr>
<td>All</td>
<td>1%</td>
<td>1%</td>
<td>4%</td>
<td>11%</td>
<td>22%</td>
<td>36%</td>
<td>274/717</td>
<td>3,832/7,17</td>
<td>64%</td>
<td>75%</td>
<td>84%</td>
</tr>
<tr>
<td></td>
<td>8/1,481</td>
<td>20/1,576</td>
<td>45/2,556</td>
<td>458/4,051</td>
<td>1,24/5,517</td>
<td>2,574/7,188</td>
<td>3,832/7,17</td>
<td>64%</td>
<td>75%</td>
<td>84%</td>
<td>62/1,042</td>
</tr>
</tbody>
</table>

Notes:
1. Blue shading = acceptance rates ≥ 75%; green shading = acceptance rates of 50–74%; orange shading = acceptance rates of 25–49%.
2. Dashes = cells with fewer than 10 observations; blank cells = cells with 0 observations.
3. For students who took the MCAT exam multiple times, the most recent MCAT total score was used in this analysis.
4. Table summarizes data for 2017 applicants who reported MCAT scores from the current exam and undergraduate GPAs (N = 44,802). About 87% of 2017 applicants applied with scores from the current version of the MCAT exam.
How well do undergraduate GPAs and MCAT scores predict students’ performance in medical school?

Predictive validity data are available for the students who entered medical school in 2016 with scores from the current version of the MCAT exam, introduced in 2015. These 2016 entrants provide the first panel of data showing how well scores from this exam predict year 1 performance in medical school. Nationally, more than 8,000 students entered medical school in 2016 with these scores.

Overall, 97% of 2016 entrants with scores from the current version of the MCAT exam did well in their first year and progressed to year 2 without delay, the first hurdle in completing medical school with unimpeded progress. Figure 10 shows that students with a wide range of MCAT scores progressed. It shows the percentage of entrants at different ranges of the MCAT total score scale who progressed to year 2 without delay. Medical students who entered with scores of 494 and above showed similar, high progression rates.

Figure 10. Percentages of 2016 entering students admitted with scores from the current MCAT exam who progressed to year 2 without delay, by MCAT total score range.

Medical school faculty evaluate student learning with multiple types of performance outcomes from matriculation through graduation, tailoring their assessments to their school’s curriculum, academic support, and learning environment. Researchers from 18 medical schools in the United States and Canada, referred to here as validity schools, partnered with the AAMC to examine how well scores from the MCAT exam predict student success in their medical schools, measuring success on local performance outcomes. These predictive validity data will help admissions committees, faculty, and stakeholders from other institutions understand how MCAT scores may contribute to decisions about the academic preparation needed to be ready for medical school.
The schools studied how well MCAT total scores and undergraduate GPAs correlated with institution-specific performance in the first year of medical school. Each school identified year 1 courses that have reliable performance measures and defined summative performance as the mean performance across these courses. Then, at each validity school, students’ MCAT total scores were correlated with their summative performance in the first year of medical school. The same analysis was done within each of those schools for undergraduate GPAs. Finally, an analysis was conducted on the joint contribution of MCAT total scores and undergraduate GPAs in predicting students’ summative performance in year 1.

Figure 11 shows the value of MCAT total scores and undergraduate GPAs, alone and together, in predicting students’ summative performance in the first year of medical school. It shows the distributions of correlations of MCAT total scores and undergraduate GPAs with students’ summative performance in year 1 at the validity schools. It also shows the distributions of correlations of MCAT total scores and undergraduate GPAs combined with students’ summative performance in year 1. These findings are based on data from about 1,000 medical students who matriculated at validity schools in 2016 with scores from the current MCAT exam and volunteered for the study.

