

SAT Content Area Benchmarks: An Analysis Conducted by Research and Development for the National Assessment Governing Board (NAGB)

By Jeffrey N. Wyatt, Mylene Remigio, and Wayne J. Camara

Introduction

In 2011, the College Board developed the SAT College and Career Readiness Benchmark to assist educators and policymakers in their efforts to better evaluate the college readiness of their students. This benchmark was designed to identify the point on the SAT scale that is indicative of students' having a high likelihood of success in college which was defined as a 65 percent probability of obtaining a first year GPA (FYGPA) of 2.67 (B-) or higher. This criteria was informed by a panel of expert educators and policy makers convened by the College Board in 2007 (Kobrin, Patterson, Wiley, and Mattern, 2012).

There are several advantages in using FYGPA as an outcome variable to measure college readiness. FYGPA encompasses all of the courses a student completes during his or her first term and often represents approximately 25 percent of the courses a student will complete during college. In addition, courses taken during a students' first year are typically more uniform than those taken during subsequent years, making it a more appropriate measure of general preparedness (Wiley, Wyatt and Camara, 2010). Research has established a strong correlation between FYGPA and retention, and the likelihood of continuing college for four years increases substantially for students with higher FYGPAs (Allen, 1999; Murtaugh, Burns, & Schuster, 1999).

One limitation of the college readiness benchmark is that it is not linked to content specific performance and may include a different range of subjects for different students. However, establishing a content related SAT section score benchmark based on a single specific course (e.g. SAT Math to College Algebra) would exclude a large percent of freshmen students who did not take that particular course (Shaw and Patterson, 2010). One way to address this limitation is to develop a benchmark which corresponds to performance in several freshmen courses within a content area(s). Accordingly, the College Board has calculated benchmarks that link SAT section scores to performance in multiple related freshmen college courses. Critical Reading section scores (SAT-CR) were linked to performance in courses which require extensive reading assignments, Math section scores (SAT-M) were linked to performance in math courses, and Writing section scores (SAT-W) were linked to performance in courses which typically require writing.

Data and Methodology

The data were obtained from a sample of 199,366 SAT takers who self reported their HSGPA, graduated high school in 2009 and attended one of the 131 four-year colleges and universities that participated in the College Board's validity study. These institutions provided information on first year course titles, grades and credit hours earned. Titles were used to identify courses utilizing reading and writing skills as well as courses in math and related subjects (see Table 1). The decision to link SAT-CR to all courses likely to have extensive reading requirements rather than solely English courses was driven both by content considerations and empirical evidence. From a content perspective, both the Common Core College Readiness standards and the National Assessment of Educational Progress (NAEP) framework emphasize the use of informational text¹ that prepares students for reading material in a variety of areas including social science, history, science, and technical areas (Camara and Quanemoen, 2012; Common Core State Standards, n.d). From an empirical perspective, performance on AP Exams in English, history, and social science is moderately to strongly correlated with both PSAT CR and PSAT W section scores (Ewing, Camara, and Millsap, 2006). This suggests that reading and writing skills are related to success in entry level college courses in these subjects.

Thus, SAT section scores were linked to college level performance in coursework in the subject areas as described in Table 1. SAT section scores were linked to content specific FYGPA's rather than to individual course grades to provide a more complete picture of student performance than would individual course grades alone.

¹ The NAEP framework recommends that 12th graders reading material be comprised of 70% informational text.

Table 1: Course Content areas that Comprise Content Area FYGPA's

Content Area FYGPA:	Reading	Writing	Math	Math & Science	STEM
Included Coursework	<ul style="list-style-type: none"> - Business & Communications - English (excluding writing) - History - Humanities - Social Science 	<ul style="list-style-type: none"> - Business & Communications - English - History - Humanities - Social Science 	-Math	<ul style="list-style-type: none"> - Math - Science 	<ul style="list-style-type: none"> - Math - Science - Computer Science - Engineering

Data Analyses

Logistic regression was used to compute the SAT content benchmarks. Logistic regression is a statistical method that uses one or more predictor variables (in this case, an SAT section score) to predict a binary outcome (e.g. achieving a content FYGPA of 2.67 or higher). A series of separate logistic regression equations were estimated for each of the five content areas (see Table 1) using the SAT section score as the predictor variable and the dichotomized content area FYGPA (e.g. 0 if below 2.67 and 1 if 2.67 or higher) as the outcome variable.