1. These data are for the 15 validity schools with summative year 1 outcomes. MCAT total scores were correlated with students’ performance across year 1 course scores on a scale of 0 to 100. Analyses were conducted within schools. Sample correlations were corrected for range restriction on MCAT total scores and total undergraduate GPAs due to student selection in the admissions process (Betty et al 2014) but not for unreliability in MCAT total scores or medical student outcomes. Corrections for range restriction were made at the institution level. At each medical school, the applicants within each cohort year served as the reference population. Using established statistical methods, the observed correlations were adjusted to reflect what the correlations would be if there had been no selection—that is, if all students had been selected for admission. The median corrected correlation is shown with a diamond, and the two ends of the gray bar show the correlations at the 25th and 75th percentiles. The horizontal line at a correlation of 0.3 shows the threshold for a medium effect size in the social sciences.
The left panel in Figure 11 shows the correlations of MCAT total scores with summative performance at individual validity schools. The correlations were ranked from low to high. The median corrected correlation (the correlation at the 50th percentile) is shown with a diamond, and the two ends of the gray bar show the correlations at the 25th and 75th percentiles. The horizontal line at a correlation of 0.3 shows the threshold for a medium effect size in the social sciences (Cohen 1992).³

The middle panel in Figure 11 shows the distribution of correlations across validity schools of students’ undergraduate GPAs with their summative performance in year 1. Finally, the right panel in Figure 11 shows the distribution of correlations across validity schools of MCAT total scores and undergraduate GPAs combined in predicting summative performance in year 1.

Overall, the correlations of MCAT total scores with summative performance in year 1 are medium to large at validity schools that provided year 1 data for the 2016 entrants with scores from this version of the exam. The correlations of undergraduate GPAs with summative performance in year 1 are also medium to large. Figure 11 shows that the combination of MCAT total scores and undergraduate GPAs provides better prediction of performance in the first year of medical school than either one alone.

Importantly, the current and previous research shows that using MCAT scores and GPAs to assess academic readiness provides a better prediction of future performance in medical school than using any single academic metric.

---

Using MCAT total scores and undergraduate GPAs provides better prediction of performance in the first year of medical school than using either one alone.

---

These findings are consistent with those from the previous version of the MCAT exam, which show the value of scores from the old MCAT exam in predicting students’ performance in medical school (Donnon et al 2007; Dunleavy et al 2013; Julian 2005; Koenig and Wiley 1997; Kroopnick et al 2013; Kuncel and Hezlett 2007). Studies show that undergraduate grades and scores from the old MCAT exam predict students’ grades in medical school, academic difficulty or distinction, scores on USMLE Step exams, time to graduation, and unimpeded progress toward graduation. Future research will examine how well scores from this version of the MCAT exam predict these same outcomes as medical students in the current study make their way through medical school.
The median correlation of MCAT scores with summative performance in year 1 in Figure 11 comes from a single medical school in the validity study. Data from the students at this school can be used to study the association of MCAT scores with student performance more closely. Figures 12 and 13 use the associations of MCAT scores with students’ performance at this medical school to illustrate the patterns that may occur at other schools that use these or similar performance outcomes.

Figure 12 shows data, from this validity school, about students’ progression to year 2 without delay by MCAT total score range. Mirroring the national results, at this school, the vast majority of students progressed to year 2. Overall, 96% of 2016 entering medical students at this validity school with scores from the current MCAT exam progressed to year 2 without delay.

Figure 12. Percentage of 2016 entering students admitted with scores from the current MCAT exam progressing to year 2 without delay, by MCAT total score range, for the validity school from Figure 11 representing the median correlation of MCAT total scores with summative performance in year 1.¹

1. The results are for the 92 medical students who entered with scores from this version of the MCAT exam at this validity school in 2016. The highlighted x-axis labels remind readers that these results are based on very small numbers of medical students.
Figure 13 shows this validity school’s students’ summative performance in year 1, again by MCAT total score range. The diamonds show the median performance of students at each score range, and the circles show the summative performance of each student at this school, in this class, participating in the validity study. The data in Figure 13 highlight three important findings. First, this validity school accepts students with a wide range of MCAT total scores. Second, students admitted with higher MCAT total scores, on average, showed higher performance across year 1 courses. Finally, at every score range, there was variability in medical student performance. Some students showed higher performance in medical school than others admitted with the same scores, while others showed lower performance. And, some students with lower MCAT scores outperformed others with higher MCAT scores.

**Figure 13. Distribution of summative performance in year 1, by MCAT total score range, for those students participating in the validity study at the school from Figure 11 representing the median correlation of MCAT scores with summative performance in year 1.**

1. The results are for the 84 medical students who entered with scores from this version of the MCAT exam at this validity school in 2016 and who volunteered to participate in the predictive validity study. Gray dots indicate an individual’s summative performance in year 1; diamonds indicate the median for that score range.

Each medical school admits classes of students that will help meet its educational, research, community service, and health care mission and goals by carefully considering the rich and assorted data that applicants provide about their experiences, attributes, and academic preparation. Faculty educate students using curricula, academic support, and a learning environment tailored to their educational goals and students’ needs. In place at each medical school are also different levels of academic, emotional, and wellness support services (see, for example, Elks et al 2018). Results from this validity research show that MCAT scores are only one signal of students’ likely success, and that other factors might have shaped their performance as well.
Together, the information in this section shows that the MCAT exam is doing its job in assessing academic readiness for medical school. Figure 11 shows that MCAT total scores, alone and together with undergraduate GPAs, demonstrate value in predicting applicants’ likely performance across year 1 courses. These data also reinforce that medical schools support the students they admit—nationally, 97% of 2016 entrants admitted with scores from this version of the exam progressed to year 2 without delay. Admissions committees select students who will succeed at their schools, and then these schools support the students they admit—academically, socially, and in other ways. The academic, social, financial, and other support offered by each medical school provides the environment where students can learn.

This is the first large-scale study on the predictive validity of scores from the current version of the MCAT exam. The preliminary results are promising. They support the use of MCAT scores, together with other application data that are important for admissions decisions. However, there is a lot more to learn about how students fare in the remaining years of medical school and whether they graduate on time according to each medical school’s curriculum. The section that follows describes the overall research agenda and timelines for providing updates on this validity research. Future reports will summarize the research into the predictive validity of MCAT scores for performance in later years of medical school and include findings based on data from additional cohorts of medical students.
What else will we learn about the fairness, impact, use, and predictive validity of the MCAT exam?

This section describes the full scope of research being conducted on the MCAT exam, including three specific areas of inquiry: 1) diversity, fairness, and academic preparation, 2) admissions decision making, and 3) predicting medical student performance.

The predictive validity research presented in the previous section is only part of the work that researchers are doing to evaluate the MCAT exam. Admissions officers and researchers from 21 medical schools and prehealth advisors from two undergraduate institutions are researching the validity of the exam. Table 3 shows the schools represented on the two committees conducting this research.

Table 3. Medical Schools Represented on the Two MCAT Validity Committees

<table>
<thead>
<tr>
<th>Participating Medical School</th>
<th>Psychological, Social, and Biological Foundations of Behavior Validity Committee</th>
<th>MCAT Validity Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston University School of Medicine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Columbia University Vagelos College of Physicians and Surgeons</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>East Tennessee State University James H. Quillen College of Medicine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Meharry Medical College</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Memorial University of Newfoundland Faculty of Medicine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Morehouse School of Medicine</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Philadelphia College of Osteopathic Medicine</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Rutgers Robert Wood Johnson Medical School</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Saint Louis University School of Medicine</td>
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<td></td>
</tr>
<tr>
<td>Stanford University School of Medicine</td>
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<td></td>
</tr>
<tr>
<td>The Ohio State University College of Medicine</td>
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<tr>
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<tr>
<td>Tulane University School of Medicine</td>
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</tr>
<tr>
<td>University of Arizona College of Medicine - Tucson</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>University of Calgary Cumming School of Medicine</td>
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<tr>
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<tr>
<td>Uniformed Services University of the Health Sciences F. Edward Hébert School of Medicine</td>
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</table>

Note: Prehealth advisors from Colgate University and Meredith College are also members of the MCAT Validity Committee.
The MCAT Validity Committee is examining the fairness, use, impact, and predictive value of scores from the MCAT exam.

The validity research agenda includes research questions about how the exam is used and its impact on examinees, applicants, medical students, and medical school admissions committees.

For example, one of the major goals of this research is to determine how well scores from the MCAT exam predict performance in medical school. Predictive validity research began in 2013, when a committee of researchers from 11 medical schools started collaborating with the AAMC to examine the predictive validity of scores from the Psychological, Social, and Biological Foundations of Behavior section of the exam. This early research was especially important because this section tested concepts and reasoning skills not previously tested on the MCAT exam. This study was designed to help admissions committees, faculty, and other stakeholders understand how scores from the Psychological, Social, and Biological Foundations of Behavior section of the MCAT exam may contribute to decisions about the academic preparation needed to be ready for medical school and to provide these findings in time for the 2016 admissions cycle—the first cycle in which applicants reported scores from this version of the exam.