SAT section benchmarks were established for each of the 131 institutions participating in the College Board validity study. Any out of range institution-level benchmark (e.g. lower than 200 or higher than 800) was excluded² and the remaining institution level benchmarks were averaged, weighted by the institution-level sample sizes. A total of eighteen benchmarks were computed for each content area using six probability levels (from 50% to 75%) and three content area FYGPA's (i.e. 2.00, 2.67, and 3.00).

Results

Table 2 includes results for each of the logistic regressions. This table contains the maximum number of institutions (K) and the sample size (N) for each subject area analysis, the K and N used to create each of the eighteen benchmarks³, and the SAT content benchmark score. The content benchmark scores associated with a 65% probability of obtaining a 2.67 or higher are highlighted. These parameters were recommended by the College Board's panel of educators and policy makers, although it should be noted that these recommendations were made based on overall FYGPA and not content specific FYGPA's⁴. The content benchmark scores associated with a 65% probability of obtaining a content FYGPA of 2.67 or higher were 500 on SAT CR (to "reading" course FYGPA's⁵); 470 on SAT W (to "writing" course FYGPA's); and, 610 - 630 on SAT M, depending on the college course composition. The benchmark SAT M score associated with a FYGPA comprised strictly of math courses was 630; the SAT M benchmark score associated with a combined math/science FYGPA is 620; and the SAT M benchmark score associated with a STEM FYGPA is 610.

The College Board now has a suite of college readiness benchmarks that provides information for a variety of purposes and objectives. The SAT College and Career Readiness benchmark of 1550 provides an indicator of overall student readiness while the SAT content benchmarks provide a measure of student readiness within specific content areas.

² The number of institutions that were excluded because of out-of-range SAT values can be calculated from Table 2 by subtracting "K" from 131.

³ Schools whose benchmark score falls below 200 or above 800 were dropped and the number of valid institutions can differ between benchmarks. More schools had "out of range" benchmark scores when 2.00 was used as the content GPA outcome (than 2.67 or 3.00) as there was less variability associated with achieving this outcome.

⁴ For more information see http://professionals.collegeboard.com/profdownload/pdf/10b_2084_DevMultiDimenRR_WEB_100618.pdf

⁵ See Table 1 for the course categorizations

Table 2: SAT Scores Associated with a Given Probability of Obtaining First Year Course Content GPA