The MCAT Validity Committee has continued and expanded this research. In addition to studying the predictive validity of total and section scores, the MCAT Validity Committee is carefully studying how students prepare for and perform on the exam and whether there are ways to improve the information and resources available to students. These researchers will also study the ways that MCAT scores are used with other information about academic preparation, experiences, and attributes in admissions decision making.
Figure 14 shows the three areas of investigation in the MCAT validity research agenda along with sample research questions. Early findings are reported in this guide, and the next few pages provide more information about future work in each area. The AAMC’s website contains a report that describes the research agenda in more detail (aamc.org/mcatvalidityresearch).

**Figure 14. MCAT validity research agenda: the three areas of investigation and sample research questions.**

<table>
<thead>
<tr>
<th>Diversity, Fairness, and Academic Preparation</th>
<th>Admissions Decision Making</th>
<th>Predicting Academic Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do scores from the new MCAT exam predict academic performance equally well for students from different demographic groups?</td>
<td>Do admissions committees balance the weight of MCAT scores with experiences, attributes, and demographics?</td>
<td>Do scores from the new MCAT exam predict academic performance in all four years of medical school?</td>
</tr>
</tbody>
</table>

**Diversity, fairness, and academic preparation**

The MCAT Validity Committee has begun examining data related to diversity, fairness, and academic preparation. It is monitoring trends in the sociodemographic makeup of examinees who take the exam. The committee is also looking closely at average differences in MCAT scores for examinees from different sociodemographic groups compared with differences on the old exam and on other standardized tests. The committee is studying whether scores from the MCAT exam predict performance equally well for medical students from different sociodemographic backgrounds.

The MCAT Validity Committee is also exploring academic preparation trends, including coursework and other ways of learning the prerequisite knowledge and skills for medical school, such as reading on one’s own or participating in study groups. The committee is looking carefully at differences in preparation for examinees from different sociodemographic backgrounds to understand how the opposing forces of academic preparation and a disadvantaged environment influence test scores. Understanding these factors will help the committee look for ways to improve the information and resources available to educationally disadvantaged students.
Admissions decision making
Research on the use of MCAT scores in admissions decision making is underway. The committee is studying how admissions officers and their committees work with the MCAT scores in the first admissions cycles in which applicants submitted scores from this version of the MCAT exam.

The MCAT Validity Committee administered a survey in the summer of 2017 to gather data about the use of this version of the MCAT exam in medical school admissions processes, admissions decisions, and how scores from the exam are being used. This survey was administered at the close of the 2017 admissions cycle, after admissions committees had worked for two years with scores from the exam. Some of the results from this survey are described on page 13.

Predicting students’ academic performance in medical school
Two committees are conducting research to examine the value of total and section scores from the MCAT exam in predicting students’ academic performance in medical school. Early research was conducted on scores from the Psychological, Social, and Biological Foundations of Behavior section to help admissions officers use scores from this section in the first few years after this version of the MCAT exam was introduced. The MCAT Validity Committee is continuing this research, examining the value of all four section scores, as well as the total scores, in predicting students’ academic performance in all four years of medical school.

The 18 medical schools participating in the MCAT validity research are collecting medical student performance data from entry through graduation for students who entered medical school in 2016 and 2017 with scores from this version of the exam. They are examining the association of MCAT scores with academic performance in medical school courses and clerkships, performance on USMLE Step exams, progression through medical school, time to graduation, and graduation rates. These data will be reported on a regular basis, beginning with data about the correlation of MCAT scores with academic performance in students’ initial courses described on pages 16–21 of this guide.

The individual medical school, or local, data will answer questions about the association of MCAT scores with outcomes tied to the medical school curriculum, such as student performance in courses, on locally maintained tests, and on important markers of progression throughout the curriculum.

The value of the local data is that they allow MCAT scores to be seen in the context of an individual medical school with its unique mission, characteristics, curriculum, support, and student body.

The research design for the predictive validity studies also includes national-level data. The national data will answer questions about the value of MCAT scores in predicting the performance of medical students attending all U.S. M.D.-granting schools. The MCAT Validity Committee will study the associations of MCAT scores with national outcomes such as performance on the licensure exams, withdrawal or dismissal for academic reasons, and completing medical school with unimpeded progress. These national outcomes have meaning for all U.S. medical schools, but they cannot answer questions about things that are important to an individual medical school.
What is the timeline for releasing key findings from the MCAT validity research?

Studying the fairness, impact, use, and predictive validity of the MCAT exam will take time. Figure 15 shows the timeline for conducting research on examinees, applicants, and medical students who took this version of the MCAT exam. The association between MCAT scores and academic performance in year 1 of medical school were available at the end of 2017 and are reported in this guide, and year 2 findings will first be available at the end of 2018. As shown in Figure 15, it will take several years to see how well MCAT scores predict graduation in four or five years.

Figure 15. Timeline for the MCAT validity research agenda.

In addition to data-based reports, the MCAT Validity Committee will share information about the overarching research agenda and goals; its work to define the societal, procedural, and exam fairness that guides their research; and its work to identify the factors that may affect the predictive validity of MCAT scores at schools that vary in their curricula, missions and goals, applicant pools, and other characteristics.

Each year, this guide to using MCAT scores in medical student selection will include updated findings. In addition, new data and research reports will be posted on the Admissions Hub of the AAMC website (aamc.org/admissions), released in peer-reviewed publications, and presented at regional and national meetings. The AAMC invites admissions officers and their committees (as well as other stakeholders) to share the types of research questions that the MCAT Validity Committee should consider as it carries out its research agenda (mcatvalidity@aamc.org).
Notes

1. At each school, the summative measure of performance correlated highly with medical students’ year 1 GPAs or class ranks.

2. Corrections for range restriction were made at the institution level. At each medical school, the applicants within each cohort year served as the reference population. Using established statistical methods, the observed correlations were adjusted to reflect what the correlation would be if there had been no selection—that is, if all students had been selected for admission.

3. According to Cohen (1992), a correlation coefficient of 0.10 is considered a small association; a correlation coefficient of 0.30 is considered a medium correlation; and a correlation of 0.50 or greater is considered a large correlation.

References


Association of American Medical Colleges, SRA International, Inc. Survey of Admissions Officers About the Use and Importance of Medical College Admission Test (MCAT) Scores in Medical School Admissions: U.S. Data Display and Table Survey Results. Washington, DC: AAMC; 2016.


Appendix A. Description of the Foundational Concepts, Scientific Inquiry and Reasoning Skills, and Information-Processing Skills Tested on the Four Sections of the MCAT Exam

Appendix A provides descriptions of the foundational concepts, content categories, and ways that examinees demonstrate their scientific inquiry and reasoning skills on the three sections of the MCAT exam that assess academic preparation in the natural, behavioral, and social sciences. It also describes the ways that examinees demonstrate their information-processing skills in the Critical Analysis and Reasoning Skills section.

The concepts tested in each section align with concepts medical school faculty, residents, and medical students rated as important to the success of entering students. They are organized around the academic competencies described by seminal reports such as the *Scientific Foundations for Future Physicians* (2009) and the *Behavioral and Social Science Foundations for Future Physicians* (2011). To read more about the quantitative and qualitative research that supports the design and development of the MCAT exam, visit aamc.org/mr5mcatcollection and see Schwartzstein et al 2013.
**Biological and Biochemical Foundations of Living Systems**

Medical school applicants must be prepared to learn about the biological and biochemical concepts that contribute to health and disease. When they enter medical school, they must be ready to learn how:

- The major biochemical, genetic, and molecular functions of the cell support health and lead to disease
- Cells grow and integrate to form tissues and organs that carry out essential biochemical and physiological functions
- The body responds to internal and external stimuli to support homeostasis and the ability to reproduce

The Biological and Biochemical Foundations of Living Systems section tests three foundational concepts and several reasoning skills that are building blocks for learning in medical school. This section asks examinees to solve problems by combining their knowledge of foundational concepts from biology, biochemistry, general chemistry, and organic chemistry with their scientific inquiry and reasoning skills.

Figure A.1 lists the foundational concepts and the more specific content categories tested within each foundational concept. It also provides examples of the ways examinees are asked to combine their knowledge of foundational concepts with their scientific reasoning skills to answer test questions in this section.