Course	Probability	Course Grade								
		2.00			2.67			3.00		
		K	N	SAT	K	N	SAT	K	N	SAT
SAT CR	50%	55	78,156	260	126	184,526	410	130	186,061	480
To	55%	65	95,963	280	129	185,899	440	131	186,282	510
“Reading” Courses	60%	75	106,630	300	129	185,899	470	131	186,282	540
(K = 131)	65%	83	125,284	310	130	186,061	500	131	186,282	570
(N = 186,282)	70%	94	143,432	340	131	186,282	530	130	185,051	590
	75%	98	147,238	370	131	186,282	560	130	185,051	630
SAT W	50%	56	79,531	250	124	185,286	400	131	193,974	470
To	55%	67	95,671	270	128	191,975	420	131	193,974	490
“Writing” Courses	60%	72	106,630	290	130	193,285	440	131	193,974	520
(K = 131)	65%	83	122,802	300	131	193,974	470	131	193,974	540
(N = 193,974)	70%	93	141,746	320	131	193,974	500	131	193,974	570
	75%	104	156,964	350	131	193,974	530	131	193,974	600
SAT Math	50%	108	120,463	350	129	142,609	520	131	143,665	570
To	55%	115	129,834	370	130	142,864	560	131	143,665	600
All Math Courses	60%	121	134,553	400	130	142,864	590	131	143,665	640
(K = 131)	65%	124	141,195	430	130	142,864	630	128	139,892	670
(N = 143,665)	70%	126	141,728	470	129	140,977	660	122	131,485	700
	75%	129	142,509	510	122	133,765	700	109	110,658	720
SAT Math	50%	114	161,190	350	130	175,439	530	130	175,496	600
To	55%	117	163,215	380	130	175,439	560	128	173,633	620
Math/ Science Courses	60%	120	163,996	410	129	174,229	590	128	173,633	650
(K = 131)	65%	128	173,875	430	129	174,229	620	127	171,387	680
(N = 175,654)	70%	131	175,654	460	128	173,633	650	124	163,256	710
	75%	130	174,387	500	127	171,387	680	109	142,646	730
SAT Math	50%	115	165,538	350	130	178,540	520	129	177,323	590
To	55%	115	165,538	380	130	178,540	550	129	177,323	620
STEM Courses	60%	122	168,330	400	129	177,323	580	128	176,705	650
(K = 131)	65%	125	170,317	430	129	177,323	610	125	173,753	670
(N = 178,755)	70%	129	177,337	460	128	176,705	640	123	169,840	700
	75%	129	177,100	500	126	173,921	670	112	152,925	730

References

- Allen, D. (1999). Desire to finish college: An empirical link between motivation and persistence. *Research in Higher Education*, 40, 461–485.
- Camara, W. J. and Quenemoen, R. (2012). *Defining and Measuring College and Career Readiness and Informing the Development of Performance Level Descriptors (PLDs)*. Commissioned white paper for PARCC. Available at <http://www.parcconline.org/sites/parcc/files/PARCC%20CCR%20paper%20v14%201-8-12.pdf>
- Common Core State Standards Initiative. (n.d.). Retrieved from: <http://www.corestandards.org/the-standards/english-language-arts-standards/introduction/key-design-considerations/>
- Ewing, M., Camara, W. J., & Millsap, R. E. (2006). *The relationship between PSAT/NMSQT scores and AP Examination grades: A follow up study*. (College Board Research Report No. 2006-1). New York: The College Board. Retrieved from: <http://professionals.collegeboard.com/profdownload/pdf/06898CBR06-1.pdf>
- Kobrin, J. L., Patterson, B. F., Wiley, A., & Mattern, K. D. (2012). *A standard-setting study to establish college success criteria to inform the SAT college and career readiness benchmark* (College Board Research Report No. 2012-3). New York: The College Board. Retrieved from: http://professionals.collegeboard.com/profdownload/pdf/10b_2084_DevMultiDimenRR_WEB_100618.pdf
- Murtaugh, P. A., Burns, L. D., & Schuster, J. (1999). Predicting the retention of university students. *Research in Higher Education*, 40, 355–371.
- Shaw, E. J., and Patterson, B. F. (2010). *What should students be ready for in college? A first look at coursework in four year postsecondary institutions in the U.S.* (College Board Research Report 2010-1). Retrieved from http://professionals.collegeboard.com/profdownload/pdf/10b_1417_FirstYrCollCourseRR_WEB_100611.pdf
- Wiley, A., Wyatt, J., & Camara, W. J. (2010). *The development of a multidimensional college readiness index* (College Board Research Report No. 2010-3). New York: The College Board. Retrieved from: http://professionals.collegeboard.com/profdownload/pdf/10b_2084_DevMultiDimenRR_WEB_100618.pdf
- Wyatt, J., Kobrin, J., Wiley, A., Camara, W. J., & Proestler, N. (2011) *SAT Benchmarks: Development of a college readiness benchmark and its relationship to secondary and postsecondary school performance*. (College Board Research Report No. 2011-5). New York: The College Board. Retrieved from: <http://professionals.collegeboard.com/profdownload/pdf/RR2011-5.pdf>