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<table>
<thead>
<tr>
<th>Foundational Concept 1</th>
<th>Foundational Concept 2</th>
<th>Foundational Concept 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomolecules have unique properties that determine how they contribute to the structure and function of cells and how they participate in the processes necessary to sustain life.</td>
<td>Highly organized assemblies of molecules, cells, and organs interact to carry out the functions of living organisms.</td>
<td>Complex systems of tissues and organs sense the internal and external environments of multicellular organisms, and through integrated functioning, maintain a stable internal environment within an ever-changing external environment.</td>
</tr>
</tbody>
</table>

**Content Categories**

- Structure and functions of protein and their constituent amino acids
- Transmission of genetic information from the gene to the protein
- Transmission of heritable information from generation to generation and the processes that increase genetic diversity
- Principles of bioenergetics and fuel molecule metabolism

- Assemblies of molecules, cells, and groups of cells within singular cellular and multicellular organisms
- The structure, growth, physiology, and genetics of prokaryotes and viruses
- Processes of cell division, differentiation, and specialization

- Structure and functions of the nervous and endocrine systems and ways in which the systems coordinate the organ systems
- Structure and integrative functions of the main organ systems

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Questions in this section of the test ask examinees to combine their knowledge of the foundational concepts listed above with their scientific inquiry and reasoning skills. Questions on this section might ask examinees to:

- Recall the structural characteristics of two tissues and relate them to one another
- Apply their understanding of Le Châtelier’s Principle to explain differences in deprotonation of organic acids when added to blood vs. pure water
- Use knowledge of adaptive immune response to evaluate the acceptability of a treatment for use in a clinical context
- Form a hypothesis about the effect of the pineal gland on thermogenesis based on the data from an experiment investigating the interaction of temperature and pineal gland activity on body and organ weights for hamsters under different experimental conditions
- Use data about wavelength and light absorption to determine the color perception of an individual with a given phenotype
Chemical and Physical Foundations of Biological Systems

Medical school applicants must be prepared to learn about the mechanical, physical, and biochemical functions of human tissues, organs, and organ systems and how these contribute to health and disease. When they enter medical school, they must be ready to learn about:

- The physiological functions of the respiratory, cardiovascular, and neurological systems in health and disease
- Molecular and cellular functions in health and disease

The Chemical and Physical Foundations of Biological Systems section tests two foundational concepts and several reasoning skills that are building blocks for learning in medical school. This section asks test takers to solve problems by combining their knowledge of foundational concepts from biology, biochemistry, physics, and general and organic chemistry with their scientific inquiry and reasoning skills.

Figure A.2 lists the foundational concepts and content categories tested in this section. It also provides examples of the ways examinees are asked to combine their knowledge of foundational concepts with their scientific inquiry and reasoning skills to answer test questions on the Chemical and Physical Foundations of Biological Systems section.

**Figure A.2. Foundational concepts, content categories, and scientific inquiry and reasoning skills tested on the Chemical and Physical Foundations of Biological Systems section.**

<table>
<thead>
<tr>
<th>Foundational Concept 4</th>
<th>Foundational Concept 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex living organisms transport materials, sense their environment, process signals, and respond to changes using processes that can be understood in terms of physical principles.</td>
<td>The principles that govern chemical interactions and reactions form the basis for a broader understanding of the molecular dynamics of living systems.</td>
</tr>
</tbody>
</table>

**Content Categories**

- Translational motion, forces, work, energy, and equilibrium in living systems
- Importance of fluids for the circulation of blood, gas movement, and gas exchange
- Electrochemistry and electrical circuits and their elements
- How light and sound interact with matter
- Atoms, nuclear decay, electronic structure, and atomic chemical behavior

**Content Categories**

- Unique nature of water and its solutions
- Nature of molecules and intermolecular interactions
- Separation and purification methods
- Structure, function, and reactivity of biologically relevant molecules
- Atoms, nuclear decay, electronic structure, and atomic chemical behavior

Questions in this section of the test ask examinees to combine their knowledge of the foundational concepts listed above with their scientific inquiry and reasoning skills. Questions on this section might ask examinees to:

- Identify the relationship between the distribution of electric charges in the axon and the electric field lines they produce
- Recognize the principles of flow characteristics of blood in the human body and apply the appropriate mathematical model to an unfamiliar scenario
- Change the experimental conditions of a test for proteins in a solution to prevent the formation of precipitates
- Select between the standard and Doppler ultrasound techniques for a given context, considering the appropriateness, precision, and accuracy of each technique
- Use, analyze, and interpret data in a graph to determine the half-life of a radioactive substance used to measure cardiac function
Psychological, Social, and Biological Foundations of Behavior

Medical school applicants must be prepared to learn about the impact of behavioral and sociocultural factors on illness and health outcomes. When they enter medical school, they must be ready to learn how:

- Cognitive and perceptual processes influence the understanding of health and illness
- Behavior can either support health or increase risk for disease
- Perception, attitudes, and beliefs influence interactions with patients and other members of the health care team
- Patients’ social and demographic backgrounds influence their perceptions of health and disease, the health care team, and therapeutic interventions
- Social and economic factors can affect access to care and the probability of maintaining health and recovering from disease

The Psychological, Social, and Biological Foundations of Behavior section tests five foundational concepts and several reasoning skills in the behavioral and social sciences that are building blocks for learning in medical school. This section tests the foundational concepts in psychology, sociology, and biology that tomorrow’s doctors need to serve an increasingly diverse population and have a clear understanding of the impact of behavior and sociocultural differences on health. Like the natural sciences sections, this section asks test takers to solve problems by combining their knowledge of foundational concepts with their scientific inquiry and reasoning skills. It does not measure applicants’ interpersonal skills, the way they will behave, or their attitudes and beliefs about social issues.

Figure A.3 lists the foundational concepts tested in this section. It also provides examples of the ways examinees are asked to combine their knowledge of foundational concepts with their scientific inquiry and reasoning skills to answer test questions on the Psychological, Social, and Biological Foundations of Behavior section.

**Figure A.3. Foundational concepts, content categories, and scientific inquiry and reasoning skills tested on the Psychological, Social, and Biological Foundations of Behavior section.**

<table>
<thead>
<tr>
<th>Foundational Concept 6</th>
<th>Foundational Concept 7</th>
<th>Foundational Concept 8</th>
<th>Foundational Concept 9</th>
<th>Foundational Concept 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological, psychological, and sociocultural factors influence the ways that individuals perceive, think about, and react to the world.</td>
<td>Biological, psychological, and sociocultural factors influence behavior and behavior change.</td>
<td>Psychological, sociocultural, and biological factors influence the way we think about ourselves and others.</td>
<td>Cultural and social differences influence well-being.</td>
<td>Social stratification and access to resources influence well-being.</td>
</tr>
<tr>
<td><strong>Content Categories</strong></td>
<td><strong>Content Categories</strong></td>
<td><strong>Content Categories</strong></td>
<td><strong>Content Categories</strong></td>
<td><strong>Content Categories</strong></td>
</tr>
<tr>
<td>Sensing the environment</td>
<td>Individual influences on behavior</td>
<td>Self-identity</td>
<td>Understanding social structure</td>
<td></td>
</tr>
<tr>
<td>Making sense of the environment</td>
<td>Social processes that influence human behavior</td>
<td>Social thinking</td>
<td>Demographic characteristics and processes</td>
<td></td>
</tr>
<tr>
<td>Responding to the world</td>
<td>Attitude and behavior change</td>
<td>Social interactions</td>
<td>Social inequity</td>
<td></td>
</tr>
</tbody>
</table>

Questions in this section of the test ask examinees to combine their knowledge of foundational concepts listed above with their scientific inquiry and reasoning skills. Questions on this section might ask examinees to:

- Draw conclusions about the type of memory affected by an experimental manipulation when shown a graph of findings from a memory experiment
- Reason about whether a causal explanation is possible when given an example of how personality predicts individual behavior
- Distinguish the kinds of claims that can be made when using longitudinal data, cross-sectional data, or experimental data in studies of social interaction
- Identify the relationship between demographic variables and health variables reported in a table or figure
- Identify the relationship between social institutions that is suggested by an illustration used in a public health campaign
Critical Analysis and Reasoning Skills

The structure of the Critical Analysis and Reasoning Skills section is different from the structure of the other sections of the exam. It asks applicants to process information, solve problems, and draw conclusions from information that is presented in passages. Medical students are required to comprehend and analyze a great deal of information in different contexts, and this section has been developed specifically to assess the information-processing skills an applicant will need to be successful in medical school.

The Critical Analysis and Reasoning Skills section tests how well applicants comprehend, analyze, and evaluate what they read; draw inferences from text; and apply arguments to new ideas and situations. It tests examinees’ ability to process information by having them read passages from a diverse set of disciplines in the humanities and social sciences. These passages are excerpted from the kinds of books, journals, and magazines that college students are likely to read.

All passages in this section of the MCAT exam consist of multiple paragraphs and require thoughtful reading. Students must grasp the meaning of each paragraph and also identify the relationships across paragraphs. Additionally, students need to attend to the authors’ stated and unstated assumptions and to the rhetorical choices they have made to develop stance, voice, and style. Some passages require an understanding of the authors’ interpretations, implications, or applications of historical accounts, theories, observations, or societal trends.

The questions that follow the passages require their own focused kinds of reading, analyzing, and reasoning because many ask students to think about the passages from different perspectives or to question the authors’ statements, judge the relevance of the authors’ examples, or consider crucial facts that might challenge the authors’ assertions or analysis. It is important to keep in mind that the questions on this section do not rely on specific background knowledge in the humanities and social sciences. Students get all the information they need to answer the questions in the accompanying passages or in the questions themselves.

The Critical Analysis and Reasoning Skills section assesses three broad critical analysis and reasoning skills: Foundations of Comprehension, Reasoning Within the Text, and Reasoning Beyond the Text. The major elements of each skill are described in Figure A.4.

Figure A.4. Analysis and reasoning skills tested on the Critical Analysis and Reasoning Skills section.

<table>
<thead>
<tr>
<th>Critical Analysis and Reasoning Skills</th>
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</thead>
<tbody>
<tr>
<td><strong>Foundations of Comprehension</strong></td>
<td>Questions measuring Foundations of Comprehension ask examinees to demonstrate their information-processing skills by:</td>
</tr>
<tr>
<td>• Understanding the basic components of the text, such as the main idea of the passage, the conclusions drawn by the author, and the intended meaning of specific words or phrases.</td>
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<tr>
<td>• Inferring meaning from rhetorical devices, word choice, and text structure, such as the use of loaded adjectives that reveal whether an author is objectively conveying factual information or a bias about an issue, the use of point-counterpoint to describe two perspectives on an issue, or the use of sarcasm or symbolism that signals that words should not be taken literally.</td>
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<tr>
<td><strong>Reasoning Within the Text</strong></td>
<td>Questions measuring Reasoning Within the Text ask examinees to demonstrate their information-processing skills by:</td>
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<tr>
<td>• Integrating different components of the text to increase comprehension or analysis, such as identifying sections of a passage that support an author’s position, identifying assumptions that underlie a position taken, distinguishing between opinion and fact, or judging the veracity of an argument.</td>
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<tr>
<td><strong>Reasoning Beyond the Text</strong></td>
<td>Questions measuring Reasoning Beyond the Text ask examinees to demonstrate their information-processing skills by:</td>
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<tr>
<td>• Applying or extrapolating ideas from the passage to new contexts, situations, possibilities, alternatives, options, or proposals, such as identifying a new scenario that is consistent with an author’s point of view or a relationship described in the passage.</td>
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<tr>
<td>• Assessing the impact of introducing new factors, information, or conditions to ideas from the passage to evaluate students’ understanding that inferences and conclusions may change in the face of new information.</td>
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</table>
Appendix B. Summary of MCAT Total and Section Scores

MCAT Total Scores and Percentile Ranks in Effect May 1, 2018–April 30, 2019

<table>
<thead>
<tr>
<th>Total Score</th>
<th>Percentile Rank</th>
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<tbody>
<tr>
<td>472</td>
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Notes

- The column labeled "Percentile Rank" provides the percentage of scores equal to or less than each score point. These percentile ranks are based on all MCAT results from the 2015–2017 testing years combined. For example, 76% of MCAT total scores were equal to or less than 508 across all exams administered in 2015–2017 combined.
- Updates to the percentile ranks will be made on May 1st each year and will be based on exams administered in the three most recent test administration years.
MCAT Section Scores and Percentile Ranks in Effect May 1, 2018–April 30, 2019

Chemical and Physical Foundations of Biological Systems

Critical Analysis and Reasoning Skills

Biological and Biochemical Foundations of Living Systems

Psychological, Social, and Biological Foundations of Behavior

<table>
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<th>Total Score</th>
<th>Percentile Rank</th>
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Using MCAT® Data in 2019
Medical Student Selection